



Rural Renewable Energy Project (RREP) in Sierra Leone

Baseline Report for the conduct of the Impact Evaluation (Work Package 2)

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List of Acronyms

CHC	Community Health Centre
DAC	Development Assistance Committee
DfID	Department for International Development
DHMT	District Health Management Team
DMO	District Medical Officer
EMIS	Education Management Information System
ENFO	Energy for Opportunity
ESMAP	Energy Sector Management Assistance Programme
EWRC	Electricity & Water Regulatory Commission
FGD	Focus Group Discussion
FQSE	Free Quality School Education
GoSL	Government of Sierra Leone
GST	Government Sales Tax
KII	Key Information Interview
kWP	Kilowattpeak
MoE	Ministry of Energy
MCC	Millennium Challenge Corporation
MoHS	Ministry of Health and Sanitation
M&E	Monitoring and Evaluation
MTNDP	Medium Term National Development Plan 2020-2023
OECD	Organisation for Economic Co-operation and Development
PI	Principal Investigator
RE	Renewable Energy
RBF	Results Based Finance
RREP	Rural Renewable Energy Project
SEC	Social Sciences Ethics Committee
SLESRC	Government of Sierra Leone Ethics and Scientific Review Committee (SLESRC)
SLL	Sierra Leonean Leone
SLPP	Sierra Leone People's Party
sPV	Solar Photovoltaic
ToC	Theory of Change
UNOPS	United Nations Office for Project Service
WHH	Welthungerhilfe
WP	Work Package
WUR	Wageningen University and Research

Executive Summary

The United Nations Office for Project Services (UNOPS) is supporting the Government of Sierra Leone's (GoSL) goal of universal access to electricity by implementing the US\$40+ million Rural Renewable Energy Project (RREP). RREP – funded by the UK Department for International Development (DfID) – is an ambitious electrification project that will provide access to off-grid solar electricity to up to 97 communities in Sierra Leone by 2020.

Sierra Leone is one of the world's poorest countries, ranking 179th out of 188 countries in the Human Development Index in 2020. In Sierra Leone, only 2.5 percent of the population in rural areas have access to electricity¹. Poor access to electricity is recognised as a binding constraint to long-term economic growth in Sierra Leone.

RREP is expected to improve Sierra Leone's economic development through an increase in access to rural energy resources. Increased access to sustainable energy is expected to increase welfare in rural communities by improving income, health, and education and lowering fuel expenses and Green House Gas emissions.

This Baseline Report is the first part of the RREP Impact Evaluation to quantify the effects of the RREP intervention by gathering and analysing primary and secondary data sources in light of the project logframe and Theory of Change. To understand the impact of mini-grids, we will look at the following four "Impact Domains", as advised in the project design documents.

1. Does increased access to electricity increase incomes and assets?
2. Does increased access to electricity improve the health conditions?
3. Does increased access to electricity increase school attendance?
4. Does increased access to electricity reduce CO₂ emission?

The evaluation strategy compares a representative sample of households in communities where mini-grids were installed as part of RREP with a representative sample of households in similar communities where no mini-grid was installed. While households from communities where RREP WP2 is going to be implemented are largely similar to households in communities that are used as comparison communities, important differences are present at baseline. For example, RREP communities have higher levels of certain wealth indicators, such as total livestock ownership and ownership of electrified assets. As detailed in the report, we find it likely these differences are pre-existing at baseline, rather than brought on by RREP. We use a difference in difference estimation strategy that accounts for these pre-existing differences.

Several findings from the baseline data stand out:

Income and Assets

Most households grow staple crops at subsistence levels, as opposed to higher valued cash crops. Out of the households surveyed, 63 percent grow rice and 43 percent grow cassava. Comparatively the proportion of households who grow cocoa is 17 percent, and an even lower proportion grow coffee, at 8 percent. Out of those growing staple crops, more than 20 percent of the rice harvested is sold at market,

¹ <https://www.se4all-africa.org/seforall-in-africa/country-data/sierra-leone/>

and roughly 30 percent of cassava produced is sold at market. Agricultural production is not statistically different between treatment and control sites in most cases.

Households working in the non-agricultural sector are more likely to be self-employed rather than hired by an organization. About a quarter of the sample (24 percent) are self-employed, the most prevalent of which are low-earning traders. Telecentres and taxi drivers are the most lucrative but make up less than 2 percent of self-employed. Only 5 percent are employed by an organization and make a salary. Households in treatment sites are more likely to be self-employed compared to control (25 percent vs 22 percent) and employed by an organization (5.5 percent vs 3.6 percent). However, we find that earnings are not statistically different between the two groups.

Livestock ownership is high, but most animals owned are of low value. Nearly 90 percent of households own chickens (a low value animal), while less than 7 percent own cows, the highest value livestock. Treatment communities have on average more goats per household than control communities; this difference is statistically significant at the 90 percent level.

There is little ownership of productivity enhancing electrified assets, such as freezer (2 percent), sewing machine (2 percent) and electric stove (0.05 percent). Of our full sample, the most commonly owned electrified assets are for communication (phone 64 percent) and entertainment (DVD equipment 7 percent, televisions 4 percent, and stereo 4 percent). We do find that ownership of freezers is higher in the treatment group compared to the control group (3.6 percent vs 1percent). Ownership of mobile phones is also 15.3 percentage points higher in the treatment group compared to the control group (72 percent vs. 56.7 percent). These differences are statistically significant.

Health Conditions

Many respondents in the sample reported suffering from acute respiratory infection (ARI), and malaria in the 30 days prior to being interviewed (23 percent and 35 percent respectively). More women reported suffering from malaria in the past month than men. Children are more heavily impacted by ARI. Around 32 percent of children under the age of 5 suffered from ARI compared to 17.9 percent of those over 5.

Health seeking behaviour for those suffering from malaria and ARI is high. 76 percent of those suffering from malaria-like symptoms sought treatment at the community health centre. For those who suffered from ARI-like symptoms, 61 percent sought treatment at the community health centre. There are no statistically significant differences between treatment and control sites in any of these health indicators.

In line with existing data, maternal and child mortality rates are high. 0.2 percent of households that reported a pregnancy in the past year reported that a woman died during pregnancy or delivery over the past year. 1.2 percent of households with at least 1 pregnancy in the past year experienced at least 1 stillbirth.

Education

Enrolment rates and attendance rates are high in our sample. Eighty-nine percent of sampled school age children are enrolled in school, with around 92.67 percent not missing a day of school in the past week. 5.56 percent report missing school 1 to 2 days in the past week. Students in the treatment groups are more likely to be enrolled (89.57%) compared to control groups (88.2%) and both groups report missing an average of 1.6 days of school in the past week. However, neither of these differences are statistically significant.

Children spend on average 7.7 hours each week studying at home, or a little more than an hour each day. Children spend more time studying in a week compared to other time uses such as household chores (7 hours), and farm work (3.6 hours). School age children in treatment groups study on average 0.7 more hours compared to children in control groups (8.1 hours vs. 7.4 hours). This difference is not statistically significant.

CO2 Emissions

There is much room for reduction of CO2 emissions through changes to household appliances. Over 99 percent of households use wood/charcoal as either a primary or secondary source of cooking energy. When broken down, 73 percent of households get their primary or secondary source of cooking energy from collected firewood, while another 16.35 percent purchase firewood, and nearly 20 percent purchase charcoal. Few households at baseline are using electric stoves. Rates of household ownership of electric stoves hover near zero at 0.1% - 0.3%. There is no statistically significant difference between electric stove ownership in treatment and control communities.

Gender Equality

Gender differences were striking for respondents who classified themselves as self-employed outside of agriculture. The mean profit for men is about 511,940 SLL per month. Women report a profit of 251,260 SLL per month, significantly less than men. This earnings gap can be explained by differences in occupations. For instance, we find that women are more likely to work in low earning occupations such as petty trading (39.5 percent) compared to men (13.6 percent).

In terms of health, more women reported suffering from malaria in the past month than men. However, women are more likely to seek treatment for their illness compared to men.

There are no statistically significant differences in school enrolment rates or attendance rates between boys and girls. However, we do find that boys are reported to study more than girls and this difference is statistically significant. Girls are found to spend more time each week doing household chores compared to boys. This difference in time spent on household chores could be driving the gender gap in study time.

Disability

Of the 7,846 respondents surveyed (across treatment and control groups), 2 percent report having difficulty hearing, remembering, or with self-control. 6 percent of respondents report difficulty seeing, and 6 percent report difficulty walking. Overall, 14 percent of individuals report having at least one disability (note that each individual can suffer from more than one disability). More men have a disability related to vision (6 percent) and hearing (2.53 percent) compared to women (vision 4.92 percent, hearing 1.58 percent).

Recommendations

The report concludes with six recommendations targeted at both policy makers and UNOPS. These recommendations aim to enhance program adaptivity and relevance. Detailed recommendations will follow in the mid-term and final evaluation reports.

Recommendation 1: Policy interventions that support private sector development should adopt a “value chain approach” and be rigorously tested.

Recommendation 2: Policy interventions that increase the adoption of productive electrified assets should be developed and rigorously tested.

Recommendation 3: The welfare benefits of policy interventions that a) support the adoption of productive technologies and b) support private sector development should be rigorously measured. Our fourth recommendation is based on findings from focus group discussions.

Recommendation 4: Policy interventions aiming at improving gender equality should consider intra household dynamics and support bargaining position of women.

Recommendation 5: Policy interventions aiming at increasing returns to education should consider combining access to electricity at school with the adoption of learning technologies.

Recommendation 6: To increase the value of lessons learnt from the impact evaluation, endline data collection should be postponed and a midline data collection for Work Package 2 (taking place in October-December 2020) should be included.

Section 1: Introduction

1.1 Background to The Rural Renewable Energy Project

In an effort to support the Government of Sierra Leone (GoSL) towards universal access to electricity, the United Nations Office for Project Services (UNOPS) is implementing the US\$40+ million Rural Renewable Energy Project (RREP), an ambitious electrification project that will provide access to off-grid solar electricity to up to 94 communities in Sierra Leone by 2020. The RREP targeted large rural towns (often chiefdom headquarter towns) throughout the country that are regional focal points for economic and social life. The RREP is funded by the UK Department for International Development (DfID) and implemented in collaboration with the GoSL Ministry of Energy and UNOPS.

The provision of off-grid solar electricity will take place in different phases. In phase 1 of the project (Work Package 1), 54 community health centres across the country were provided electricity. In the next phase (Work Package 1+), 50 solar mini-grids have been set up in 50 communities across different districts of the country. In Work Package 2, 44 additional mini-grids will be set up and managed by private sector operators. It is anticipated that Work Package 1+ and Work Package 2 will lead to more households becoming connected to electricity.

There are currently three private sector operators involved in the RREP, brought in through a competitive international tender for operations and maintenance of the 50 existing sites; and to operate, maintain and co-invest in 44 additional, larger mini-grids. The sites have been split into four geographical lots, with Off-Grid Power awarded two; Winch Energy awarded one; and Energiciti (a subsidiary of Ghana-based Blackstar) awarded one. Off Grid Power has since been bought by PowerGen, who also head the African Mini-Grid Association. The operators are now in the process of finalizing their debt and equity financing, mobilizing in country, and going through site handover processes.

While the Impact Evaluation focuses only on Work Packages 1/1+ and 2, there are four remaining Work Packages: Work Package 3 focuses on providing technical capacity building to government and private sector partners; Work Package 4 was an amendment to the initial contract to support the response to landslide and flooding; Work Package 5 focuses primarily on monitoring and evaluation; and Work Package 6 is focused on private sector engagement and strengthening to promote use economies in mini-grid catchment areas.

The expected impact of the project is that it will improve Sierra Leone's economic development through an increase in access to rural energy resources. In doing so it expects to increase the welfare in rural communities in terms of saved fuel costs, improved income, improved health and education outcomes, and lower Green House Gas emissions. The project intends to enhance, in an integrated way, energy security, business start-ups, reduction of local pollution and improvement of the livelihoods and living conditions of the local communities, with special attention to vulnerable groups, including women and young people.

The overall outcome of the project is improved rural renewable energy access through private sector involvement. It is estimated that approximately 300,000 direct beneficiaries in rural Sierra Leone will be connected to electricity, with a further 480,000 indirectly benefitting from access to low carbon electricity

over the 48 months project lifetime. More than half a million Sierra Leoneans living in remote and rural areas will benefit overall from the project and will be provided with universal access to electricity.²

1.2 Country Context

Sierra Leone is one of the world's poorest countries, ranking 179th out of 188 countries in the Human Development Index in 2020.³ Poverty is widespread with more than 56.8 percent of the population living below the national poverty line.⁴ The country has an increasingly young population, with about 42 percent of the population aged under 15. Youth unemployment is also high, at 60 percent.

The new Government has made education a top priority for the country. President Maada Bio's Sierra Leone People's Party (SLPP) manifesto prioritises the Free Quality School Education (FQSE) initiative, launched in August 2018. The FQSE aims to provide free education to 1.5 million children in Government and Government-assisted schools.⁵

Health outcomes in Sierra Leone are poor. A critical shortage of skilled health personnel is compounded by the majority of health workers working in urban areas (for example, 40 percent of all midwives serve in Freetown). Maternal mortality is the highest in the world with 1,360 deaths per 100,000 live births, caused primarily by preventable causes. Sierra Leone also has the 4th highest under-five mortality rate in the world, again with the majority of these deaths a result of easily preventable causes.⁶

Multidimensional child poverty rates are high in Sierra Leone, with 8 out of every 10-children deprived in at least one dimension. The Gini coefficient stands at 35.4.⁷ Over seventy percent of Sierra Leonean children are poor, suffering a violation of at least one of their basic rights. Rural areas have a higher incidence of child poverty than urban areas.⁸

In Sierra Leone, only 2.5 percent of the population in rural areas have access to electricity.⁹ Poor access to electricity is recognised as a binding constraint to long-term economic growth in Sierra Leone¹⁰. Policy makers, donors, and international development organisations have made universal access to electricity a priority in Sierra Leone as a result.

The Government's Medium-Term National Development Plan 2019-2023 (MTNDP) outlines its key policies for the next four years.¹¹ By 2023 the Government plans to:

² RREP Project Brief, 14 September 2018

³ Human Development Index (HDI) by Country Population. (2020-02-17). Retrieved 2020-03-05, from [http://worldpopulationreview.com/countries/human-development-index-\(hdi\)-by-country/](http://worldpopulationreview.com/countries/human-development-index-(hdi)-by-country/)

⁴ https://www.statistics.sl/images/StatisticsSL/Documents/SLIHS2018/SLIHS_2018_New/sierra_leone_integrated_household_survey2018_report.pdf

⁵ The New Direction

⁶ UNICEF Situation Analysis 2019

⁷ <http://hdr.undp.org/en/content/income-gini-coefficient>

⁸ UNICEF Situation Analysis 2019

⁹ World Bank SE4ALL

¹⁰ Rural Renewable Energy Project Brief, UNOPS, 2018

¹¹ Medium Term National Development Plan 2020-2023, GoSL, 2019

1. Embark on increasing electricity generation, transmission, and distribution.
2. Improve on the policy and regulatory environment of the energy sector.
3. Restore electricity supply to all district headquarter towns and cities.
4. Increase investment in low-cost renewable energy (solar, hydro, wind, and biomass) production and distribution.
5. Improve governance at all levels of the sector – the Ministry of Energy, the Electricity Distribution and Supply Authority, the Electricity Generation and Transmission Company, and the Electricity and Water Regulatory Commission – to develop responsible leadership and institutional culture.
6. Ensure expansion of the transmission grid nationwide by increasing the annual regular kilometric coverage.
7. Ensure rural electrification is carried out through engagement and involvement of key stakeholders, including the private sector.

The GoSL approved the Electricity & Water Regulatory Commission's (EWRC) mini-grid regulations in 2019. This has provided clarity on licensing, grid arrival and the tariff formula for mini-grid operators and indicates a long-term commitment to the sector. GoSL is agreeing tariffs and contracting processes with the three operators based on the mini-grid code in the regulations. There is also extension of tax incentives as part of a wider commitment to the off-grid sector in the Finance Act, which includes provisions for a duty waiver and Government Sales Tax (GST) extension.

The Ministry of Energy is undertaking a Multi-Tier Framework survey to provide data on energy consumption (including mini-grids).

Three other grids have been constructed in Sierra Leone by Welthungerhilfe (WHH), with funds from the European Union, plus one constructed by Energy for Opportunity (ENFO), funded by the Economic Community for West African States' (ECOWAS) Centre for Renewable Energy and Energy Efficiency.

A number of other organisations are looking at market entry in Sierra Leone, including Cross Boundary Energy and Power Corner. Several are leveraging scale up opportunities in the region. For example, the Millennium Challenge Corporation's (MCC) Results Based Finance (RBF) programme is funding 40 mini-grids with 8 new companies in Benin. Some of these organisations are looking closely at growth opportunities in Sierra Leone.

1.3 Impact Evaluation of the RREP

This Baseline Report is the first part of the RREP Impact Evaluation to quantify the effects of the UNOPS RREP intervention in Sierra Leone by gathering and analysing primary and secondary data sources. The evaluation strategy compares beneficiary households in communities where mini-grids will be installed as part of RREP with households in similar communities where no mini-grid was installed. The Impact Evaluation will generate lessons and recommendations that can be used in the design and implementation of similar interventions in Sierra Leone and elsewhere in the world.

The Impact Evaluation will also assess the Value for Money of different mini-grid interventions; whether the respective projects have been efficiently implemented; and whether the interventions were, as a whole, worthwhile. This will enable the IE report’s end-users to:

- a. Build the evidence base for further off-grid rural electrification projects across the African continent and beyond
- b. Build the evidence base for a model for public-private partnership in rural renewable energy provision
- c. Report to beneficiaries, stakeholders and donor on what has been achieved through the project life.

The primary evaluation question of the Impact Evaluations is: What is the impact of mini-grids installed in WP1/1+ and WP2 as part of RREP? To understand the impact, we will look at the following four “Impact Domains”.

1. Does increased access to electricity increase incomes and assets?
2. Does increased access to electricity improve the health conditions?
3. Does increased access to electricity increase school attendance?
4. Does increased access to electricity reduce CO₂ emission?

In addition, the impact evaluation will investigate the effects of RREP on different gender and disability groups and ages. It will assess whether there are unintended positive or negative consequences of electrifying rural communities through solar mini grids; and how the effects of electrification change over time.

Table 1: Timeline of Key Evaluation Activities

Key Evaluation Activity	Key Timelines
1. Baseline WP1/1+	
<i>Develop methodology</i>	<i>March – April 2019</i>
<i>Design sampling</i>	<i>April – May 2019</i>
<i>Deliver inception report</i>	<i>May 2019</i>
<i>Data collection</i>	<i>June – July 2019</i>
<i>Deliver baseline report</i>	<i>August 2019</i>
2. Baseline WP2	
<i>Develop methodology</i>	<i>September 2019</i>
<i>Design sampling</i>	<i>September 2019</i>
<i>Deliver inception report</i>	<i>September 2019</i>
<i>Data collection</i>	<i>October - December 2019</i>
<i>Deliver baseline report</i>	<i>February 2020</i>
3. Midterm WP1/1+	
<i>Deliver inception report</i>	<i>April 2020</i>
<i>Data collection</i>	<i>April 2020</i>
<i>Deliver midterm assessment</i>	<i>June 2020</i>
4. Endline	
<i>Deliver inception report</i>	<i>February 2021</i>
<i>Data collection</i>	<i>February – March 2021</i>
<i>Deliver midterm assessment</i>	<i>June 2021</i>

The Impact Evaluation will follow the Organisation for Economic Co-operation and Development's (OECD) Development Assistance Committee's (DAC) criteria and its standards for evaluating development assistance.¹² Specifically the Impact Evaluation will look at the relevance, effectiveness, efficiency, impact and sustainability of the RREP's intervention, specifically related to its intended impact using a quasi-experimental evaluation design.

The Impact Evaluation will evaluate the theory of change's (ToC) impact and outcomes. It will focus solely on the medium-term impact of increased access to electricity on individuals and households.

1.4 RREP Theory of Change

Figure 1 shows the ToC of the mini-grids created under RREP, describing the mechanisms through which access to electricity is expected to impact the desired outcomes. The theory of change describes *how* the inputs of the project are expected to lead to improved outcomes and, ultimately, positively impact the targeted population.

The different components of the theory of change are:

- **Challenges:** Sierra Leone faces key development challenges relates to low access to energy and underdevelopment
- **Inputs:** resources invested in the construction of mini-grids as part of RREP
- **Outputs:** specific realizations of the programme. In what way were resources deployed?
- **Outcomes:** expected changes to key indicators as a result of the construction of mini-grids. Outcomes explain how outputs can lead to the desired impact.
- **Impact:** Medium term (2 year) effects of mini-grids on impact indicators. Used to determine if the programme meets its objectives.

While the intended impact has been described above, below are the RREP's outputs, outcomes and assumptions.

1.4.1 Outputs

- 1) Electrification of Community Health Centres (CHC) and extension of the mini-grids to households communities (WP-1 and WP-2). This provides access to reliable electricity to rural areas that otherwise are unpowered.
- 2) Private sector invests, operates and maintains generation and distribution equipment. Mini-grids are operated by private sector contractors. This leads to private sector engagement in investments, operations, and maintenance of the generation and distribution equipment.
- 3) Improved environment to support private sector investment, and commercial sustainability of off-grid electricity provision.

¹² <https://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm>

- 4) Increased demand for electricity provided through stimulation of private sector development. This sparks interest for private firms to explore business opportunities in rural areas.

1.4.2 Outcome

The evaluation team will collect information needed to assess the outcomes based on key outcome indicators. RREP initial outcome target: *“337,613 people (50 percent females) in rural Sierra Leone will directly benefit from access to low carbon electricity. Baseline value will be established which will be compared with the endline through the survey and triangulated through project reports and reports from the private sector energy suppliers.”*

1.4.3 Assumptions

A key area to examine over the course of the IE are the underlying assumptions of the ToC. The ToC assumes that the following will take place over the course of the project:

Output Level Assumptions

- CHCs will operate for longer hours following access to electricity
- Households are willing to pay
- GoSL remains committed to the intervention
- Private companies become interested in investing in rural areas due to increased opportunities
- Operations and maintenance are sufficient for effective supply
- Demand does not affect the stability of the mini-grids

Outcome Level Assumptions

- Households and businesses will choose to connect to the mini-grids
- There will be up to 1.8m indirect beneficiaries
- Vulnerable households are not discriminated against
- Women and girls benefit from increased access to electricity as much as men and boys

Impact Level Assumptions

- *Time saved through electrification will be spent on income generating activities by women and men*
- *Electrical appliances yield better results than non-electrical appliances*
- *Students will use the extra time they have available to study*
- *Households value renewable energy over fossil fuels*

These impact level assumptions will be considered across the IE at baseline, midterm, and endline research instruments. Understanding whether these assumptions are correct, particularly the attitudes and behaviours around how individuals use time saved as a result of access to electricity, will be critical to assessing the impact of the RREP.

1.4.4 Key Stakeholders

The key stakeholders and end users of this report include the Government of Sierra Leone, in particular the MoE and Ministry of Health and Sanitation (MoHS); development projects in Sierra Leone and sub-Saharan Africa; policy actors in Sierra Leone and sub-Saharan Africa; private sector solar operators; academics and research institutions; and consumers. (See Annex D for a full list of stakeholders.)

RREP Theory of Change (Oct 16 to Oct 20)

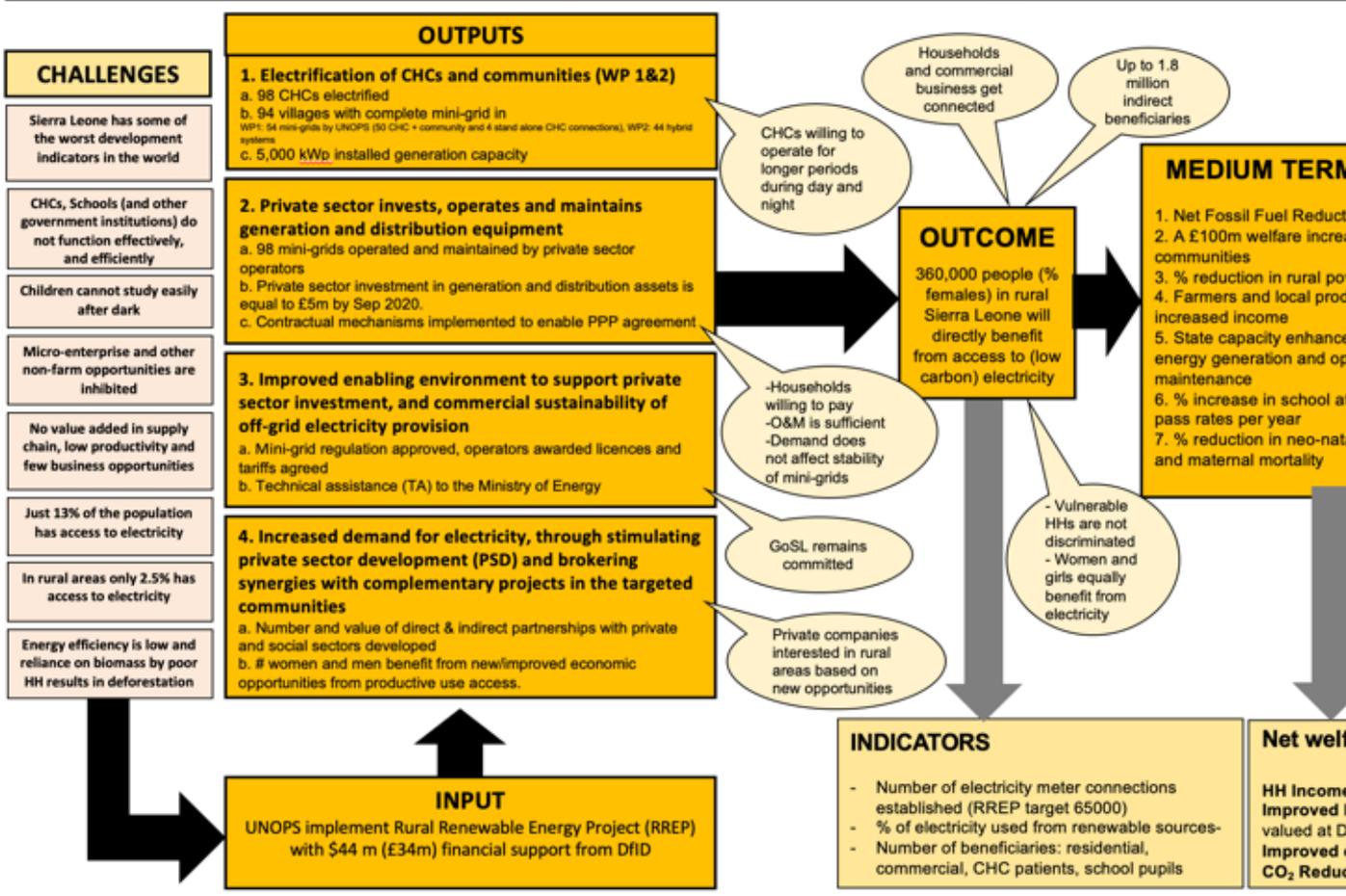


Figure 1: RREP Theory of Change

1.5 Governance of Baseline

UNOPS leads on the design and management of the baseline study for the impact evaluation of the RREP. UNOPS appointed Wageningen University and Research (WUR) and its partners, including Yale University and the International Growth Centre (IGC) for deliverables such as a baseline report for the RREP, summary factsheets and infographics amongst others.

UNOPS also engaged the M&E department of the Ministry of Energy in Sierra Leone as one of the key stakeholders to the design and conduct of the baseline study for the RREP. Throughout the Impact Evaluation process to date the Government has been engaged and its recommendations included in the evaluation approach. The Project Board is regularly updated on all the activities under the M&E workstream of the project.

Table 2: Overview of Baseline Governance

Partner Name	Roles and responsibilities
Wageningen University and Research (WUR)	<p>WUR is the evaluation manager for this impact evaluation. The WUR team is led by Maarten Voors, Research Coordinator. It employs several key personnel, including the Research Coordinator, the Research Associate, the Qualitative Researcher, Field Manager, Field Coordinator, and Enumerators.</p> <p>WUR is responsible for the following activities:</p> <ul style="list-style-type: none"> - Designing and delivering the evaluation strategy - Training interviewers and piloting research tools - Analysis for primary data and reporting - Data collection, processing and cleaning - Secondary data collection - Sharing key findings and lessons learned - Quality assurance and data quality - Validation workshops
Yale University	<p>Yale University is responsible for designing and developing the data collection tools, an evaluation design, as well as providing guidance to all team members on research methodology and implementation. It will also lead on data analysis and cleaning. Yale University contributions are overseen by the Team Leader, Mushfiq Mobarak.</p> <p>Yale University is responsible for the following activities:</p> <ul style="list-style-type: none"> - Development and finalization of data collection tools - Evaluation design - Training of enumerators - Analysis of all baseline, mid-term and endline data - Support with reporting - Data cleaning - Development of infographics

International Growth Centre (IGC)	<p>IGC is responsible for providing the Research Manager to oversee research design. The Research Manager, Niccolo Meriggi, will be based full-time in Sierra Leone.</p> <p>IGC is responsible for:</p> <ul style="list-style-type: none"> - Inputs into research design, methodology, data collection tools. - Data analysis from a local context - Facilitate building the evidence base for maximum policy impact. - Liaise with stakeholders (e.g., GoSL, UNOPS, DFID, Inensus), and between Key Personnel and field teams.
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1.6 Purpose of Baseline

The baseline report is the first of three processes of the impact evaluation that comprise the Impact Evaluation of the mini-grids intervention of RREP. The purpose of the Impact Evaluation is to estimate the effects of the mini-grids on community welfare and development. Specifically, WUR will evaluate socio-economic impacts across four key domains:

- Income and Assets
- Health Outcomes
- Education Outcomes
- CO₂(e) Reductions

The baseline data collection measures the target population’s current socio-economic status across those four key domains, prior to the intervention. The baseline data will then be compared against the mid- and end-line research to assess the medium-term impacts of the RREP’s mini-grids. For a detailed overview of the methodology see Section 2.

This baseline report focuses on UNOPS Work Package 2. This work package is in the process of installing stand-alone solar photovoltaic (sPV) systems in 43 communities. Unlike WP1 communities, sPV in WP2 communities will be “hybrid systems”, meaning that electricity will not only be produced with PV, but will likely be a combination of PV and fossil fuels. In addition, WP2 communities are expected to be bigger (i.e. larger population) than WP1 communities, and here the generation capacity of these “hybrid systems” is also higher (ranging between 200-250 KW). The generation capacity will be based on demand projections (currently being finalized by operators).

The baseline has taken place before the construction work of the sPV systems in WP2 communities began and before electricity access was provided to the households and businesses to enable us to track household and individual level changes following access to electricity.

The baseline findings are analysed in this report, and disseminated to stakeholders for insight into what changes could take place in communities as a result of the RREP. In addition to providing insights into the four key domains, the baseline explores two key areas: the first, current access to, and affordability of, energy among our target population. The second is qualitative insights into income generating activities that are currently taking place in communities. Both of these areas will serve to provide further insights for policy makers. (See Annex F: Knowledge Management Plan for further details.)

1.7 Baseline report structure

The findings section is structured around the key RREP research questions relating to the impact of the project.

Table 3: Key Baseline Research Questions and Structure of the Report

Key Baseline Research Questions	Report Section Addressing Questions
1. Does increased access to electricity increase incomes and assets?	Section 3.2
Agricultural production	
Non-agricultural activities	
Livestock and land ownership	
Household assets ownership	
2. Does increased access to electricity improve the health conditions?	Section 3.3
Acute Respiratory Infections (ARI)	
Eyesight	
Other disabilities	
Other disease prevalence	
Neo-natal and under-five mortality	
Maternal death	
3. Does increased access to electricity increase school attendance?	Section 3.4
Higher student attendance	
Improved literacy	
4. Does increased access to electricity reduce CO₂e emission?	Section 3.5
Reduced household fossil fuel consumption	

1.8 Data Ownership

UNOPS is the sole owner of all intellectual property, products, processes and documents that are developed for the baseline report and the Impact Evaluation. UNOPS has a perpetual license to use this intellectual property as it sees fit.¹³

¹³ https://content.unops.org/service-Line-Documents/Procurement/UNOPS-General-Conditions-Services-2017_EN.PDF

Section 2: Methodology

This section provides an overview of the methodology and data sources developed and used by the impact evaluation team led by WUR during the baseline assessment. Section 2.1 explains the approach to delivering the field work. Section 2.2 provides an overview of data cleaning processes. Section 2.3 explains the different streams of evidence employed to feed into the analysis. Section 2.4 explains the approach to measuring the impact of the thematic impact domains. Section 2.5 briefly covers the analytical approach used to report on baseline findings.

2.1 Approach to Delivering Fieldwork

The table below provides an overview of the approach to delivering the fieldwork.

Table 4: Approach to Delivering Fieldwork

Methodological Issue	Delivery approach	Reference for Annex
Research permission	WUR gained ethical and scientific approval for the entire impact evaluation research from the Office of the Sierra Leone Ethics and Scientific Review Committee (SLESRC). The approval is valid between 14 May, 2019 – 13 May, 2020.	Annex D
Sampling Approach	<p>To evaluate the impacts of the mini-grids installed under RREP, the impact evaluation team employed a Difference-in-Difference design, comparing changes in key indicators in communities where mini-grids were installed with communities where no mini-grids were installed. To see the logic of our identification strategy, consider that the ideal means to identify the welfare effects of the RREP would be to compare two types of villages that on average have the same characteristics before the intervention, i.e. during the baseline survey, except that one was randomly allocated to receive the RREP intervention and one was not. We would then measure key indicators in both types of villages during follow up surveys. If welfare indicators were different in the two villages, we would be able to credibly claim that this difference was due to the effect of the RREP intervention. However, villages that received the RREP programme are, by definition, not the same as those that did not receive the intervention.</p> <p>The location of the mini-grid sites has been selected by UNOPS in consultation with other key stakeholders – e.g. the GoSL Ministry of Energy (MoE) – and may not be representative of the typical community in Sierra Leone. Specifically, each of the community has a Community Health Centres (CHC) and a school. The WP2 villages tend to be larger in size. Therefore, during the selection process the team paid careful attention to the way that “comparison villages” were selected. These villages are those that we compare to the set of villages that received the RREP intervention. By carefully selecting comparison villages, <i>and</i></p>	Annex B

	<p>assessing changes over time, we can create a credible counterfactual and minimize bias in our comparisons.</p> <p>To make causal claims about the impact of the RREP, we rely on a difference-in-difference comparison, which accounts for all time invariant differences between intervention and control villages. Causal identification in difference-in-difference relies on a parallel trends assumption— the assumption that outcomes of interest in treatment units are changing at the same rate as outcomes of interest in control units. The parallel trends assumption is credible to the extent that treatment and control units are similar along factors that drive changes in the outcomes of interest. In our case, this means that we should sample households from villages with similar characteristics. As a result, we use a matching algorithm to select villages that are similar to RREP villages. (See Annex B for more details.)</p> <p>Unlike WP1/1+ villages, no mini-grid was built prior to the baseline survey in WP2 beneficiary communities. This further reduces the concern of possible biases.</p>	
Respondent Attrition	<p>As in every survey, risk of attrition is present. Our team will work to reduce attrition in the sample to the minimum. In order to do that, we will collect phone numbers, house/structure features, GPS location and address of all households interviewed. Once we come back in the future, we will be able to find the same respondents following this information. Expected attrition will be due to household members deaths or moving out of the community where they were living at the beginning of the project.</p>	N/A
Enumerator Training	<p>WUR recruited 2 Research Associates, 2 field managers, 6 field supervisors and 61 enumerators (30% female) for the primary data collection.</p> <p>All enumerators were trained on:</p> <ul style="list-style-type: none"> - Basic enumerating skills - Interacting with human subjects - Ethical responsibilities - Purpose of the impact evaluation - Handling tablets and ODK Collect - Best practices for field research <p>A considerable part of the training time was spent on each of the survey questions, analysing their purpose, meaning, expectations, reading and translations to Krio and other local languages. Enumerators were provided with Training Manuals, Scripts, Deployment Guides, and any other materials needed for the proper performance of their assigned tasks. One training took place for each data collection process.</p>	Annex C
Pilot Testing	<p>Three (3) pilot communities were selected within close proximity to Freetown in order to facilitate the logistics. These pilot communities were Malekuray, Kamasondo and Petifu. These</p>	N/A

	<p>communities were visited once before the start of the data collection period to test the validity of the instruments; and check for any mistakes due to the coding of the instrument; and the wording of the questions and/or the coherence of the complete questionnaire together. Pilot visits helped the team understand more about the culture and environment of the communities and to anticipate some of the challenges that could arise during fieldwork (language, logistics, roads, etc.).</p> <p>In addition to these three communities, the team used another two communities as “field tests” to test and evaluate enumerators’ understanding of the activity and its protocols. Since the impact and activities in these two communities was bigger, we decided to use two communities that were not part of the RREP.</p>	
Fieldwork Supervision	<p>The Field Manager supervised all logistics and operational requirements prior to and during data collection. The field manager was in the field full-time during data collection periods, with additional time built in for preparation and closeout of field operations. Responsibilities included coordinating training and meeting venues, transportation and fuelling, distribution of per diems, addressing human resource requirements, and tracking field expenditures.</p> <p>The Field Coordinators supervised the teams of Enumerators, and were responsible for coordinating with the Research Associates to ensure timely data upload to the Data Manager, and quality control of collected data. They will also be liaised with the Field Manager for personnel and logistics requirements. Four Field Coordinators supervised a team of ten Enumerators. They were based full-time in the field during data collection periods.</p>	N/A
Enumerator Incentives and Retention	<p>The Impact Evaluation Team led by WUR instituted a system of awards, both monetary and nonmonetary in the form of certificates, given to enumerators with consistently high performance at the end of the field work. The performance was measured in three criteria:</p> <p>First, based on the quality of the data; second, the number of census surveys that the enumerator averaged throughout the duration of the field work; third, WUR asked the field supervisors, who had experience supervising each team at some point in the field work, to give recommendations on who they thought were the best enumerators in terms of their professional decorum, and level of enthusiasm.</p>	N/A
Quality Control	<p>Quality control was managed from Freetown by a team of Research Associates. Checks were made every second day and several course corrections were made. These took place either in the field or during feedback meetings each week in Freetown. Data was uploaded after each string/phase (every three days) and there was no missing or lost data.</p>	N/A

In addition to the quantitative tools, the evaluation team used secondary data sources and qualitative methods to gain further insight into some of the key domain areas.

Secondary Sources

The evaluation team utilized several secondary data sources both in an effort to construct a representative control group for the mini-grid site, and to help the field team conduct their field work. The variables used in the matching algorithm were from census data that was provided by Statistics Sierra Leone. The datasets included a population level dataset containing demographic variables, population size, as well as the number and types of structures for every community in Sierra Leone. The census also included household-level asset variables that were used for wealth indices in the matching algorithm.

Statistics Sierra Leone also provided GPS coordinates of each community which significantly aided the field team to travel to their communities. The Ministry of Health and Sanitation provided a list of health facilities which was used to identify whether potential control communities had a health facility within the community - a necessary criteria for the inclusion into our sample frame. This facility-level dataset contained the names of the facilities, type of facilities, and their locations. Finally, the team also used the Education Management Information System (EMIS) school census to determine how many schools were located in each community, and the names of those schools to help the field teams with locating them for the school survey.

Key Informant Interviews (KII)

Key Informant Interviews (KII) were conducted with 13 people, including the three mini-grid operators and key actors from Education, Energy, Environment Control and Health Authorities. KII were administered to respondents with large experience and first-hand information on the related topics relevant to the evaluation. KII included some of the primary stakeholders of the programme, as their insights and opinion are very much needed to adequately evaluate the impact of the intervention.

Detailed protocols for KIIs and results qualitative report are attached to this report in Annex G and Annex H respectively

Focus Group Discussions (FGD)

Focus Group Discussions (FGDs) were conducted to gain additional information on the different outcome domains that cannot be grasped in quantitative data, and sharpen and enhance insights into impact pathways and to assess the quality of the intervention. Additionally, due to the social dynamics of FGDs, they are useful instruments to provide insights into sensitive topics and cultural norms and dynamics. This helps understand possible changes in gender roles resulting from the intervention, including shifts in decision-making, household food-security and nutrition, division of workload and control over income and assets.

Detailed protocols for KIIs and results qualitative report are attached to this report in Annex G and Annex H respectively

2.2 Data quality and cleaning

The team developed rigorous processes to ensure that the data was of a high quality and that it was cleaned effectively. This included data storage, version control, peer review and communication processes to ensure that the data cleaning process was accurate, and the data is of the highest quality. The following are the steps taken by the data analysts to clean and manage the data for RREP.

For information on data protection please see Section 2.5: Inclusion and Ethics.

Table 5: Data Governance Processes

Data Governance Process	Description
Data Storage	Great care was placed in making sure that the data is properly organized into specialized repositories. Raw data, coding files, clean data, and any other outputs were each placed in separate file repositories. All raw data was stored in a “raw data” repository, organized into subfolders for the different surveys (household, school, CHC, etc.); all cleaning code files were stored in a “build” repository; and all clean data was stored in a “clean” repository. This ensured that work flows were efficiently systematized. For example, cleaning code in the “build” repository imported the raw data from the “raw” repository, processed it, and saved it into the “clean data” repository. This way, the data was be cleaned without overwriting the pre-existing raw data.
Version Control	Each file was allocated a version number indicated at the top of each cleaning file. When changes were made, the changes were recorded and noted down by the analyst as comments in the file, along with the name of the team member and the date. The version number enabled the team members track the changes that other team members have made. In addition, the cleaned files were periodically be moved into an “archive” folder, and a copy was made. The copy was then made part of the “active” cleaning file. Each copy was given a date in the name of the file so the team can quickly and accurately reference them. Having a historical record of changes also ensured that past data cleaning could be replicated in the case of a mistake in the code. In such a case, once the data analyst team spotted it, he or she could check which version the change was made, and at which date, then go to that version and reconstruct the previous dataset.
Peer Review	All data analysts communicated all changes that are made, and each analyst reviewed those changes after each version. In addition, every cleaning code produced a log file which results a full report that is printed at the end of the code. Log files were saved in their own repository and ensures that data analysts can review the changes even when the statistical software we use was not accessible. Log files display all commands, inputs, and outputs from the code for the data analysts to review.
Communications	The data analysts communicated over <i>Slack</i> , an online work platform through which team members sent messages to one another and shared snippets of code for each person to review and provide feedback. Using <i>Slack</i> as a platform for communication led to more efficient workflows. The analysts separated their operations into different “workspaces” for

specialized tasks. In addition, all work was easily be communicated to the PIs for feedback, troubleshooting and high-level decisions.

2.3 Approach to Measuring Baseline

This section describes how the key thematic impact domain indicators are measured. The Key Indicators are grouped into four domains (as per ToR): 1) income and assets, 2) health, 3) education, 4) CO₂ emissions.

2.3.1 Measuring Thematic Impact Domains

This baseline assesses the current RREP outcome indicators across the four domain outcomes prior to the RREP interventions: 1) income and assets, 2) health, 3) education, 4) CO₂ emissions. The indicators and survey measure were selected based on two principles. Key Indicators a) comprehensively capture impacts of electrification on household income and assets and b) enable interpretation of *how* electrification leads to these changes. These indicators were obtained using three surveys, targeting different actors within a given community.

All data is disaggregated by age, gender and disability. For disability related questions the assessment used the Washington Group Disability Questions. With this information we will be in a better position to explain the mechanisms through which electricity is affecting households at the midterm and endline stages; and to understand the equity considerations of the electrification of rural communities.

Table 6: Key Indicators and Resource Streams

Domain	Key indicators	Description	Resource Stream
Household Income and Assets	Agricultural production	Quantity of agricultural products obtained during the last harvest (e.g. rice, cocoa, coffee, cassava)	HH Survey, KIIs, FGDs
	Non-agricultural activities	Wages earned from other activities like small businesses, service provision (bike rider), employment (teacher, civil servant)	HH Survey, KIIs, FGDs
	Livestock ownership	Number/ type of livestock owned	HH Survey
	Land ownership	Size of land	HH Survey
	Household asset ownership	Value in SLL of all other assets in the household (e.g. fan, fridge, radio, cooking utensils)	HH Survey, KIIs, FGDs
Improved Health	Acute Respiratory Infections (ARI)	Presence of this condition in the past months	HH Survey, CHC records (if possible)
	Eyesight	Subjects self-report sight problems/difficulties in the past year (chronic)	HH Survey

	Other disabilities	Presence of any other	HH Survey
	Disease prevalence	Number of cases diagnosed	Registered Data
	Neo-natal mortality	Cases per thousands of children OR deaths during the first 28 days of life (0-27) recorded in the past month.	CHC Survey/ Registered Data
	Under-five mortality	Cases per thousands of children OR Under-five deaths in the past month	CHC Survey/ Registered Data (if possible)
	Maternal death	Cases per thousands of mothers during/after delivery – classified by “time of the day” based on availability on records.	CHC Survey / Registered Data (if possible) / HH survey
Education	Attendance	Number of days missed in the past month because student was working or helping out in household duties	HH Survey / school registers (if possible), KIIs, FGDs
	Improved Literacy	Administer a literacy test	HH Survey/Registered data (if possible)
CO ₂ Reduction	Fuel consumption	Value in SLL of the consumption of diesel/petrol, batteries, kerosene, charcoal in the last 2 weeks	HH Survey, KIIs, FGDs
	Cooking facility	Type of kitchen/stoves used	HH Survey, FGDs

2.3.2 Description of Key Indicators

For each outcome domain, we first describe how the Key Indicators relate the high-level outcome domain indicators. Then we describe the specific survey measures that are used to construct these Key Indicators. While describing how our key Indicators relate to outcome domain, we review *why* electrification might change Key Indicators - therefore reviewing the assumptions in the theory of change.

2.3.2.1 Domain 1: Household Income & Assets

Relation of Key Indicators to Outcome Domain

Electrification can impact income activities and assets accumulation in both agricultural and non-agricultural sectors. Only by measuring the both, we can obtain accurate asset *levels* and *changes* of impacts. If we fail to measure both agricultural and non-agricultural sectors, we may not accurately capture the impacts of electrification as changes in one domain may substitute or complement activities in another. For example, if electrification leads to an increase in small business employment, we would overestimate the impact if we failed to account for (potential) negative impact on agricultural production (as households leave farm for non-agricultural employment). Conversely, if electrification makes

household activities more time efficient, excluding the agricultural sector would lead us to underestimate the impacts of electrification.

Electrification can directly stimulate agricultural income by enabling agricultural technologies such as water pumps, and indirectly by saving time on household activities that can be reallocated to agricultural work. In addition, extra income earned through electrification can be invested / stored in livestock. Electrification can increase non-agricultural income by stimulating local business, empowering value-added technologies, and increasing employment opportunities. Electrification can lead to the accumulation of household assets due to increased demand for these assets and higher levels of income leads to accumulation.

Key Indicator A: Agricultural Production

Our measure of agricultural production focuses on two key staple crops (rice and cassava) and two key cash crops (coffee and cocoa). We measure how much of each crop is grown, harvested, and sold. This allows us to untangle changes in both consumption patterns and product sold.

Key Indicator B: Non-Agricultural Activities

It is possible that electrification drives small business growth. Our survey captures whether the respondent or their spouse owns or is employed by a small business and how much time they commit to this activity. We also track the electricity usage of the small business and revenue, costs, and profits associated with the business, and wages associated with employment

Key Indicator C: Livestock Ownership

We catalogue all animals owned in the household -- ownership defined as the right to kill or sell the animal. We also quantify what share of the household's animals are (at least) jointly shared by women.

Key Indicator D: Land Ownership

Land is an important indicator of wealth and agricultural production potential. We capture the total size and value of land owned by the household.

Key Indicator E: Household Asset Ownership

We probe respondents on their ownership of 29 different household assets. Importantly, we measure baseline ownership of electrified assets, so that we may gauge how electrification affects the adoption of electrified assets over time.

2.3.2.2 Domain 2: Improved Health

Relation of Key Indicators to Outcome Domain

Electricity has the potential to drastically improve health outcomes. We measure health impacts through a) household surveys and b) CHC administrative records and CHC surveys. Electrification can improve health directly by a) changing household conditions, such as cooking conditions or b) improving hospital conditions, and indirectly by c) increasing household income or d) modifying health-seeking behaviour. Specifically, changes to household conditions can have impacts on respiratory and eye issues, two problems we measure directly. Improved (electrified) hospitals may stay open later and be better able to

provide important pre- and post-natal care to women. When hospitals are better equipped, pregnant women may be more willing to deliver their babies at hospitals. Increased income from electrification may allow households to better deal with preventable diseases, such as malaria. We directly measure household health outcomes for children under five and for women who have recently given birth. In addition, we capture disability data for household members and will measure how electrification effects differ between households where some members have disabilities and households where members do not suffer from disabilities.

Key Indicator A: Acute Respiratory Infection (ARI)

To measure the prevalence of ARI, we first ask respondents if there are times when they experience the symptoms of ARI: difficulty breathing, runny nose, cough, and sore throat. We then ask if these symptoms have been experienced by the respondent in the last 30 days, and for how many days. In addition, we measure health seeking behaviour, asking respondents if they sought medical treatment and if so, which type of medical treatment.

Key Indicator B: Eyesight

To measure the impacts of electrification on eye conditions we first asked respondents if they suffered from problems with itchy, tired, red or burning eyes. Blurred and cloudy vision. We use a Krio word, common in other Sierra Leonean languages, that people usually use to describe this set of symptoms: "apolo".

Key Indicator C: Other Disabilities

We measure other disabilities for every person on the household roster through using the Washington Disability Group Questions. We used the Short Set¹⁴ of questions, which are designed for use in questionnaires that are measuring a multitude of socio-economic indicators. They primarily focus on measuring whether people have difficulty universal basic functions and identifying a portion of population that is at risk of participation restrictions. While the Short set of questions do not go into extensive detail on disabilities, they enable disaggregation of other measures by disabilities (in our survey these are income, education, and CO2e emissions. Each household member is asked if they have difficulty seeing, hearing, walking or climbing steps, remembering or concentrating, self-care (such as washing or dressing), or communicating in their primary language. We create a disability index based on responses to these questions.

Key Indicator D: Disease Prevalence

Many common diseases are preventable. It is possible that electrification leads to a decrease in preventable diseases, either by increased drug or service availability at health clinics, or changes in health seeking behaviour. In our household survey we measure the prevalence of malaria symptoms as a proxy for common and preventable diseases. In our health centre survey, we measure the stock of vaccines and drugs, and the presence of medical equipment that might lead community members to seek out services.

Key Indicator E: Neo-Natal Mortality

¹⁴ <http://www.washingtongroup-disability.com/washington-group-question-sets/short-set-of-disability-questions/>

First, we ask if there is a woman in the household who has given birth in the last year. If the answer is affirmed, we ask about the pre-natal care that the woman received and where she sought it. We then ask if any pregnancy ended in stillbirth in the last 12 months.

Key Indicator F: Maternal Death

We ask if there has been a woman in the household who died during childbirth in the last 12 months. Asking about death can be a sensitive topic. Our survey protocol instructs enumerators to start with facts before moving to the question. Enumerators state: “During delivery, women sometimes suffer complications and bear the risk of dying.” Only then do we ask if there has been a woman who died during childbirth in the last 12 months.

2.3.2.3 Domain 3: Education

Relation of Key Indicators to Outcome Domain

Below we describe how we measure our two primary education outcomes: attendance and literacy. However, our surveys also contain data that helps us to interpret *how* electrification might improve these educational indicators. Specifically, we capture how school children allocate their time between: farm work, house chores, recreation, studying, and sleeping. We also measure how children’s educational experience might change through electrification, focusing on: teacher attendance, hours of operation, energy access and electrified appliances.

Key Indicator A: Attendance

First, we record the household members who are currently in school and capture the educational achievement of those who are no longer in school. Then we ask how many days of school each child has missed in the last week (excluding holiday). We average this across the household for a household level attendance indicator.

Key Indicator B: Improved Literacy

While we have village-level measures of literacy at baseline (taken from 2015 census), we do not have a baseline household measure of literacy. We plan to capture this measure at endline by administering a test in all schools, and accessing existing test result data.

2.3.2.4 Domain 4: CO₂ Emissions

Relation of Key Indicators to Outcome Domain

Rural households create emissions mainly through the energy used for household lighting and cooking. We measure these two indicators with a comprehensive set of survey questions.

Key Indicator A: Fuel Consumption

We capture the use of fuel in cooking and lighting the house. Specifically, we measure the amount of money spent on kerosene, firewood, charcoal, and petrol for lighting and cooking. We then use the market price to back out the quantity of each, and convert to CO₂ emissions. Electricity should reduce reliance on these “dirty” fuels.

Key Indicator B: Cooking Facility

Home cooking is a leading area of CO₂ emissions in rural households. Electrification allows for the adoption of “clean” electric cooking facilities, such as electric stoves. We measure if households adopt clean cooking technologies.

2.3.2.5 Monetizing Impacts

The impact of the RREP will be measured in terms of cumulative increase in welfare, measured in financial improvements. We aim to monetize key changes in the main four outcome groups. This conversion will be used to assess progress against Impact Indicator 1 (i.e. achieving a 100m GBP welfare increase) as a result of the project. These welfare improvements are presented from the standing of rural households, projected over the lifetime of the mini-grid installation (50 years) and appropriately discounted.

Below we summarize the core conceptual approach to the conversion into monetary equivalents of changes in the four domains of interest.

Household Income and Assets

Indicators from “Section 2: Income and Wealth” can be used to measure how much income and assets have changed for programme beneficiaries. Such a measure is expressed in monetary terms already, and the team will calculate the present value of the change due to the mini-grids by choosing appropriate time horizon of the programme and discount rate.

Improved Health

Indicators from household survey “Section 4: Health Related Data” and CHC survey can be used to calculate the monetary value of RREP induced health improvements. We quantify the monetary impacts of a) reductions in child mortality, b) reduction in maternal mortality, and c) reductions in disease burden. Our strategy for monetizing the impacts of these three categories is as follows:

A. Child Mortality

To monetize potential reductions in child mortality, we take our Difference-in-Difference estimate of the reduction of child mortality due to RREP and multiply by current scholarly estimates of the effect of child mortality on GDP, taken from top public health journals. One recent study in a top public health journal estimates GDP losses per child death at \$25,508.¹⁵ We incorporate uncertainty by considering 95% confidence intervals of both RREP child mortality reduction estimate and the literature’s estimate of impact of child mortality on GDP.

B. Maternal Mortality

To monetize potential impacts of maternal mortality, we rely on a similar strategy as the one outlined above for child mortality. We take our Difference-in-Difference estimate of the reduction of maternal

¹⁵ Kirigia, Joses M., et al. "Counting the cost of child mortality in the World Health Organization African region." *BMC public health* 15.1 (2015): 1103.

mortality due to RREP and multiply by current scholarly estimates of the effect of maternal mortality on GDP, taken from public health journals. One recent study finds that a one percent reduction in maternal mortality leads to a 0.11 percent increase in GDP.¹⁶ An update to this study found that maternal mortality of one person reduces GDP by \$0.36 per year.¹⁷ We can leverage this study to estimate the impact of the RREP programme, by calculating maternal mortality in RREP communities as a percent of national maternal mortality. For example, if RREP sites at baseline contain 1% of all maternal mortality in Sierra Leone and – following the study cited above— a 1% reduction in maternal mortality in RREP sites leads to an estimated .0011 increase in national GDP, then the 1% reduction in maternal mortality through RREP will lead to a .0011 percent increase in GDP. Taking the current GDP in Sierra Leone at 4 billion, that’s an impact of 4.4 million USD to GDP.¹⁸ Again, we incorporate uncertainty by considering 95% confidence intervals of both RREP child maternal reduction estimate and the literature’s estimate of impact of maternal mortality on GDP.

C. Disease Burden

To monetize potential impacts of disease burden, we follow the conceptual framework outlined by the WHO’s “Guide to Identifying the Economic Consequences of Disease and Injury”.¹⁹ The authors of this guide note, “in the simplest case, the incidence of disease or injury event has two immediate potential effects. Firstly, the diseased or injured person may have to reduce their normal level of productive activity, secondly, the household may have to increase its consumption of health services or goods” (pg. 62). Within this framework, we leverage our survey data which contains information on health expenditures and information on the frequency by which respondents have suffered from common illness in the past 30 days. Under certain assumptions, we can compute economic loss from these events.

First, to estimate impact on productive activity, we take our Difference-in-Difference estimate of reduction in sick days due to RREP and multiply it by average daily income (calculated from income section of survey). This estimate depends on assumptions about the degree to which sickness leads to productivity loss. That is, people may still work when sick. Therefore, we calculate different estimates under different assumed levels of productivity loss.

Second, we estimate reductions in health treatment / service costs associated with health benefits of RREP. A crucial assumption here is that the RREP does not affect demand for health services. If we drop this assumption., we can still estimate reductions in health treatment / service costs associated with health benefits of RREP, by controlling for differences in demand for health services at similar health levels.

Education

¹⁶ Kirigia, Jose M., et al. "Effects of maternal mortality on gross domestic product (GDP) in the WHO African region." *African journal of health sciences* 13.1 (2006): 86-95. This article has been cited in leading health and medical science journals, for example *The Lancet* (Langer et al. 2015).

¹⁷ Kirigia, Jose M., et al. "Effects of maternal mortality on gross domestic product (GDP) in the WHO African region." *African journal of health sciences* 13.1 (2006): 86-95.

¹⁸ <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=SL&view=chart>

¹⁹ https://www.who.int/choice/publications/d_economic_impact_guide.pdf

Similar to our strategy for monetizing the impacts of “Improved Health”, the team will use household survey “Section 5: Education” and school survey to measure possible improvements related to schooling, such as school attendance, educational attainments and literacy rates.

There exist many ways of estimating value for money in poverty reduction interventions. In virtue of its simplicity and international acceptance, we will use this framework to support our monetization of education outcomes. Our preferred method for calculating the value for money, common in the field of education, is to assign monetary value to additional schooling years enabled by the implementation of a programme. It is well known in the education literature that additional years of education are associated with higher lifetime earnings (Card, 1999)²⁰. To calculate these lifetime earnings as a function of years of schooling, it is common to use a Mincer’s human capital earning function. This Mincer equation explains earnings as a function of schooling and labour market experiences, estimating the average monetary returns of one extra year of schooling.

Due to the lack of large longitudinal dataset that reliably estimates the returns to education in Sierra Leone, we need to make use of existing literature in Sub-Saharan Africa, West Africa or a country in the same geographical area and similar background characteristics as Sierra Leone. Literature on Sub-Saharan Africa and on Ghana are available, that can be used for the purposes of this analysis. See Annex I for more details, including the specific assumptions made and an example of the method.

CO₂ Reduction

Survey questions contained in “Section 3: Energy Use” can be used to estimate possible reduction in CO₂ emissions associated with reduced use of generators, combustion of other fossil fuels and batteries for lightening (and/or cooking). Reduced CO₂e emissions can be valued using international standards and associated impacts on the environment for the duration of the programme and discounted to calculate present value.

It is important to point out that conversion of these indicators into monetary equivalent often requires strong assumptions which are not free of critique. The evaluation team will be working together with UNOPS M&E to choose the most appropriate assumptions for the valuation of benefits.

2.4 Approach to Reporting Baseline Findings

2.4.1 Approach to Survey Response Bias

In this section we detail our strategy for dealing with common forms of survey response bias. Given the ethnic and linguistic diversity of Sierra Leone, we might be concerned about various forms of interviewer bias-- be it the place of birth, ethnicity, or first language of the interviewer.

²⁰ Card, D. (1999). The Causal Effect of Education on Earnings. *Handbook of Labor Economics*

Interview language bias & bias vs. measurement error

Krio was the default language for conducting all surveys. However, because enumerators were sent to areas where they had linguistic speciality, enumerator and respondent sometimes matched on a non-Krio primary language, and then the interview was conducted in that language. This means respondents who speak major languages (i.e. Mende / Temne) as a first language are more likely to have the interview conducted in their primary language than respondents from minor languages. If the enumerator and respondent did not share a primary language, and the respondent did not speak Krio, a trusted person was recruited to translate. Both of these situations - speaking in a mother language or speaking through a translator - deviate from the default option of Krio and may engender different responses.

We do not expect there to be large “language effects” as language would most likely affect responses through for sensitive questions where trust / familiarity is important; our survey data does not hinge on sensitive questions. Moreover, it is important to distinguish between “measurement error” and “bias”. Measurement error occurs when the level of an outcome captured in a survey differs from the true value of the outcome; every question on every survey contains some degree of measurement error. However, “bias” comes into the picture when respondents in treatment and control respond to questions in a different way. There is no reason to expect that we will have more measurement error in treatment compared to control communities. This means we have no reason to expect language bias errors.

The same logic can be applied to other factors that may create measurement error, such as a) respondent and interviewer of different gender, b) respondent and interviewer from different region, c) respondent and interviewer from different class backgrounds. While all of these might introduce a certain degree of measurement error, we can expect this measurement error to be equal in treatment and control and therefore create no bias.

2.4.2 Relevance of the Sampling Regime

We use probability sampling to obtain a group of respondents that are representative of the whole town. A main tenet of probability sampling is that every unit has the same probability of being selected into the survey. This would not be achieved through a simple random sample that utilized a “random walk” procedure. In a random walk strategy, respondents selected are a product of where one enters the town or from where one begins their “random walk” which is usually the centre of town or someone other important building; this cannot be considered a random part of town. To avoid this problem, we use a town census to develop a full list of households. We then randomly sample households from this list. (See Annex B for more information on our sampling strategy).

Our use of probability sampling means that we can assume that our household survey is representative of the village population. One issue that could potentially challenge the representativeness of our survey is non-response. Non-response can create bias if non-response patterns are different across treatment and control. We can test for this pattern by regression treatment status on non-response in a given variable. If there are differences across treatment and control, we can analyse *which* kinds of people are not responding so that we can better interpret our findings.

2.5 Inclusion and Ethics

A detailed inclusion and ethics approach was applied to the baseline assessment, taking into account DfID's commitment to human rights-based approaches of participation and inclusion, non-discrimination and equality, and accountability. WUR has been working in Sierra Leone for 15 years, and has conducted a large number of research projects. In this time it has adhered to international standards of ethical conduct, and developed an in depth understanding of power dynamics, inclusion, and equity issues during research processes.

Respondents were selected randomly from village listings to ensure the sample was representative and inclusive of marginalised households. Female headed households were interviewed for relevant questions. The team did not interview children directly.

The Impact Evaluation team received ethics approval from the WUR Social Sciences Ethics Committee (SEC). The SEC stated that the proposal dealt with ethics issues in a satisfactory way, and that it complied with the Netherlands Code of Conduct for Research Integrity. The team also received ethics approval from the Government of Sierra Leone Ethics and Scientific Review Committee (SLESRC).

2.5.1 Data Protection

A number of precautions were taken to ensure the confidentiality of all information collected from subjects in the studies it conducts. Administrative data was collected using Open Data Kit (ODK) software on smartphones/tablet and was sent to the server through 3G. Other than usage analytics and crash reports ODK software does not send or communicate any survey data information back to ODK servers. When we do gather data, we default to anonymous or aggregate methods. An encrypted version of the database is stored on Dropbox and made accessible only to those in possession of a password that is shared exclusively among members of the research team. All data is backed up on an external hard drive that will be kept in the research team's office, where only authorized persons are permitted.

No identifiable data is ever published or passed to any third party, since the digitized data collected are automatically encrypted. This means that not even the person collecting the information had access to it. No identifiable data is ever printed. WUR field staff have access to some identifiable data (names, dates of birth, and village names). This data is exclusively used to identify respondents for follow up surveys and to verify the accuracy of administrative data. This data will be stored securely on mobile devices under password protection. Other researchers assisted the Principal Investigator's (PI) team for data analysis and report writing. These researchers were granted access to de-identified data only (withholding names of respondents).

2.5.2 Informed Consent

All individuals were informed of the identity of the survey enumerator, the nature of the survey, informed of their right not to participate in the survey, and of their right to refuse to answer any question during the survey. Moreover, individuals were informed of the confidentiality of the data, and given information about who to contact in case they have any questions about the status or use of the survey. Only after all of the above was described to the individual was the individual invited to participate in the survey.

Enumerators orally translated the informed consent into local languages (English, Krio, Mende, Temne, depending on the site) when they administered surveys.

2.5.3 Withdrawal From Study

All study participants have the right to withdraw from the study at any point. The study focuses on the impact of electrification, complementary inputs, and market access on development. Withdrawing from the study means that potential beneficiaries do not disclose information to the research team. If any community member decided to not disclose information, she/he was free to do so. Withdrawal from the study in no way affects the subject's relationship with the study team or any partner associated with the study team.

2.5.4 Risks and Benefits to Participation

It was ensured that there were minimal risks to respondents from participating in both the intervention and the questionnaire. WUR informed participants that this study will benefit subjects by helping to identify how benefits of electrification can be maximized for the beneficiaries. One risk that the team considered was the possibility of animosity as a result of being a comparison village and not gaining access to electricity through the mini-grid. Enumerators explained to participants that better quality data will enable the government to make informed decisions about how to best electrify communities, identify which sub-populations to target first, and what complementary technologies to improve access to.

The questionnaire content is of a non-sensitive nature, and WUR designed the survey process to take as little time as possible from the respondent during interviews. The team also recruited field staff who as far as possible spoke the appropriate local language to ensure that the respondents feel comfortable.

Section 3: Descriptive Analysis and Results

The following section will summarize and describe the key results from the baseline survey. There are two main kinds of tables in this document: summary statistics tables and balance tables. Summary statistics tables give us the estimated means, medians and modes for a specific category of variables or outcomes of interest.

Table 7 provides an explanation of how to read the typical summary statistics table.

Table 7: Example Summary Statistics Table

Variable	count	mean	sd	p50	min	max
Grows Rice	3257	0.54	0.50	1.00	0.00	1.00
Bushels of Rice Harvested	1740	11.14	15.76	6.50	0.00	300.00

Note: The quantities harvested and sold are in reference to the respective crop. This table shows summary statistics of agricultural production. Column (1) is the sample size. The quantities harvested and sold are in reference to the respective crop. Column (2) shows the mean of the variable. A mean between 0 and 1 is the share of the sample that grows the respective crop. Column (3) shows the standard deviation, and columns (4) and (5) show the minimum and maximum of the variable respectively.

In the summary stats table above, we present the counts, averages, standard deviations, the 50th percentile (median), and the minimum and maximum for the crops measured in our survey. Row (1) in Table 7 represents the number of people in our sample that grows rice. From column 1 the reader can see how out of 3257 people who were asked whether they grow rice or not, on average 54 percent grow rice (approximately 1,758 respondents). Row (2) shows us how much rice was harvested by farmers that reported growing rice. 1740 farmer out of 1758 (54 percent of 3257) reported harvesting rice for the agricultural season considered in the survey. On average, 11.14 bushels (1 bushel = approx. 25 kgs) of rice were harvested. Each table will also come with a note explaining what the table is presenting.

Balance tables present the estimated measure of for a specific attribute for control and treatment (beneficiary) communities. Statistics presented in the balance table include the average of the attribute considered by group (control VS treatment) and the difference in averages between the two groups. The rows show the observable characteristics that we are comparing the two groups on. It is preferable not to observe systematic differences between the two groups at baseline. This helps us attribute any effect to the program/intervention itself and not to any underlying differences between the groups. The third column in the table gives us the difference in means between the two groups. In Table 8, we see that our control group and treatment group both sow an average of 1.5 to 1.8 bushels of rice respectively. This is not a highly significant difference, and we can state that our sample is balanced across this characteristic. However, we see that the difference in means for heaps of cassava sown has three stars, and this difference is highly significant at the 99 percent level.

Table 8: Example Balance Table

Variables	Control	Treatment	Difference in Means
	(1)	(2)	(3)
Bushels of Rice Sown	1.814 (0.178)	1.509 (0.148)	0.305 (0.230)
Heaps of Cassava sown	89.749 (11.229)	52.186 (8.331)	37.563*** (13.921)
N	1631	1709	3340
Note: This table shows a balance test between treatment and control for the non-agricultural variables. Standard errors are clustered at the village level. *p<.1 **p<.05 ***p<.01 Standard errors are reported in parentheses.			

3.1 Census Statistics

As outlined in Annex B, the sampling process for WP2 was different from WP1. Instead of implementing a partial census to use as a basis for sampling respondents, we conducted a full village census. The full village census gives us information on the actual population in the study communities, household size, occupation, and electricity access. The full census allows us to draw the most representative sample and gives us an accurate picture on the size of the communities.

Table 9 presents a comparison of key characteristics between WP1 and WP2 mini-grid sites. We see that on average WP2 communities are larger as expected, and this could justify larger installations. Compared to WP1 communities, we see that the average WP2 communities have 530 more households. We also see that WP2 communities on average have a greater number of business owners, more farmers, and more people who plan on starting a business. The difference in means for all these characteristics is statistically significant at the 99 percent level.

Table 9: Statistics from Census for Work Package 1 and Work Package 2 sites (Treatment only)

Difference in means between Work Package 1 and Work Package 2 mini grid sites			
Variables	WP1	WP2	Difference in Means
	(1)	(2)	(3)
Number of HHs in the community	272.852 (27.584)	803.372 (90.068)	-530.52*** (94.090)
Number of business owners in the community	54.037 (8.992)	195.721 (26.982)	-141.68*** (28.409)
Number of business owners in comm that can benefit from electricity	19.222 (2.475)	71.395 (11.517)	-52.17*** (11.765)
Number of people who own/plan to start bus that can benefit from electricity	76.815 (6.926)	231.953 (37.087)	-155.13*** (37.681)

Number of farmers in the community	136.148 (11.226)	300.977 (27.660)	-164.82*** (29.821)
Number of people who do not own businesses and do not farm	98.463 (16.335)	360.791 (56.261)	-262.32*** (58.517)
N	54	43	97
Note: This table shows a comparison between WP1 and WP2 mini-grid sites. Standard errors are in parentheses. Column 3 shows the difference in means. Stars indicate significance level. *<.10 **<0.05 ***<0.01			

During the census we took information on all the households about their business occupations and agricultural practices. Table 10 reports the summary statistics of all treatment and control communities. We see that the average number of households in each community within the sample are 554 households. Business wise this is broken down by business owners (average 119 households), those businesses who can benefit from electricity (average 46 households), and those who want to start a business (average of 167 households). There are around 243 farmers in each of the communities and 222 who do neither business nor farm.

Table 10: Summary Statistics for Census in WP2 sites (treatment and control communities)

	(1)	(2)	(3)	(4)	(5)
	Mean	Std. Dev.	Median	Min.	Max.
Number of HHs in the community	554.31	505.21	450	28	3019
Number of business owners in the community	119.49	149.23	69	1	872
Number of business owners in the community that can benefit from electricity	45.86	60.40	30	0	473
Number of people who own or plan to start bus that can benefit from electricity	166.70	191.90	124	5	1506
Number of farmers in the community	242.92	165.79	196	22	922
Number of people who do not own businesses and do not farm	221.83	300.82	110	5	2021
Observations	86				

3.2 Income and Assets

Electrification can impact income activities and asset accumulation in both agricultural and non-agricultural sectors. Electrification can directly stimulate agricultural income by enabling agricultural technologies; and indirectly by saving time on household activities that can be reallocated to agricultural work. In addition, extra income earned through electrification can be invested or stored in livestock. Electrification can increase non-agricultural income by stimulating local business, empowering value-

added technologies, and increasing employment opportunities. Electrification can lead to the accumulation of household assets due to increased demand for these assets and higher levels of income leads to accumulation.

3.2.1 Agricultural Production

As in WP1, our measure of agricultural production focuses on two key staple crops (rice and cassava) and two key cash crops (coffee and cocoa). Table 1 reports the proportion of households participating in each activity. As expected, staple crops (rice and cassava) are much more likely to be grown than cash crops. 63 percent of the households surveyed grow rice and 43 percent grow cassava, compared to only 17 percent of households who report they grow cocoa and 8 percent reporting they grow coffee.

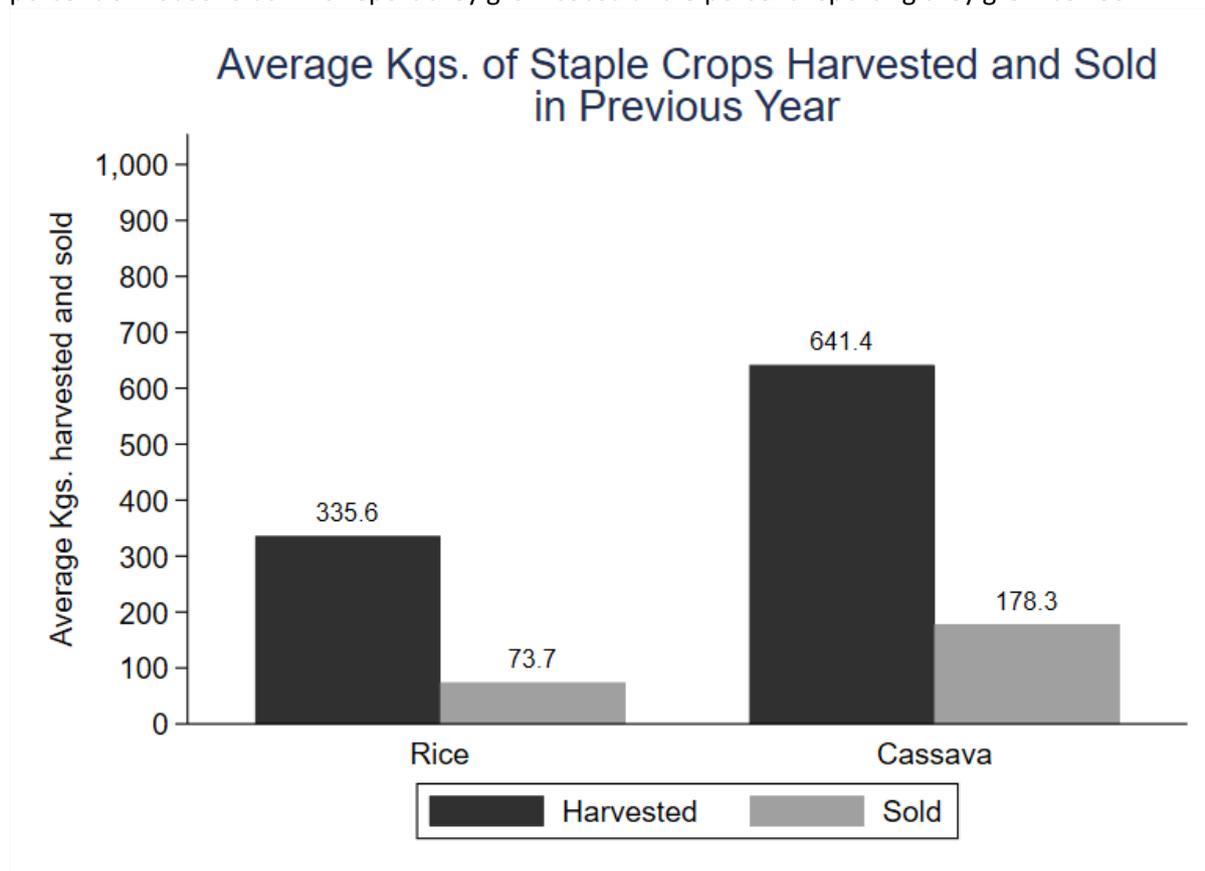


Figure 2: Staple Crops Harvested vs Sold

The figure above shows the average kilograms of staple crops that were harvested and sold by our sample in the previous year. While both staple crops are mainly for consumption, farmers are more likely to sell cassava than rice. Slightly more than 20 percent of rice harvested is sold at market, while nearly 30 percent of cassava is sold at market. Table 12 provides a more detailed breakdown of production and selling patterns by crop.

Table 12: Agricultural Variables Summary Table

	(1)	(2)	(3)	(4)	(5)
	Sample Size	Mean	Std. Dev.	Min.	Max.
Grew rice in 2018	2959	0.63	0.48	0.00	1.00
Kgs of rice harvested in 2018	1859	335.65	387.01	0.00	2250.00
Kgs of rice sold in 2018	1859	73.72	175.26	0.00	1050.00
Grew cassava in 2018	2958	0.43	0.49	0.00	1.00
Kgs of harvested cassava in 2018	1265	641.38	1127.87	0.00	7300.00
Kgs of cassava sold in 2018	1265	178.26	585.54	0.00	4000.00
Grows cocoa in 2018	2959	0.17	0.38	0.00	1.00
Kgs of harvested cocoa in 2018	510	83.84	146.11	0.00	800.00
Grows coffee in 2018	2959	0.09	0.28	0.00	1.00
Kgs of harvested coffee in 2018	253	51.95	88.11	0.00	450.00

Note: The quantities harvested and sold are in reference to the respective crop. This table shows summary statistics of agricultural production. Column (1) is the sample size. The quantities harvested and sold are in reference to the respective crop. Column (2) shows the mean of the variable. A mean between 0 and 1 is the share of the sample that grows the respective crop. Column (3) shows the standard deviation, and columns (4) and (5) show the minimum and maximum of the variable respectively.

Similar to WP1, we see in Table 12 that there is much more variation in production among farmers growing cash crops than farmers that grow staple crops. Of households that grow either upland or swamp rice (63 percent), the average harvested is 335.65 kgs. Of farmers who grow cassava (43 percent), the average harvested is 641.38 kg.

This is in stark contrast to cash crop production, where there is substantial variation in production amongst farmers that grow cash crops. 17 percent of our sample planted cocoa trees and among these cocoa growers 510 reported harvesting cocoa over the past year. On average, 83.84 kgs of cocoa were harvested. Out of the 9 percent of coffee growers in our sample, 253 reported harvesting coffee this past year with only an average of 51.95 kgs of coffee harvested. There were also a portion of cocoa and coffee growers who reported zero harvests this past year. This could be attributed to crops being recently planted. It is normal for coffee plants to take 2-3 years for the first harvest, with plants being productive

for nearly 5 years after²¹. Similarly, cocoa plants flower after two years of planting²² so there won't be harvests for a few years. The statistics presented in Table 12 and in the description above are for households that reported yields more than zero.

Figure 3 breaks down staple crop production patterns by disability status. Each of the six sub-figures for both rice and cassava displays harvesting for each of the six disability domains. The bars on the left side of each figure in blue represent harvesting and selling patterns for non-disabled people, while the bars on the right side of each figure in red represent harvesting and selling patterns for disabled people. On average, harvesting patterns seem to be slightly consistent between disabled and non-disabled households, across each disability category and we perceive no systematic differences at baseline. The differences are not statistically significant as shown by the confidence interval bars which overlap for disabled and non-disabled. This is very consistent with results from WP1 baseline.

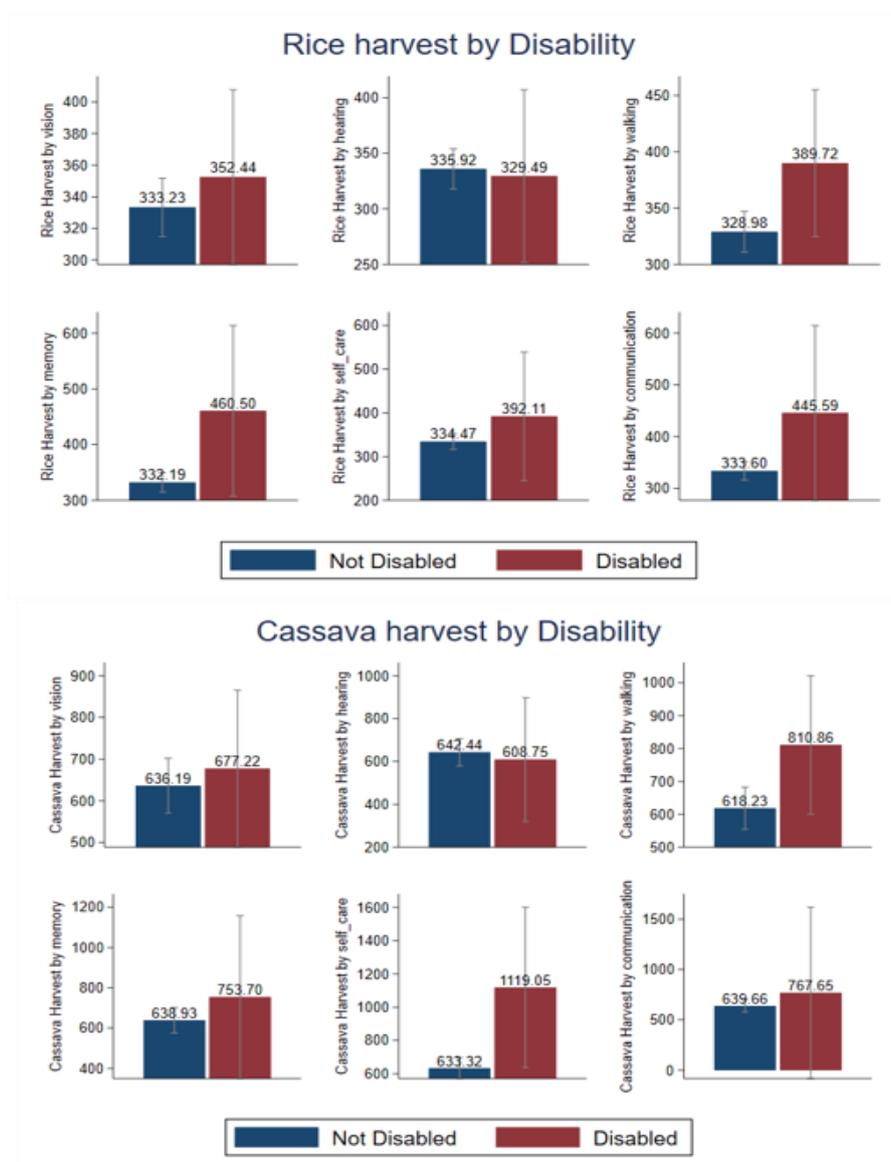


Figure 3: Crops by Disability Status

²¹ <http://producemonitoringboard.sl/harvest-and-post-harvest-2/>

²² <http://www.fao.org/3/AD220E/AD220E05.htm>

Table 13 compares how agricultural activities differ across treatment and control communities. There is no reported difference in rice or cassava production or selling patterns across treatment and control sites. There is slight variation with the growing of cocoa and coffee trees, but overall there is no difference between treatment and control communities. Figure 4 illustrates the differences between treatment and control across harvested and sold rice and cassava.

Table 13 - Balance Table: Agricultural Variables for Mini-Grid Sites and Non-Mini-Grid Sites

Variables	(1) Control	(2) Treatment	(3) Difference in Means
For all farmers: Grew rice in 2018	0.653 (0.032)	0.601 (0.030)	0.052 (0.044)
For rice growers: Kgs of rice harvested in 2018	332.510 (33.269)	339.312 (18.939)	-6.802 (38.066)
For rice growers: Kgs of rice sold in 2018	64.820 (11.794)	84.119 (9.124)	-19.299 (14.827)
For all farmers: Grew cassava in 2018	0.448 (0.036)	0.405 (0.027)	0.043 (0.045)
For cassava growers: Kgs harvested in 2018	648.823 (76.358)	632.504 (61.709)	16.318 (97.635)
For cassava growers: Kgs sold in 2018	206.977 (65.492)	144.021 (35.126)	62.956 (73.908)
For all farmers: Grows cocoa	0.191 (0.036)	0.152 (0.033)	0.039 (0.049)
For cocoa growers: Kgs harvested in 2018	87.696 (16.100)	78.631 (16.819)	9.065 (23.062)
For full sample: Grows coffee	0.096 (0.020)	0.074 (0.021)	0.023 (0.029)
For coffee growers: Kgs harvested in 2018	57.122 (11.112)	44.667 (14.103)	12.455 (17.713)

This table shows the difference in means for agricultural production between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column 1 and 2 are the respective means for control and treatment. Column 3 is the difference between the means (Control – Treatment). Standard errors are in parentheses and are clustered at the village level. Stars indicate significance level. *<.10 **<0.05 ***<0.01

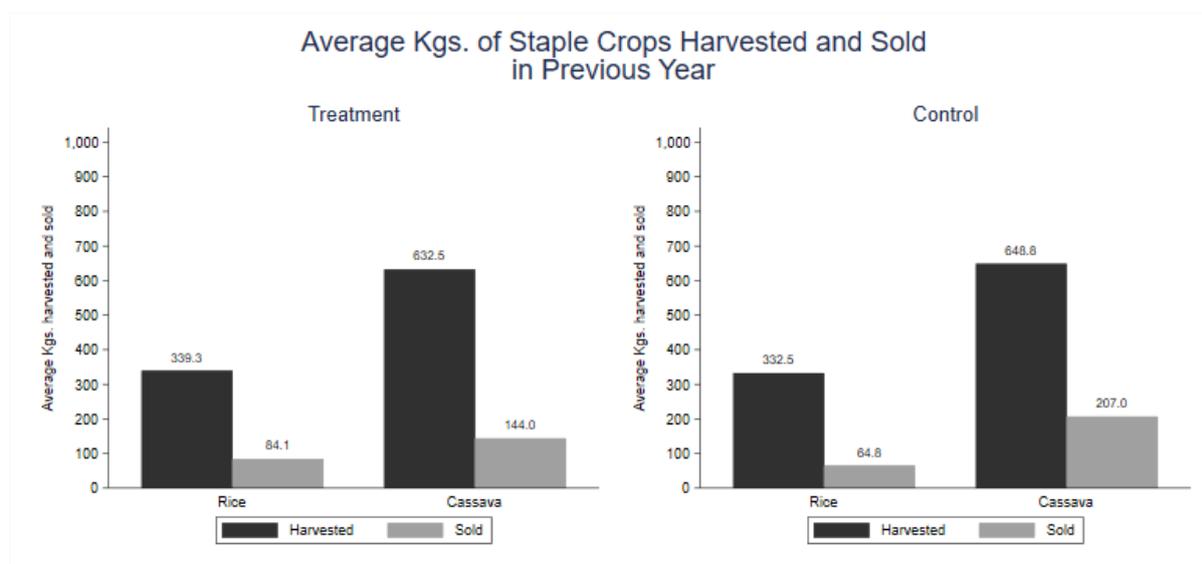


Figure 4: Crop Production by Treatment Status

3.2.2 Non-Agricultural Activities

As already discussed in WP1, electricity can be an engine of structural change, shifting rural economies from agrarian subsistence towards non-agricultural enterprises. To evaluate such claim, we capture baseline measure of non-agricultural employment (such as respondents who are self-employed business owners of tea shops, agriculture processing shops or provisional shops) and existing uses of electricity, investigating how these outcomes differ across gender and disability status, and between treatment and control villages. Formal employment incorporates jobs in the government sector, non-governmental organizations and other private companies.

Individuals who are employed outside of the agricultural sector are more likely to work for themselves than working for an external employer. Table 14 — which reports the responses of all adults who are over 18 years old (compared to WP1 Baseline where we looked at only the respondent and their spouse) — shows that a substantial 24 percent of respondents who are over 18 are self-employed, whereas only 5 percent of respondents are formally employed at an organization where they receive a regular salary. In terms of earnings, individuals who work for a formal organization have an average net salary of almost 679,000 SLL per month.

Table 14: Non-agricultural Employment Outcomes

	(1)	(2)	(3)	(4)	(5)
	Sample Size	Mean	Std. Dev.	Min.	Max.
Self-employed and owns a business	12085	0.24	0.43	0.00	1.00
Number of hours work in a typical week	2841	40.49	25.26	0.00	105.00
Own business requires electricity	2894	0.18	0.38	0.00	1.00

Revenue in the last month (1000s SLL)	2838	1172.22	2689.91	0.00	20000.00
Costs in the last month (1000s SLL)	2848	855.14	2443.81	0.00	20000.00
Employed in a formal organization with salary	12065	0.05	0.21	0.00	1.00
Net salary from formal org. (1000s SLL) in last month)	533	679.76	702.59	0.00	5000.00

Note: This table shows summary statistics of non-agricultural production. Column (1) is the sample size. Column (2) shows the mean of the variable. A mean between 0 and 1 is the share of the sample that works. Column (3) shows the standard deviation, and Columns (4) and (5) show the minimum and maximum of the variable respectively.

Average reported monthly profits for self-employed worker is around 374,000 SLL (with outliers removed), a little more than half of the monthly reported salary of respondents employed in the formal sector. Average reported revenue for self-employed workers is 1,172,000 SLL and average monthly costs are 855,000 SLL.

Figure 5 shows the distribution of average monthly profits across all self-employed individuals. There is a high variation that we see where some of those who are self-employed are having a loss while some are earning a higher sum of money each month. However, the majority of self-employed is net positive with over 50 percent having at least 180,000 SLL in profits and an average earning of 374,000 SLL.

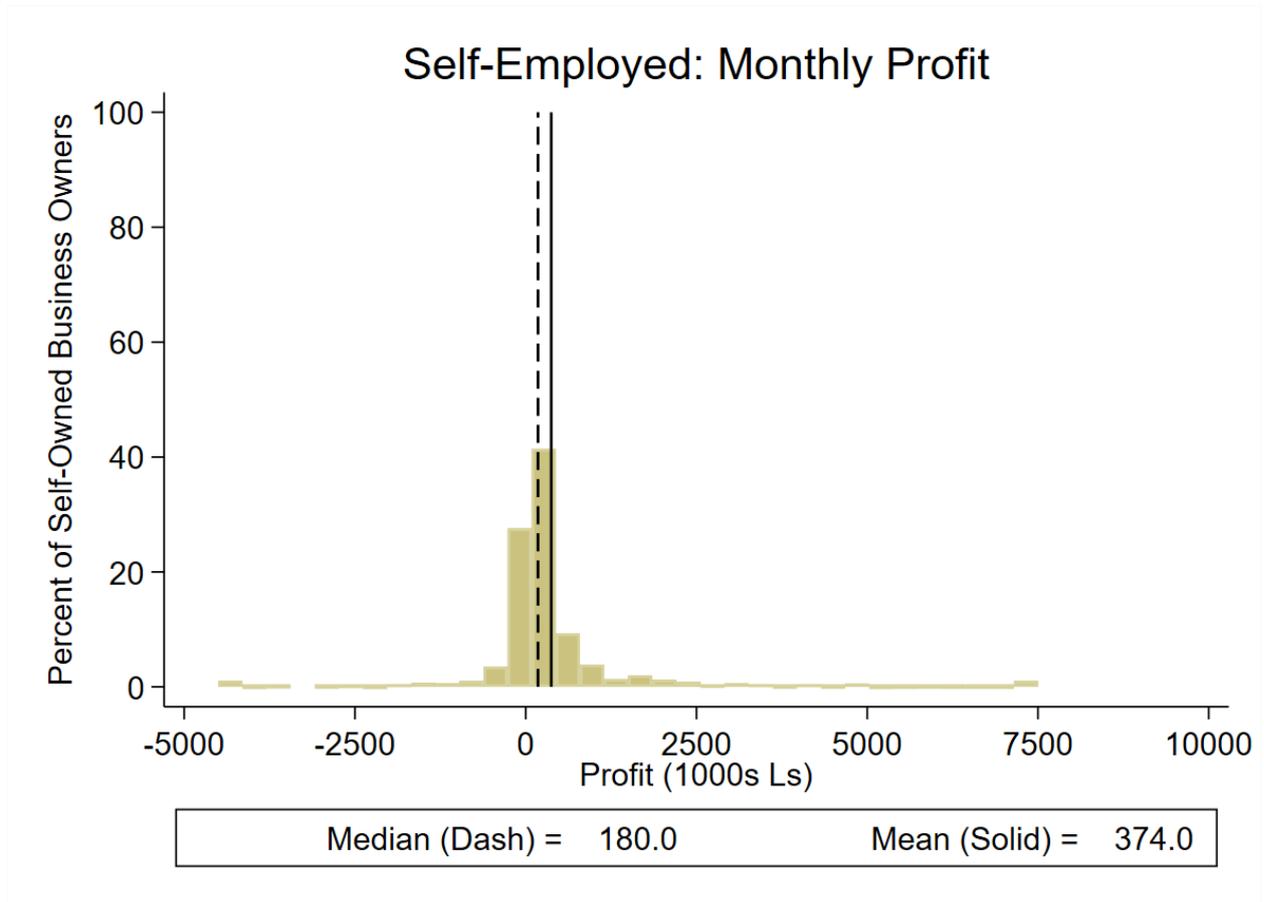


Figure 5: Profits for Self-Employed Individuals

Despite low average profits, we observe that the weekly time spent working is high. Figure 6 shows the distribution of the number of hours per week worked by the self-employed. Self-employed individuals work an average of 41 hours per week and more than 50 percent of self-employed individuals work over 36 hours per week.

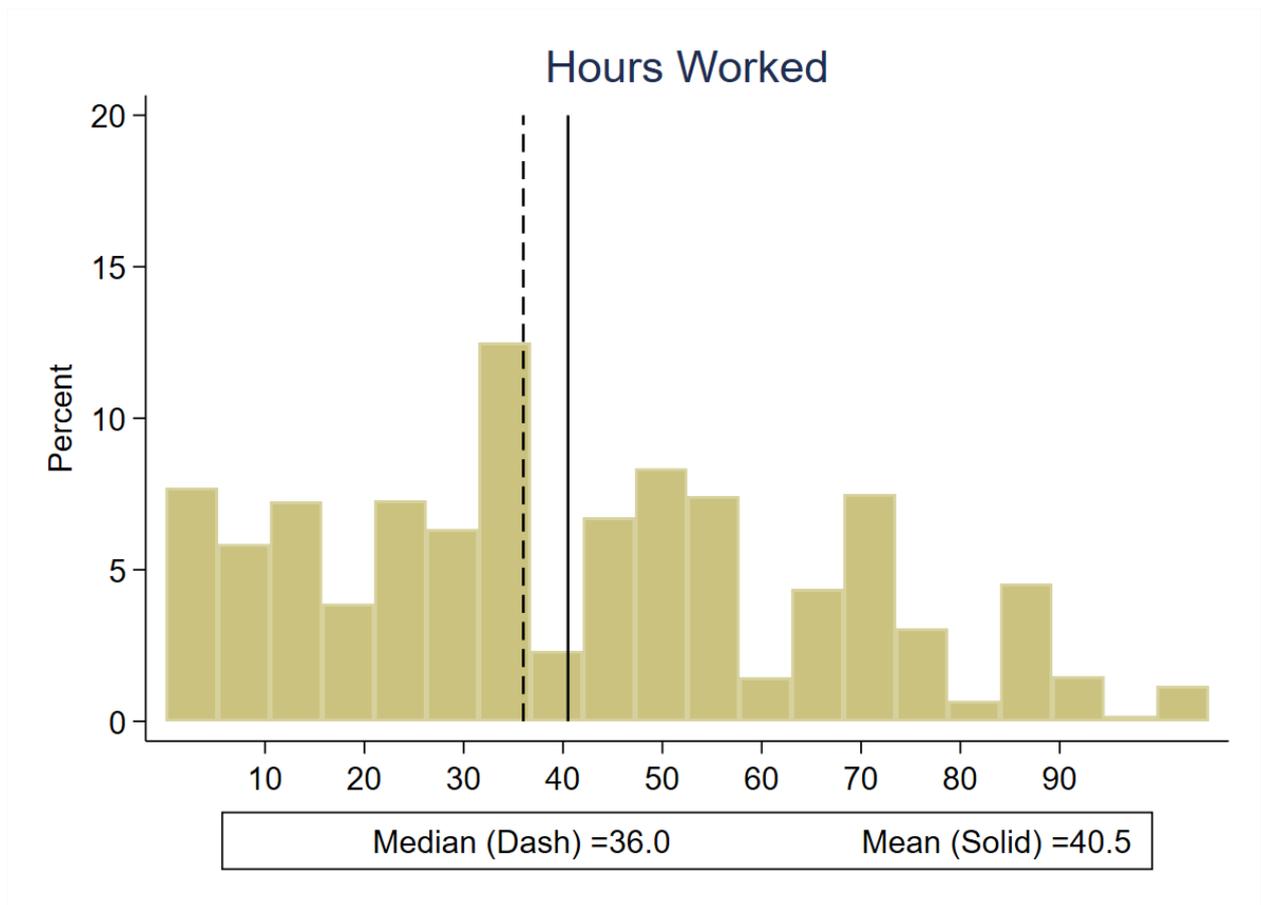


Figure 6: Hours Worked in A Typical Week By Self-Employed Individuals

Figure 7 and Figure 8 add nuance to our understanding the performance of entrepreneurs at baseline. Figure 7 shows the percent of self-employed individuals that work in each business type, and Figure 8 breaks down average business profits by business type. 51.7 percent of all self-employed classify themselves as “petty traders”, where generating profits seems particularly difficult. Petty traders report an average profit of 180,000 Leones a month. 13.2 percent of self-employed workers classify themselves as involved in “processing of agricultural goods”. Self-employed workers who process agricultural goods fare a little better, generating an average profit of 553,000 SLL per month. All self-employed individuals earn on average more than 100,000 SLL a month. The respondents who are most profitably self-employed are those who run an entertainment center (1,190,000 SLL a month); the least profitably employed individuals are those who run a tea shop (130,000 SLL a month).

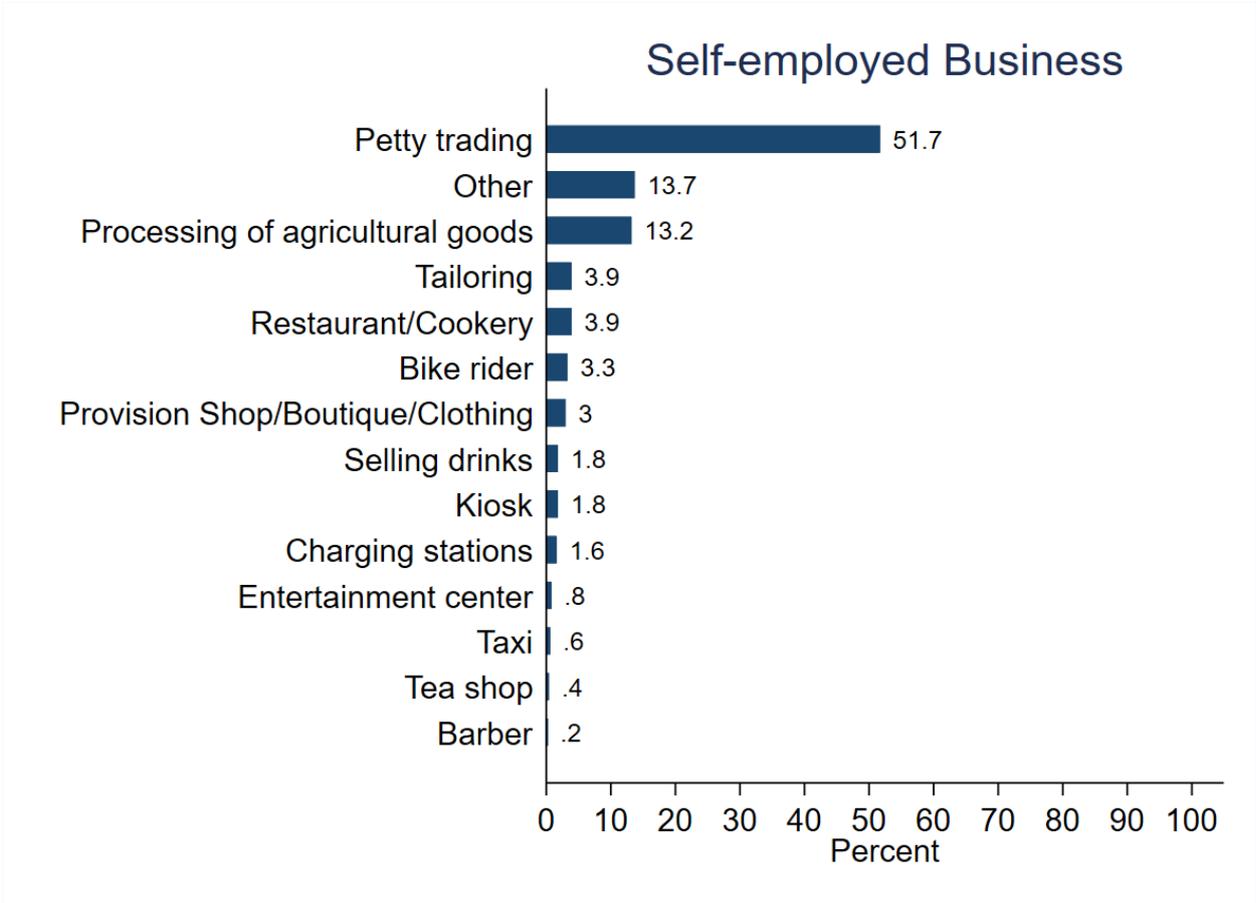


Figure 7: Self-Employed Business Type

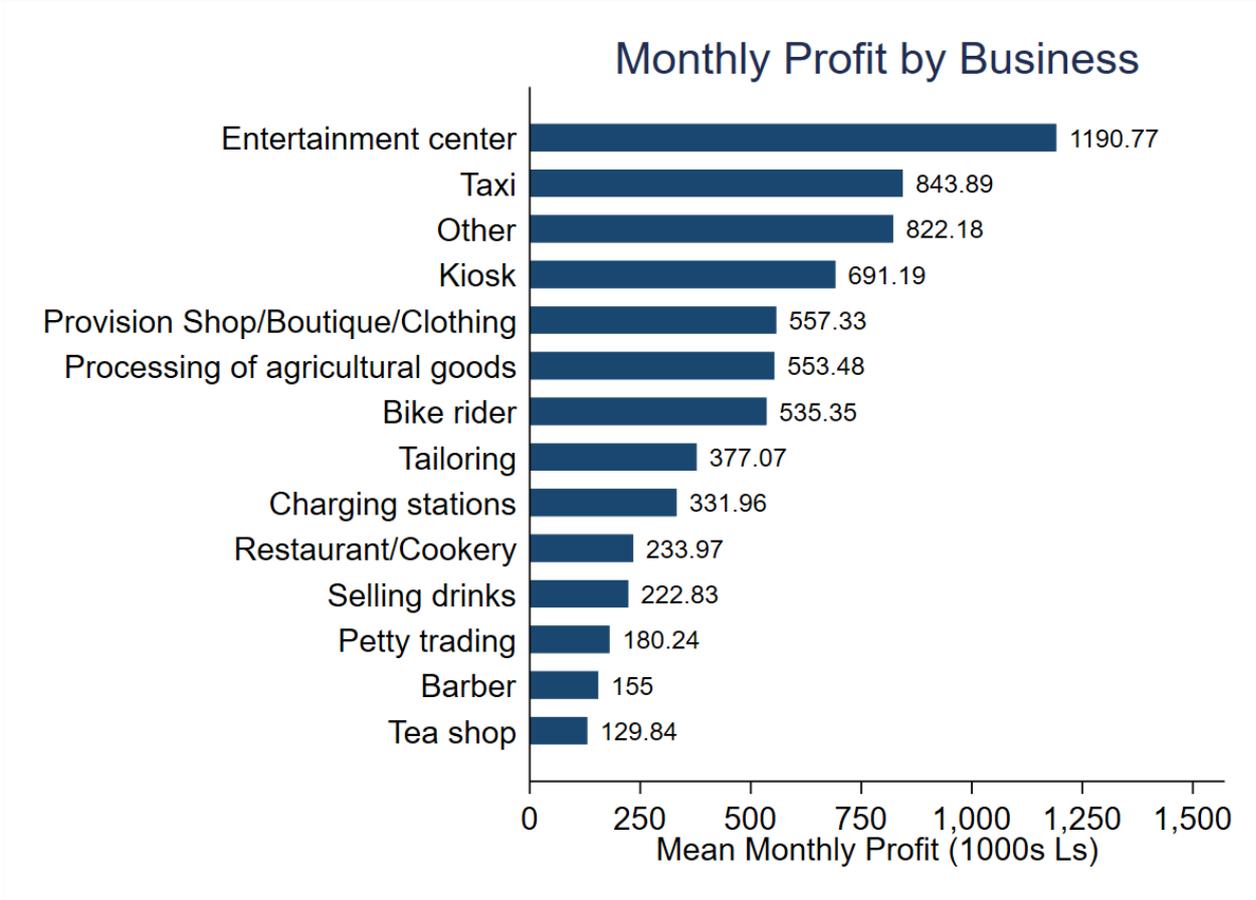


Figure 8: Monthly Profits by Self-employed Business Type

Figure 9 shows that businesses that are using electricity are rarely putting electricity to productive use. 86.67 percent of businesses use electricity for lighting. A smaller amount of businesses report using electricity for freezing (30.78 percent) or refrigeration (9.80 percent), but it's unclear to which extent this use of electricity can really be considered productive. If freezing and refrigeration were being used to transport agricultural products to the market, this would increase farm-gate prices for farmers and could be considered a "productive use". However, to the extent that refrigeration is being used to cool drinks, it might slightly modify consumption patterns, but likely will not drastically improve economic production in rural economies. Given the lack of in-country cold chain, it seems likely refrigeration and freezing is being used for the latter rather than the former. Figure 10 shows differences in electricity usage between treatment and control communities. Beyond lighting and cooling, electricity is mainly used for entertainment and communication, with 24.90 percent of businesses powering radios, 20.2 percent of charging phones, and 15.69 percent powering televisions. Figure 10 shows differences in electricity usage between treatment and control.

Similarly to what is reported for WP1 baseline report, the most common expectations for businesses following electrification was for fridges and freezers. In Focus Group Discussions (FGD), respondents stated that they would use fridges and freezers for 'kukri' businesses to preserve food for longer; to bring fish and other food to town to sell; and to sell cold drinks.

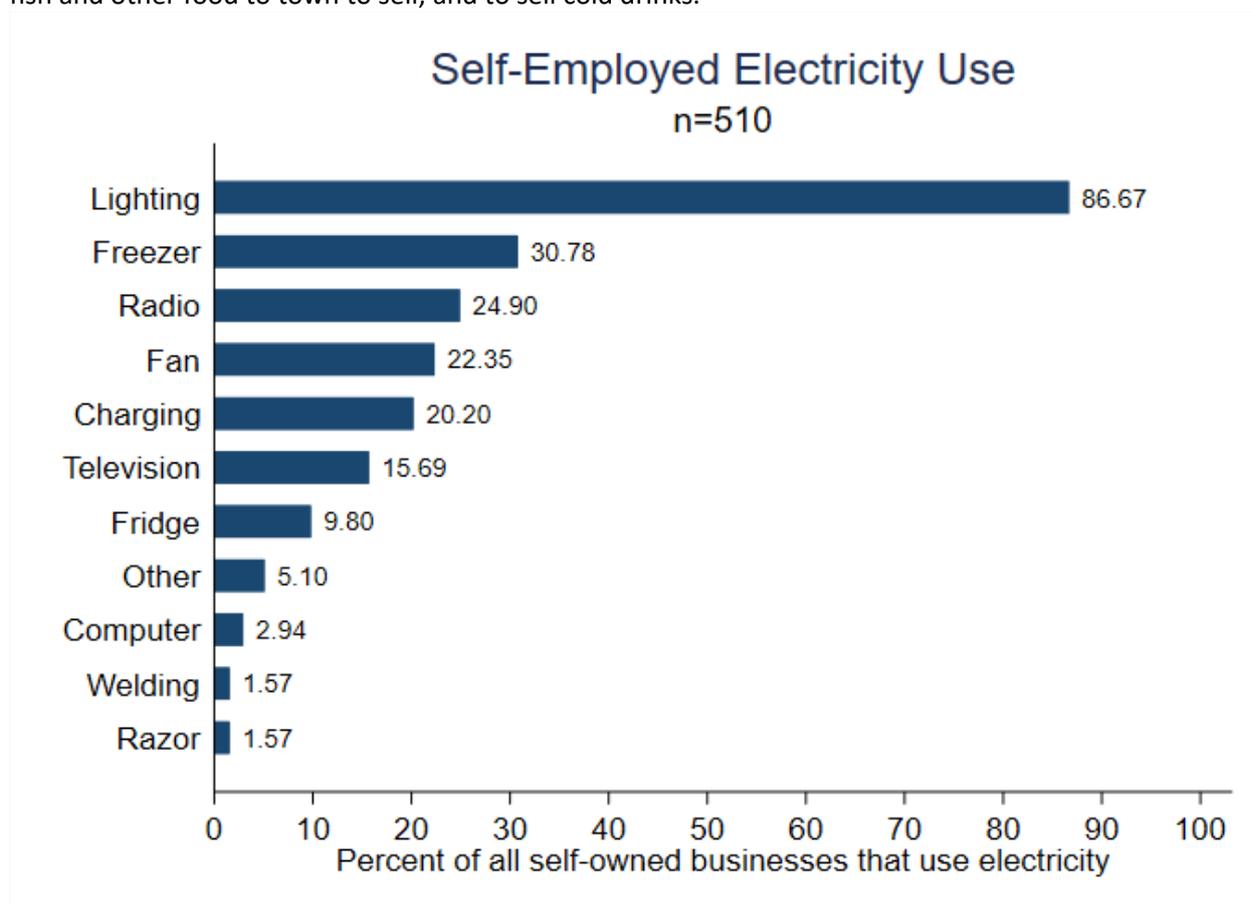


Figure 9: Self-Employed Use of Electricity

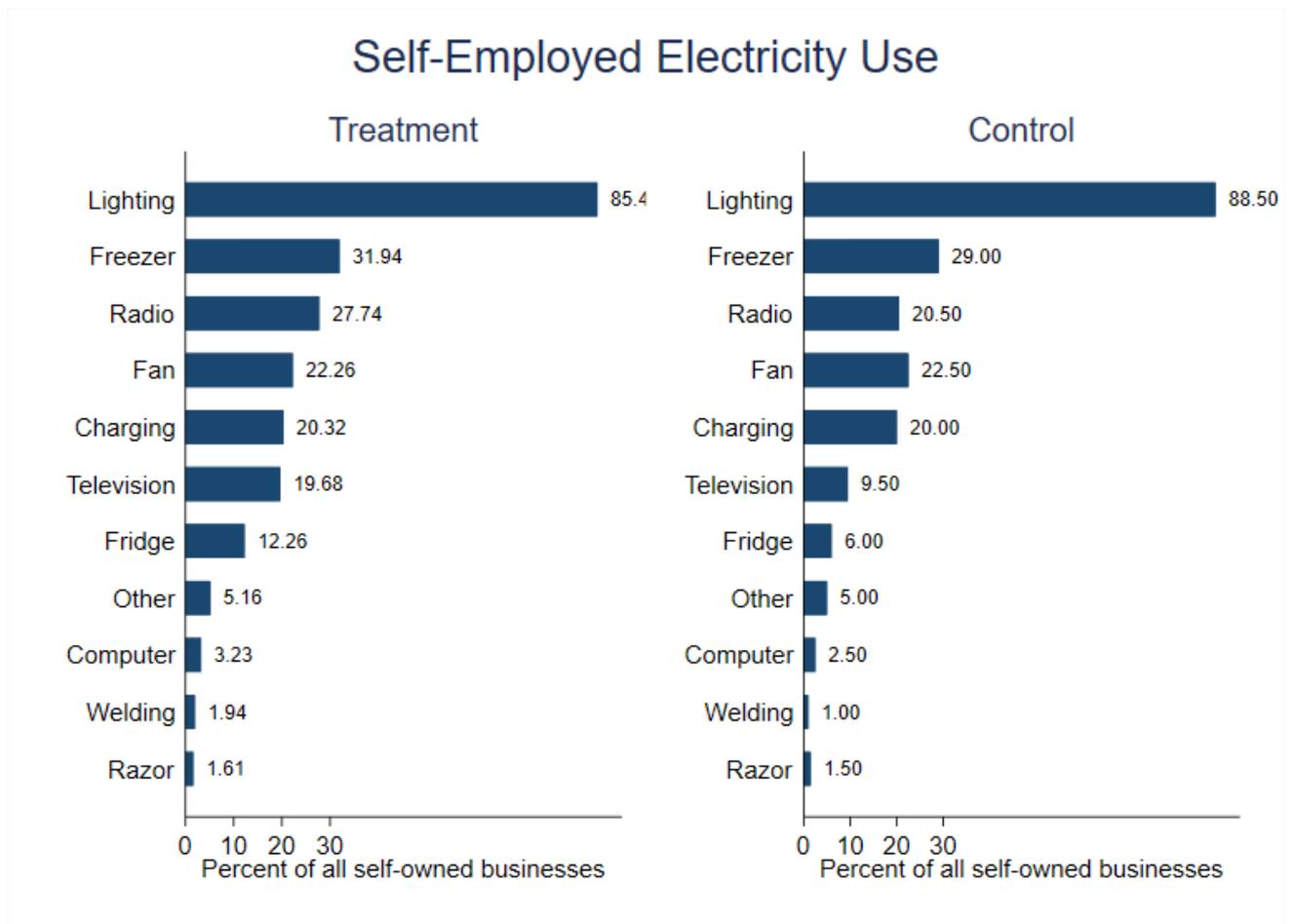


Figure 10: Self-Employed Use of Electricity by Treatment and Control

Table 15 compares electricity use between control and treatment groups. We see that the two samples are balanced in all but two uses. Self-owned businesses in the treatment groups are 6.3 percentage points more likely to own refrigerators, and 10.2 percentage points more likely to own tv/dvd players. However, these differences will not bias our analysis because the difference in difference estimation strategy controls for initial differences in electricity usage levels and compares the *rates of change* of electricity usage in treatment vs control communities.

Table 15: Self-Employed Use of Electricity by Mini-Grid Sites and Non-Mini-Grid Sites

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Freezer	0.290 (0.050)	0.319 (0.047)	-0.029 (0.068)
Refrigerator	0.060 (0.019)	0.123 (0.029)	-0.063* (0.035)
Fan	0.225 (0.055)	0.223 (0.035)	0.002 (0.065)
TV/DVD Player	0.095 (0.027)	0.197 (0.036)	-0.102** (0.045)
Charging Station	0.200 (0.033)	0.203 (0.036)	-0.003 (0.049)
Welding	0.010 (0.007)	0.019 (0.009)	-0.009 (0.011)
Electric Razor	0.015 (0.008)	0.016 (0.007)	-0.001 (0.011)
Radio/Music System	0.205 (0.046)	0.277 (0.072)	-0.072 (0.085)
Lighting	0.885 (0.035)	0.855 (0.026)	0.030 (0.044)
Computer/Laptop	0.025 (0.011)	0.032 (0.011)	-0.007 (0.015)
N	200	310	510
Notes: This table shows the difference in means for self-employed use of electricity between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column 1 and 2 are the respective means for control and treatment. Column 3 is the difference between the means (Control - Treatment). Standard errors are in parentheses. Stars indicate significance level. *<.10 **<0.05 ***<0.01			

While on average self-employed individuals do not claim much profit, the success of a business differs considerably by gender. Figure 11 reports business profits by gender. The mean profit for men is about 511,940 SLL per month. Women report a profit of 251,260 SLL per month, which is significantly less than men. This can be further explained by the types of businesses that women run.

The ways in which employment patterns differ by gender may shed some light on the substantial gendered differences in self-employment profits. Figure 12 shows that women are more likely to respond that they are self-employed (23.24 percent) compared to men (24.85 percent), but women are less likely to take up outside employment (1.66 percent) than men (8.2 percent). While men and women report working the around the same number of average hours in self-employment (Figure 13), their forms of self-employment differ. Figure 14 shows that women are much more likely to work as petty traders (39.5 percent) than men (13.6 percent), and that men are much more likely to work in construction or as bike riders. Self-employed women are more likely to work as a farm trader, own a kiosk, and run a catering business or a restaurant while men are more likely to own a construction business, be a bike rider, tailor, fisherman, own a charging centre, telecentre, as well as a tea shop. As we saw in Figure 14, the types of business that women are more frequently involved in— such as petty trading or being a farm trader— are less profitable businesses on average.

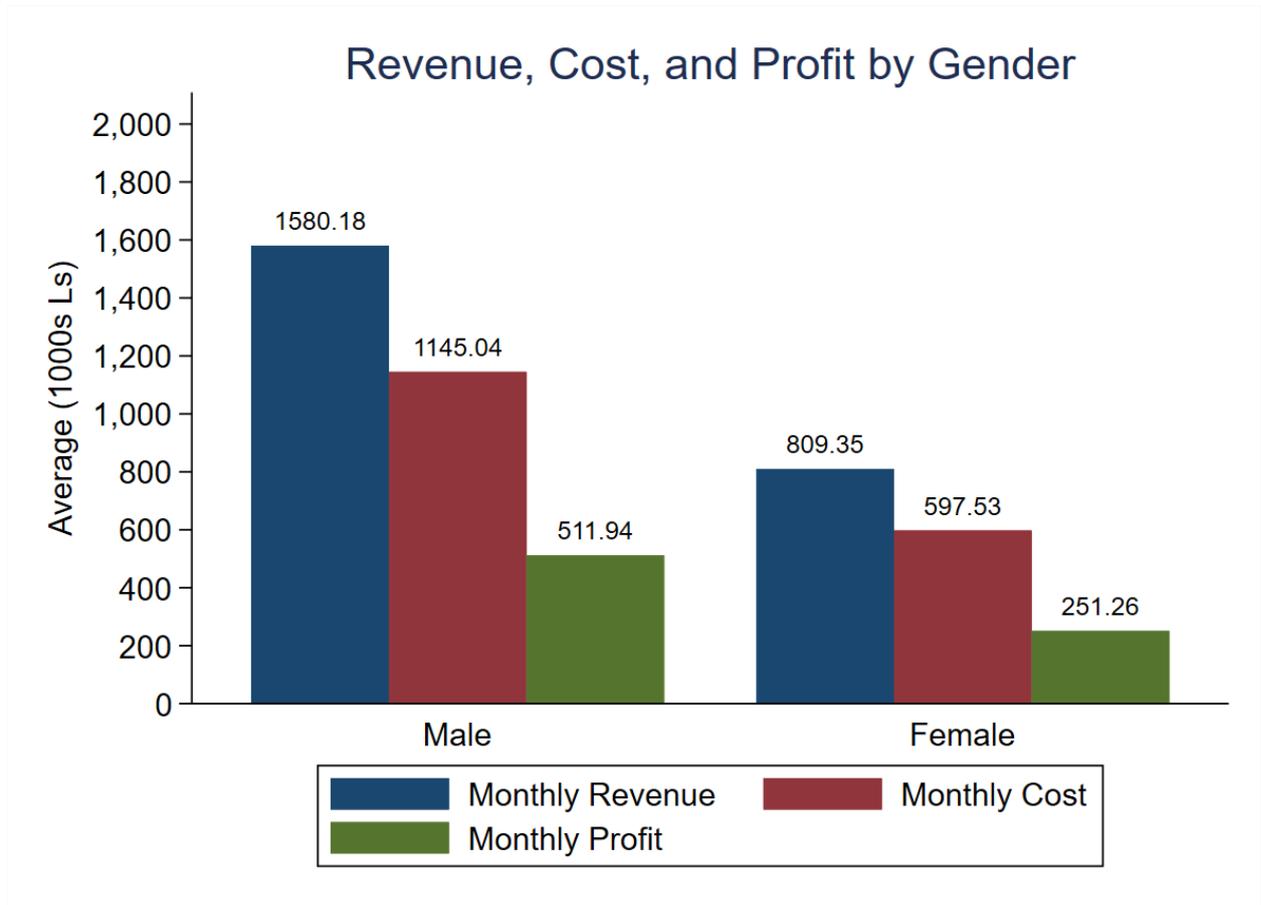


Figure 11: Revenue, Cost, and Profit by Gender

Employment Status by Gender

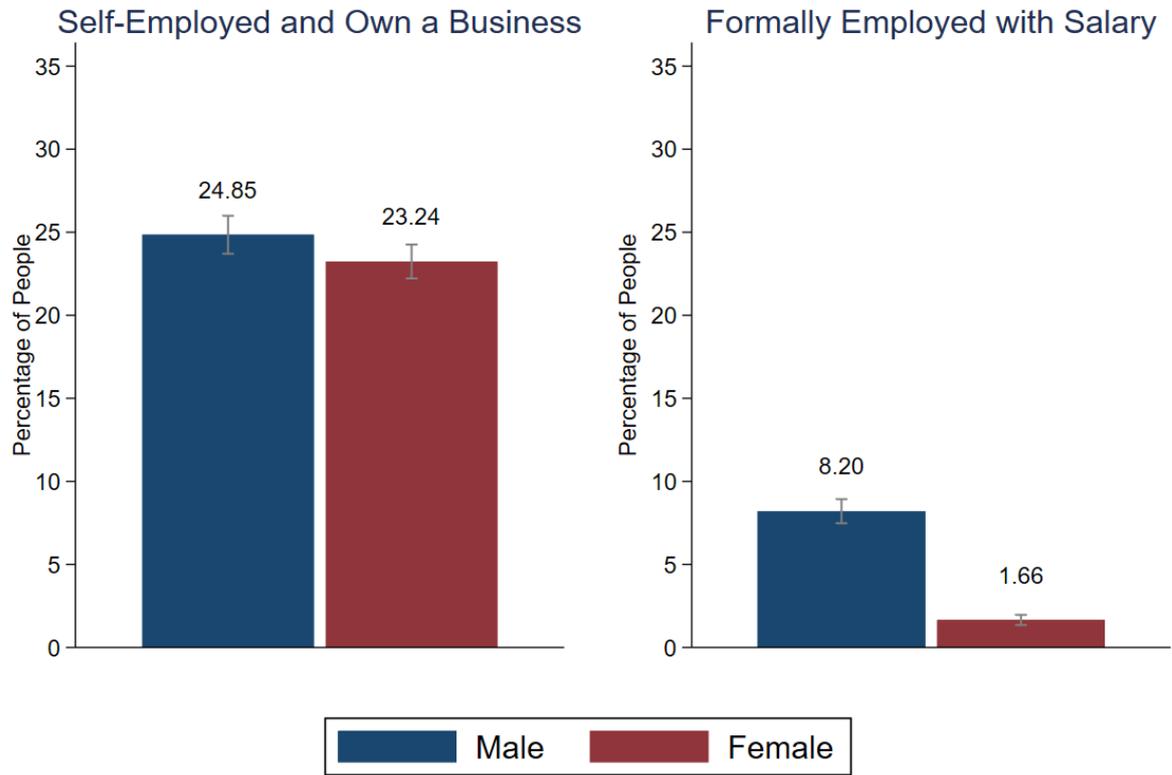


Figure 12: Employment Status by Gender

Self Employed Hours Worked per Week

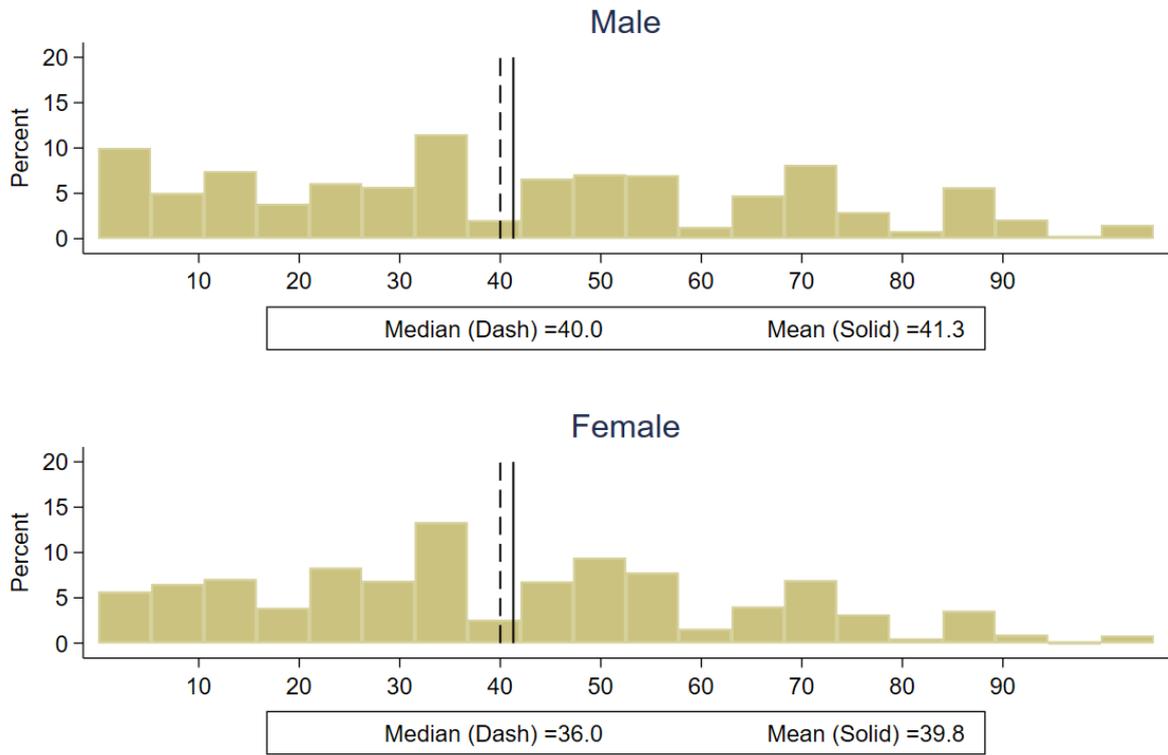


Figure 13: Self-Employed Hours Worked per Week by Gender

Self-employed Business Type by Gender

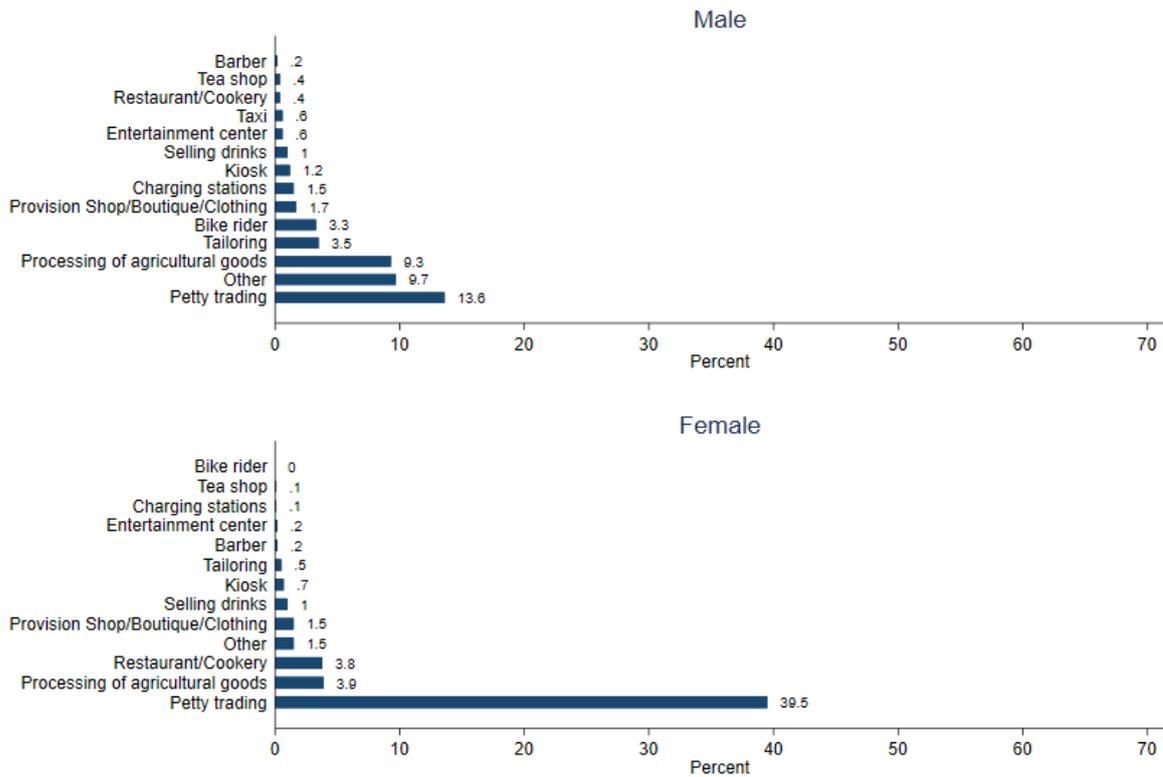


Figure 14: Self-Employed Business Type by Gender

Figure 15 and Figure 16 breaks the employment status by disability. The y-axis in Figure 15 displays the percent of self-employed and the y-axis in Figure 16 percent of formally employed. The red bars are those who are disabled, and the blue bars those with no disability. We see that when we disaggregate by disability status, those who suffer from disabilities seem to be less likely to be either self-employed or formally employed. For example, those who have at least some difficulty with vision are about 6 percentage points less likely to be self-employed compared to those with no vision disability. For self-employed, the differences in the percent employed across the disability statuses is statistically significant across all disability statuses except for those with difficulty with communication.

The differences for formal employment between disabled and non-disabled is also stark for vision, walking, self-care, and communication. Only 6.3 percent of respondents who have trouble with their vision are employed in the formal sector, compared to 10.7 percent of respondents who report no trouble with vision. Those who have no difficulty with their vision are statistically significant compared to those who have no difficulty with vision. Moving to the hearing figure, 10.3 percent of those who are formally employed in our sample have no difficulty with hearing at all, and 7.5 percent of our sample do have some difficulty with hearing. Although there is a difference in formal employment status between those with walking disabilities and those without, this difference is not statistically significant.

Self-employment by Disability

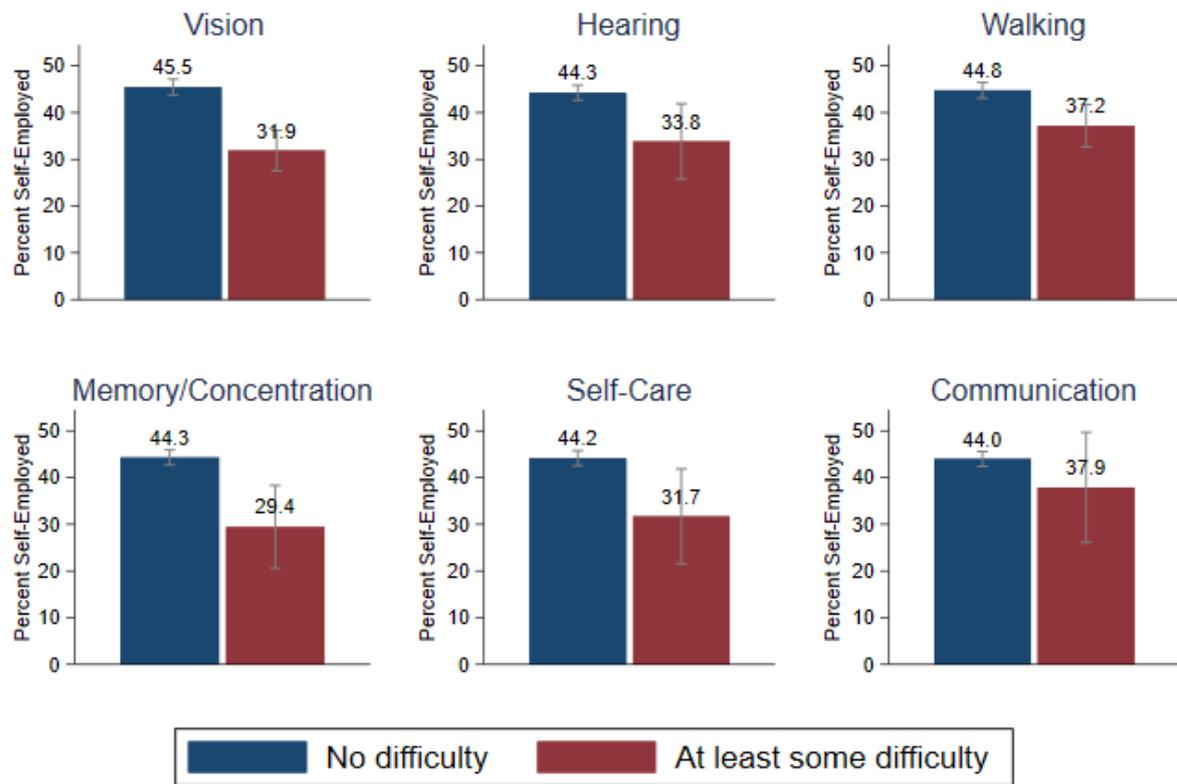


Figure 15: Self-Employment Status by Disability

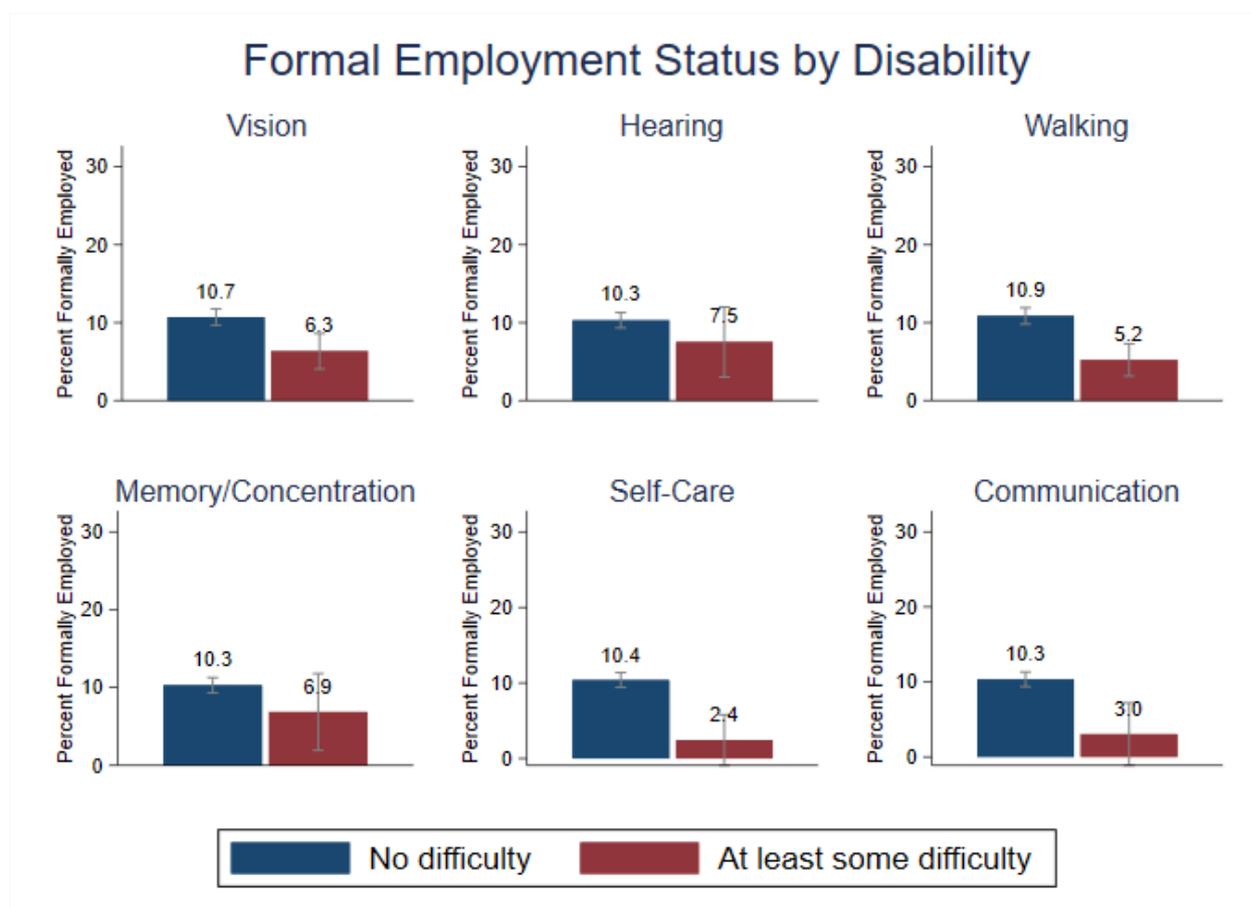


Figure 16: Formal Employment Status by Disability

Table 16 shows how individuals in mini-grid communities (treatment) and non-mini-grid communities (control) differ across several important non-agricultural employment variables. We find no statistically significant differences in baseline levels of the number of hours worked per week in self-employment, the requirements of electricity in self-employment, or average business revenue and costs which is similar to what was seen in WP1 Baseline. At baseline, individuals in treatment communities are roughly 3 percent more likely to be self-employed and are nearly 20 percent more likely to have outside employment with an organization. Figure 17 shows the breakdown of self-employed business type by treatment status. While our difference-in-difference estimation strategy can account for these baseline differences, it is important to note them.

Table 16 - Balance Table: Non-agricultural Employment Outcomes by Mini-Grid Sites and Non-Mini-Grid Sites

Variables	Difference in means between Mini-grid Sites and Non-Mini-grid Sites		
	Control (1)	Treatment (2)	Difference in Means (3)
For Full Sample: Self-employed and owns a business	0.222 (0.013)	0.256 (0.010)	-0.034** (0.016)
For Self-employed: Number of hours work in a typical week	40.730 (1.453)	40.304 (1.060)	0.426 (1.788)
For Self-employed: Own business requires electricity	0.159 (0.021)	0.190 (0.028)	-0.031 (0.034)
For Self-employed: Revenue in the last month (1000s Ls)	1278.368	1089.737	188.631

	(256.655		
)	(96.433)	(272.604)
For Self-employed: Costs in the last month (1000s Ls)	1016.829	729.732	287.097
	(159.507		
)	(80.814)	(177.787)
For Full Sample: Employed in a formal organization with salary	0.036	0.055	-0.019***
	(0.004)	(0.005)	(0.007)
For Formally Employed: Net salary from formal org. (1000s Ls) in last month)	584.354	735.696	-151.343*
	(44.642)	(79.720)	(90.902)
N	5705	6400	12105

Standard errors are in parentheses. Column 3 shows the difference in means. Stars indicate significance level. * $<.10$ ** <0.05 *** <0.01

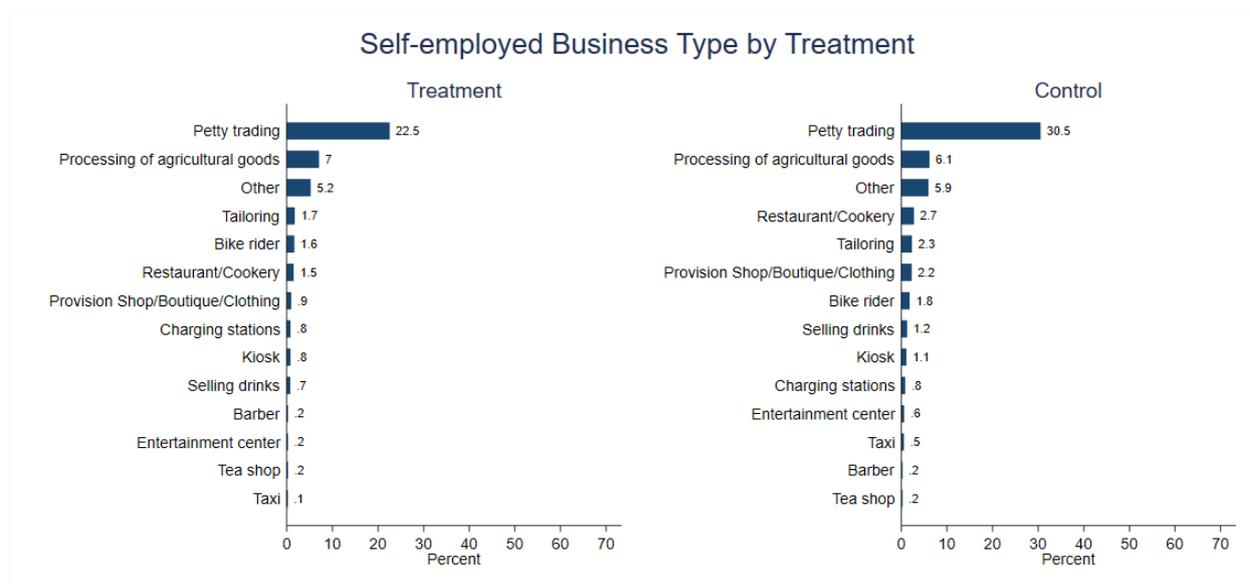


Figure 17: Self-Employed Business by Treatment Status

3.2.3 Livestock

Livestock is sometimes referred to the “savings account” of the rural economy. If electrification raises incomes – either through agricultural production or non-agricultural employment – households may decide to invest some of this extra income in livestock. Therefore, it is essential that we capture baseline levels of livestock in treatment and control communities. We catalogue all animals owned in the household— ownership defined as the right to kill or sell the animal. We also quantify the share of the household’s animals owned (at least in part) jointly shared by women.

Table 17 shows that about 66 per cent of the sample household own at least 1 animal. The mean average number of animals owned by a household is 7 (See figure 18). Of course, which type of animal owned has an impact on its value. Figure 19 breaks down animal ownership by type of animal. Nearly 90 percent of households own chickens (a low value animal), almost 40 percent of households own at least one goat, and 23 percent of households own at least one sheep. Cows, the highest value livestock, are owned by less than 7 percent of households. By breaking down livestock by animal type, we can untangle not only if electrification is changing total livestock ownership, but also if livestock is changing the composition of household livestock towards higher value animals.

Table 17: Summary Statistics for Livestock Ownership

	(1) Sample Size	(2) Mean	(3) Std. Dev.	(4) Min	(5) Max
Owens or Shares Livestock	3801	0.66	0.47	0.00	1.00
For full sample: Number of livestock owned	3803	7.03	8.76	0.00	42.00
For livestock owners: Number of livestock owned	2526	10.58	8.83	0.00	42.00
Goat	2524	0.37	0.48	0.00	1.00
Sheep	2524	0.23	0.42	0.00	1.00
Chicken	2527	0.89	0.31	0.00	1.00
Duck	2527	0.11	0.31	0.00	1.00
Pig	2523	0.01	0.11	0.00	1.00
Cow	2525	0.06	0.24	0.00	1.00

Note: This table shows summary statistics of livestock ownership in our sample. Column (1) is the sample size of either the full sample, or the subsample of livestock owners. Column (2) shows the mean of the variable. A mean between 0 and 1 is the share of the sample or subsample. Column (3) shows the standard deviation, and columns (4) and (5) show the minimum and maximum of the variable respectively.

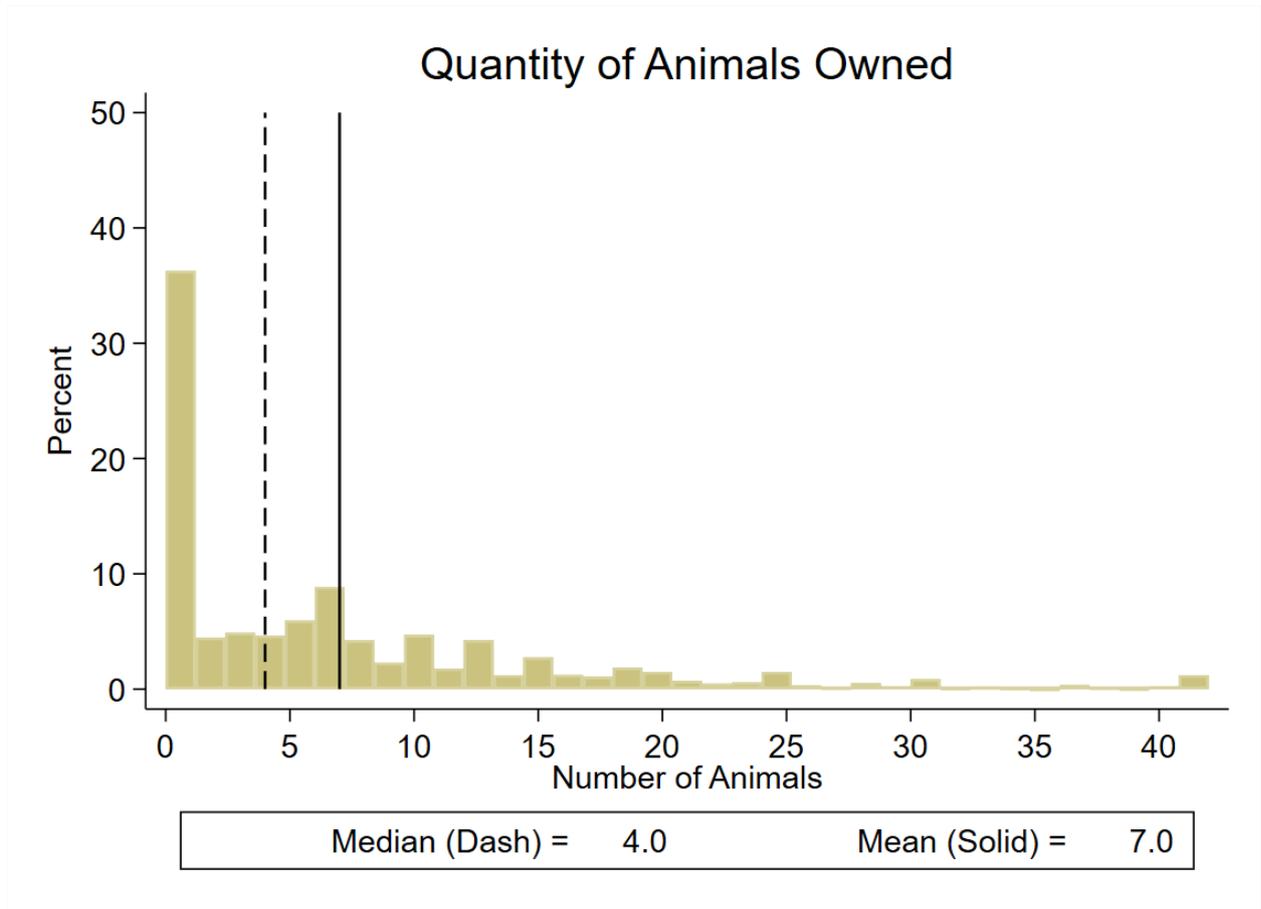


Figure 18: Quantity of Animals Owned

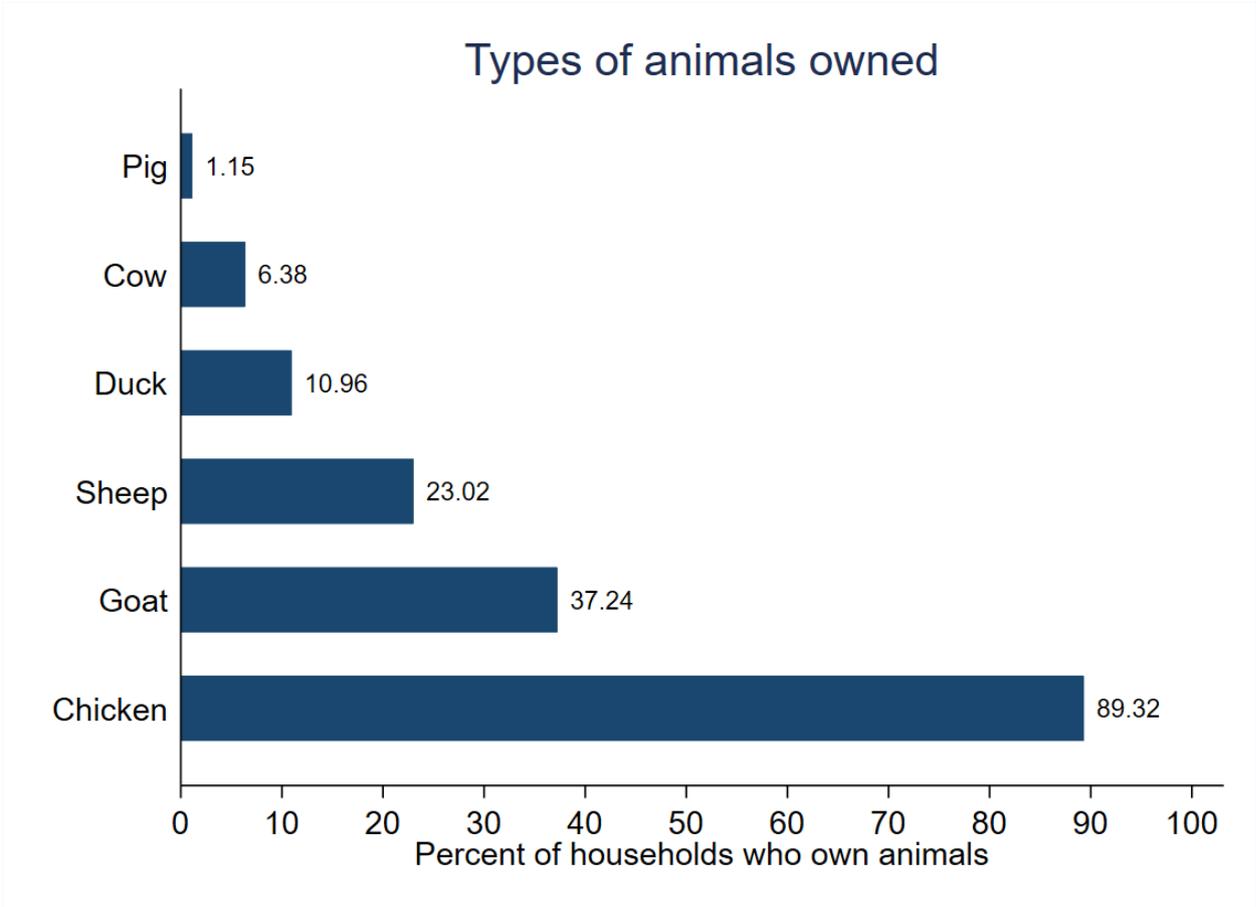


Figure 19: Types of Animals Owned

Figure 20 compares the average number of animals owned in households where the household head suffer from a disability to households whose household head does not suffer at all from a disability. Average livestock ownership is nearly identical in disabled and non-disabled households across all disability domains.

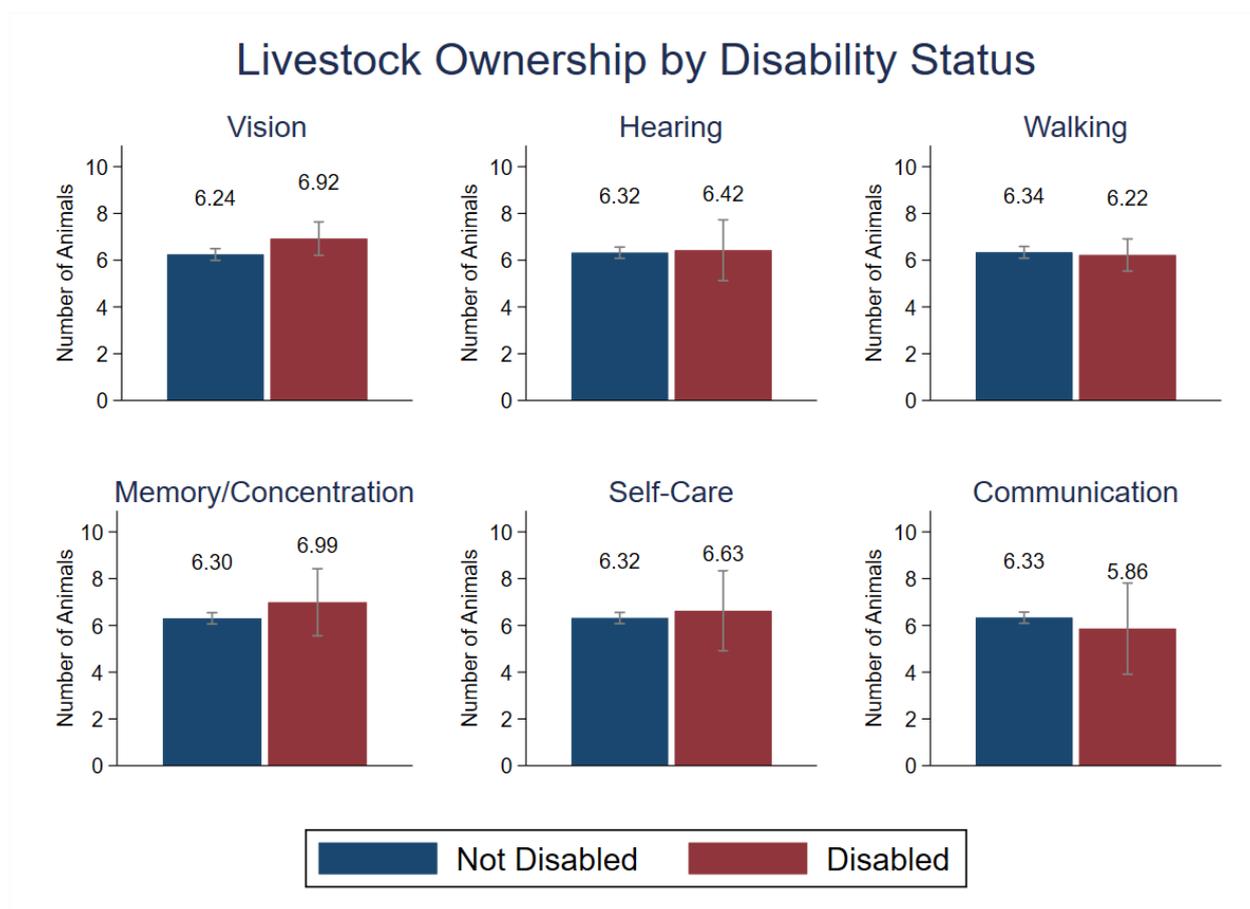


Figure 20: Livestock by Disability Status

Table 18 reports the differences in livestock ownership between the treatment and control communities. We see that baseline livestock ownership is balanced across treatment and control in all indicators except for the share of households that own goats. However, this difference is only statistically significant at the 90 percent level.

The difference in difference estimation strategy controls for initial differences in livestock levels and compares the *rates of change* of livestock ownership in treatment vs control communities.

Table 18 – Balance Table: Livestock Ownership by Mini-Grid Sites and Non-Mini-Grid Sites

Balance Table for Livestock Ownership (Non-Mini-Grid Sites vs Mini-Grid Sites)			
Variables	Control (1)	Treatment (2)	Difference in Means (3)
For full sample: Owns Livestock	0.676 (0.019)	0.654 (0.019)	0.022 (0.027)
For full sample: Number of livestock owned	7.060 (0.397)	6.998 (0.319)	0.062 (0.507)
For livestock owners: Number of livestock owned	10.465 (0.405)	10.699 (0.391)	-0.235 (0.559)
Share of HHs that owns at least one goat	0.410 (0.031)	0.335 (0.023)	0.075* (0.039)
Share of HHs that owns at least one sheep	0.229	0.231	-0.002

	(0.027)	(0.025)	(0.037)
Share of HHs that owns at least one chicken	0.904	0.883	0.021
	(0.014)	(0.020)	(0.024)
Share of HHs that owns at least one duck	0.100	0.119	-0.018
	(0.013)	(0.012)	(0.017)
Share of HHs that owns at least one pig	0.010	0.013	-0.004
	(0.004)	(0.005)	(0.006)
Share of HHs that owns at least one cow	0.049	0.078	-0.029
	(0.023)	(0.030)	(0.038)
N	1875	1929	3804

Note: This table shows the difference in means for livestock ownership between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column 1 and 2 are the respective means for control and treatment. Column 3 is the difference between the means (Control - Treatment). Standard errors are in parentheses. Stars indicate significance level. *<.10 **<0.05 ***<0.01

3.2.4 Household Assets

Figure 21 shows the ownership of electrified assets. Here we see that communication and entertainment items are the most commonly owned electrified assets. Specifically, the most popularly owned electrified assets are mobile phones (64 percent) and radio (52 percent), followed to a lesser extent by DVD equipment (7 percent) and a television (4 percent). Percent ownership is below three percent for economically productive assets, such as sewing machines (2 percent), freezers (2 percent) and electric stoves (0.05 percent).

Electrified Asset Ownership

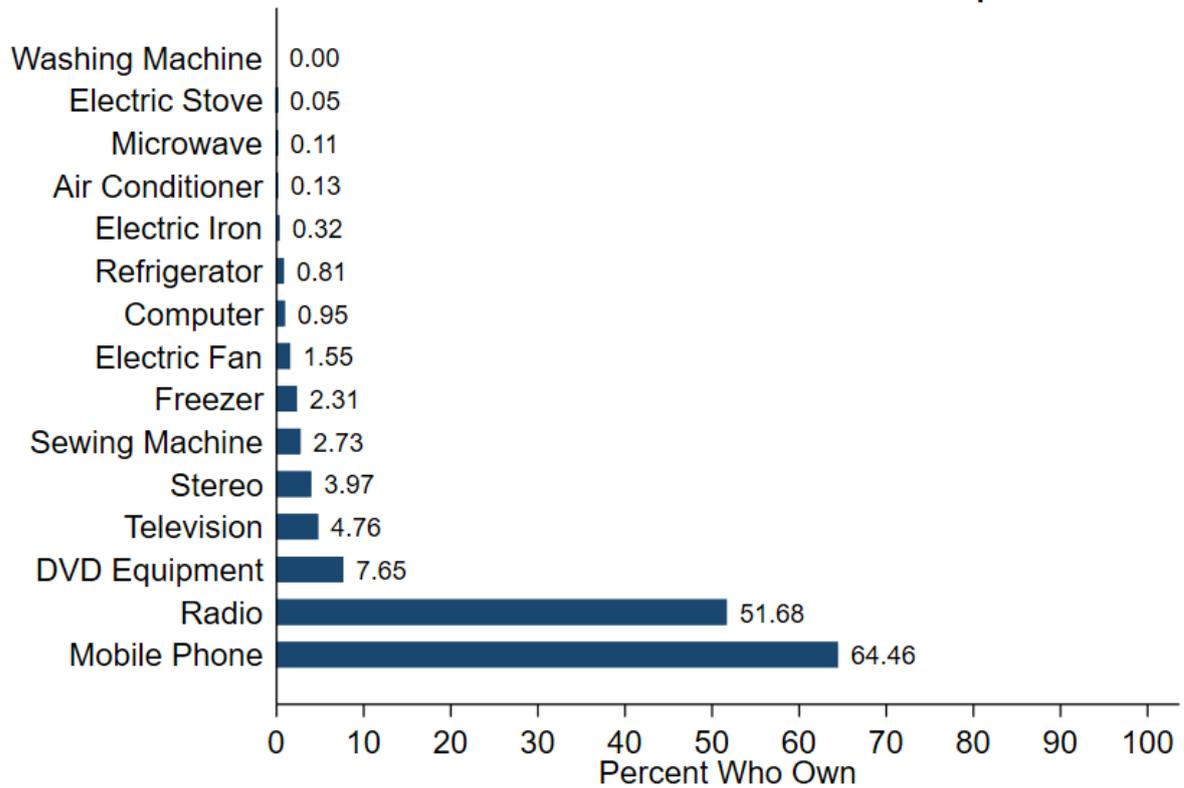


Figure 21: Ownership of Electrified Assets

Table 19 - Balance Table: Ownership of Electrified Assets

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Washing machine	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Stove (electric)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)
Microwave	0.001 (0.001)	0.002 (0.002)	-0.001 (0.002)
Air conditioner	0.000 (0.000)	0.003 (0.002)	-0.003 (0.002)
Iron (electric)	0.001 (0.001)	0.005 (0.002)	-0.004** (0.002)
Refrigerator	0.004 (0.002)	0.012 (0.003)	-0.008** (0.004)
Computer	0.006 (0.002)	0.013 (0.003)	-0.007* (0.004)
Electric fan	0.006 (0.002)	0.025 (0.005)	-0.019*** (0.005)
Freezer	0.010 (0.003)	0.036 (0.006)	-0.027*** (0.007)
Sewing machine	0.023	0.032	-0.009

	(0.003)	(0.005)	(0.006)
Stereo system	0.029	0.050	-0.021**
	(0.005)	(0.008)	(0.010)
Television	0.030	0.064	-0.034***
	(0.006)	(0.008)	(0.010)
Video/DVD equipment	0.052	0.100	-0.048***
	(0.008)	(0.009)	(0.012)
Radio	0.481	0.552	-0.072**
	(0.022)	(0.022)	(0.031)
Mobile phone	0.567	0.720	-0.153***
	(0.025)	(0.022)	(0.033)
<p>Note: This table showed the difference in means for health indicators between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column (1) and Column (2) are the respective means for control and treatment. Column (3) is the difference between the means (Control - Treatment). Standard errors are in the parentheses and are clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.01</p>			

Table 19 reports the differences in ownership of electrified assets between control and treatment communities. While the overall ownership of electrified assets is low, households in treatment communities tend to have slightly higher ownership rates. As seen in WP1 Baseline, the largest difference between households in treatment communities and households in control communities is in the domain of communication and entertainment. Households in treatment communities are 15.3 percentage points more likely to own a mobile phone, 7 percentage points more likely to own a radio, 4.8 percentage points more likely to own a video/dvd equipment, 3.4 percentage points more likely to own a television, and 2.1 percentage points more likely to own a stereo. A smaller portion of businesses in treatment communities report using electricity for freezing (2.7 percentage points) and even lower for refrigeration (0.8 percentage points) which makes it unclear as to what extent the use of electricity is productive. As noted in the methodology section, it is possible that differences in ownership of electrified assets are due to treatment communities increased expectations about future access to electricity. That said, we suspect that this baseline difference is *not* due to the effects of the RREP program, but existing baseline wealth differences between RREP sites and non-RREP sites.

3.3 Health Outcomes

This section outlines health indicators and outcomes measured in the Household Survey. This report only presents indicators measured through household questionnaire. However, the team has requested access to administrative data, and changes in indicators collected through administrative data will be monitored and presented in the end line report.

Statistics here presented are based on questions asked during the household questionnaire and addressed to the household head, and two randomly selected children that live in the household.

3.3.1 Acute Respiratory Infection

Table 18 reports the summary statistics of health indicators for disease prevalence and health-seeking behavior. Out of the entire sample, 35 percent reported suffering from symptoms of malaria (2,101 respondents). Out of the 2,101 people who suffered from malaria, 76 percent sought treatment at a CHC. This is different from the estimates for WP1 (where we found 49 percent sought treatment) and shows that there is higher health-seeking behavior amongst our sample in WP2. Twenty-three percent of sample reports suffering from symptoms of acute respiratory infection (ARI) in the past 30 days, and of those

people, 75 percent sought treatment from the CHC. Finally, only 9 percent of people in our sample reported symptoms of cataracts or dry eyes in the past 30 days, and of these people, 61 percent sought treatment at a CHC. The results suggest that baseline levels of health seeking behavior is modestly high for ARI and malaria, with 75-76 percent of people seeking treatment at a CHC. Health seeking behavior for ARI is less (61 percent), but still high considering the few cases.

Table 18: Summary Statistics of Health Indicators

	(1) Sample size	(2) Share	(3) n (Sample size x Share)
Has suffered from malaria in the past 30 days	6076	0.35	2101
Suffered from malaria in past 30 days and sought treatment at CHC	2099	0.76	1592
Has suffered from acute respiratory illness (ARI) in the past 30 days	6064	0.23	1412
Suffered from ARI in past 30 days and sought treatment at CHC	1412	0.75	1065
Has suffered from cataracts/dry eyes in the past 30 days	6063	0.09	540
Suffered from Cataracts/Dry Eyes in past 30 days and sought treatment at CHC	540	0.61	328

Note: This table shows summary statistics of health indicators. Column (1) is the sample size for either the full sample of women and children, or a subsample that suffered with the disease in the past 30 days. Column (2) is the share of the sample/subsample that suffered from the illness or sought treatment at a CHC, and column (3) is the number of observations that suffered from the illness or sought treatment at a CHC.

Figure 22 shows the incidents of illness reported in the past 30 days disaggregated by age. The blue bar in each figure is to represent people below the age of 5 (age 5 included), the red bar is representing those who are above 5 years old. It shows that children under the age of 5 (32 percent) are more likely to suffer from symptoms of ARI than respondents over 5 (17.9 percent). This difference is statistically significant as evident by the confidence intervals on the two bars. We see no significant difference between age groups for cataracts/dry eyes.

We see that nearly a quarter of our respondents have suffered from an acute respiratory infection in the past month. Children under the age of 5 are most susceptible to respiratory infections. These estimates are similar to what we presented in the WP1 baseline report.

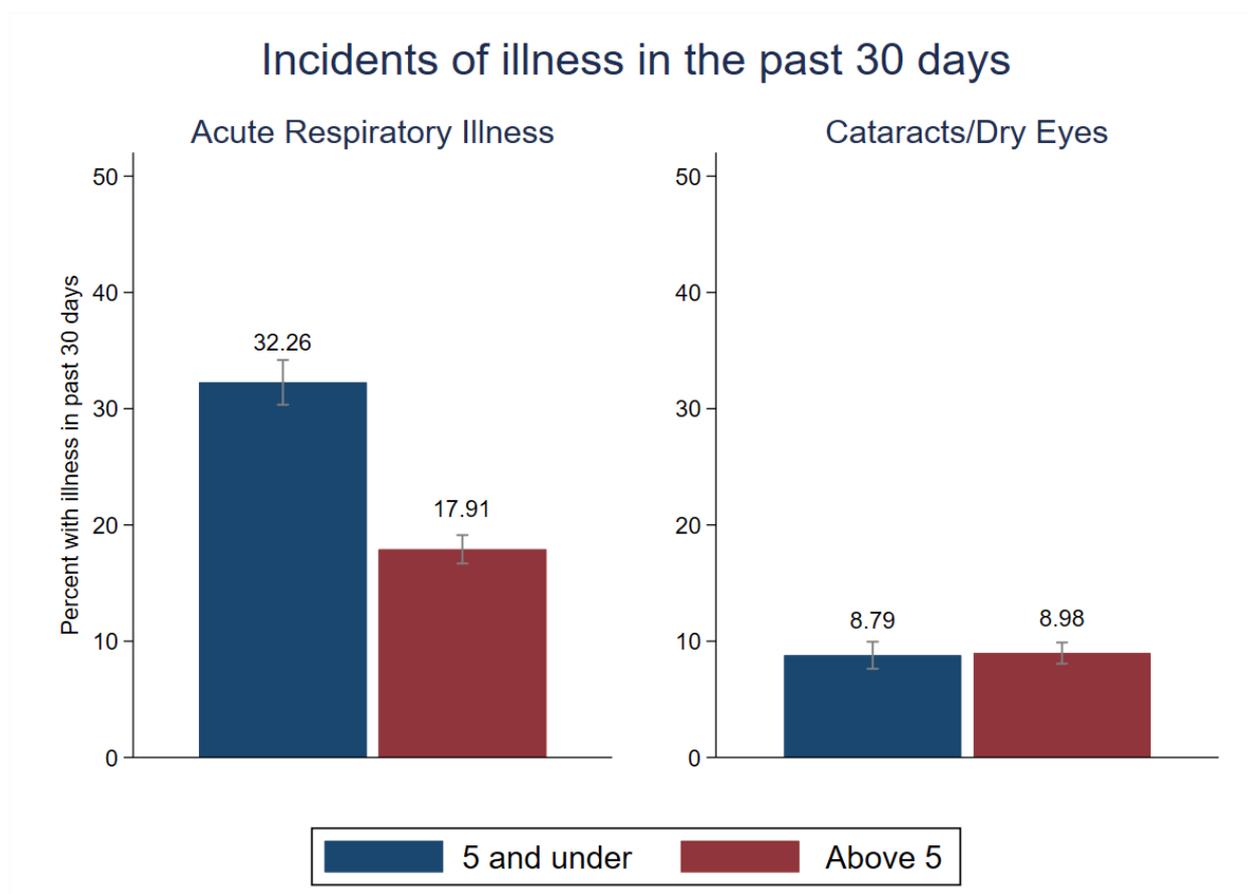


Figure 22: Infections by Age Group

3.3.2 Health Indicators by Treatment and Control Groups

Table 19 compares baseline health indicators between control and treatment communities. Respondents in control communities are significantly more likely to suffer from symptoms of malaria and symptoms of cataracts/dry eyes than respondents in treatment communities. The control communities are 5.7 percentage points more likely to have reports of malaria and 2.9 percentage points more likely to have reports of cataracts/dry eyes. However, both differences are only statistically significant at the 90 percent level.

Table 19 - Balance Table: Health Indicators for Mini-Grid Sites and Non-Mini-Grid Sites

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Has suffered from malaria in the past 30 days	0.375 (0.021)	0.317 (0.021)	0.057*
Suffered from malaria in past 30 days and sought treatment at CHC	0.744 (0.024)	0.775 (0.025)	-0.031 (0.035)
Has suffered from acute respiratory illness (ARI) in the past 30 days	0.244 (0.017)	0.222 (0.016)	0.022 (0.023)
Suffered from ARI in past 30 days and sought treatment at CHC	0.768 (0.027)	0.740 (0.033)	0.028 (0.042)
Has suffered from cataracts/dry eyes in the past 30 days	0.104 (0.014)	0.075 (0.010)	0.029* (0.017)

Suffered from Cataracts/Dry Eyes in past 30 days and sought treatment at CHC	0.563 (0.041)	0.668 (0.049)	-0.105 (0.064)
Note: This table showed the difference in means for health indicators between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column (1) and Column (2) are the respective means for control and treatment. Column (3) is the difference between the means (Control - Treatment). Standard errors are in the parentheses and are clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.01			

Table 20 compares the differences in health indicators by the gender of respondents. More women report suffering from almost all illnesses. Women are 3 percentage points more likely to have suffered from ARI symptoms in the past 30 days, and this is statistically significant at the 5 percent level. Women are also more likely to seek treatment than men. Women are 4.8 percentage points more likely to seek treatment for ARI symptoms, but this is only statistically significant at the 10 percent level.

Table 20 – Balance Table: Health Indicators by Gender

Variables	Male (1)	Female (2)	Difference in Means (3)
Has suffered from malaria in the past 30 days	0.343 (0.016)	0.352 (0.017)	-0.009 (0.013)
Suffered from malaria in past 30 days and sought treatment at CHC	0.753 (0.019)	0.771 (0.023)	-0.018 (0.021)
Has suffered from acute respiratory illness(ARI) in the past 30 days	0.224 (0.012)	0.254 (0.015)	-0.030** (0.012)
Suffered from ARI in past 30 days and sought treatment at CHC	0.738 (0.025)	0.786 (0.023)	-0.048* (0.026)
Has suffered from cataracts/dry eyes in the past 30 days	0.090 (0.009)	0.088 (0.009)	0.002 (0.007)
Suffered from Cataracts/Dry Eyes in past 30 days and sought treatment at CHC	0.597 (0.035)	0.632 (0.046)	-0.035 (0.045)
N	4420	2683	7103
This table showed the difference in means for health indicators between Male and Female. Column (1) and Column (2) are the respective means for male and female. Column (3) is the difference between the means (Male - Female). Standard errors are in the parentheses and are clustered at the community level. Stars indicate statistical significance level. *<.10 **<0.05 ***<0.01			

3.3.3 Disabilities

Table 21 reports respondents who answered that they have at least some difficulty with day-to-day tasks such as communication, hearing, remembering, seeing, and exhibiting self-care. To measure disability, we use the Washington Group Disability Questions. The Washington Group Short Set of Disability Questions is effective at identifying individuals in a population with disabilities, but it does not go into a lot of detail about psycho-social disabilities. These questions allowed the evaluation team to gain enough information

on disability to disaggregate it with other indicators in the survey. The findings provide a broader picture of the kind of disabilities that exist in Sierra Leone.

For the analysis we asked disability questions for the head of the household, as well as two randomly selected children between the ages of 6 and 18, of different genders when possible. This gave us a total of 9,027 observations with information on disabilities. Each disability is a binary variable equal to one if the person has at least some trouble with that category of disability, and zero if they have no trouble at all. We see that disability status is low for most disability categories, even using this broad definition of disability. The highest is vision and walking which are both around 6 percent of the sample, or 502 and 504 people respectively. Pooling all disabilities together into a category equal to one if the person has any disability at all, and zero if they do not, we see that 14 percent has at least some disability. This amounts to about 1,253 people in our sample.

Table 21 – Disabilities: Summary Statistics

	(1) Sample Size	(2) Share	(3) Std. Dev	(4) Number Disabled (Sample size x Share)
Vision	9027	0.06	0.23	502
Hearing	9027	0.02	0.15	194
Walking	9027	0.06	0.23	504
Memory/Concentration	9027	0.02	0.15	222
Self-Care	9027	0.02	0.14	169
Communication	9027	0.02	0.13	166
Has any disability	9045	0.14	0.35	1253

Note: This table shows summary statistics of disability status. Column (1) is the sample size of either the full sample (including those that refuse to answer), or a subsample that is conditioned on there being a certain disability. Column (2) shows the share of each sample/subsample. To get percent, multiply share by 100. Column (3) shows the standard deviation, and column (4) shows the number of incidents which is the sample/subsample multiplied by the share.

Figure 23 breaks down disability by gender. We see that there is hardly any difference between male and female across most disability categories. The only categories where there is a slight difference are vision and hearing, where males have about 1 percentage point more disabled than females in both.

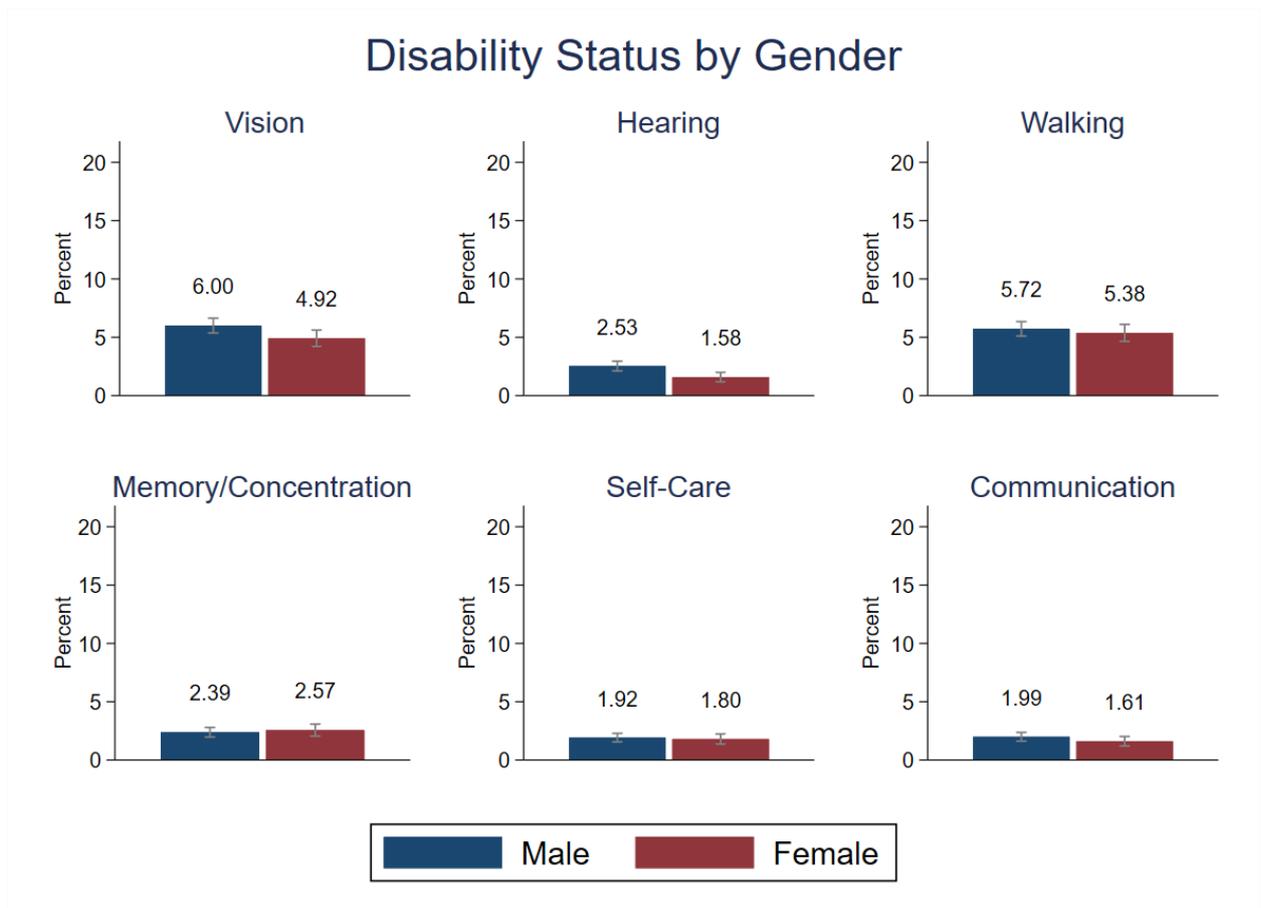


Figure 23: Disability Status by Gender

Table 23 is a balance table that breaks down disability prevalence across treatment and control and compares the means between the two. We see that there is no difference that is statistically different from zero in all disability categories except for hearing, where the difference in means is significant at the 95 percent level.

Table 23 – Balance Table: Disability Status for Mini-Grid Sites and Non-Mini-Grid Sites

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Vision	0.060 (0.005)	0.052 (0.004)	0.008 (0.007)
Hearing	0.026 (0.003)	0.017 (0.002)	0.009** (0.004)
Walking	0.057 (0.004)	0.054 (0.004)	0.003 (0.006)
Memory/Concentration	0.026 (0.005)	0.023 (0.003)	0.002 (0.006)
Self-Care	0.018 (0.004)	0.019 (0.002)	-0.001 (0.004)
Communication	0.017 (0.003)	0.020 (0.003)	-0.003 (0.004)

Has any disability	0.147 (0.009)	0.131 (0.008)	0.016 (0.012)
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Notes: This table shows the difference in means for disability status between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column 1 and 2 are the respective means for control and treatment. Column 3 is the difference between the means (Control - Treatment). Standard errors are in parentheses and clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.01

Figure 24 breaks down disability status by age. We see that in almost all categories, those older than the age of 18 are more likely to have some disability. In some cases, this difference is stark. For vision and walking, older people are about 10.5 percentage points more likely to have a disability than younger people and the confidence intervals for both categories show high statistical significance. There is a large difference for hearing as well, where older people are 2 percentage points more likely to have difficulty than younger people.

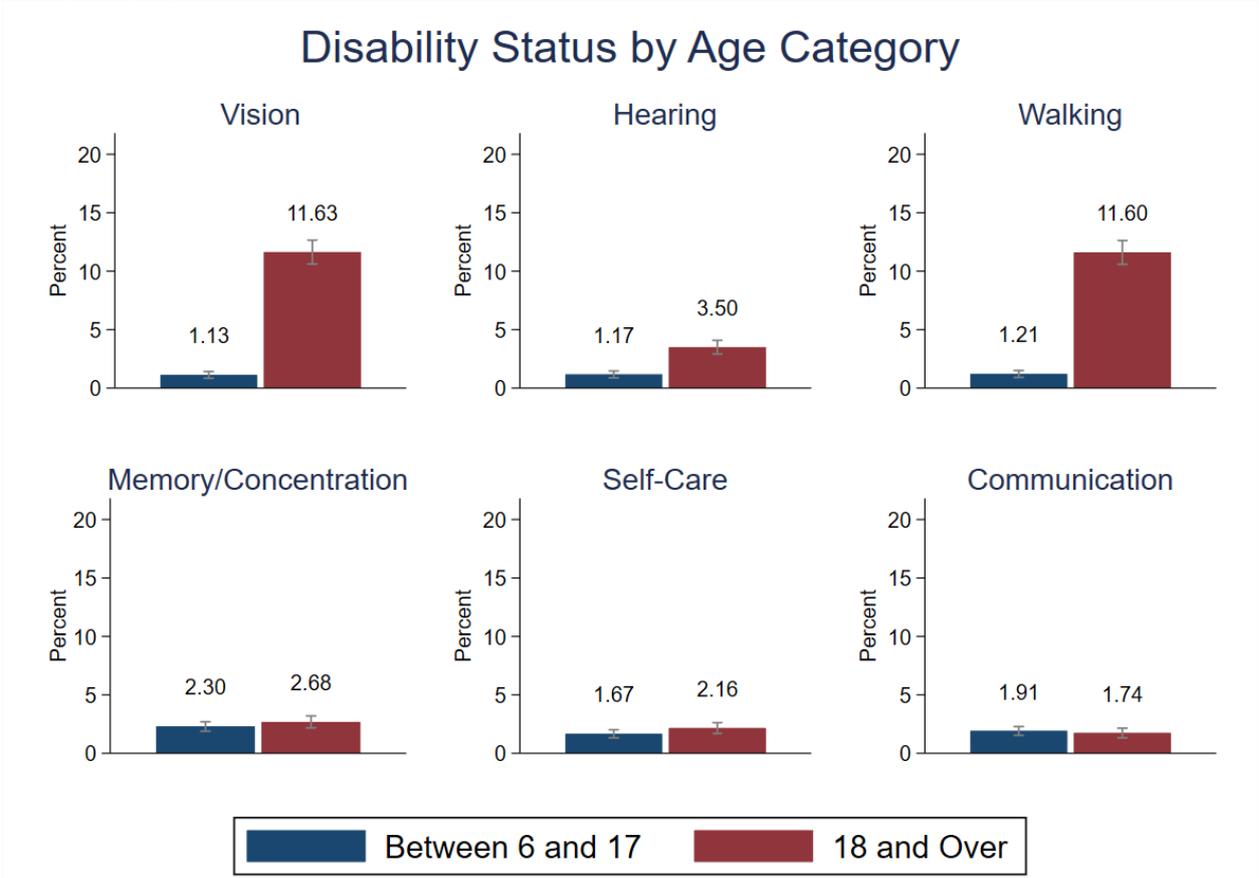


Figure 24: Disability Status by Age

3.3.4 Other Disease Prevalence

Table 24 shows summary statistics on health indicators pertaining to maternal, neonatal, and infant health. We see that of the 3,804 households in the sample, 17.3 percent had at least one woman in the household give birth to a child in the past year, amounting to 657 cases. Of these 657 cases with at least one pregnancy in the household, 77.5 percent was delivered in a CHC/PHU. In addition, about 42 percent of pregnancies (or 279 cases) were delivered at night.

3.3.5 Neo-Natal & Under 5 Mortality

We also collected data on maternal, neonatal, and infant mortality. From the full sample, there were 7 cases (0.2 percent of the sample) where a woman in the household died during pregnancy in the past one year. In 46 cases or (1.2 percent of the sample), there was a pregnancy that ended in a still birth. For infant mortality, there were 74 cases, or 1.9 percent where a child under the age of 5 in the household died in the past year.

3.3.6 Maternal Health and Child Mortality

Table 24: Summary Statistics of Maternal Health and Child Morality

	(1) Sample Size	(2) Share	(3) Std. Dev.	(4) Number of incidents (Sample Size x Share)
Woman in HH gave birth to a child in the past year	3804	0.173	0.38	657
For those with a birth: Child was delivered in CHC/PHU	657	0.775	0.42	509
For those with a birth: Child was delivered at night	657	0.425	0.49	279
Child under 5 years old died in the past year	3804	0.019	0.14	74
HH had a pregnancy end in still birth in the past year (at HH level)	3803	0.012	0.11	46
Woman in HH died during pregnancy in the past one year (at HH level)	3801	0.002	0.04	7

Note: This table shows summary statistics of health indicators for pregnancy, and maternal, neonatal, and infant health. Column (1) is the sample size of either the full sample, or a subsample that is conditioned on there being a woman gave birth. Column (2) shows the share of each sample/subsample. To get percent, multiply share by 100. Column (3) shows the standard deviation, and column (4) shows the number of incidents which is the sample/subsample multiplied by the share.

Table 25 showed a balance table between treatment and control for health indicators regarding maternal, neonatal, and child mortality. We see that pregnancies in communities where the mini-grids are going to be built are 15.8 percentage points more likely to have the child delivered in a CHC/PHU. This difference is statistically significant to the 99 percent level.

Unlike WP1, WP2 CHCs have not yet been connected to the mini-grid. We cannot comment on the effect of electricity access on the quality of care provided. However, KIIs with CHC officials revealed to us that the biggest change they are anticipating after getting electrified is the availability of light. During focus groups in WP1 mini grid sites, having light at night was said to bring about the greatest difference in the quality of care. We can anticipate that in WP2 treatment sites as well, CHCs will be able to provide better

healthcare through having light. From our analysis of WP1 CHCs, we can anticipate that electrification will lead to fewer mistakes made during childbirth.

Table 25 – Balance Table: Maternal Health and Child Mortality for Mini-Grid Sites and Non-Mini-Grid Sites

Maternal Health and Child Mortality. Difference in means between Treatment and Control			
Variables	Control (1)	Treatment (2)	Difference in Means (3)
Woman in HH gave birth to a child in the past year	0.190 (0.013)	0.156 (0.012)	0.034* (0.017)
For those with a birth: Child was delivered in CHC/PHU	0.702 (0.051)	0.860 (0.025)	-0.158*** (0.056)
For those with a birth: Child was delivered at night	0.402 (0.030)	0.452 (0.032)	-0.050 (0.044)
Child under 5 years old died in the past year	0.022 (0.005)	0.017 (0.004)	0.006 (0.006)
Pregnancy end in stillbirth in the past year	0.014 (0.003)	0.010 (0.003)	0.005 (0.004)
Woman in HH died during pregnancy in the past one year	0.002 (0.001)	0.002 (0.001)	0.001 (0.001)

Note: This table shows the difference in means for health indicators regarding pregnancy, and maternal, neonatal, and infant health between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column 1 and 2 are the respective means for control and treatment. Column 3 is the difference between the means (Control - Treatment). Standard errors are in parentheses and clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.01

3.4 Education Outcomes

Table 26 summarizes education indicators for children (6-18 years old). The sample includes up to two randomly selected children from each household, one of each gender whenever possible. Of this sample, 88.94 percent of children between the ages 6-18 are enrolled in school, which amounts to 4,623 students. Respondents report that children miss on average only 0.17 days of school per week. We also see that students study at home on average 7.8 hours in a typical week, which is slightly over 1 hour a day.

Table 26: Education indicators for Children 6-18

	(1)	(2)	(3)	(4)	(5)
	Sample size	Mean	Std. Dev.	Min.	Max.
Percent Enrolled in School	5198	88.94	31.37	0.00	100.00
For enrolled students- Number of days missed in the past week	4623	0.17	0.75	0.00	7.00

For enrolled students- Time spends studying in a typical week	4208	7.77	5.33	1.00	24.00
Observations	5198				

Table 27 compares the gender differences in education indicators for children between the ages of 6-18. On average, boys missed more school than girls which is statistically significant, but the difference is only 0.05 days. Boys also report spending more time studying in a typical week and this difference is statistically significant at the 95 percent level.

Table 27: Gender Differences in Education Indicators for Children 6-18

Variables	Boys (1)	Girls (2)	Difference in Means (3)
Percent Enrolled in School	89.297 (0.839)	88.575 (0.910)	0.722 (1.019)
For enrolled students- Number of days missed in the past week	0.193 (0.019)	0.138 (0.017)	0.055** (0.021)
For enrolled students- Time spends studying in a typical week	7.943 (0.270)	7.599 (0.259)	0.344** (0.151)

Note: This table showed the difference in means for education indicators between boys and girls. Column (1) and Column (2) are the respective means for boys and girls. Column (3) is the difference between the means (boys - girls). Standard errors are in the parentheses and are clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.01

3.4.1 Attendance

Figure 25 shows the percentages of students enrolled who miss school from 0 days up to 5 days or more in the past week. The blue bar reports that 92.67 percent of students missed 0 days of school. The red bar represents 5.56 percent of enrolled students who report missing 1-2 days of school. Under 2 percent of students report missing more than 2 days of school.

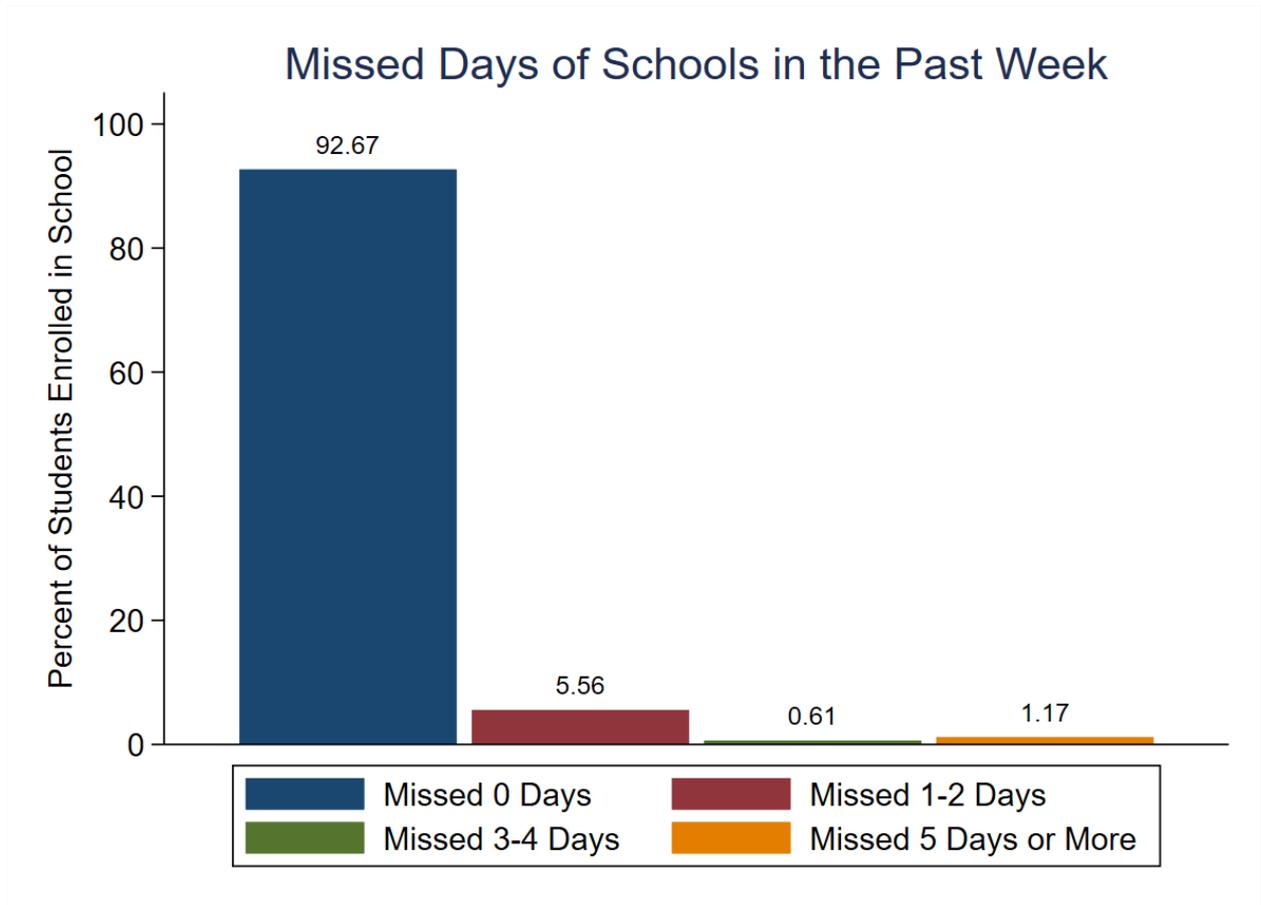


Figure 25: School Attendance

Figure 26 explains the time-use patterns between boys and girls in our sample. The blue bar in each graph represents the boys, while the red bar represents the girls in the sample. Respondents report that boys have worked more on the family farm in the past week, while girls spend slightly more time helping with chores in the past week. Boys also report spending a higher number of hours boys studying. This could be because girls spend more time working on household chores. The data show that girls spend over a half an hour more on average working on household chores than boys and these estimates are similar to what was reported for WP1 sites. The confidence intervals tell us that these differences are statistically significant.

Time use in a typical week by gender

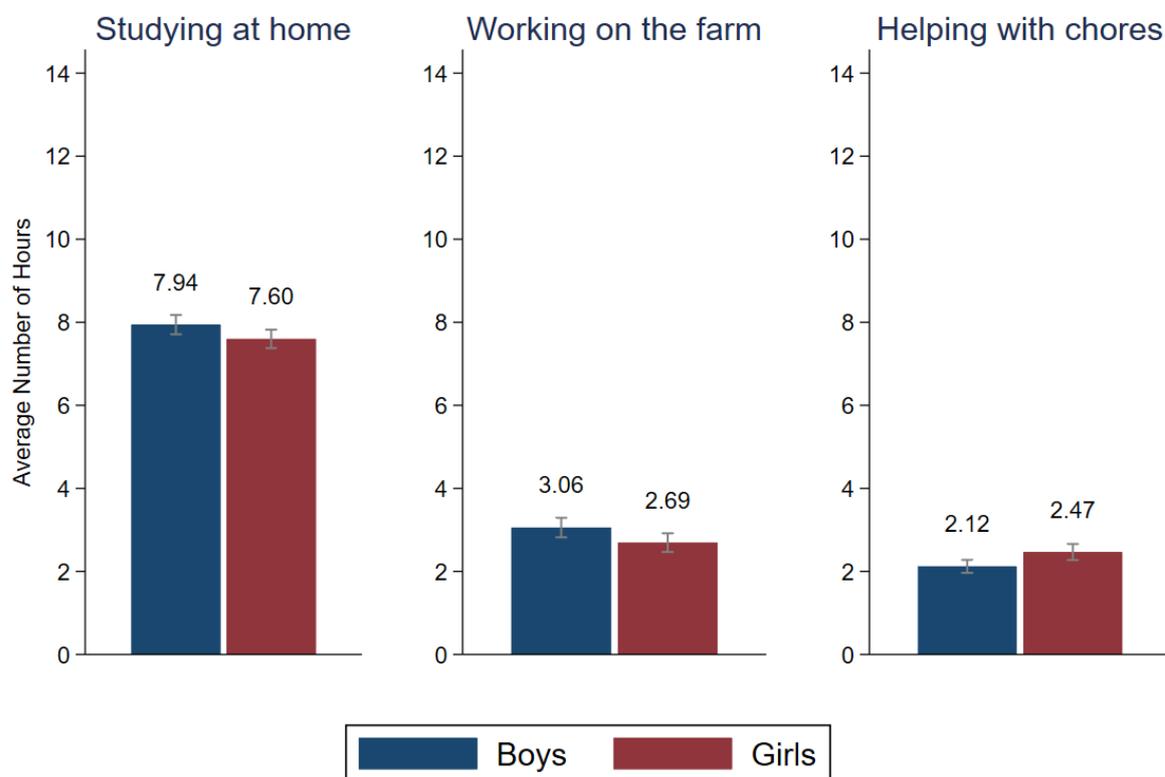


Figure 26: Time-Use of Children by Gender

Table 28 reports the enrollment of student differences between control and treatment communities. On average, enrollment, school attendance, and reported at home study time are equivalent across treatment and control communities.

Table 28 - Balance Table: Education Outcomes for Mini-Grid Sites and Non-Mini-Grid Sites

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Percent Enrolled in School	88.268	89.570	-1.302
	(1.108)	(0.913)	(1.427)
For enrolled students- Number of days missed in the past week	0.169	0.162	0.007
	(0.024)	(0.018)	(0.030)
For enrolled students- Time spends studying in a typical week	7.411	8.101	-0.690
	(0.391)	(0.327)	(0.506)

Note: This table showed the difference in means for education indicators between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column (1) and Column (2) are the respective means for control and treatment. Column (3) is the difference between the means (Control - Treatment). Standard errors are in the parentheses and are clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.010.01

In addition to the indicators presented above that were collected through household survey, the research team is collecting additional indicators through administrative records stored at school facilities. The primary information we hope to obtain from administrative records is student enrolment. Trends in these indicators will be presented in end line report.

3.5 Reduction of CO₂ emissions

Rural households create emissions mainly through the energy used for household lighting and cooking. Because the RREP project produces clean solar energy, RREP electrification will reduce CO₂e emission to the extent that households replace existing “dirty” household cooking and lighting technologies with clean solar-electrified technologies.

3.5.1 Fuel Consumption

Households consume fuel for both cooking and lighting. Different fuel sources have different CO₂e emissions impacts. In this section we describe the energy sources used for household lighting and cooking. Electricity should reduce reliance on these “dirty” fuels.

Figure 27 shows over 99 percent of households use either firewood or charcoal as either a primary or secondary source of cooking energy. 73 percent of households get their primary or secondary source of cooking energy from collected firewood, while another 16.35 percent purchase firewood, and nearly 20 percent purchase charcoal.

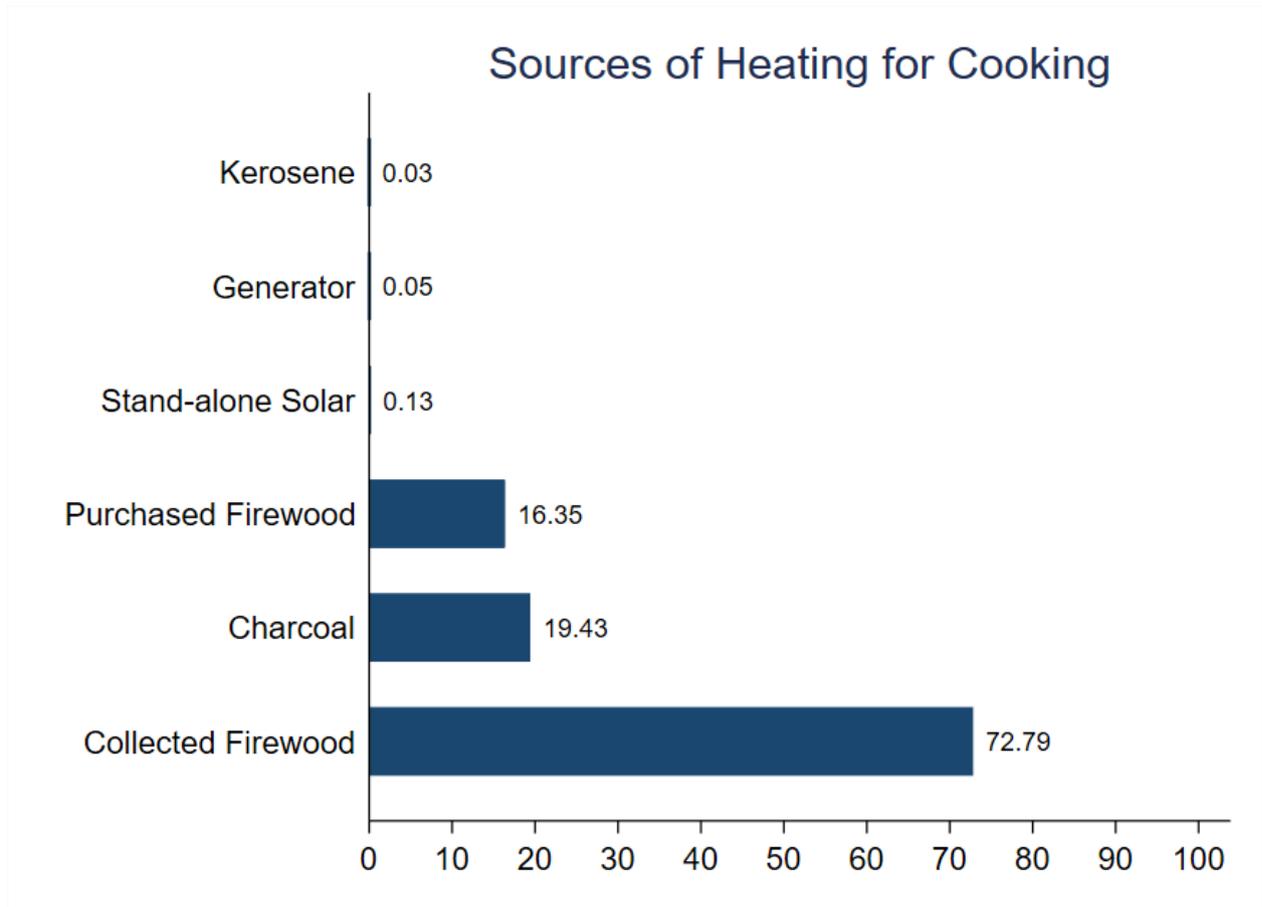


Figure 27: Source of Heating for Cooking

Figure 28 shows the different sources of household lighting. Close to half of the sample (46.9 percent) uses a solar lantern as their primary source of light in the household, while a slightly smaller percentage (43.35 percent) use a battery-powered lamp. All the other sources of lighting, such as the stand-alone solar or a generator, account for less than 4 percent of the households' primary lighting sources.

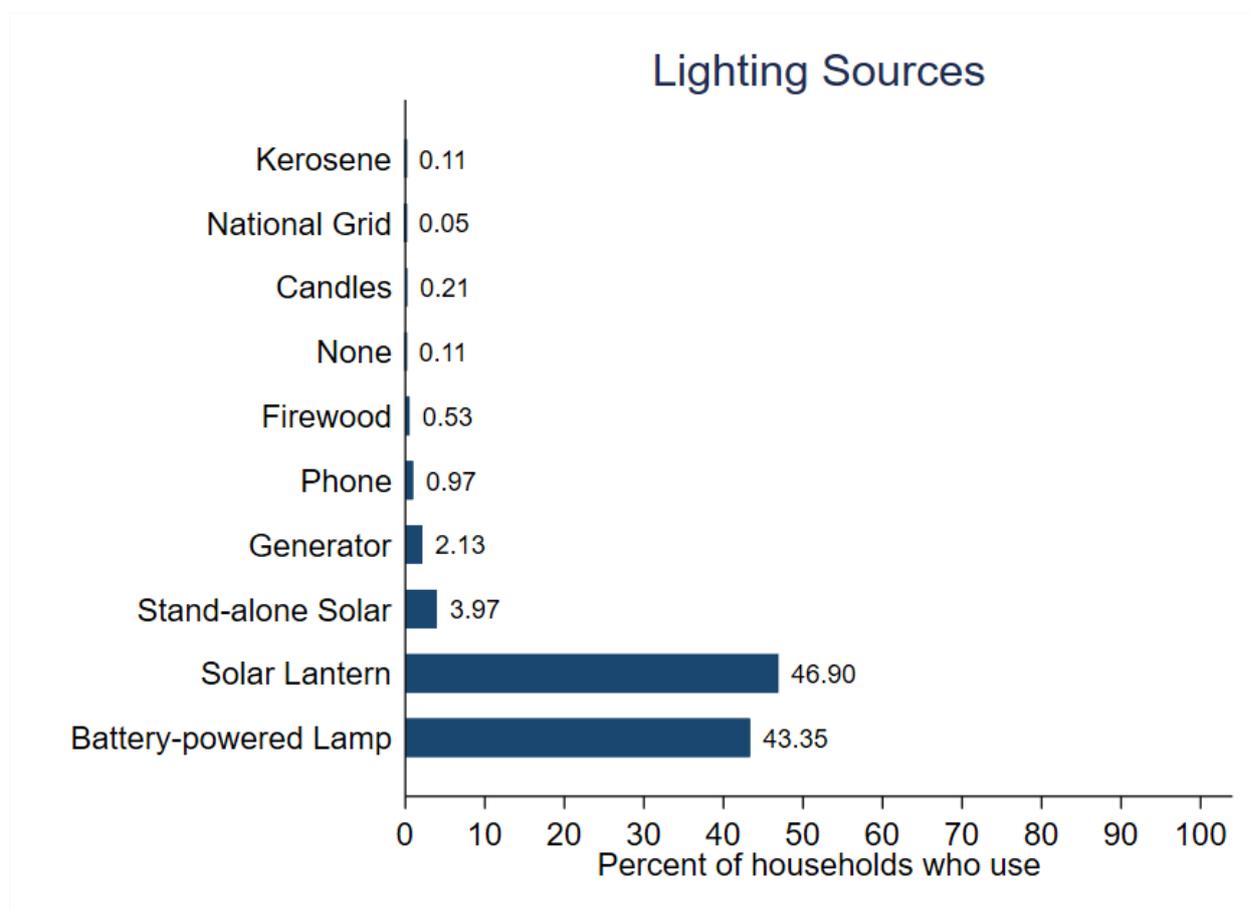


Figure 28: Sources of Energy for primary lighting

Table 29 reports the differences in sources of household energy consumption between control and treatment communities. The treatment and control communities vary slightly between which ones use more of the different sources of lighting. The control communities are 0.2 percent points more likely to use kerosene, 0.3 percent points more likely to use candles and 0.5 percent points more likely to use firewood than the treatment communities. The treatment communities are 2.6 percentage points more likely to use a generator than the control communities. While these differences are statistically significant, it is important to note that the magnitude of these differences is very small.

Table 29 - Balance Table: Sources of HH Lighting for Mini-grid Sites and Non-Mini-Grid Sites

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Kerosene	0.002 (0.001)	0.000 (0.000)	0.002** (0.001)
National Grid	0.000 (0.000)	0.001 (0.001)	-0.001 (0.001)
Candles	0.004 (0.002)	0.001 (0.001)	0.003** (0.002)
No Lights	0.002 (0.001)	0.001 (0.001)	0.001 (0.001)
Firewood	0.008 (0.002)	0.003 (0.001)	0.005** (0.003)
Phone Light	0.009 (0.003)	0.010 (0.002)	-0.001 (0.003)

Generator	0.008 (0.002)	0.034 (0.006)	-0.026*** (0.007)
Solar Panels	0.033 (0.010)	0.047 (0.007)	-0.014 (0.013)
Solar-powered Lantern	0.448 (0.034)	0.489 (0.031)	-0.041 (0.046)
Battery-powered Lantern	0.469 (0.036)	0.399 (0.031)	0.070 (0.047)

Note: This table showed the difference in means for sources of lighting indicators between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column (1) and Column (2) are the respective means for control and treatment. Column (3) is the difference between the means (Control - Treatment). Standard errors are in the parentheses and are clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.010.01

Table 30 reports the differences in means of cooking sources between control and treatment communities. The treatment communities are 8.3 percentage points more likely to use purchased firewood and 14.5 percentage points more likely to use charcoal than the control communities. We see that these differences are statistically significant at the 99 percent level.

Table 30 - Balance Table: Cooking Sources for Mini-Grid Sites and Non-Mini-Grid Sites

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Kerosene (cooking)	0.000 (0.000)	0.001 (0.001)	-0.001 (0.001)
Generator	0.000 (0.000)	0.001 (0.001)	-0.001 (0.001)
Solar	0.001 (0.001)	0.002 (0.001)	0.000 (0.001)
Purchased firewood	0.122 (0.022)	0.204 (0.021)	-0.083*** (0.030)
Charcoal	0.121 (0.027)	0.266 (0.032)	-0.145*** (0.042)
Collected firewood	0.822 (0.031)	0.636 (0.036)	0.186*** (0.047)

Note: This table showed the difference in means for cooking sources between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column (1) and Column (2) are the respective means for control and treatment. Column (3) is the difference between the means (Control - Treatment). Standard errors are in the parentheses and are clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.010.01

3.5.2 Cooking Facility

As we saw above in Figure 27, firewood and charcoal account for nearly every households' primary and secondary source of cooking energy. This suggests that few households at baseline are using electric stoves. Table 31 shows that rates of household ownership of electric stoves hover near zero. There is no statistically significant difference between electric stove ownership in treatment and control communities.

Table 31 - Balance Table: Electric stoves as Cooking Sources for Mini-Grid Sites and Non-Mini-Grid Sites

	Control	Treatment	Difference in Means
Variable	(1)	(2)	(3)
Stove (Electric)	0.001 (0.001)	0.003 (0.002)	-0.002 (0.002)
N	1875	1929	3804

Note: This table showed the difference in means for electric stoves as cooking source between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column (1) and Column (2) are the respective means for control and treatment. Column (3) is the difference between the means (Control - Treatment). Standard errors are in the parentheses and are clustered at the community level. Stars indicate significance level. *<.10 **<0.05 ***<0.01

3.6 School Tables

Table 32 reports the summary statistics of schools in the sample. There is a total of 319 schools across the 86 communities. Within these schools, the mean average number of students attending the schools is 381 students. There are more boys than girls on average who are attending the schools. The number of disabled students is low, with an average of 5 students. Several schools were unable to provide us with the number and disaggregation of disabled students, which is why the observations for number of schools is varying in Table 21. We did not include those schools in our analysis of the disability categories.

Table 32: Summary Statistics of Schools

	(1)	(2)	(3)	(4)	(5)
	Number of Schools	Mean	Std. Dev.	Min	Max
Number of students	319	381.37	251.00	40.00	1890.00
Number of boys	319	193.21	149.59	0.00	1320.00
Number of girls	319	188.16	124.72	0.00	908.00
Number of disabled students	318	5.19	7.74	0.00	57.00
Number of disabled boys	317	2.69	4.08	0.00	28.00
Number of disabled girls	316	2.50	4.08	0.00	35.00

Note: This table shows summary statistics of school record data. Column (1) is the number of schools in the analytical sample. Column (2) is the mean number of students. Column (3) is the standard deviation, and columns (4)-(5) are the minimum and maximum respectively.

Table 33 compares the differences in means in schools between control and treatment communities. On average, there are more students attending schools in treatment communities than in control communities. Schools in treatment communities have on average 73 more students compared to schools in control communities. Breaking the number of students down by gender we see that school in treatment communities have around 36-37 more boys and girls compared to schools in control communities.

Table 33 - Balance Table: Schools for Mini-Grid Sites and Non-Mini-Grid Sites

Difference in means between Mini-grid Sites and Non-Mini-grid Sites

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Number of students	332.143 (24.53)	405.528 (24.436)	-73.385** (34.469)
Number of boys	168.990 (13.805)	205.098 (13.890)	-36.108* (19.496)
Number of girls	163.152 (11.04)	200.430 (12.121)	-37.278** (16.323)
Number of disabled students	5.143 (1.093)	5.216 (0.605)	-0.073 (1.244)
Number of disabled boys	2.743 (0.574)	2.670 (0.299)	0.073 (0.644)
Number of disabled girls	2.400 (0.547)	2.545 (0.331)	-0.145 (0.637)
N	110	216	326

Note: This table shows the difference in means for number of students of the respective type between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column 1 and 2 are the respective means for control and treatment. Column 3 is the difference between the means (Control - Treatment). Standard errors are in parentheses. Stars indicate significance level. *<.10 **<0.05 ***<0.01

3.7 Community Health Clinic

Table 34 reports the summary statistics of the Community Health Clinics in the treatment communities in our sample in the year 2018. CHCs record patient details on a case basis. This means that when patients visit the CHC several times with different ailments, their details get recorded as a new case for each unique ailment. The mean number of total patients in the CHCs are 4,848, whereas the average number of new cases reported in the same year is 1,849 patients. We see that more women (2,930) in the communities come into the CHCs than males (1,917) do. This is true for the new case patients as well.

Table 34: Summary Statistics of CHCs

	(1)	(2)	(3)	(4)	(5)
	Number of CHCs	Mean	Std. Dev.	Min	Max
Number of Patients in 2018	85	4848.11	4745.82	0.00	28353.00
Number of New Patients in 2018	85	1849.52	2900.57	0.00	21764.00
Number of Male Patients in 2018	85	1917.46	1882.60	0.00	10911.00
Number of New Male Patients in 2018	85	675.17	789.62	0.00	4100.00
Number of Female Patients in 2018	85	2930.65	3063.07	0.00	21764.00
Number of New Female Patients in 2018	85	1174.35	2294.34	0.00	17664.00

Note: This table shows summary statistics of CHC patient data. Column (1) is the number of CHCs in the

analytical sample. Column (2) is the mean number of patients. Column (3) is the standard deviation, and columns (4)-(5) are the minimum and maximum respectively.

Table 35 is a balance table on patients in the CHCs between the control and treatment communities. The CHCs in the treatment communities in the year 2018 have almost 2,000 more patients than the control communities and is statistically significant. The other prominent figure is the new female patients, where there is a significantly higher amount of new case female patients in the treatment communities compared to the control communities. Overall, we see that the CHCs in treatment communities are visited by a higher number of patients than the control communities. This could be attributed to treatment communities for WP2 being chiefdom headquarters and catering to a larger catchment area.

Table 35 – Balance Table: CHCs for Mini-Grid Sites and Non-Mini-Grid Sites

Variables	Control (1)	Treatment (2)	Difference in Means (3)
Number of Patients in 2018	3918.310 (692.967)	5756.292 (745.314)	-1837.982* (1017.618)
Number of New Patients in 2018	1367.167 (328.499)	2320.657 (528.802)	-953.490 (622.484)
Number of Male Patients in 2018	1605.905 (317.853)	2221.766 (257.101)	-615.862 (408.788)
Number of New Male Patients in 2018	540.095 (105.624)	807.103 (134.025)	-267.008 (170.631)
Number of Female Patients in 2018	2312.405 (387.345)	3534.525 (524.846)	-1222.120* (652.256)
Number of New Female Patients in 2018	827.071 (254.399)	1513.553 (421.962)	-686.482 (492.682)
N	42	43	85
This table shows the difference in means for number of patients of the respective type between Control (Non-Mini-Grid Sites) and Treatment (Mini-Grid Sites). Column 1 and 2 are the respective means for control and treatment. Column 3 is the difference between the means (Control - Treatment). Standard errors are in parentheses. Stars indicate significance level. *<.10 **<0.05 ***<0.01			

Section 4: Conclusions and Recommendations

The ultimate goal of the RREP impact evaluation is to 1) provide conclusions regarding the effect of electricity on key indicators through comprehensive data collection and rigorous analysis; and to 2) provide sound policy recommendations based on those conclusions. These goals will be achieved through the methodology described in this report as well as in the inception report, and which relies on multiple rounds of data collection.

Findings presented in this report rely only on the data collected at baseline for WP2 communities, and therefore on one (the first) round of data collection. While insightful, this only provides one piece of data necessary for the comprehensive analysis required to make conclusive recommendations. It's only when the data from endline data collection will be available that the impact evaluation team will be available to estimate changes in the domains of interest attributable to RREP. The baseline findings give us an understanding of the economic situations in many locations that are about to be electrified and their selected "comparison" locations.

Our first set of recommendations stems from the following baseline findings:

- 1) WP2 communities are significantly larger than WP1 communities (on average 530 more households)
- 2) There are more business owners in WP2 communities than in WP1 communities (on average 141 more businesses owners)
- 3) There are more business owners that can benefit from electricity in WP2 communities than in WP1 communities (on average 52 more business owners that can benefit from electricity)
- 4) People spend significant amount of time working, but the profitability of labor is very low
- 5) The number and type of businesses that can benefit from electricity is relatively small and characterized by low profitability
- 6) There are structural differences in employment by gender, with women engaged in businesses characterized by (even) lower profitability

Despite the larger size of the communities and the larger number of business that can benefit from electrification, respondents in WP2 communities show very similar patterns to respondents in WP1 communities.

4.1 – Recommendation 1

Policy interventions that support private sector development should adopt a "value chain approach" and be rigorously tested

In section 3.2 we show the majority of respondents are farmers, and that those respondents self-employed and owning a business are mostly engaged in petty trade (often of agricultural product) or in the processing of agricultural goods. However, the profitability of these activities is relatively small and often non benefiting from electricity.

A strategy to develop the private sector should be considering how to leverage existing practices and businesses, and how to support coordination to create complementarities in production. One example could be supporting the production of selected agricultural products and their processing in-loco to locally increase the value of those products using electricity. However, given the limited size of local market, effort should be made to facilitate connections to bigger markets.

Such a strategy could lead to improved welfare of several businesses and people through forward and backward links in production.

4.2 – Recommendation 2

Policy interventions that increase the adoption of productive electrified assets should be developed and rigorously tested.

Electrification can lead to welfare improvements if it enhances the productivity of self-employed people and micro-enterprises. To achieve this, people should not only have increased access to electricity, but also improved access to technologies that can allow the increase productivity. In this case, electricity acts as an “enabler”. However, several respondents seem to prioritize the purchase of appliances for entertainment (see qualitative report) rather than purchasing appliances for productive use.

Literature on technology adoption shows that individuals will not necessarily adopt new technologies, even when doing so would lead to welfare improvements and economic development.²³

This seems to be due partly to individual preferences, but mostly to limited access to capital, credit and knowledge to acquire and operate those technologies remains substantial.

That is because people either i) face liquidity constraints and cannot afford the technology, or ii) lack the information necessary to successfully adopt the technology or iii) cannot bear the risk of experimenting a new technology.

Subsidization of new technologies, in conjunction with knowledge dissemination have been found to be cost-effective measures to stimulate the adoption of new welfare improving technologies. Solutions leveraging on subsidization and diffusion of information for the adoption of “productive” technologies, could be effective at driving people away from the adoption of non-productive technologies (e.g. television, fans and DVD players) and instead stimulate the adoption of productive technologies. These should be rigorously tested to credibly estimate achievable returns to the new “enabling environment” created through electrification.

The impact evaluation team is available to support with this.

²³ Alcott, H. and J. Kessler 2018. The Welfare Effects of Nudges: A Case Study or Energy Use Social Comparisons. *American Economic Journal: Applied Economics* 11(1): 236-276

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4.3 - Recommendation 3

The welfare benefits of policy interventions that a) support the adoption of productive technologies and b) support private sector development should be rigorously measured.

Electricity is an “enabling factor” rather than a direct “output” that necessarily leads to welfare improvements. Recommendations 1 and 2 suggest development and testing of policy interventions that complement electrification. Given that a) the RREP programme is a pioneering electrification effort in the region and b) little is known about the impact of large-scale electrification or steps that can be taken to maximize the returns to electrification, the RREP programme presents an ideal opportunity for understanding how electrification can be complemented by other interventions. This can be achieved through measuring the marginal and compounded effects of these complementary interventions.

Similarly to the recommendation made for the WP1 baseline report, we strongly recommend that policy interventions that attempt to increase the use of productive technologies or stimulate private sector development should be tested in conjunction with the RREP program and evaluated in coordination with the evaluation team. This coordination would allow the impact evaluation team to disentangle the effects of the electrification programme from the effects of each additional intervention and identify the additional benefits of implementing interventions together. Through effective coordination, the impact evaluation team could leverage existing data collection efforts to measure the effects of complementary interventions, thus improving the cost-effectiveness of the evaluation.

4.4 - Recommendation 4

Policy interventions aiming at increasing gender equality should consider intra household dynamics and support bargaining position

Women are found to make less profit than men and engage in activities that are less profitable.

Respondents at the Ministry of Energy and mini-grid operators feel electrification could have stronger effects on women than on men, since women carry out the majority of domestic unpaid work and benefit strongly from the introduction of electricity-powered appliances such as washing machines, electric stoves, microwaves and refrigerators. This could lead women to engage in income-generating activities.

Women are usually deemed responsible for taking care of children, men only step in in case their wife is sick, busy or visiting family.

There is a general consensus among respondents that women can work outside the home as long as it benefits the household in terms of income generation and as long as the woman is known to be serious and trustworthy. However, for some male respondents it is deemed unacceptable for a woman to do work outside the home.

Respondents report that decisions on the purchase of electricity-powered assets are always negotiated between husband and wife and that none of them can make decisions by themselves. However, for women to buy a certain appliance, she would usually require explicit permission of the husband.

One could consider offering more advantageous conditions for purchase of productive appliances to women.

4.5 - Recommendation 5

Policy interventions aiming at increasing returns to educations should consider combining access to electricity at school with the adoption of learning technologies

School staff agree that the most important indicators for the provision of quality education are decent infrastructure (space, classrooms, electricity), availability of water and sanitation, qualified and certified teachers and learning materials. Most of those are not currently met.

Electrification would allow students, especially those whose parents cannot afford to buy batteries for torchlights, to go to schools during evenings to read and study and allow the set-up of a library in the school.

Electrification would allow the introduction of different appliances in schools, such as televisions, laptops and printers, as well as photocopy machines, laminating machines and printers. Televisions are believed to provide opportunities for alternative learning methods to develop. However, there is scepticism on the extent to which these appliances could actually be used.

Having light in schools could improve security and deter thieves from breaking into schools and stealing learning materials or registers.

Overall, electrification was expected to make it more comfortable for students and teachers to go to school, although the above-mentioned problems still deter teachers from attending.

The main reasons for student absenteeism are children working in the home or on the farm during school time, occurrence of traditional events in the community, migration and parent's unfavourable attitudes to education.

4.6 - Recommendation 6

To increase the value of lessons learnt from the impact evaluation, endline data collection should be postponed and a midline data collection for world package 2 should be included.

It is becoming evident that the return to electrification will take longer than conceived at the project design stage to materialize.

This means the impact evaluation might risk to underestimate the return to electrification simply because measurements are taken too soon to capture changes attributable to electrification.

The impact evaluation team recommends postponing endline data collection for (at least) eight months.

In addition, to increase the precision of the estimate, the impact evaluation could benefit from an additional data point for WP2 sites. In particular, adding a midline data collection would enable to measure changes in the short term and improve the estimate of the effects in the longer term.

The impact evaluation team recommends considering introducing a midline data collection for WP2.

Annexes

Annexes included:

- a. The original terms of reference
- b. Baseline Sampling Plan
- c. Enumerator Training Manual + Questionnaire
- d. Stakeholder Mapping
- e. Research Permission
- f. Knowledge Management Plan
- g. Qualitative Data Collection Protocols
- h. Qualitative Data Collection Results

Section II: Schedule of Requirements

E-sourcing reference: RFP/2018/5748

TERMS OF REFERENCE

Design and implementation of the Impact Evaluation of Rural Renewable Energy Project in Sierra Leone

1. Background

UNOPS - United Nations Office of Project Services, is implementing a 40+million US Dollar project in Sierra Leone in the renewable energy sector supported by funding from the United Kingdom Department for International Development (DFID). The Rural Renewable Energy Project (RREP) will provide off-grid solar electricity to up to 94 communities across Sierra Leone through the construction of mini-grids by 2020.

Sierra Leone has limited electricity access with only 1% of people in rural areas connected to the national grid. It ranks 172/182 in the World Bank's Doing Business Index on access to energy.

In remote areas, mini-grids are a far cheaper alternative to expanding the national grid. Last year, the project has powered 54 Community Health Centers (CHCs) where solar power stations had been installed, and converted 50 of them into mini-grids to power the surrounding communities. The project is also close to finalizing agreements with private operators to operate and maintain these mini-grids while co-investing with DFID in 44 more.

RESL's projected impact is about US\$130m welfare increase in rural communities through economic growth, saved fuel costs, improved health and education outcomes, and improved communications. The project will also significantly reduce Sierra Leone's future Green House Gas emissions.

The implementation of the project is structured around 6 work packages. This Terms of Reference and Consultancy comes under Work Package 5 (WP-5), as summarized below:

Work Package 1 and 1+ (WP-1/1+): Installation of stand-alone 6kWp solar photovoltaic (sPV) systems in 50 communities by July 2017. The stand-alone 6kWp solar photovoltaic systems will provide electricity to the Community Health Centres (CHCs), and subsequently be expanded into small mini-grids in the 50 villages and connect all other public institutions and households in the villages. The 50 small mini-grids (< ~36kW) will be operated by private operators with commercial interests ensuring long-term sustainability.

Work Package 2 (WP-2): Support a range of public-private sector business models for providing rural communities with electrification through the installation of environmentally and economically sustainable mini-grids (> ~36kW). A minimum of 40 mini-grids will be completed by October 2020, adding up to 5MW to the country's power generation capacity.

Work Package 3 (WP-3): Technical Assistance (TA) and institutional development (capacity building) is to be provided to both government authorities and private sector stakeholders linked to the RREP, as part of the holistic approach to facilitate mini-grid development and long term sustainable operations.

Work Package 4 (WP-4): The Freetown Landslide Emergency Earthworks Response and Camp Preparatory Works. The initial project budget for the RREP was amended in 2017 to include the Emergency Earthworks and Temporary works in response to the Freetown Landslide and Flooding. This work package was completed in March 2018.

Work Package 5 (WP-5): This work package focus majorly on the Monitoring and Evaluation function. An M&E Plan including a detailed Impact Evaluation design will be developed and implemented for accountability and learning for the life of the project.

Work Package 6 (WP-6): Private sector development. Through this work package, RREP seeks to develop a private sector engagement and strengthening strategy, underpinned by a keen understanding of local market systems, to promote productive use economies in mini-grid catchment areas; supporting both the commercial viability of the privately operated mini-grids, and promoting local income improvements and local job creation.

1.1 Project Expected Results Overview:

The table below contains key project information, annex-1 contains the logframe, Annex-2 the Project Site Location Map and Annex-3 the List of Villages.

Primary sector of intervention	Renewable energy, Economic growth, Health, Education, CO2 Reduction
Project Locations	<p>Total: 98 villages in Sierra Leone (See Annex-3 for a detailed list of villages)</p> <p>WP-1/1+ Villages: 54 Villages (6kW to 36kW) Current status:</p> <ul style="list-style-type: none"> - Solar power stations installed in all 54 villages¹; - Electricity provided to 54 Community Health Centers (CHCs) - Mini-grids installed in communities surrounding CHCs - Electricity not yet provided to the communities² <p>List of villages:</p> <ul style="list-style-type: none"> - Type-0, 4 pilot villages with Stand-alone systems (6kWp) only for the CHCs: Kukuna, Mambolo, Koinadugu 2 and Levuma. - Type-1, 14 villages (16kWp): Gbalamuya, Sendugu, Kathantha Yimboi, Batkanu, Kagbere, Kamaranka, Rokonta, Kaodu, Gbap, Mokelleh, Bomotoke, Mano Gbongeima, Futa Pejeh and Mabang. - Type-2, 22 villages (26kWp): Kamasasa, Baimoi, Kamasondo, Petifu, Malekuray, Fintonia, Mara, Musaia, Kombayendeh, Kainkordu, Jagwema, Madina, Tihun, Bandajuma, Dia, Shenge, Njama, Mano Dasse, Senehun, Bauya, Masimera and Bandajuma Sowa - Type-3, 14 villages (36kWp): Kychom, Conakry Dee, Sinunia, Bajodia, Yifin, Kayima, Tombodu, Bumpeh, Sanduru, Gandorhun, Sembahun, Kangahun, Bradford, Gbangbatoke <p>WP-2 Villages: 44 villages (=>36kWp to 50kWp) Hybrid systems: Current status:</p> <ul style="list-style-type: none"> - Solar power stations not installed; - Electricity not yet provided to CHCs - Mini-grids not yet installed in communities surrounding CHCs - Electricity not yet provided to the communities³ <p>List of villages: Koribondu, Buedu, Moriba Town, Sumbuya, Manowa, Bindi, Baomahun, Tikonko, Taiama, Jimi Bagbor, Alikalia, Masiaka, Gbojibu, Bonumbu, Rotifunk, Rokupr, Jojoima, Mobai, Koindu, Daru, Moyamba Junction, Gegbwema, Pendembu, Gbendembu, Gorahun, Seria, Baoma, Kondembaia, Falaba, Bonthe, Foredugu, Firawa, Mathoir, Sahn, Mange,</p>

¹ This includes 4 pilot villages with electricity only provided to the CHCs

² Currently UNOPS is finalizing agreements with private operators to operate and maintain these mini-grids in these communities. It is expected that the electricity will be provided to these communities by end February 2018. The baseline survey should be conducted before this.

³ It is expected that the electricity will be provided to these communities after the installation of solar power stations is completed by October 2019. The baseline for WP-2 should be conducted before the provision of electricity in these communities.

	Madina Junction, Dogoloya, Bendugu, Mogbwemo, Bendugu, Nyandehun, Sulima, Masumbri, (+1 additional village to be added to this list)
Impact	RREP projected impact is a £100m welfare increase in rural communities through economic growth, saved fuel costs, improved health and education outcomes, and improved communications. The programme will also significantly reduce Sierra Leone's future Green House Gas emissions.
Outcomes	People in Sierra Leone benefit from access to low carbon electricity. <i>This will be measured with the help of the following indicator:</i> Utilisation of electricity by CHCs, households, businesses, and other public institutions. At least 50% of electricity should be from renewable sources.
Outputs	<ol style="list-style-type: none"> 1. Electrification of Community Health Centres and extension to mini-grids for the 2. communities (WP-1/1+ and WP-2) 3. Private sector invests, operates and maintains generation and distribution equipment 4. Improved enabling environment to support private sector investment, and commercial sustainability of off-grid electricity provision 5. Increased demand for electricity provided, through stimulating private sector development and brokering synergies with complementary projects in the targeted communities

2. Justification

The key objective of this Impact Evaluation (IE) is to gather and analyse primary and secondary data on project participant group and the comparison group to assess the impact and outcome of the project and generate lessons and recommendations that can be used in the design and implementation of similar interventions in Sierra Leone and elsewhere in the future.

The IE will be designed to allow measurement of the extent to which the RREP has contributed to the increase in net welfare of target population as compared to the non-participants group. To this end the project will collect data before implementation, mid-term and at completion and it will undergo an ex-post impact evaluation.

The Impact Evaluation is also expected to assess the Value for Money of different mini-grid interventions.

Use of the Impact Evaluation:

The information gathered through this exercise will enable its end-users to:

- Build the evidence base for further off-grid rural electrification projects across the African continent and beyond
- Build the evidence base for a model for public-private partnership in rural renewable energy provision
- Report to beneficiaries, stakeholders and donor on what has been achieved through the project life

Stakeholders of the Impact Evaluation:

The key stakeholders of this IE are: Local communities, Ministry of Energy, DFID and UNOPS

3. Objectives

The overall objectives of this TOR and Request for Proposals (RFP) is to recruit an experienced and reputable consulting firm or institution for the Design and implementation of the Impact Evaluation of Rural Renewable Energy Project in Sierra Leone.

4. Scope of the Assignment

The impact of this project will be measured across four specific domains (i) household income and assets; (ii) health; (iii) education; (iv) CO2 reduction.

4.1 Increase in household (HH) income and assets

The RREP expects an increase in HH income from enterprise development or employability and fuel savings by the end of the project. This can be measured through household income and expenditure surveys built on DFID's Sustainable Livelihoods Approach and/or Standard of Living Index (or similar indicators).

4.2 Improved health

The improvement in health will be measured through maternal and child mortality and/or increase in Disability Adjusted Life Years in the interventional and comparison villages. These findings will also be converted into GBP equivalent value with the help of a specialist.

4.3 Improved education

The RREP expects an increase in return to education and net employability by the end of the programme. This will also be converted into GBP equivalent value with the help of a specialist.

4.4 CO2 reduction

The RREP expects reduction in CO2 as a result of provision of renewable energy in the selected areas. An economic value will also be driven through calculating CO2 equivalent of fossil fuel consumption reduced multiplied by carbon price.

The qualitative analysis will specifically cover changes in gender roles, including decision making, household food security and nutrition, control over fundamental assets and division of work load.

5. Methodology

The Impact Evaluation will adopt a mixed-method approach for primary data collection using quantitative and qualitative tools. The core instrument for quantitative data collection is the household impact survey which will be complemented by a set of qualitative tools, e.g., Focus Group Discussions (FGDs) and key Informant Interviews (KIIs). The Impact Evaluation report will also be complemented by the use of satellite images and air quality monitoring which are separate to this consultancy agreement.

The survey will be administered to a sample of household in the beneficiary group and a sample in the comparison group. These two groups will be compared at baseline, mid-term and at the end of the project using Difference in Difference method. To increase confidence in the results, and to ensure that the two groups are comparable on observable characteristics, Propensity Score Matching will also be used. This means that a sample of household/CHC/School directly involved in the project will be compared to household/CHC/School from comparison group, which will be selected from the neighboring villages that had not been included in the project, but had similar characteristics at the time of baseline (i.e., before the operation of mini-grid system in the selected villages). Moreover, a Quasi-Experimental Impact Evaluation will be conducted on project completion. The results of the survey will be presented in Working Papers that will inform the overarching impact evaluation report.

Sampling:

Selection of treatment and comparison groups:

Treatment group: 98 villages (i.e., 54 villages for WP-1 and 44 for WP-2) are selected by UNOPS and MoE following a set criteria.

Comparison group: The comparison villages will be identified based on the same criteria UNOPS and MoE followed for the treatment group, villages in which the project was not implemented but had similar characteristics, and where no other similar intervention is implemented.

The sampling will follow a phased approach as per the Timeframe explained in Section-7 of this document.

The sampling strategy, including the total sample size, will be confirmed at the time of the survey design, using information or estimates on the population's statistical characteristics (e.g., their levels of income, literacy, land holding, etc.) with representation of both men and women in the communities. The consulting firm/institution is required to propose an appropriate sampling strategy for the treatment and comparison groups. The consulting firm/institution should provide a justification for the sampling strategy including the power calculation that lead to determine the sample sizes. Risk of spill overs effects and contamination, as well as potential biases that could occur while targeting marginal groups must be taken into due account in the sampling phase and discussed in the technical proposal.

It is anticipated that for this study, a two-phased proportional stratified random sampling will be used, with the sampling units as Chiefdom villages. In the first phase, villages will be selected randomly within all provinces of Sierra Leone. The second phase will involve selecting households amongst these selected villages.

All data collected is to be disaggregated by men, women, boys and girls and people with disabilities. The impact survey is expected to include the Washington Group disability questions.

Primary data collection:

Quantitative tools:

Impact survey:

The survey should include a detailed exploration of economic / income and social variables on both the intervention and comparison groups.

- Economic / Income variables, should include economic activities in HH including domestic time-use, agricultural productivity and non-agriculture employment household level IGA, as well as prices of major commodities, income and expenditure of households in particular on cell batteries and other domestic energy needs
- Commercial enterprises / Employment patterns
- Social variables should include survey of availability and access to health, food and education.

Qualitative tools:

As shown in the table in Section-3 above, it is expected that some impact domains may be better explored through quantitative analysis, others through qualitative, and some through a combination of the two. The qualitative part of the Impact Evaluation will also be utilized to identify confounding factors at play which may be challenging to control with only with the survey.

Focus Group Discussions:

Focus group discussions (FGDs) will be conducted to gather qualitative information on access to health, education and food security. These villages will be randomly selected from the sampling frame to cover a range of geographic locations. All participants will be randomly selected by using the PPA/Transect Walk approach, however this will be further elaborated in the technical design. The number of FGDs will be divided in terms of mixed gender and age and gender and age segregated discussions.

Key Informant Interviews:

Key informant interviews (KII) shall be undertaken with Education, Energy, Environment Control and Health Authorities at the village, district, regional and national levels. Convenient/purposive sampling will be used for the KIIs.

Additional evaluation tools that will complement the above but are outside the scope of this consultancy. The UNOPS M&E Specialist will lead and carry out these activities:

Below are some additional evaluation methods used to inform the final Impact Evaluation Report. Please note that the below activities will be led internally and you are not required to include these in your proposal.

Change-story interviews using Sprockler or similar software: (Led by UNOPS M&E Specialist)

The Change-story in simple words mean an individual's story of change. This exercise will be done with the WP-1 beneficiaries in August 2019 and WP-1 and WP-2 beneficiaries in June 2020. Sprockler or similar software will be used to gather, analyse and visualize the findings.

Remote Sensing/satellite imagery: (Led by UNOPS M&E Specialist)

Satellite data will be used to acquire information/images on land use and agricultural change/patterns and demographic distributions amongst the treatment and comparison villages before and after the intervention.

Air Quality, Noise Check and/or Vehicular Movement: (Led by UNOPS M&E Specialist)

The Air quality assessment will be used to identify CO₂ in the air periodically at baseline, mid-term and project endline. The noise check and vehicular movement will be assessed as a proxy to economic growth in the beginning and end of the project.

Configurational Analysis using EvalC3: (Led by UNOPS M&E Specialist)

The UNOPS M&E Specialist will run Configurational Analysis that is composed of Qualitative Comparative Analysis (QCA) and Predictive Analytics (PA) using EvalC3 software to find out the relationship between the consumption of electricity and increase in income. Different attributes will be identified at the baseline stage while the analysis will be done at mid-term and end-line to identify common characteristics amongst households with increased income to predict outcomes in future.

Secondary data collection:

UNOPS will provide the consulting firm/institution with access to project documents relevant for the Impact Evaluation. The consulting firm or institution is expected to research and include additional secondary sources in the analysis as needed besides the local and national health and education institutions and departments.

Community Health Centers (CHCs) and Schools: The Impact Evaluation will collect data from the CHCs and primary and secondary schools in the treatment and comparison villages periodically and for monitoring purposes. This exercise will be done parallel to the HH survey.

The consulting firm or institution will conduct a detailed literature review of best practice related to Impact Evaluation of rural electrification projects, review all relevant documents of the project including the feasibility / demand survey [which should act as a key starting point for the survey design, all relevant evaluation and review reports as well as existing national datasets including but not limited to the 2015 Census, Household Income & Expenditure Survey (HIES) and Labour Force Survey (LFS) and Multiple Indicator Cluster Survey (MICS).

5.1 Validation Workshops

Validation workshops with the communities will be organized at the end of data collection with selected communities to validate the findings.

5.2 Use of Technology

Primary data collection is expected to comply with recognized ethical principles.

As described above, the IE will make extensive use of ICT such as use of smartphones or tablets, ODK, Kobo, Sprockler, Sensemaker, EvalC3 or similar applications.

5.3 Timeframe:

Below are tentative deadlines for the tasks and deliverables. The exact deadlines will be established by UNOPS together with the consulting firm/institution at inception reporting stage.

Baseline:

The Baseline for Work Packages 1 and 2 will be conducted both with the treatment and comparison groups at different timeframes in 2019.

Baseline for Work Package 1/1+:

- WK2 to WK4, January 2019: Finalisation of analytical framework, methodology and sampling
- WK1 February to WK2 March 2019: Primary data collection and data cleaning
- WK2 to WK4 March 2019, Data Analysis and Report writing
- WK1 to WK3 April 2019, Report review, feedback and finalization.

Baseline for Work Package 2:

- WK1 to WK4 September 2019: Primary data collection and data cleaning
- WK1 to WK3 October 2019, Data Analysis and Report writing
- WK1 to WK4 November 2019, Report review, feedback and finalization.

Mid-Term for Work Package 1/1+⁴:

A Mid-Term assessment will only be carried out with WP-1/1+ villages and its comparison group during the below timeframe:

- WK1 to WK4 September 2019: Primary data collection and data cleaning
- WK1 to WK4 October 2019, Data Analysis and Report writing
- WK1 to WK3 November 2019, Report review, feedback and finalization.

Final Impact Evaluation:

The final impact evaluation will be carried out with both WP-1/1+ and WP-2 villages and comparison villages in 2020.

- WK1 to WK-4 September 2020: Primary data collection and data cleaning
- WK1 to WK3 October 2020, Data Analysis and Report writing
- WK1 to WK4 November 2020, Report review, feedback and finalization.

6. Expected tasks and deliverables:

The expected tasks and deliverables of this consultancy are:

1. Review of all project documents as well as secondary data (e.g., 2015 Census, Household Income & Expenditure Survey (HIES) and Labour Force Survey (LFS) and Multiple Indicator Cluster Survey etc.) available.
2. Based on the total targeted population of the RREP, determine an appropriate sample size for both treatment and comparison groups with a justification for the sampling strategy including the power calculation that lead to determine the sample sizes. The sample shall include an adequate number of women respondents to assess the impact of the project on gender equality and women empowerment.
3. Develop a proposal for the selection of both treatment and comparison groups. Maximum care should be taken to ensure that the comparison group is statically equivalent, or at least as similar as possible, to the treatment group (but without having benefitted from RREP activities).
4. Propose the most appropriate econometric method(s) for the analysis of impact

⁴ The baseline for Work Package 2 in September 2019 will also include a mid-term assessment for the Work Package 1/1+ villages (both treatment and comparison) using mixed methods

- “with and without” and “before and after” the project.
5. Develop a draft methodological note within 15 days from the signature of the contract including: (i) final sampling strategy and sample size, (ii) final impact indicator matrix (based on the logframe), (iii) clear indication of the econometric method and of how to overcome potential spill over and contamination effects as well as potential bias.
 6. On the basis of the methodological note, design the instruments for data collection (both quantitative and qualitative), ensuring that all main indicators of change are adequately included therein.
 7. Deploy teams of enumerators for data collection, from both the treatment and comparison groups. The institution will train the enumerators and undertake field tests (in a few households) of the instruments of data collection and refine them as needed thereafter, before fully implementing the impact survey.
 8. Ensure electronic tabulation of the data collected, and conduct the required statistical analysis across the defined indicators of change. As mentioned previously, particular attention will be devoted to assessing impact “before and after” and “with and without” the RREP.
 9. Prepare thematic working papers on the 4 domains of change described in Section-II and Value for Money of different mini-grid interventions at Baseline, Mid-term and End-term stages. The paper will contain tables and charts deriving from the econometric analysis. It will also display charts with the mean and the median along with the most commonly used measures of dispersion of the collected data (e.g., standard deviation and interquartile range). The paper will also comment on the propensity of the households to participate in the project.
 10. Submit the draft paper to UNOPS for review and comments and include all UNOPS comments in the final document. These papers will be compiled by the UNOPS M&E Specialist in the final report with inputs from the consulting firm.
 11. Draft and final summary reports for Baseline, Mid-term and project endline. These reports will also contain summary fact sheets and tables with baseline, mid-term and endline values analysed as per the logframe and the value for money assessment on all mini-grid interventions. The table of contents of the Thematic Working Papers and the summary reports for baseline, mid-term and endline will be prepared by UNOPS M&E Specialist and shared in due course with the consulting firm/institution that will be selected.
 12. At least one academic journal article on one of the key thematic areas written with UNOPS M&E Specialist.
 13. Infographics on key findings compiled at baseline, mid-term and endline stages to be shared via UNOPS social media channels.
 14. Provide an electronic file with all quantitative and qualitative data collected and the final reports.
 15. Participate in any discussion organised by UNOPS in the course of 2019 and 2020 on the overall design and implementation of the impact survey as well as on the econometric analysis.

All deliverables will be provided in English.

7. Inputs, Contract and Payment Terms

7.1 Inputs

The consulting firm or institution will use her/his/their own office/resources/materials, transport and technology in the execution of this assignment. Any requests for office sharing arrangements or any other proposals should be highlighted in the proposal.

7.2 Contract

The contract will be issued and renewed on annual basis, e.g., the firm will be first contracted for the activities in 2019 (i.e., baseline and mid-term assessment) and the contract will be then renewed in 2020 upon successful completion of the required tasks and deliverables mentioned in this ToR. Any changes to this will be discussed with UNOPS in

advance

The lead evaluator for the impact evaluation is the UNOPS M&E Specialist. The lead evaluator will be overall in charge of the exercise and will approve the contract, the deliverables and the payment. The lead evaluator will also be responsible for providing necessary background information and facilitate contacts with national authorities and partners. The institution/company will work closely with the UNOPS lead evaluator in all the tasks to be undertaken, to ensure a successful outcome of the impact evaluation.

7.3 Payment Terms

The consulting firm or institution will be paid by UNOPS as follows (to be agreed at negotiation stage):

Signature of the contract:

- 10% upon signature of the contract

Baseline for WP-1/1+:

- 15% upon delivery and our approval of an inception report containing the methodology note and the first draft of tools, and, hiring of field enumerators.
- 10% on successful submission and our approval of the Thematic Working Papers and Summary Baseline Report for WP-1/1+.

Baseline for WP-2 and Mid-term Assessment for WP-1/1+:

- 15% upon delivery and our approval of an inception report containing the methodology note and the first draft of tools, and, hiring and training of field enumerators.
- 10% on successful submission and our approval of the Thematic Working Papers and Summary Baseline Report for WP-2 and mid-term assessment of WP-1/1+.

Final Endline Impact Evaluation:

- 15% upon delivery of a brief inception report containing the methodology note and the first draft of tools, and, hiring and training of field enumerators for the end-term evaluation.
- 25% on successful submission and our approval of the final Thematic Working Papers, summary Endline Evaluation Report using the OECD DAC Criteria and contribution to the Final Impact Evaluation Report

8. Proposals – The proposal should include the following:

1. Offer's profile
 - Offeror to provide brief description of the organization, including the year and country of incorporation, and types of activities undertaken
 - Offeror to provide information on general organizational capability which is likely to affect implementation: management structure, financial stability and project financing capacity, project management controls, extent to which any work would be subcontracted including relevance of specialised knowledge and experience on similar engagements done in the region/country
 - Experience of similar studies undertaken (including relevant details such as dates, client, project value, nature of study, etc.)
 - CVs of key personnel proposed for the assignment
2. Technical Proposal

Offeror is required to **use Form D, Technical Proposal Form** to submit a technical proposal which indicates how the consulting firm or institution is going to undertake the activities highlighted in the ToR with initial indication of the enumerators and timeframe required. The proposal should be submitted according to the ToR requirement.

DO NOT INCLUDE FINANCIAL DETAILS IN TECHNICAL PROPOSAL.

3. Financial Proposal

Offeror is required to **use Form C, Financial Proposal Form** to submit a financial proposal to this TOR and RFP. Consultant to list all costs associated with the assignment, including (a) remuneration for staff, (foreign and local, in the field and at headquarters); and (b) reimbursable expenses such as subsistence (per diem, housing), transportation (international and local, for mobilization and demobilization), services and equipment (vehicles, office equipment, furniture, and supplies), office rent, insurance, printing of documents, surveys, and training, if it is a major component of the assignment. Where appropriate, these costs should be broken down by activity and, if appropriate, into foreign and local expenditures.

9. Evaluation Criteria

See RFP_Section_III_Evaluation Criteria in the Document Section

10. Annexes to the TOR

See attached

Annex 1 – Logical Framework

Annex 2 – RREP site Location Map

Annex 3 – List of Villages

SAMPLING OF COMMUNITIES AND HOUSEHOLDS FOR BASELINE DATA

a. Identification Strategy

To evaluate the impacts of the mini-grids installed under RREP, we use a Difference in Difference design, comparing changes in key indicators in communities where mini-grids were installed to communities where no mini-grids were installed. To see the logic of our identification strategy, consider that the ideal way to identify the welfare effects of the RREP would be to compare two types of villages that on average have the same characteristics before the intervention, ie during the baseline survey, except that one was randomly allocated to receive the RREP intervention and one does not. We could then during follow up surveys measure key indicators in both types of villages; if welfare indicators were different in the two villages, we could credibly claim that this difference was due to the effect of the RREP programme. However, villages that received the RREP programme are, by definition, not the same as those that did not receive the intervention.

The location of the mini-grid sites have been selected by UNOPS in consultation with other key stakeholders – e.g. the GoSL Ministry of Energy (MoE) – and may not be representative of the typical community in Sierra Leone. Specifically, communities each have a Community Health Centers (CHC) and school, and for WP2 villages tend to be larger in size. Therefore, we must pay careful attention to the way that we select “comparison villages”— villages that we compare to the set of villages that received the RREP intervention. By carefully selecting comparison villages, *and* assessing changes over time, we can create a credible counterfactual and minimize bias in our comparisons.

To make causal claims about the impact of the RREP, we rely on a Difference in Difference comparison. This accounts for all time invariant differences between intervention and control villages. In addition to improve on our estimates, we select control villages based on a matching algorithm. Specifically, our matching procedure is executed as follows:

First, we restricted possible control locations to villages that contain a Community Health Center (CHC), Community Health Post (CHP), or Maternal and Child Health Post (MCHP). This decision is based on conversation with UNOPS Sierra Leone team that a CHC was a requirement for a village being selected into the RREP program.

Second, we construct a data set by merging census data to all villages with a CHC or similar (our universe of cases). Our dataset contains variables that can potentially explain (ie are correlated with) villages being selected in RREP program. These variables are:

- Village Population
- Number of Structures in Village
- Average Age in Village
- Percent of community members born in Chiefdom
- Percent Muslim
- Percent employed in agriculture
- Ethnic Fractionalization Index
- Percent of community immunized
- Percent of community disabled
- Percent of community that owns land

- Percent of community getting light from grid electricity
- Household Asset index
- Percent respondents within one mile of school
- Percent respondents within one mile of health center
- Percent respondents within one mile of water source

Third, we estimate a probit model where the dependent variable is a dummy variable that takes the value of 1 if a community was selected into RREP Program and the explanatory variables are the above listed variables. In doing so, we estimate the degree to which a given variable predicts that a community was assigned to the RREP program. We multiply these estimated coefficients by the values of each corresponding variable to create a “propensity score” for each community.

Fourth, we match communities that received the RREP program to communities that did not based on two dimensions. First, treatment communities are matched to control communities within the same District. Second, conditional on being in the same District, each treatment community is matched to a control community with the most similar propensity score.

Fifth, we check the effectiveness of our matching procedure by looking at a balance table which compares how similar treatment and control villages across all variables.

From the final list of potential control communities, some were dropped due to special circumstances. These communities were dropped because:

- Had electricity from another source (national grid, solar mini-grids from a different program)
- Were on an island. We cannot assume that communities on an island are comparable to in-land communities.

See “Field Plan” for final result for Work Package 2 villages

b. Sampling of households for WP2

The baseline was implemented in 86 communities across Sierra Leone.

There are six surveys to complete in each village: (i) town chief survey (ii) census (iii) household survey, (iv) clinics survey, (v) school survey, (vi) completion survey.

Below we discuss the *sampling protocol* for each.

For WP2:

1. First, a full village census field exercise was conducted. This was carried out across all 86 treatment and control communities.
2. A representative sample was drawn after the census field exercise was completed in all 86 communities.
3. Baseline surveys were administered to the representative sample drawn.

Protocol for full village Census in each community:

- Arrive before Day 1, or on Day 1 in the planned district
- Conduct Town Chief Survey on Day 1 in assigned communities
- Zones/Sections assigned to enumerator teams

- Enumerators conduct census surveys (It is expected to take 1-2 days to complete full census in each district)
- Enumerators do the Completion Survey and travel to next assigned district.

i. Town chief survey

When we first arrive in a community, we will visit the town chief and consult with them about the size of the community and how many zones/sections they are divided into. We will also ask to be assigned a community guide to help navigate the community.

ii. Census

After getting an estimate of the size of the community, a full census was carried out. All the heads of the households in every structure of the community were surveyed. The enumerators were divided into teams of 4, sometimes 5. The teams have been assigned zones where they administered the census survey to all the households in their assigned zone. They introduced themselves, find out if the head of household (or person in-charge) is available, read out informed consent and administered the survey.

iii. Completion survey.

At the end of the stay in the community, the enumerators have to do the completion survey which will be a check-list for all the tasks that were assigned. They need to make sure that all households have been surveyed in their assigned zone, and no structure/household has been left behind. Enumerators will also ensure that the GPS coordinates for the surveys have been recorded correctly.

iv. Household Survey

The household survey respondents will be randomly selected by the research team based on the census data. Team will have a list with the 30- 43 selected households ready before they arrive at the community, along with replacements in case the sampled households are unavailable. Enumerators will be able to identify households with the identifying information collected during census and by the head of the household name.

At the start of the survey, the enumerators will also inform the respondent that in the survey there are questions about his/her spouse, and we should have them present if possible.

Ideal respondent priority list:

- Household Head
- Household In-charge
- First spouse

v. Clinics survey

Community Health Centre Survey: each community has one Community Health Centre (CHC). In the CHC, we will interview the Community Health Officer (CHO). If we cannot find the CHO, please interview the Head Nurse.

vi. School survey

Most of the communities will have more than one school. We are interested on primary and (junior or senior) secondary government schools. Private schools or Quranic schools will not be surveyed. If a community has more than one primary or secondary government school, you will conduct the school survey on the closest to the centre of the community.

Once the school(s) have been chosen, we need to select who to interview. We want to interview only one person per school. Ideally, this person should be the Principal. If the Principal is not around, we will try to find the Head Teacher. These are the only two people we want to interview. Any other school employee are not valid respondents.

vii. Completion survey.

At the end of your stay in the community, you will have to complete a completion survey on your phone. This survey serves as a check list for all the tasks- household surveys, CHC surveys, and School surveys to be carried out during the visit.



TRAINING MANUAL

BASELINE EVALUATION RURAL RENEWABLE ENERGY PROJECT

Authored by: Sierra Leone Field Research Team
Wageningen University, Netherlands

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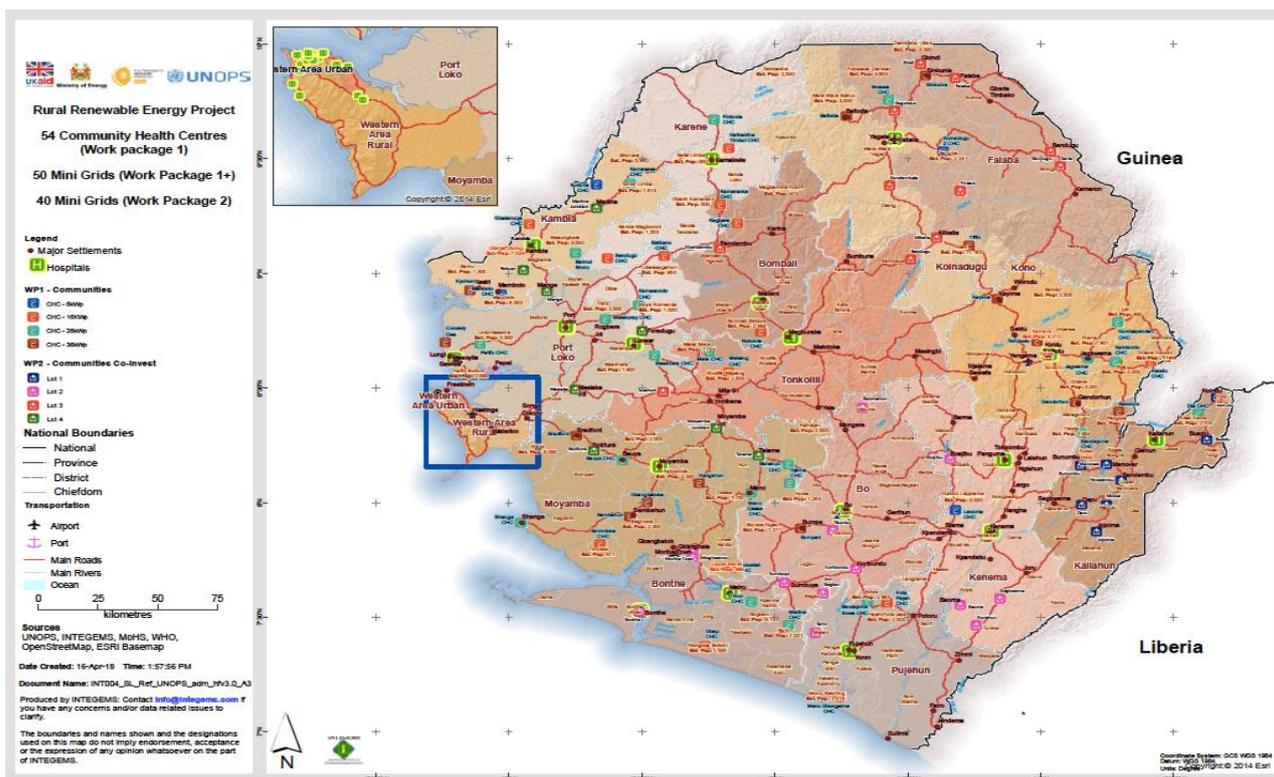
1.1 Background

Limited access to electricity can hamper economic development. For this reason, universal access to electricity has become a primary goal for policy makers, international organizations and donors. In Sierra Leone, only 2.5% of the population in rural areas have access to electricity¹. The newly elected Government of Sierra Leone (GoSL) promises an ambitious rural electrification policy and calls the improvement of the supply of energy “an imperative for any meaningful development and poverty reduction” (SLPP 2018, pg. 75).

In an effort to support the GoSL towards universal access to electricity, the United Nations Office for Project Services (UNOPS) is implementing the Rural Renewable Energy Project (RREP), an ambitious electrification project that will provide access to off-grid solar electricity to up to 94 communities in Sierra Leone. The RREP is funded by the UK Department for International Development (DfID) and implemented in collaboration with the GoSL Ministry of Energy and UNOPS.

The provision of off-grid solar electricity will take place in different phases. In phase 1 of the project (Work Package 1), 54 community health centres across the country will be provided electricity. In the next phase (Work Package 1+), 50 solar mini-grids will be set up in 50 communities across different districts of the country. In the final phase (Work Package 2), 40 mini-grids will be set up will be set up. It is anticipated that Work Package 1+ and Work Package 2 will lead to more households getting connected to electricity.

The following map lists the sites of the UNOPS mini-grids:



Wageningen University and Research (WUR) is tasked with the development of the Impact Evaluation of the mini-grids intervention of RREP. The purpose of the Impact Evaluation is to estimate the effects of the mini-grids on community welfare and development. Specifically, we aim to evaluate socio-economic impacts across four key domains:

- I. Income and Assets
- II. Health Outcomes
- III. Education Outcomes

IV. CO₂(e) Reductions

The Impact Evaluation began in March 2019 and lasts for two years. This time period will allow us to assess the medium run impacts of the mini-grids.

1.2 Objectives

The primary question for this evaluation is: *What is the impact of mini-grids installed?* Specifically, we are interested in:

- ✓ Does increased access to electricity increase incomes and assets?
- ✓ Does increased access to electricity improve the health conditions?
- ✓ Does increased access to electricity increase school attendance?
- ✓ Does increased access to electricity reduce CO₂e emission?

In addition, we disaggregate by the following parameters:

- *Gender*
 - Do results differ by gender of the household head?
 - Does increased access to electricity change women's allocation of time across household, agriculture, and employment activities?
 - Does the programme promote female decision and empowerment within the household?
- *Age*
 - Do results differ by age (based on cohorts)?
- *Disability*
 - Do results differ by disability group (based on Washington Group disability questions)?
- *Unintended consequences:*
 - Are there side or unintentional effects of electrifying rural communities through solar mini-grids?
- *Timeliness*
 - How do the effects of electrification progress and change over time? Are there larger effects at later stages of the programme?

How are we testing these objectives?

These objectives will be tested through a series of data collection activities namely:

- **Baseline**

This training is geared to prepare enumerators to carry out baseline data collection activities. This is the first time that the communities will be exposed to the UNOPS RREP impact evaluation. In this round, we will collect survey data from households, schools and health centres on a range of topics relevant to the evaluation in both treatment and control communities (more information on this below). The baseline activities are set to take place from end of November 2019 to middle of December 2019.

What do we mean by treatment?

Treatment communities are those that already have UNOPS solar mini grids installed or will have them installed in the near future.

What do we mean by control?

Control communities are those that DO NOT have UNOPS solar mini grids installed and WILL NOT receive them in the future. They form the comparison group for our treatment communities.

- Midline
To take place one year after the baseline.
- Endline
To take place two years after the baseline.

1.3 Organization of the Team

The UNOPS Baseline Data Collection is conducted by a team of international researchers from different universities across the globe and an in-country team that consist of international and national staff members. We will refer to this team as the “Impact Evaluation Team”.

The Impact Evaluation Team consist of:

- Principal Investigators
- Lead Monitoring and Evaluation Specialist
- Research Associates
- Field Coordinators
- Field Supervisors
- Enumerators

The training program and field implementation activities will be headed by Research Associates, who will be your direct point of contact for the entire duration of employment. Research Associates are responsible for supervising data collection activities and will serve as your direct supervisors. All your questions and concerns regarding logistics, payments, surveys, protocols and field schedules must be directed to them.

Candidates will be selected for one of the following two roles, contingent on their performance:

a) Enumerators

Enumerators form the base of our data collection activities. They are responsible for the following:

- ✓ Conducting interviews with households or other relevant stakeholders
- ✓ Recording survey responses on tablets
- ✓ Recording GPS location
- ✓ Filling out forms in communities as instructed by Research Associates
- ✓ Recording information as necessitated by the project

Enumerators serve as the face of the project in the communities and hence it is important that the highest levels of professionalism, integrity and honesty is maintained at all times. They are provided with all logistical support from the Research Associates prior to heading to the field, including but not limited to, tablets, power banks, USB chords, etc.

b) Field Supervisors

Field supervisors act as a liaison between the enumerators and research associates. Their role is more managerial in nature and involves supervision of enumerators to ensure that all data collection activities are being followed as per protocol. Field supervisors are generally not responsible for conducting survey, but they need to be proficient in ODK and need to know the ins and outs of the surveys so as to assist enumerators in the field, should any problems arise.

IMPORTANT NOTE: Both enumerators and field supervisors, for the entire duration of the baseline, will represent the Impact Evaluation Project from Wageningen University. Please DO NOT claim to represent UNOPS or other agencies.

1.4 Training and Activity Details:

The training will begin on November 4 and completed by November 16, for a total of 13 days of training. Training sessions on each day will be divided into a morning and afternoon session, unless mentioned otherwise. A one-hour lunch break (between 1 and 2 pm) will be provided for each day.

On two of the training days (most likely Day 12 and Day 13), a field visit shall be organized for all the trainees. The whole team, including Research Associates and Field Coordinators, will head to two pilot communities to conduct surveys and simulate the entire data collection procedure in a real-life setting.

There will be 71 enumerators in total during the training, of which will be selected (64 enumerators plus 6 supervisors) for the duration of the baseline fieldwork (*subjective to good performance*). The entire training will take place in Freetown at the YWCA, and will be led by the Research Associates in cooperation with UNOPS and other relevant stakeholders. The criteria for final selection of enumerators will be based on a final test as well as observations of performance during the training, where the remaining trained candidates will be kept as back up in case of unexpected dropouts.

Compensation:

For the training, enumerators shall be provided with allowance and transport for each day successfully completed. Breakfast and lunch shall also be provided for the entire duration of the training.

Activity Details and Schedule:

The baseline activities shall take place for approximately 18 days. During this time, enumerators will spend 1-3 days in each community conducting the different surveys (will discuss later), locating respondents and recording information as required. Enumerators shall be provided with specific information on which communities to go to, how long to spend in each community and what set of tasks to carry out.

Field supervisors will be responsible for all activities as per the supervision plan (that the Research Associates will provide) and will monitor enumerators to ensure smooth flow of activities and adherence to protocols.

Compensation:

Both enumerators and field supervisors shall be provided a daily allowance and DSA towards their services. All transportation and logistics shall be arranged by the project. The allowance for enumerators and field supervisors will vary, given that the nature of responsibilities is different.

1.10 Terminology

Respondent: The respondent for the survey should preferably be the head of the household. If he/she is absent the next person who is acting as head of household or a responsible adult in the household should be interviewed. This person should be a member of the household and must be capable of providing all the necessary information on each household member. The interviewer has to ask a few questions to be able to identify who the head of the household is with the help of the respondent. Other members can help by adding information or details in the questions concerning them.

- *Dwelling unit/Structure*

A dwelling unit/structure is a self-contained unit of accommodation used by one or more households. It can be:

- a single-family house/hut



➤ a flat/apartment (self-contained)



➤ several huts/buildings (same compound)



➤ several huts/buildings (different compound)



- *Household*

In this survey, a household will be defined as a group of people who have usually slept in the same dwelling and taken their meals together for at least 9 of the 12 months preceding the interview. The following are examples of a household: -

- A household consisting of a man and his wife/wives and children, father/mother, nephew and other relatives or non-relatives;
- A household consisting of a single person;
- A household consisting of a couple or several couples with or without their children.

- *Head of household*

The head of household is the person within a household who is financially supporting their dependents and providing the food for them with all the essential needs. He/she will have the main opinion and say for the decision making of the household. He/she will be the person named when you ask the question "Who is the head of this household?"

- *In-Charge Person*

The "in-charge" person is a respondent who is NOT the head of household but has knowledge about what each member of the household does in relation to the head of household. If the head of household is not around, this is who we will be asking all the survey questions to.

- *Members*

- Household head: Person who is responsible for governing a group that lives together and is providing the primary support for the family. They will be identified as the head of household even if they have not been with the household for 9 months or more
- Relatives, such as father/mother, wife/wives and children, cousins, nieces and nephews of household head absent 3 months or less in past 12 months and who are not permanent residents of other households
- Newly born children; Infants less than 6 months old
- New permanent residents of the household, less than 6 months because they were newly demobilized, married, or had a job transfer
- Students living outside the household, but still supported by their family only.
- Relatives of household head whose work requires them to be outside the household for more than 6 months of the year, but who are considered in the household budget
- Guests living with the household 6 or more months

- *Non-members*
 - Individuals who died during the past 12 months
 - People who have lived in the household for 6 months but left due to marriage etc.
 - Hired workers, servants or lodgers
 - Guests and all other people not listed in the definition of household members
 - People who have joined the army but planned to return to the household

- *Tenant*

A tenant is someone who pays for board and/or lodging. If a tenant lives in the dwelling being interviewed but does not eat with the rest of the household, then he/she is not a member of that household being interviewed and should therefore be considered as a separate single person household together with his/her spouse(s) and children if any. However, if the tenant eats with the family, then by definition (above) he/she is part of the household and should be included in the household roster.

1.5 Survey Questionnaires

The enumerator will administer five surveys in each community: Town Chief Questionnaire, Household survey, Community Health Centre survey, School survey and Completion Survey. Data will be collected electronically, using tablets and a data collection software called ODK Collect (see **Section 1.7** for instructions on how to use ODK Survey).

Below is a brief description of each survey, which we will describe later in this document in more detail:

I. Town Chief Survey

The town chief survey will be the first survey conducted as the enumerator meets with the chief. We will be introducing the project to the chief and obtaining their contact information to ensure we stay in touch with them throughout the duration of this project. This is a very short survey and needs to be done when first entering the community.

II. Household survey

The primary focus of the household survey will be on how access to electricity affects households in four domains: i) household income and assets, ii) improved health, iii) improved education and iv) CO² reduction. We will collect relevant data for both treatment and control communities for each stage of the intervention (baseline, midline, and endline). The specific sub-sections of the survey include respondent information, income and wealth, energy usage, health, education, social and political attitudes. All data will be disaggregated by age, gender and disability. With this information, we hope to better explain mechanisms through which electricity affects households.

This survey will ideally be administered to head of households (those who are financially taking care of the family and does decision making). However, participation from other family members (especially women) will be highly encouraged as certain questions are targeted towards them.

III. Community Health Centre Survey:

The goal of the CHC Survey is to capture the conditions and services offered at the CHC and whether there are improvements after electricity is supplied. CHC will be able to store drugs and vaccines using refrigerators, extend consultation/opening hours using lights at evening/night or improve the quality of their services with better electrified equipment. Additionally, staff and patients will have a better experience when working/visiting the CHC. The CHC Survey will allow us to collect more aggregate, community-level data as well as specific information regarding the CHC that members of the communities cannot provide.

This survey will ideally be administered to Community Health Officers (CHO). However, other hospital staff (like head nurses) who are well-equipped to answer questions on hospital facilities, equipment and electrification would also be accepted.

IV. School Survey:

The school survey aims at identifying changes in schools due to electricity access. Electricity can impact attendance rates, school time and shifts, student performance and teacher quality/engagement through the introduction of multimedia/computers etc. Attendance rates and student performance could be better captured through school records, while information about school time and shifts could be collected through the school survey.

This survey will be ideally administered to School Principal or head teacher or other staff members who provide information about number of children attending, number of shifts, school facilities, and have access to official school records.

V. Completion Survey

This survey must be undertaken at the end of an enumerator’s stay in the community. The survey will verify whether the different tasks that the enumerator should have completed is actually done. It can be thought of as a checklist at the end of one’s stay in the community.

1.6 Confidentiality

The respondent must be assured that information they furnish will be confidential and will not be divulged to any unauthorized persons. Under no circumstances will the information be used for any purpose other than meeting the objectives of the survey. No individual-level information will be analyzed. The enumerator should emphasize this point to the respondent. In this connection, enumerators must also make sure that completed questionnaires are handled with the greatest of caution.

1.7 Introduction to ODK Collect and Tablets

ODK Collect is an open source Android app that replaces paper forms used in survey-based data gathering. It supports a wide range of question and answer types, and is designed to work well without network connectivity.

ODK Collect renders forms into a sequence of input prompts that apply form logic, entry constraints, and repeating sub-structures. Users work through the prompts and can save the submission at any point. Finalized submissions can be sent to (and new forms downloaded from) a server. ODK Collect supports location, audio, images, video, barcodes, signatures, multiple-choice, free text, and numeric answers. It can even accept answers from other apps on your device.

For the purpose of this project, we shall be using a variety of Asus and Samsung tablets as the primary device which hosts the ODK collect app and using these to record the GPS locations. The ODK collect app will be installed on tablets that shall be provided to each enumerator. The relevant surveys will be pre-loaded in the tablet, so the enumerator will have to simply open the application and select the relevant survey to complete.

The various tablets are quite simple to use. The following picture explains basic features and buttons:



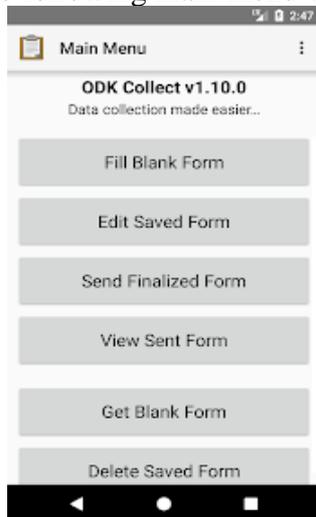
On this tablet, an application for ODK collect will be pre-loaded. This is what the enumerators will be using.

Let us now look at how to fill up a survey using ODK collect on the tablet.

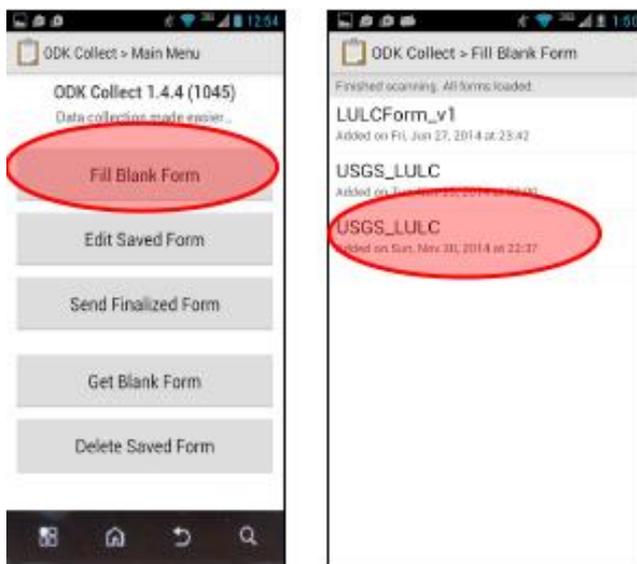
Step 1: Open the ODK collect application. It can be located with the help of an icon that looks like a notepad



Step 2: Once the application is opened, the following main menu will open

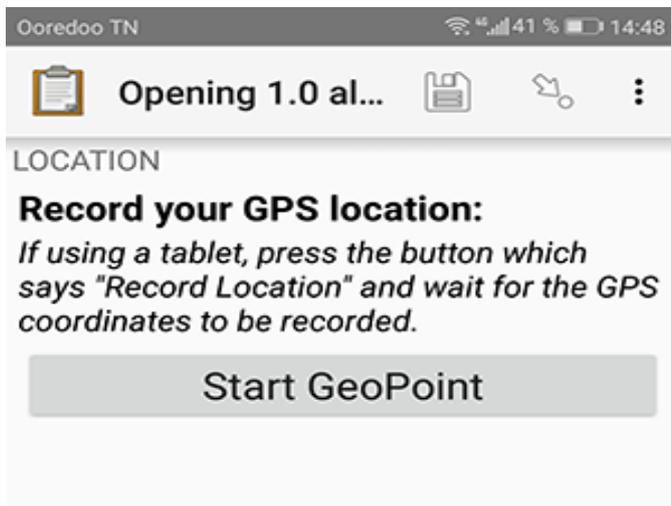
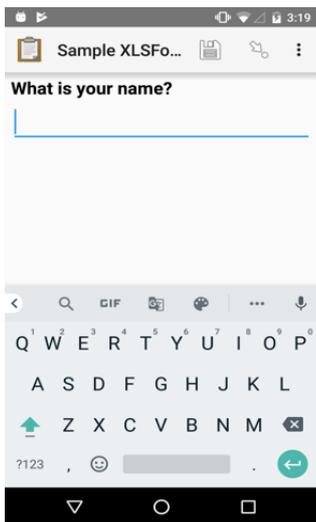


Step 3: The enumerator has to select “Fill Blank Form” option. Once this option is selected, survey(s) that have been pre-loaded from the ODK server will appear in a list-format. The enumerator must select the relevant survey name that needs to be completed. In the example below, the enumerator selects USGS_LULC survey to fill out:

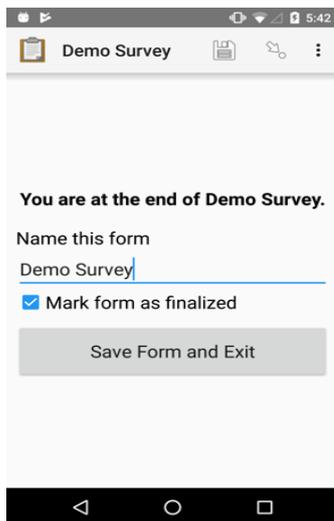


Step 4: The enumerator must complete the survey. The surveys may contain a combination of text, numeric, single-option, multiple-option, date/time, geo-location type questions. Below are examples of some of these question types:

Step 5: Once the survey has been completed, the following pop-up will appear. The name of the survey will often be auto-filled. The enumerator must check “Mark form as finalized” in the event that the survey has been completed and he/she wishes to save the results. After this, the “Save Form and Exit” must be selected



for the survey to be recorded/saved in the tablet and to exit.



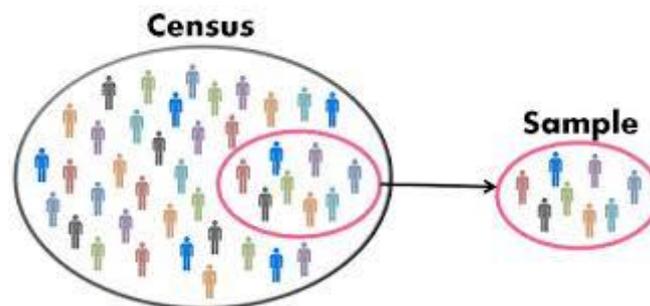
Step 6: Once “Save Form and Exit” is selected, the enumerator is brought back to the main menu. The saved survey will now appear under “Edit Saved Form” and “Send Finalized Form” options in parenthesis (). For example, “Edit Saved Form (3)” means that 3 surveys have been completed and saved in the tablet, ready to be sent to the server.



After surveys are completed, they will be transferred to the servers by the Research Associates. Enumerators are only to complete the surveys and ensure that they are saved correctly on the tablets.

1.8 Sampling

In each community (control and treatment), there is a population from which we would like to sample. Typically, the entire population is listed, from which some households are randomly chosen for a household survey. It is assumed that the selected households are representative of the community population. The illustration below captures this idea:



We have already done a full census to obtain the population. From here, we will be randomly selecting the households that will be our sample. These households are believed to be a representation of the population as mentioned previously.

For each community, enumerators will be provided with the exact number of households and sample of households that need to be surveyed, along with additional replacement households in case any households are unavailable.

1.9 Interview Procedures

Step 1: Arriving to community

A team of enumerators and field supervisors will arrive to their assigned community early in the morning or the night before. Upon arrival (or the next morning in case the team arrives the night before), the field supervisor will introduce him/herself and the team to the Town Chief and relevant elders in the community. He/she will also inform about the nature of their work and length of the stay. They will also answer any questions that the Town Chief or elders might have.

Step 2: Conduct Household Surveys

Household surveys will be administered through the list of households that were randomized from the census survey. This list will be provided to you by the RAs from the census that was completed previously. You must proceed to re-identify these households using the house features and head of the household name to verify

you have the correct household before you can begin the survey. All this information will be in the list of randomized names provided to you. It is highly important that we find the exact same households that we have selected for the enumerators to survey.

Each household survey will take close to 2 hours (or 120 minutes) to complete. You must make the respondent aware of the time commitment and make sure they are comfortable with it. For questions requiring physical inspection, please be sure to verify before entering the responses into the tablet. Don't forget to SAVE the responses after each section as you're working through the survey.

What do we do if.....?

a) *Household head is not available/present?*

We need to interview someone who is aware of the household composition and activities. Ideally, this person should be the head of the household or spouse. If they are not available, we will ask when are they expected to be available. If they will be available during our stay in the community, we must wait. If they will not be around during our stay, we must either: i) find somebody else with sufficient knowledge about the household and its activities, or ii) replace this household with a replacement from the replacement list.

b) *Head of the household is below 18 years of age?*

We cannot interview individuals below 18. In this case, we must find someone else in the household able to answer our questions. The under 18 individuals can, however, stay during the interview and help the main respondent answer our questions. We need to know that minors are not allowed to answer any of the questions directly due to ethical reasons and the data will not be usable. We cannot direct any questions to the under-aged.

c) *Respondent says he/she does not have time or does not want to talk with us?*

We understand that not everyone will be willing to make time for us. However, it is very important that we do everything at our disposal to convince them to be interviewed. You should:

- Explain the importance of their participation and the purpose of the interview
- Listen to their concerns and answer any question they might have
- Give them time to think/decide. Suggest coming at a different time if there are busy now

If they still don't want to talk to us, we need to fill out a survey and select that the respondent did not consent to participate in the evaluation.

d) *Respondent needs to leave in the middle of the interview*

We cannot force anyone to be interviewed. If the respondent decides to leave or stop the interview, we should ask them what the reason is for them to leave. If possible, agree with the respondent to continue the interview at another more suitable time. However, if the respondent says he/she does not want to continue at all, we should save changes in the questionnaire and inform the supervisor about the incident and make a note at the end of the survey for the RAs to know that the respondent chose to have the interview stop.

Step 3: Conduct Community Health Centre (CHC) Survey(s)

The health survey must be carried out at the CHC at a time when the community health officer (CHO) is mostly likely to be around. There is only one CHC (or other various sorts of health centres) in every community, so this survey will only have to be conducted once. The CHC survey needs to be conducted in

the time frame that the RAs have communicated that the enumerators will be staying within the community. Only one person needs to conduct this survey. This will have to be communicated and organized with the team of enumerators, so every survey is completed in the allotted time frame. The CHC survey should take about 1 hour to complete.

What do we do if.....?

a) *CHO/Head Nurse are not available?*

If CHO or Head Nurse are not available, we must wait until they find time to talk to us. In case they will not be available during our stay in the community, we will talk with the most senior person in the centre who has access to the all the appropriate information.

Step 4: Conduct School Survey(s)

The school survey must be conducted at government assisted schools assigned to your community at a time when school principal or head teacher is most likely to be around. The list of schools to conduct interviews in for EACH community will be provided to the enumerators. The school survey needs to be conducted in the same time frame as the household and CHC surveys. This will require the team of enumerators to be efficient with assigning who is going where and at what time. If possible, obtain the contact information of the school principal or head teacher by a community member so a time frame can be given for conducting the survey and time is not wasted. Each school survey will take between 45 minutes to an hour.

What do we do if.....?

a) *Principal/Head Teacher are not available?*

If Principal or Head Teacher are not available, we must wait until they find time to talk to us. In case they will not be available during our stay in the community, we will talk with the most senior teacher available at that time. They will need to be able to access school records for some of the questions. Ensure that they can obtain these items.

b) *There are more than one administration using the same structure?*

Sometimes, two different school administration share the same building to teach their lessons. In the school survey, we ask “how many administrations are using these premises”. You will have a list of schools that you have to collect information about. If the same premises are used by two or more administrations, you have to make sure you are interviewing someone who belongs to the right administration. A short conversation with the respondent about the number of administrations and school names should suffice to confirm the identity of the respondent.

Step 5: Conduct Completion Survey

At the end of the allotted time frame for the community each team of enumerators are at, the following surveys should have been completed:

- a) Town Chief survey
- b) Household survey
- c) CHC survey
- d) School survey

The Completion survey must be carried out on the last day right before leaving community. The survey will serve as a checklist and ask you questions about whether or not all the surveys that were supposed to be completed were actually finished. You **MUST** fill the survey at the end of your stay in every community.

Other important pointers:

Private nature of the Interview: All the data collected are strictly confidential. Any breach of the confidentiality is forbidden by your oath of secrecy. In principle, all the questions should be asked in complete privacy to ensure that the answers remain confidential. The presence of other people during the interview may cause him/her embarrassment and influence some of his/her answers.

There are some sections which could be extra sensitive and might require more privacy. See the examples below:

- Health (which asks questions concerning pregnancies)
- Agriculture (where questions on assets and income generated from agricultural activities would be asked)
- Income and miscellaneous income and expenditures
- Assets owned by the household

When you get to these sections you should explain to the respondents that some questions are confidential and ask him/her for the best place in the house where he/she is least likely to be disturbed. If another adult does not understand and refuses to leave, you must use tact and imagination to try and get rid of him/her. For example, you could do the following:

- Ask the respondent to persuade the other person to leave.
- Explain as politely as possible that the interview must be conducted in private.
- Try to satisfy the person's curiosity by reading/interpreting the first few questions, and then say something like "you have heard some of the questions. Will you now excuse us for a little while?"

Objectivity of the Interviewer: It is extremely important that you should remain absolutely NEUTRAL about the subject of the interview. Most people are naturally polite, particularly with visitors, and they tend to give answers and adopt attitudes that they think will please the visitor. You must not express surprise, approval, or disapproval about the answers given by the respondent. You must not tell him/her what you think about these things. You must avoid any preconceived ideas about the respondents ability to answer certain questions or about the kind of answer he/she is likely to give. Your most important task is to read/interpret the questions exactly as they are written in the questionnaire.

Use of interpreters: When you first enter a household, you must find out whether you will need an interpreter or not. If no one in the household speaks English/Krio well enough to interpret and none of the team members speaks the language of the household, you must ask the household to choose someone (for instance, a friend, a neighbor or a relative) to interpret for the interviewer. This person should be someone who speaks English/Krio well and is trusted by the household, since the questions are confidential.

You should be aware that in either case certain problems could arise from the use of interpreters:

- It is difficult to know how good the translation is. It is possible that the respondent's friend who speaks English/Krio does not speak it well enough to translate everything said during the interview, and he/she will not want to admit it.
- If you find that the replies do not correspond to the questions, try tactfully to help the interpreter or to replace him. You could for instance, suggest that interpreting is a very tiring job, and that the interpreter should take a rest while someone else carry on. Or you might say that you have already taken up too much of his (interpreter's) time, and that the job should be shared among a number of people.
- Another difficulty often encountered is that the interpreter is so familiar with the household that he starts to answer for the respondent without directing the question to him (respondent). In such a situation you must politely remind the interpreter that it is the respondent that has

been chosen for the interview, and that it is only his/her answers that you can write in the questionnaire.

Code of Conduct for Enumerators:

Impartiality: The Enumerators/Data Collectors (EDC), in the performance of their official duties, shall always act with impartiality, objectivity and professionalism. They shall not act in a way that unjustifiably could lead to actual or perceived preferential treatment for, or against particular individuals, groups or interests.

Integrity: EDCs shall maintain the highest standards of integrity, including honesty, truthfulness, fairness, and incorruptibility, in all matters affecting their official duties and the interests of the Mini Grid Impact Evaluation Project.

Respect for human rights: EDCs shall fully respect the human rights, dignity and worth of all persons and shall act with understanding, tolerance, and sensitivity and respect for diversity and without discrimination of any kind.

Harassment, Harsh or Inhumane Treatment: EDCs should maintain an environment that treats everyone with dignity and respect and will not use any threats of violence, sexual exploitation or abuse, verbal or psychological harassment or abuse. No harsh or inhumane treatment coercion or corporal punishment of any kind is tolerated, nor is there to be the threat of any such treatment.

Conflict of interest: EDCs shall arrange their private interests in a manner that will prevent actual, potential or apparent conflicts of interest from arising, but if such a conflict does arise between their private interest and their official duties and responsibilities, the conflict shall be disclosed and resolved in favour of the interests of Mini Grid Impact Evaluation Project.

Abuse of Authority: EDCs shall not use the authority entrusted to them, in particular by taking advantage of colleagues, beneficiaries or other individuals or groups, for financial, political, sexual or other gain.

Confidentiality of information: EDCs shall not use information that is not generally available to the public, for private gain, financial or otherwise, to benefit themselves, or others with whom they have personal, family or other ties, nor shall they disclose such information to the public without authorization.

Post-evaluation activity: EDCs shall not act in such a manner as to take improper advantage of their functions and positions, including privileged information obtained from such functions and positions.

Teamwork and split of tasks: Your role as an interviewer is crucial to the survey. The quality of the data to be collected will be determined by the quality of your work. You should keep in constant touch with your supervisor and inform him/her of any problems you encounter in your work in the field. All tasks must be split equally and fairly by the team, regardless of age or gender. All team members must support each other and work together when needed in a positive manner.

The Supervisor, on his/her part, will provide you with all the necessary materials and instructions and will also collect and check your work and help you solve any problems that may arise.

Your principal task is to conduct interviews with households at the rate of at least 5-7 per day during the survey period. You must follow strictly all instructions contained in this manual. Read all questions exactly as they appear in the surveys.

1.11 Conflict Resolution

General Pointers:

- Conflict isn't always bad - channel it the right way
- Be diplomatic – But do not make up facts or take any decisions without consultation

- Do not guess, do not give personal opinions

Potential issues and responses:

Scenario 1: Interviewee asks: ‘How can I connect my household to electricity? Can you assist me with the process?’

Response: I represent the impact evaluation team that is here to study the impact of solar mini-grids on community welfare. Unfortunately, I do not have information on the process of how to connect to the mini-grid or what it entails. If you’d like to know more, I would suggest you reach out to the operator in the community. They can guide you through the process.

Scenario 2: The electricity is too expensive for me to afford – can you help me?

Response: I represent the impact evaluation team that is here to study the impact of solar mini-grids on community welfare. I am unfortunately not in a position to assist you financially, but I hope you understand that this impact evaluation will assist policymakers in understanding how electrification can benefit you and others in your community.

Scenario 3: Why should I be a part of this intervention? What tangible benefits will I get from participating in the project?

Response: We give you the choice whether or not you consent to participate in the intervention. It is important for us that you feel comfortable answering these questions truthfully, bearing in mind that all answers are confidential. This impact evaluation will help policymakers in understanding the potential benefits of electrification, which in turn helps you and your community.

Scenario 4: When will you return to our community again?

Response: We are here now for the baseline survey, which is the first round of data collection for the project. We will return to conduct the midline and endline surveys over the course of the next two years. So, we will return to your village two more times in the next two years.

Scenario 5: We have solar minigrids in the community but not a single household is connected yet. Why is this the case?

Response: I represent the impact evaluation team that is here to study the impact of solar minigrids on community welfare. Unfortunately, the organization I work for does not work on the connections for the households, so please direct this question to the operator and they may be able to answer your question.

Scenario 6: We got our house/school/CHC wired over a year ago and we are still awaiting meters. Can you tell us when we will receive them?

Response: I represent the impact evaluation team that is here to study the impact of solar minigrids on community welfare. The organization I work for does not work on the connections for the households/CHCs/Schools, so unfortunately, I am not in a position to say when the meters will arrive. You can however ask this question to the operator.

Scenario 7: The solar panels require maintenance. Who can I contact to report current complaints or in case of future issues?

Response: I represent the impact evaluation team that is here to study the impact of solar minigrids on community welfare, so I am not equipped to take care of maintenance of solar mini grids. For any issues with maintenance, the main point of contact would be the operator.

ANNEX I: Questionnaires
CENSUS SURVEY

Informed Consent

Note: “A household is defined as all members linked to one kitchen and pooling in their resources to meet their expenditures jointly”.

VISIT DETAILS			
1	Enumerator Name		
2	Enumerator ID		
3	Date of interview (DD/MM/YY)		
4	Time of interview (hh:mm)		
5	Location		

LOCATION DETAILS			
6	Full name (<i>confirm spelling is correct</i>)		
8	Phone number (<i>confirm it is correct</i>)		
	Personal Question to Confirm Identity		

DEMOGRAPHIC DATA			
10	How many people live in this household?		
11	What is the main source of income in the household	<ol style="list-style-type: none"> 1. Farmer/livestock rearing 2. Manufacture 3. Market seller/trader 4. Own business (self-employed) 5. Public Service 6. Household Care 7. Unemployed 8. Other 	
11a	Specify other		
12	How much money comes to the household at the end of the month	<ol style="list-style-type: none"> 1. Less than 200.000 SLL 2. Between 200.000 – 500.000 SLL 3. Between 500.000 – 1.000.000 SLL 4. More than 1.000.000 SLL 	
13	If HH owns lands, how many acres of lands do you own?	Number	
14	Do you plant something in there?	<ol style="list-style-type: none"> 1. Rice 2. Maze 3. Others (potato, plantain, fruits) 	
15	If livestock owner, how many heads do you own? What type of animal?	Animal/number	
16	What is the house made of (walls)? (<i>ENUMERATOR: You can see it by yourself, ask if unsure</i>)	<ol style="list-style-type: none"> 1. Wood 2. Mud 3. Mud/Cement 4. Cement 5. Brick 	
17	Roof material (<i>ENUMERATOR: You can see it by yourself, ask if unsure</i>)	<ol style="list-style-type: none"> 1. Iron Sheets 2. Grass 	

		3. Clay 4. Cement	
18	Floor material (<i>ENUMERATOR: You can see it by yourself, ask if unsure</i>)	1. Sand/dust ground 2. Tiles 3. Plastic carpet 4. Cement	
19	Of these assets, select the ones you own	1. Motorbike 2. Table/chairs 3. Bed and mattress 4. Freezer/fridge 5. TV 6. Radio 7. Car 8. Fan 9. Smartphone 10. Tablet 11. Laptop 12. Sofa 13. Bicycle	
	Type of bathroom	1. Latrine outside 2. Toilet outside 3. Latrine inside 4. Toilet inside	
20	Do you have running water at your house?		
21	How many rooms does this structure have (<i>count only bedrooms or storage rooms</i>)	Number	
22	How many members of this household are employed?	Number	
23	Is this house rented or owned?	1. Own house 2. Rented house 3. Don't know	
24	How much rent do you pay? (<i>in Leones/month</i>)		
25	Is the household able to save money at the end of the month?		
26	If yes, what do you think is that money saved for?		

	ELECTRICITY RELATED DATA		<i>These questions are trying to find out about current electricity usage or potential usage.</i>
21	Do you have access to a generator?	0. No 1. Yes 2. Refuse to answer 3. Don't know	
22	Who owns this generator?		

23	What do you use the generator for?	<ol style="list-style-type: none"> 1. Household appliances (lighting, fan, TV) 2. Business appliances (freezers, charging stations – anything that generates revenue) 3. Other 4. Refused to answer 5. Don't know 	
23a	If other, please explain		
24	In a typical week , how many hours do you run the generator?		
25	In a typical week , how much do you spend on fuel to run the generator?		
	SOCIAL NETWORK		These questions are mapping out agricultural social networks.
26	Do you own the plot that you farm on?	<ol style="list-style-type: none"> 0. No 1. Yes 2. Refuse to answer 3. Don't know 	
27	Do you share your farm plot with anyone else?	<ol style="list-style-type: none"> 0. No 1. Yes 2. Refuse to answer 3. Don't know 	
28	What is their name?		
29	What is their nickname?		
30	What is their phone number?		
35	If you need advice on using farm machines, who do you seek in the community?		
36	What is their nickname?		
37	What is their phone number?		
38	Which of these crops did you grow in the past two years?		
38a	Specify other		
39	If you need advice on farming, who do you seek in the community?		
40	What is their nickname?		
41	What is their phone number?		
42	If you need advice on growing maize, who do you seek in the community?		
43	What is their nickname?		
44	What is their phone number?		
48	Which of these fruits do you harvest?	<ol style="list-style-type: none"> 1. Mango 2. Banana 3. Pineapple 4. Guava 5. Watermelon 6. Oranges 	

		7. Citrus Papaya	
49	If you need advice on harvesting fruits, who do you seek in the community?		
50	What is their nickname?		
51	What is their phone number?		
	SOCIAL NETWORK- OTHER		<i>These questions are mapping out other non-agricultural social networks.</i>
	What is the name of the person in the community who you seek out for help with all technologies that use electricity?		
	What is their nickname?		
	What is their phone number?		
	Among your close friends, what is the name of the person you go to most frequently for help with money?		
	What is their nickname?		
	What is their phone number?		
	What is the name of the head of household with whom you celebrate holidays?		
	What is their nickname?		
	What is their phone number?		
	What is the name of the person in the community who you seek out for help with all technologies that use electricity?		
	What is their nickname?		
	ENTREPRENEURS		
67	Is your main occupation 'business'?	0. No 1. Yes 2. Refuse to answer Don't know	
68	What type of business do you run?	1. Tea shop 2. Kiosk 3. Restaurant 4. Bike rider 5. Taxi 6. Entertainment Center 7. Barber 8. Charging stations 9. Selling drinks	

		10. Processing of agricultural goods 11. Petty trading 12. Other 13. Refuse to answer Don't know	
68a	Specify other		
69	If you need advice on doing business, who do you seek in the community?		
70	What is their nickname?		
71	What is their phone number?		
72	Do you intend on starting a business?	0. No 1. Yes 2. Refuse to answer Don't know	
73	Of what kind?		
73a	Specify other		
	Which of these steps have you taken towards starting your business?	1. Put away money in savings 2. Taken out a loan 3. Bought materials 4. Rented/bought a space (if applicable) 5. Started building a space (if applicable) 6. Bought an okata/motor vehicle 7. Other 8. Refuse to answer 9. Don't know	
	Specify other		
74	What are the main barriers to starting your business?	1. Lack of capital 2. Lack of constant electricity 3. Too much competition 4. High maintenance costs 5. Low returns 6. Lack of relevant skills 7. Other 8. Refuse to answer Don't know	
74a	Specify other		
75	QUESTION FOR ENUMERATOR: Do you think this person is actually considering/able to start a business		

76	Please record the GPS coordinates of this structure		
77	This is the end of the interview. Please, make sure to save and finalize the survey at the end. Write down anything you want to communicate to the research team?		

TOWN CHIEF SURVEY

Sl.	RESPONDENT INFO	CHOICES	COMMENTS
<i>Note</i>	<i>READ Informed Consent</i>		
1.	Who are you talking to?	1. Town Chief 2. Section Chief 3. Paramount Chief 4. Town Speaker	
2.	What is the Chief's traditional name?	Text	
3.	What is the Chief's first name?	Text	
4.	What is the Chief's last name?	Text	
5.	What is their contact information?	Integer	<i>Note: Please get their phone number</i>
6.	Who is the second person in command we could talk to?	Text	
7.	What is the second person in commands number?	Integer	<i>Note: Please get their phone number</i>
8.	Does your community have a health clinic?	1. Yes 2. No	
9.	What type of community health clinic does your community have?	1. CHC 2. MCHP 3. PHU 4. CHP 5. Hospital 94. None 95. Other 99. Don't know	
9.	Does your community have electricity?	1. Yes 2. No	<i>Note: Electricity through the grid, which means through a utility company/solar grid</i>
<i>Note</i>	<i>READ thank you note</i>		

HOUSEHOLD SURVEY MODULE

Respondent for Household survey: please interview the **household head**, if they are not available speak to an **in-charge person** of the household.

INFORMED CONSENT

My name is _____. I am an enumerator hired by the Rural Renewable Energy Project (RREP) of Wageningen University in the Netherlands. I would like to invite you to participate in a short survey. The RREP, aims to provide off-grid electricity to 94 communities across Sierra Leone. This evaluation will help us better understand the benefits of providing off-grid access to electricity in rural communities in Sierra Leone and thus help policy makers to take the right decisions in the future. The project is conducted by professionals working at Wageningen University, the Netherlands, International Growth Centre in the UK and UCLA and Yale University, USA. We will be interviewing about 5,700 people in Sierra Leone for this evaluation.

You will be asked a series of questions about yourself and your household. There are minimal risks to you from answering these questions. If you experience distress over the nature of some of the questions, you are free to skip any question. Through the course of the survey, we can take a break, stop and continue a bit later, or stop altogether anytime. You will not be penalized in any way for deciding to stop participation at any time. Declining will not affect chances of receiving an intervention or change your status with this project. There are no correct or incorrect responses, so please express your opinions freely.

The participation is anonymous, and you can refuse to give us any information including your name. No publication will include any of your personal details. Having said that, please note that evaluators will keep your information confidential to the extent possible and allowable by law. The survey should take about 90 minutes. Participation is purely voluntary and not rewarded. There are no costs of participation except your time.

If you have any questions regarding this research or your rights as a research study participant, you may contact the people listed on this Contact Sheet.

Hand over the sheet

Do we have your consent to proceed with the survey?

I	Visit Details	Choices	Notes and Comments
1	Enumerator Name		* Code
2	District		Code
3	Select the chiefdom you are in		Code
4	Select the section you are in		Code
5	Select the community you are in		Code
6	Select the household being surveyed		Code
7	Is the head of household, or an in-charge, present in the household?	Yes No	

8	Enumerator: Please select whether you are interviewing the head of household, or the in-charge person.	Head of Household In-Charge person Minor	
INFORMED CONSENT			
II	Respondent Information	Choices	Notes and Comments
1	You said that you are the head of the household. You are the person responsible for taking care of all the essential needs of the household, and make all the important decisions for the household. Is that correct?	Yes No	
2	So you said the main decision maker and provider (head of household) is not available. You told me that you know all the happenings in this household and are capable of answering all the questions related to the affairs of this household. Is that correct?	Yes No	<i>If person says that they are 'In-charge'</i>
3	How are you related to the head of the household?	2 Wife 3 Son/Daughter 4 Brother/Sister 5 Father/Mother 6 Nephew/Niece 7 Uncle/Aunt 8 Grandparent 9 Cousin 10 Friend 11 Grandson/daughter 12 Husband 95 Other relation	<i>If person says that they are 'In-charge'</i>
Respondent			
4	Do you have a phone number that you can share with us? Even if it is not your own, but someone in your household is willing to share theirs	0 No, I don't have phone number 1 No, I don't want to share my phone number 2 Yes 3 I don't have a phone number, but I can give you the phone number of someone else living in the household	
5	Write the phone number	text	
6	Whose phone number is this?	text	
7	So, you provided me with the phone number (phone number). Is this information correct?	Yes No	
8	I will now ask you about everyone living in your household. As we said, a household consist of people living under the same roof and eating from the same pot. Think about all the people living in your household. Can you help me make a list of them? Enumerator: Take your notebook and write down the household composition with the help of the respondent	note	
10	Enumerator: How many people in total did you list down?	integer	<i>Enumerator Note: INCLUDE THE RESPONDENT</i>
11	Enumerator: Now write down the members of the household that are above 18 years old	note	
12	How many adults (above 18 years old) live in this household?	integer	<i>Enumerator Note: Include all adults, INCLUDING the respondent</i>
Head of the Household details			
13	What is the first name of the head of the household?	text	
14	What is the middle name?	text	<i>Leave blank if no middle name</i>
15	What is the last name/ family name?	text	
16	What other name does the head of household go by in the community?	text	<i>Leave blank if no nickname</i>

17	DO NOT READ: What is the gender of the head of the household?	1. Male 2. Female	
18	What is the head of the household's age?	integer	<i>Enumerator Note: If they do not know their age, please take a guess</i> <i>State the age in completed years</i>
19	Are you married?	Yes No	
20	Do you have more than 1 wife?	select_one yes_no	<i>If Head of Household is Male: In #17 Male is selected</i>
21	How many wives do you have?	integer	<i>If respondent says 'Yes' in #20</i>
		end_group	
	Get the information of all the adults in the household, EXCLUDING the head of the household.	note	
	Household Roster Adults		WILL REPEAT FOR NUMBER OF ADULT PEOPLE IN THE HOUSEHOLD
22	Name	text	<i>Full name (First, Middle and Last if applicable)</i>
23	Is this the respondent?	Yes No	
24	What is his/her age?	integer	
25	What is his/her gender?	1. Male 2. Female	
26	What is his/her relationship to the head of the household?	2 Wife 3 Son/Daughter 4 Brother/Sister 5 Father/Mother 6 Nephew/Niece 7 Uncle/Aunt 8 Grandparent 9 Cousin 10 Friend 11 Grandson/daughter 12 Husband 95 Other relation	
27	What is your wife rank?	1 First wife 2 Second wife 3 Third wife 4 Fourth wife 5 Fifth wife 6 Sixth wife 7 Seventh wife	<i>If relationship in household roster is 'Wife'</i>
		end_repeat	
28	Enumerator: Now write down the information about boys younger than 5 years old	note	
29	How many boys under-five live in the household?	integer	
	Household Roster Boys 0-5 y/o	begin_repeat	REPEATS FOR NUMBER OF BOYS IN HOUSEHOLD WHO ARE 0-5 YRS
30	Name	text	<i>Full name (First, Middle and Last if applicable)</i>
31	What is his age?	integer	
32	What is his relationship to the head of the household?	2 Wife 3 Son/Daughter 4 Brother/Sister 5 Father/Mother 6 Nephew/Niece 7 Uncle/Aunt 8 Grandparent 9 Cousin 10 Friend 11 Grandson/daughter 12 Husband 95 Other relation	
		end_repeat	
33	Enumerator: Now write down the information about girls younger than 5 years old	note	

34	How many girls under-five live in the household?	integer	
	Household Roster Girls 0-5 y/o	begin_repeat	<i>REPEATS FOR NUMBER OF GIRLS WHO ARE 0-5 YRS</i>
35	Name	text	<i>Full name (First, Middle and Last if applicable)</i>
36	What is her age?	integer	
37	What is her relationship to the head of the household?	2 Wife 3 Son/Daughter 4 Brother/Sister 5 Father/Mother 6 Nephew/Niece 7 Uncle/Aunt 8 Grandparent 9 Cousin 10 Friend 11 Grandson/daughter 12 Husband 95 Other relation	
		end_repeat	
38	Enumerator: Now write down the information about boys between 6 and 18 years old	note	
39	How many boys between 6 and 18 years old live in the household?	integer	
	Household Roster Boys 6-18 y/o	begin_repeat	<i>REPEATS FOR NUMBER OF BOYS WHO ARE 6-18 YRS</i>
40	Name	text	<i>Full name (First, Middle and Last if applicable)</i>
41	What is his age?	integer	
42	What is his relationship to the head of the household?	2 Wife 3 Son/Daughter 4 Brother/Sister 5 Father/Mother 6 Nephew/Niece 7 Uncle/Aunt 8 Grandparent 9 Cousin 10 Friend 11 Grandson/daughter 12 Husband 95 Other relation	
		end_repeat	
43	Enumerator: Now write down the information about girls between 6 and 18 years old	note	
44	How many girls between 6 and 18 years old live in the household?	integer	
	Household Roster Girls 6-18 y/o	begin_repeat	<i>REPEATS FOR NUMBER OF BOYS WHO ARE 6-18 YRS</i>
45	Name	text	<i>Full name (First, Middle and Last if applicable)</i>
46	What is her age?	integer	
47	What is her relationship to the head of the household?	2 Wife 3 Son/Daughter 4 Brother/Sister 5 Father/Mother 6 Nephew/Niece 7 Uncle/Aunt 8 Grandparent 9 Cousin 10 Friend 11 Grandson/daughter 12 Husband 95 Other relation	

	I will ask you now about difficulties you or the roster member may have doing certain activities because of a HEALTH PROBLEM. Let's start with yourself	note	
III	Health Problems	Choices	Notes and Comments
1	Do you have difficulty seeing, even if wearing glasses?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
2	Do you have difficulty hearing, even if using a hearing aid?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
3	Do you have difficulty walking or climbing steps?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
4	Do you have difficulty remembering or concentrating?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
5	Do you have difficulty (with self-care such as) washing all over or dressing?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
6	Using your usual (customary) language, do you have difficulty communicating, for example understanding or being understood?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
		end group	
	Health Problems - Boy 6-18 1		
7	You told me before that, in your household, there are {X#} boys above 5 years old. You told me that one of the boys was \${name_boy_618_1}. Next questions are about \${name_boy_618_1}.	note	
8	Does \${name_boy_618_1} have difficulty seeing, even if wearing glasses?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
9	Does \${name_boy_618_1} have difficulty hearing, even if using a hearing aid?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
10	Does \${name_boy_618_1} have difficulty walking or climbing steps?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
11	Does \${name_boy_618_1} have difficulty remembering or concentrating?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
12	Does \${name_boy_618_1} have difficulty (with self-care such as) washing all over or dressing?	1 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	

13	Using your usual (customary) language, does \${name_boy_618_1} have difficulty communicating, for example understanding or being understood?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
		end_group		
Health Problems - Boy 6-18 2				
14	You told me before that, in your household, there are {X#} boys above 5 years old. Before, we talked about \${name_boy_618_1}. Now I want to ask you about \${name_boy_618_2}	note		
15	Does \${name_boy_618_2} have difficulty seeing, even if wearing glasses?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
16	Does \${name_boy_618_2} have difficulty hearing, even if using a hearing aid?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
17	Does \${name_boy_618_2} have difficulty walking or climbing steps?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
18	Does \${name_boy_618_2} have difficulty remembering or concentrating?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
19	Does \${name_boy_618_2} have difficulty (with self-care such as) washing all over or dressing?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
20	Using your usual (customary) language, does \${name_boy_618_2} have difficulty communicating, for example understanding or being understood?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
		end_group		
Health Problems - Girl 6-18 1				
21	You told me before that, in your household, there are {X#} girls above 5 years old. You told me that one of the girls was \${name_girl_618_1}. Next questions are about \${name_girl_618_1}.	note		
22	Does \${name_girl_618_1} have difficulty seeing, even if wearing glasses?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
23	Does \${name_girl_618_1} have difficulty hearing, even if using a hearing aid?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
24	Does \${name_girl_618_1} have difficulty walking or climbing steps?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
25	Does \${name_girl_618_1} have difficulty remembering or concentrating?	1 2 3	No - no difficulty Yes - some difficulty Yes - a lot of difficulty	

		4 98	Cannot do at all Refuse to answer	
26	Does \${name_girl_618_1} have difficulty (with self-care such as) washing all over or dressing?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
27	Using your usual (customary) language, does \${name_girl_618_1} have difficulty communicating, for example understanding or being understood?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
		end_group		
	Health Problems - Girl 6-18 2	begin_group		
28	You told me before that, in your household, there are \${X#} girls above 5 years old. Before we talked about \${name_girl_618_1}. Now I want to ask you about \${name_girl_618_2}	note		
29	Does \${name_girl_618_2} have difficulty seeing, even if wearing glasses?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
30	Does \${name_girl_618_2} have difficulty hearing, even if using a hearing aid?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
31	Does \${name_girl_618_2} have difficulty walking or climbing steps?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
32	Does \${name_girl_618_2} have difficulty remembering or concentrating?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
33	Does \${name_girl_618_2} have difficulty (with self-care such as) washing all over or dressing?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
34	Using your usual (customary) language, does \${name_girl_618_2} have difficulty communicating, for example understanding or being understood?	1 2 3 4 98	No - no difficulty Yes - some difficulty Yes - a lot of difficulty Cannot do at all Refuse to answer	
IV	Income and Wealth	Choices		Notes and Comments
	Agricultural Production			

	<p>ENUMERATOR: Now we move into the Section 2: Income and Wealth, subsection 1: Agricultural Production</p> <p>READ: In this part of the survey, I am going to ask you about your farm activities in the last year (2018). We are interested in knowing how much your household produced, what quantity was sold, at what price etc. By household we mean people that live under the same roof and eat from the same pot.</p> <p>If the respondent is not a farmer or does not plant/produce any farm products, please write 0.</p> <p>Please, write: -99 = Don't know -98 = Refuse to answer</p>	note	
1	Do you or any member of your household grow any crops?	Yes No Refuse to Answer Don't know	
2	Think of all the plots that you or your household member grows crops on. How many plots do you have?	integer	<i>A plot is any piece of land where the household grows crops. This can be a farm, a backyard garden, a cocoa/coffee garden, swamp, or upland farm, etc.</i>
3	You told me you have {X} number of plots. Let's talk about them one at a time.	text	<i>Use the laminated sheet and marker given to you and help the respondent map out where the farm plots are located.</i>
Farming practices			WILL REPEAT FOR NUMBER OF PLOTS
4	Can you tell me where this plot is located?	text	<i>These are the ways the respondent refers to the plot, such as 'plot next to the pond', 'plot by the highway', etc. Also use the drawing you helped the respondent make to understand these locations.</i>
5	What type of plot is this?	1 Swamp (In-valley swamp, Mangrove, Elephant Grass, Grassland) 2 Upland farm 3 Garden 4 Garden at place of residence 98 Refuse to answer 99 Don't Know	
6	What is the size of the plot? (in acres)	decimal	<i>If the respondent cannot mention exact number in acres, ask them how many bushels of rice can be planted in the land. 1 bushel = 1 acre</i>
7	Did you grow UPLAND RICE on this farm/garden in the past 2 years?	Yes No	
8	Did you grow LOWLAND RICE on this farm/garden in the past 2 years?	Yes No	
9	Did you grow CASSAVA on this farm/garden in the past 2 years?	Yes No	
10	Did you grow GROUNDNUT on this farm/garden in the past 2 years?	Yes No	
11	Did you grow MAIZE on this farm/garden in the past 2 years?	Yes No	
12	Did you grow COFFEE on this farm/garden in the past 2 years?	Yes No	

13	Did you grow COCOA on this farm/garden in the past 2 years?	Yes No	
14	Did you grow any CASHEW on this farm/garden in the past 2 years?	Yes No	
15	Did you grow GARDEN EGGS on this plot in the past 2 years?	Yes No	
16	Did you grow PEPPERS on this plot in the past 2 years?	Yes No	
17	Did you grow ONIONS on this plot in the past 2 years?	Yes No	
18	Did you grow OKRA on this plot in the past 2 years?	Yes No	
19	Did you grow POTATOES on this plot in the past 2 years?	Yes No	
	Upland rice		<i>Will show up if selected 'Yes' in #7</i>
20	You told me that you farmed UPLAND RICE on this plot in the past 2 years. Can you tell me what month in 2019 you planted rice in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
21	How many <i>bushels</i> of UPLAND RICE did you plant this past season (2019)?	decimal	
22	Thank you for telling me about the UPLAND RICE that was planted in the 2019 season. Now let's talk about the season before this. Can you tell me what month in 2018 you planted rice in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
23	How many <i>bushels</i> of UPLAND RICE did you sow in 2018?	decimal	
24	What month in 2018 did you harvest the UPLAND RICE?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
25	How many <i>bushels</i> of UPLAND RICE did you harvested in 2018?	decimal	
26	How many <i>bushels</i> of harvested UPLAND RICE did you sell in 2018?	decimal	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>

27	How many Leones did you sell {g1_c} bushels of harvested UPLAND RICE for?	integer	<i>Enumerator Note: Write the response in '000. If the respondent says 40.000Le, write 40.</i>
35	Enter the exact amount	integer	
		end_group	
	Lowland Rice		<i>Will show up if Lowland Rice is grown on this plot</i>
41	You told me that you farmed LOWLAND RICE on this plot in the past 2 years. Can you tell me what month in 2019 you planted rice in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
42	How many <i>bushels</i> of LOWLAND RICE did you sow this past season (2019)?	decimal	
43	Thank you for telling me about the LOWLAND RICE that was planted in the 2019 season. Now let's talk about the season before this. Can you tell me what month in 2018 you planted rice in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
44	How many <i>bushels</i> of LOWLAND RICE did you sow in 2018?	decimal	
45	What month in 2018 did you harvest the LOWLAND RICE?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
46	How many <i>bushels</i> of LOWLAND RICE did you harvested in 2018?	decimal	
47	How many <i>bushels</i> of harvested LOWLAND RICE did you sell in 2018?	decimal	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
48	How many Leones did you sell {g1_c} bushels of harvested LOWLAND RICE for?	integer	<i>Enumerator Note: Write the response in '000. If the respondent says 40.000Le, write 40.</i>
56	Enter the exact amount	integer	
	Maize	begin_group	<i>Will show up if maize is grown on this plot.</i>
62	You told me that you farmed MAIZE on this plot in the past 2 years. Can you tell me what month in 2019 you planted maize in this field?	1 January 2 February 3 March 4 April 5 May	

		6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
63	How many <i>cups</i> of MAIZE seeds did you sow in 2019?	decimal	
64	Thank you for telling me about the MAIZE that was planted in the 2019 season. Now let's talk about the season before this. Can you tell me what month in 2018 you planted maize in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
65	How many <i>cups</i> of MAIZE seeds did you sow in 2018?	decimal	
66	What month in 2018 did you harvest the MAIZE?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
67	How many <i>cobs</i> of MAIZE did you harvest in 2018?	decimal	
68	How many <i>cobs</i> of harvested MAIZE did you sell last season (2018)?	decimal	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
69	How many Leones did you sell {g5_c} cobs of harvested MAIZE for?	integer	
77	Enter the exact amount	integer	
83	Do you keep any of the harvested MAIZE for personal consumption?	Yes No Refuse to answer Don't know	<i>By personal consumption, we mean for use by the household members to prepare food. NOT FOR ANIMALS</i>
84	How many <i>cobs</i> of MAIZE did you keep for personal consumption in the past 12 months?	decimal	
85	Did you keep any of the harvested MAIZE to feed your livestock?	Yes No Refuse to answer Don't know	
86	How many <i>cobs</i> of MAIZE did you keep for your livestock in 2018?	decimal	
87	Which animals do you feed your harvested MAIZE to?	Goats Sheep Chicken Duck Pig Cow Other Refused to answer Don't know	

		end_group	
	Groundnuts		<i>Will show up if Groundnuts are grown on this plot</i>
88	You told me that you farmed GROUNDNUTS on this plot in the past 2 years. Can you tell me what month in 2019 you planted groundnuts in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
89	How many <i>bushels</i> of GROUNDNUTS did you sow in 2019?	decimal	
90	Thank you for telling me about the GROUNDNUTS that was planted in the 2019 season. Now let's talk about the season before this. Can you tell me what month in 2018 you planted groundnuts in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
91	How many <i>bags (50kg rice bags)</i> of GROUNDNUT seeds did you sow in 2018?	decimal	
92	What month in 2018 did you harvest the GROUNDNUTS?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
93	How many <i>bags (50kg rice bags)</i> of unshelled GROUNDNUTS did you harvested last season (2018)?	decimal	<i>Unshelled = shell still intact</i>
94	How many <i>bags (50kg rice bags)</i> of harvested unshelled GROUNDNUTS did you sell last season (2018)?	decimal	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
95	How many Leones did you sell {g6_c} bags of harvested unshelled GROUNDNUTS for?	integer	
103	Enter the exact amount	integer	
		end_group	
	Cassava	begin_group	<i>Will show up if Cassava is grown on this plot.</i>
109	You told me that you farmed CASSAVA on this plot in the past 2 years. Can you tell me what month in 2019 you planted cassava in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August	

		9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
110	How many <i>sticks</i> of CASSAVA did you sow in 2019?	decimal	
111	Have you harvested any CASSAVA leaves in the past month?	Yes No Don't Know Refuse to Answer	
112	How many <i>ties</i> of CASSAVA leaves have you harvested in the past month?	integer	
113	Thank you for telling me about the CASSAVA that was planted in the 2019 season. Now let's talk about the season before this. Can you tell me what month in 2018 you planted CASSAVA in this field?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
114	How many <i>sticks</i> of CASSAVA did you sow last season (2018)?	decimal	
115	Did you harvest the CASSAVA yourself or sell the farm?	1 Harvest myself 2 Sell the land	
116	How many Leones did you sell the farm for?	integer	
124	Enter the exact amount	integer	
130	What month in 2018 did you harvest the cassava?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
131	How many <i>bags (50kg rice bags)</i> of CASSAVA did you harvested in 2018?	decimal	
132	How many <i>bags (50kg rice bags)</i> of harvested CASSAVA did you sell in 2018?	decimal	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
133	How many Leones did you sell {g2_c} bags of harvested CASSAVA for?	note	
141	Enter the exact amount	integer	
		end_group	
	Garden eggs	note	
147	Can you tell me what month in 2019 you planted GARDEN EGGS in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer	

		99 Don't know	
148	How many <i>cups</i> of GARDEN EGGS seeds did you sow in 2019?	integer	
149	Can you tell me what month in 2018 you planted GARDEN EGGS in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
150	How many <i>cups</i> of GARDEN EGGS seeds did you sow in 2018?	integer	
151	What month in 2018 did you harvest the GARDEN EGGS?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
152	How many <i>bags (50kg rice bags)</i> of GARDEN EGGS did you harvest in 2018?	integer	
153	How many <i>bags (50kg rice bags)</i> of harvested GARDEN EGGS did you sell last season (2018)?	integer	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
154	How many Leones did you sell {g2_c} bags of harvested GARDEN EGGS for?	integer	
162	Enter the exact amount	integer	
	Peppers	note	
168	Can you tell me what month in 2019 you planted PEPPER in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
169	How many <i>cups</i> of PEPPER seeds did you sow in 2019?	integer	
170	Can you tell me what month in 2018 you planted PEPPERS in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	

171	How many <i>cups</i> of PEPPER seeds did you sow last season (2018)?	integer	
172	What month in 2018 did you harvest PEPPER?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
173	How many <i>bags (50kg rice bags)</i> of PEPPER did you harvested last season (2018)?	integer	
174	How many <i>bags (50kg rice bags)</i> of harvested PEPPER did you sell last season (2018)?	integer	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
175	How many Leones did you sell {g2_c} bags of harvested PEPPER for?	integer	
183	Enter the exact amount	integer	
	Onions	note	
189	Can you tell me what month in 2019 you planted ONIONS in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
190	How many <i>cups</i> of ONION seeds did you sow in 2019?	integer	
191	Can you tell me what month in 2018 you planted ONIONS in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
192	How many <i>bags cups</i> of ONION seeds did you sow last season (2018)?	integer	
193	What month in 2018 did you harvest ONIONS?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
194	How many <i>bags (50kg rice bags)</i> of ONIONS did you harvested last season (2018)?	integer	

195	How many <i>bags (50kg rice bags)</i> of harvested ONIONS did you sell last season (2018)?	integer	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
196	How many Leones did you sell {g2_c} bags of harvested ONIONS for?	integer	
204	Enter the exact amount	integer	
	Okra	note	
210	Can you tell me what month in 2019 you planted OKRA in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
211	How many <i>cups</i> of OKRA seeds did you sow in 2019?	integer	
212	Can you tell me what month in 2018 you planted OKRA in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
213	How many <i>cups</i> of OKRA did you sow in 2018?	integer	
214	What month in 2018 did you harvest OKRA?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
215	How many <i>bags (50kg rice bags)</i> of OKRA did you harvested last season (2018)?	integer	
216	How many <i>bags (50kg rice bags)</i> of harvested OKRA did you sell last season (2018)?	integer	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
217	How many Leones did you sell {g2_c} bags of harvested OKRA for?	integer	
225	Enter the exact amount	integer	
	Potatoes	note	<i>Will show up if Potatoes are grown on this plot</i>
231	Can you tell me what month in 2019 you planted POTATOES in this farm/garden?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October	

		11 12 98 99	November December Refuse to answer Don't know	
232	How many <i>cups</i> of POTATOES seeds did you sow in 2019?	integer		
233	What month in 2019 did you harvest POTATOES?	1 2 3 4 5 6 7 8 9 10 11 12 98 99	January February March April May June July August September October November December Refuse to answer Don't know	
234	Have you harvested any POTATO LEAVES in the past month?	Yes No Don't Know Refuse to Answer		
235	How many <i>ties</i> of POTATO LEAVES have you harvested in the past month?	integer		
236	Can you tell me what month in 2018 you planted POTATOES in this farm/garden?	1 2 3 4 5 6 7 8 9 10 11 12 98 99	January February March April May June July August September October November December Refuse to answer Don't know	
237	How many <i>cups</i> of POTATOES seeds did you sow last season (2018)?	integer		
238	What month in 2018 did you harvest POTATOES?	1 2 3 4 5 6 7 8 9 10 11 12 98 99	January February March April May June July August September October November December Refuse to answer Don't know	
239	How many <i>bags (50kg rice bags)</i> of POTATOES did you harvested last season (2018)?	integer		
240	How many <i>bags (50kg rice bags)</i> of harvested POTATOES did you sell last season (2018)?	integer		<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption DOES NOT COUNT.</i>
241	How many Leones did you sell {g2_c} bags of harvested POTATOES for?	integer		
249	Enter the exact amount	integer		
		end_group		
	Cocoa	begin_group		<i>Will show up if Cocoa is grown on this plot</i>
255	How many <i>trees</i> of COCOA do you currently have?	integer		
256	How many <i>trees</i> of COCOA did you sow in 2018?	integer		
257	How many <i>kgs</i> of COCOA did you harvest in 2018?	integer		

258	How many Leones did you sell the harvested COCOA for?	integer	
266	Enter the exact amount	integer	
		end_group	
	Coffee	begin_group	<i>Will show up if Coffee is grown on this plot</i>
272	How many <i>trees</i> of COFFEE do you currently have?	integer	
273	How many <i>trees</i> of COFFEE did you sow in 2018?	integer	
274	How many <i>kgs</i> of COFFEE did you harvest in 2018?	integer	
275	How many leones did you sell the harvested COFFEE for?	integer	
283	Enter the exact amount	integer	
		end_group	
	Cashew	begin_group	<i>Will show up if Cashew is grown on this plot</i>
289	How many <i>trees</i> of CASHEW do you currently have?	integer	
290	How many <i>trees</i> of CASHEW did you sow in 2018?	integer	
291	How many <i>kgs</i> of CASHEW did you harvest in 2018?	integer	
292	How many leones did you sell the harvested CASHEW for?	integer	
300	Enter the exact amount	integer	
		Repeat Group Ends	
	Oil Palm	begin_group	
306	Did you harvest any Oil Palm fruit in the past 2 years?	Yes No	
307	How many <i>drums</i> of Oil Palm did you harvest in 2019?	integer	
308	How many <i>drums</i> of Oil Palm did you harvest in 2018?	integer	
309	How many leones did you sell the harvested Oil Palm for?	integer	
317	Enter the exact amount	integer	
		end_group	
	Citrus (Oranges)	begin_group	
323	Did you harvest any Citrus in the past 2 years?	Yes No	
324	How many <i>bags (50kg rice bags)</i> of citrus did you harvest in 2019?	integer	
325	How many <i>bags (50kg rice bags)</i> of citrus did you harvest in 2018?	integer	
326	How many leones did you sell the harvested Citrus for?	integer	
334	Enter the exact amount	integer	
	Plantains		
335	Did you harvest any Plantains in the past 2 years?	Yes No	
336	How many <i>bags (50kg rice bags)</i> of Plantains did you harvest in 2019?	integer	
337	How many <i>bags (50kg rice bags)</i> of Plantains did you harvest in 2018?	integer	
338	How many leones did you sell the harvested Plantains for?	integer	
346	Enter the exact amount	integer	

	Non-Agricultural Employment		
	Thanks for telling me about your farming practices. Now I want to ask you some questions about other ways you make money. I am now interested on non-farming activities. By these activities, I mean other activities like self-employed, businesses or wage-employment.	note	
	Non-Ag Income - Head of Household	begin_group	
1	Does (head of household name) have a self-owned business (self-employed)?	Yes No	

		Refuse to answer Don't know	
2	What type of self-employed/business is this person running?	1 Tea shop 2 Kiosk 3 Catering/Restaurant 4 Bike rider (Okada) 5 Taxi driver 6 Leisure center/charging center 7 Street vendor (petty trading) 8 Barber shop / Hair Salon 9 Welding shop 10 Telecentre 11 Farm Trader (crops, meat, staples, etc) 12 Fishing 13 Carpenter / Blacksmith / Construction 14 Tailoring 95 Other business/employment	<i>The following questions will appear if the head of the household selects 'Yes' in #1.</i> <i>If run more than one business, please select the one that gives them more benefits</i>
3	Specify other	text	
4	When did this person open/start operating that business?	date	<i>Enumerator Note: If don't know, write January 2020</i>
5	Does the business require electricity to operate?	Yes No Refuse to answer Don't know	
6	What does this person use electricity for in their business?	1 Freezer 2 Refrigerator 3 Fan 4 TV/DVD player 5 Charging station 6 Welding 7 Electric razor 8 Radio/Music System 9 Lighting 10 Computer/Laptop 95 Other	
7	Specify other	text	
8	Over the past 7 days, how many hours in total did this person work in this business?	integer	
9	Over the past year, in which months did this person work in this business?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
11	We want to know how much this person made in their business over the past month.	note	
12	SELECT THE RANGES (Refer to the document with the Agricultural section)		
25	We want to know how much this person's running costs were over the past month.	note	<i>Running costs are raw materials, labor and salaries, rent and whatever other expenditures you incur while running your business.</i>
33	Enter the exact amount	integer	
39	Benefit	calculate	<i>This will be done automatically by the tablet</i>
	Running costs over the year.	begin_group	<i>If the Benefit calculated is <0</i>
40	Now I want to talk about this person's running costs over the past year.	note	
41	How much did they spend in running costs in the month of September?	note	

42	SELECT THE RANGES		
43	How much did they spend in running costs in the month of August?	note	
44	SELECT THE RANGES		
45	How much did they spend in running costs in the month of July?	note	
46	SELECT THE RANGES		
47	How much did they spend in running costs in the month of June?	note	
48	SELECT THE RANGES		
49	Enter the exact amount	integer	
196	Is {Head of Household} currently employed with a business or an organization?	Yes No Refuse to answer Don't know	<i>Enumerator Note: NOT self owned business</i>
197	What type of position is this?	1 Government job 2 NGO 3 Local business in the community 4 Business out of my community 5 Church Organization 95 Other business 98 Refuse to answer	
198	Specify other	text	
199	Think of the place where this person works. Does that place have access to electricity?	Yes No Refuse to answer Don't know	
200	When did this person start this position?	date	<i>Enumerator Note: If don't know, write January 2020</i>
201	Over the past 12 months, in which months did this person work in this position?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
202	Months worked	calculate	
203	Over the past 7 days, how many hours did this person work in this position?	integer	
204	In the past month working in this position, how was this person compensated for their work?	1 Cash 2 In-kind (food, lodging, gifts, etc) 3 A combination of both	
205	In the past month working in this position, what was the total value of their gross cash salary?	note	<i>If respondent says that they were paid in cash or a combination of both in Q#204.</i>
206	SELECT THE RANGES		
219	You mentioned that this person received some In-Kind compensation for the work they did in this position over the past month. Can you tell me what In-Kind compensation did they receive?	text	<i>If respondent says that they were paid in-kind or a combination of both in Q#204.</i>
220	If they had to buy these items at the market, how much would they have to pay for them?	note	<i>If respondent says that they were paid in-kind or a combination of both in Q#204.</i>
221	SELECT THE RANGES		
222	Working in this position in September , how was this person compensated for their work?	1 Cash 2 In-kind (food, lodging, gifts, etc) 3 A combination of both	

234	What was the value of their gross cash salary in the month of SEPTEMBER ?	note	<i>If respondent says that they were paid in cash or a combination of both in Q#222</i>
248	You mentioned that this person received some In-Kind compensation for the work they did in this position for September. Can you tell me what In-Kind compensation did they receive?	text	<i>If respondent says that they were paid in-kind or a combination of both in Q#222.</i>
249	If they had to buy these items themselves at the market, how much would they have to pay for them?	note	<i>If respondent says that they were paid in-kind or a combination of both in Q#222.</i>
250	REPEAT QUESTIONS 222 – 249 FOR AUGUST, JULY, JUNE, MAY, APRIL		
	<i>Non-Ag Income 1</i>	begin_group	
1	Does {name_01} have a self-owned business (self-employed)?	Yes No Refuse to answer Don't know	
2	What type of self-employed/business is this person running?	1 Tea shop 2 Kiosk 3 Catering/Restaurant 4 Bike rider (Okada) 5 Taxi driver 6 Leisure center/charging center 7 Street vendor (petty trading) 8 Barber shop / Hair Salon 9 Welding shop 10 Telecentre 11 Farm Trader (crops, meat, staples, etc) 12 Fishing 13 Carpenter / Blacksmith / Construction 14 Tailoring 95 Other business/employment	<i>If run more than one business, please select the one that gives them more benefits</i>
3	Specify other	text	
4	When did this person open/start operating that business?	date	<i>Enumerator Note: If don't know, write January 2020</i>
5	Does the business require electricity to operate?	Yes No Refuse to answer Don't know	
6	What does this person use electricity for in their business?	1 Freezer 2 Refrigerator 3 Fan 4 TV/DVD player 5 Charging station 6 Welding 7 Electric razor 8 Radio/Music System 9 Lighting 10 Computer/Laptop 95 Other	
7	Specify other	text	
8	Over the past 7 days, how many hours in total did this person work in this business?	integer	
9	Over the past year, in which months did this person work in this business?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
10	Months worked	calculate	

11	We want to know how much this person made in their business over the past month.	note	
25	We want to know how much this person's running costs were over the past month.	note	<i>Running costs are raw materials, labor and salaries, rent and whatever other expenditures you incur while running your business.</i>
39	Benefit	calculate	<i>This will be done automatically by the tablet</i>
	Running costs over the year.	begin_group	<i>If the Benefit calculated is <0</i>
40	Now I want to talk about this person's running costs in the past.	note	<i>SELECT RANGES</i>
42	How much did they spend in running costs in the month of September?	note	<i>SELECT RANGES</i>
56	How much did they spend in running costs in the month of August?	note	<i>SELECT RANGES</i>
70	How much did they spend in running costs in the month of July?	note	<i>SELECT RANGES</i>
84	How much did they spend in running costs in the month of June?	note	<i>SELECT RANGES</i>
		end_group	
210	Is {name_01} currently employed with a business or an organization?	Yes No Refuse to answer Don't know	<i>Enumerator Note: NOT self owned business</i>
211	What type of position is this?	1 Government job 2 NGO 3 Local business in the community 4 Business out of my community 5 Church Organization 95 Other business 98 Refuse to answer	
212	Specify other	text	
213	Think of the place where this person works. Does that place have access to electricity?	Yes No Refuse to answer Don't know	
214	When did this person start this position?	date	<i>Enumerator Note: If don't know, write January 2020</i>
215	Over the past 12 months, in which months did this person work in this position?	1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Refuse to answer 99 Don't know	
216	Months worked	calculate	
217	Over the past 7 days, how many hours did this person work in this position?	integer	
218	In the past month working in this position, how was this person compensated for their work?	1 Cash 2 In-kind (food, lodging, gifts, etc) 3 A combination of both	
219	In the past month working in this position, what was the total value of their gross cash salary?	note	<i>If respondent says that they were paid in cash or a combination of both in Q#218.</i>
233	You mentioned that this person received some In-Kind compensation for the work they did in this position over the past month. Can you tell me what In-Kind compensation did they receive?	text	<i>If respondent says that they were paid in-kind or a combination of both in Q#218.</i>

234	If they had to buy these items themselves at the market, how much would they have to pay for them?	note	<i>If respondent says that they were paid in-kind or a combination of both in Q#218.</i>
248	REPEAT Questions 218- 234 for SEPTEMBER, AUGUST, JULY, JUNE, MAY, APRIL	note	
	Livestock		
	Ownership	begin_group	
1	Now I will ask you about the livestock that your household owns	note	
2	Do you or any of your household members own any livestock?	Yes No Refuse to answer Don't know	<i>Ownership is defined as the right to sell or kill an animal.</i>
3	Do you own any goats?	Yes No Refuse to answer Don't know	
4	How many goats do you own?	integer	
5	Do you own any sheep?	Yes No Refuse to answer Don't know	
6	How many sheep do you own?	integer	
7	Do you own any chickens?	Yes No Refuse to answer Don't know	
8	How many chickens do you own?	integer	
9	Do you own any ducks?	Yes No Refuse to answer Don't know	
10	How many ducks do you own?	integer	
11	Do you own any pigs?	Yes No Refuse to answer Don't know	
12	How many pigs do you own?	integer	
13	Do you own any cows?	Yes No Refuse to answer Don't know	
14	How many cows do you own?	integer	
	Total number of animals owned	calculate	<i>Will be calculated by the tablet.</i>
15	You said your household owns \${animals_own} in total. Is this correct?	Yes No Refuse to answer Don't know	<i>Enumerator Note: If it is not correct, go back and correct the responses from previous questions</i>
16	Of this quantity (\${animals_own} animals), how many are shared or owned by women?	integer	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
	Sell		
17	Did you sell any animals that you owned this past year (in 2018)?	Yes No Refuse to answer Don't know	<i>We want to know about animals in the household. If the spouse sold animals, these should also be included here</i>
18	How many animals did you sell this past year (2018)?	integer	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
	Land Ownership		
19	I will now ask you questions about your land ownership	note	<i>Enumerator Note: please, remember that for numeric questions:</i>

			-99 = Don't know -98 = Refuse to answer
20	Do you or your household members own any land?	Yes No Refuse to answer Don't know	Any type of land. It can be residential, for agriculture, etc.
21	Think about all the land owned by you or members of your household. How many acres of land does your household have in total?	decimal	<i>Enumerator Note: if respondent struggles to respond in acres, ask how many bushels of rice could be planted out on all the land they own. Bushels of upland rice ~1 acre.</i> <i>If respondent still does not know, write -99.</i> <i>Remember you can write decimals. If the respondent owns less than one acre, for example, 2 town lots, you can write 0.2</i>
22	You told me that you and your household members own {o2} acres of land. If you wanted to sell all of that land, what is the fair price? (In Leones)?	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200.</i> <i>If respondent does not know, write -99.</i>
	Home Characteristics		
23	I will now ask you questions about the house/structure you and your household live in.	note	
24	How many bedrooms are there?	integer	<i>Enumerator Note: we want to know how many habitable rooms. Room dedicated ONLY for storage or kitchen should not be counter here</i>
25	How many non-habitable rooms are there?	integer	<i>Enumerator Note: we want to know other rooms where household members don't spend time like storage rooms, garages, etc</i>
26	DO NOT READ: What materials are the floors made of?	1 Earth/mud 2 Tile 3 Wood 4 Concrete/Cement 5 Stone 6 Plastic tile/carpet 95 Other	<i>Enumerator: see and answer this question based on your observation. If flooring is different in different areas of the house, focus on the head of the household main bedroom.</i> <i>If you are not in the respondent's house, ask this question to him/her</i>
27	Specify other	text	
28	DO NOT READ: What materials is the roof made of?	1 Thatch (grass or straw) 2 Corrugated iron sheets 3 Concrete/Cement 4 Roofing tiles 5 Tarpaulin 95 Other	<i>Enumerator: see and answer this question based on your observation. If roof is different in different areas of the house, focus on the head of the household main bedroom</i> <i>If you are not in the respondent's house, ask this question to him/her</i>
29	Specify other	text	
30	DO NOT READ: What materials are the walls made of?	1 Mud bricks 2 Mud bricks with cement 3 Wooden boards 4 Corrugated iron/zinc sheets 5 Cement blocks 95 other	<i>Enumerator: see and answer this question based on your observation. If walls are different in different areas of the house, focus on the head of the household main bedroom</i> <i>If you are not in the respondent's house, ask this question to him/her</i>
31	Specify other	text	
32	What kind of toilet facilities do you have in your current residence?	1 Private 2 Shared 97 Not applicable 98 Refuse to answer 99 Don't know	
33	Specify other	text	
34	Is this toilet private or shared with other households?	1 Latrine outside house 2 Toilet outside house 3 Latrine inside house 4 Toilet inside house 5 Portable toilet 6 Water side	<i>Enumerator: Mark as 'shared' if the toilet is being used by people from a DIFFERENT household</i>

		7 Bush 95 Other	
	Consumption	begin_group	
1	We will now talk about the consumption of general goods in your household.	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
2	What is the amount of these particular staples consumed in total by your household in the past 7 days? Amount in SLL	integer	<i>READ: Rice, plantains, cassava, potato. NOTE: these are amounts consumed, so regardless if bought, gifted, from stock, etc Please, write the amount in '000. If they say 200.000, write 200.</i>
3	How many <i>KGs</i> of RICE did your household consume in the past 7 days?	decimal	
4	How many <i>tubers</i> of CASSAVA did your household consume in the past 7 days?	decimal	
5	How many PLANTAINS did your household consume in the past 7 days?	decimal	
6	How many POTATOES did your household consume in the past 7 days?	decimal	
7	What is the total amount of vegetables consumed in total by your household in the past 7 days? Amount in SLL	integer	<i>READ: cassava leaf, potato leaf, okra, beans, tomatoes, gardeneggs, pepper, onions, carrots, cabbage Please, write the amount in '000. If they say 200.000, write 200.</i>
8	How many <i>ties</i> of CASSAVA LEAF did your household consume in the past 7 days?	integer	
9	How many <i>ties</i> of POTATO LEAF did your household consume in the past 7 days?	integer	
10	How many <i>KGs</i> of OKRA did your household consume in the past 7 days?	decimal	
11	How many GARDEN EGGS did your household consume in the past 7 days?	integer	
12	How many <i>KGs</i> of PEPPER did your household consume in the past 7 days?	decimal	
13	How many <i>KGs</i> of ONIONS did your household consume in the past 7 days?	decimal	
14	What was the total amount of meat consumed in total by your household in the past 7 days? Amount in SLL	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200.</i>
15	How many <i>KGs</i> of MEAT did your household consume in the past 7 days?	decimal	
16	What was the total amount of fish consumed in total by your household in the past 7 days? Amount in SLL	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200.</i>
17	How many <i>KGs</i> of FISH did your household consume in the past 7 days?	decimal	
18	What was the total amount of fruit consumed in total by your household in the past 7 days? Amount in SLL	integer	<i>READ: Bananas, pineapples, oranges, apples, mango, avocado. Please, write the amount in '000. If they say 200.000, write 200.</i>
19	How many <i>KGs</i> of FRUIT did your household consume in the past 7 days?	decimal	
20	What was the total amount of other goods consumed in total by your household in the past 7 days? Amount in SLL	integer	<i>READ: cooking fat, oil, sugar, tea, coffee, bread, biscuits, tomato paste, maggi, salt, mayonaise Please, write the amount in '000. If they say 200.000, write 200.</i>
21	How many <i>Litres</i> of Oil did your household consume in the past 7 days?	decimal	
22	How many <i>KGs</i> of Sugar did your household consume in the past 7 days?	decimal	
23	How many <i>Loaves</i> of BREAD did your household consume in the past 7 days?	decimal	
24	How many <i>cubes</i> of MAGGI did your household consume in the past 7 days?	integer	
	Food Security		

25	I will now ask you some questions about the food that is available for your households and the meals you are used to eat	note		
26	Over the last 7 days (week), how often has your household...	note		
27	Eaten foods that you ordinarily would not eat i.e. "less preferred foods"?	1 None of the times	<p><i>Note: Less preferred include food consumed because the household does not have the means to buy their preferred food item or because it is unavailable in the market</i> <i>Enumerator Note: Financially or provision of food items. If respondent asked for help BUT did not received help, don't count it</i></p>	
28	Asked for help from relatives or friends?	2 One day		
29	Reduced portions/quantities served per meal for adult males?	3 Two or three days		
30	Reduced portions/quantities served per meal for adult females?	4 Four or five days		
31	Reduced portions/quantities served per meal for boys under age 10?	5 Everyday		
32	Reduced portions/quantities served per meal for girls under age 10?	98 Refuse to answer		
33	Eaten fewer times per day than normal for this time of year?	99 Don't know		
34	Spent whole day without eating?			
	I will now ask you some questions about the assets you own.	note		
	Assets	begin_group		
1	Do you own a...	note	<i>Enumerator Note: By own we mean the right to sell the item</i>	
2	Sofa set?	1 Yes		
3	Dining table and chairs?	2 No		
4	Bed frame?			
5	Mattress?			
6	Sewing machine?			
7	Charcoal cooking pot			
8	Stove (electric)			
9	Stove (gas)			
10	Stove (kerosene)			
11	Refrigerator			
12	Freezer			
13	Air conditioner			
14	Washing machine			
15	Iron (electric)			
16	Electric fan			
17	Iron (charcoal)			
18	Car			
19	Motorcycle			
20	Bicycle			
21	Mobile phone			
22	Radio			
23	Television			
24	Stereo system			
25	Video/DVD equipment			
26	Camera			
27	Computer			
28	Microwave			
		end_group		
	Quantity	begin_group		
29	From the items that you own above, how many of the following do you own?	note		
30	Sofa set?	integer		
31	Dining table and chairs?	integer	<i>Enumerator Note: Write 1 if they own one dining table, 2 if two dining tables, etc</i>	

32	Bed?	integer	
33	Mattress?	integer	
34	Sewing machine?	integer	
35	Charcoal cooking pot	integer	
36	Stove (electric)	integer	
37	Stove (gas)	integer	
38	Stove (kerosene)	integer	
39	Refrigerator	integer	
40	Freezer	integer	
41	Air conditioner	integer	
42	Washing machine	integer	
43	Iron (electric)	integer	
44	Electric fan	integer	
45	Iron (charcoal)	integer	
46	Car	integer	
47	Motorcycle	integer	
48	Bicycle	integer	
49	Mobile phone	integer	
50	Radio	integer	
51	Television	integer	
52	Stereo system	integer	
53	Video/DVD equipment	integer	
54	Camera	integer	
55	Computer	integer	
56	Microwave	integer	
		end_group	
	Plans	begin_group	
57	Is there any item that you are planning to buy in the next 3 months?	select_one yes_no2	
58	Which asset(s) are you planning to buy?	1 Sofa set 2 Dining table and chairs 3 Sideboard/ dresser table 4 Bed frame 5 Mattress 6 Sewing machine 7 Charcoal cooking pot 9 Stove (electric) 10 Stove (gas) 11 Stove (kerosene) 12 Refrigerator 13 Freezer 14 Air conditioner 15 Washing machine 16 Iron (electric) 17 Electric fan 18 Iron (charcoal) 19 Car 20 Motorcycle 21 Bicycle 22 Mobile phone 23 Radio 24 Television 25 Stereo system 26 Video/DVD equipment 27 Camera 28 Computer 29 Microwave 95 Other	<i>DO NOT READ THE OPTIONS</i> <i>Select ALL that apply, but remind the respondent we mean PLANNING to buy, not WANTED to buy</i>
59	Specify other	text	
	Now, I am going to ask you about you AND your spouse activities during the day. I will divide the	note	

	day in different periods of two hours and will ask you what activities did you or your household members perform on that particular day at that time. We know you are likely doing multiple activities, please report on the main activity:		
	Time Use 1	begin_repeat	
	Current day	calculate	
1	Think about $\{c_day\}$ day(s) ago, what activities did you do during the following period of times?	note	<i>Enumerator Note: If $\{c_day\}$ day(s) ago was Weekend or Holiday, ask about the previous day. We only want to ask this question for WEEKDAYS</i>
2	6AM - 8AM	1	Leisure (talking, socializing, religious activities)
3	8AM - 10AM	2	HH Chores (fetching water/firewood, cooking, cleaning)
4	10AM - 12PM	3	Farm activities
5	12PM - 2PM	4	Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc)
6	2PM - 4PM	5	Wage labor, non-farm (timber, mining)
7	4PM - 6PM	6	Traveling
		95	Other
		98	Refuse to answer
		99	Don't know
		end_repeat	
8	Is your spouse around to answer the questions about Time-Use?	select_one yes_no	
9	In that case, can you provide us with that information?	select_one yes_no	<i>If spouse is not around to answer questions.</i>
	Time Use 2	begin_repeat	
	Current day	calculate	
10	Think about $\{c_day_s\}$ day(s) ago, what activities did your spouse do during the following period of times?	note	<i>Enumerator Note: If $\{c_day_s\}$ day(s) ago was Weekend or Holiday, ask about the previous day. We only want to ask this question for WEEKDAYS</i>
11	6AM - 8AM	1	Leisure (talking, socializing, religious activities)
12	8AM - 10AM	2	HH Chores (fetching water/firewood, cooking, cleaning)
13	10AM - 12PM	3	Farm activities
14	12PM - 2PM	4	Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc)
15	2PM - 4PM	5	Wage labor, non-farm (timber, mining)
16	4PM - 6PM	6	Traveling
		95	Other
		98	Refuse to answer
		99	Don't know
	Life Satisfaction	begin_group	
17	Let's now talk about your personal feelings and satisfaction	note	
18	Taking all things together, Would you say you are "very happy", "quite happy", "not very happy" or "not at all happy"?	1	Very happy
		2	Quite happy
		3	Not very happy
		4	Not happy at all
19	Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?	98	Refuse to answer
		99	Don't know
20	All things considered, how satisfied are you with your life as a whole these days on a scale of 1 to 10? (1= very dissatisfied...10= very satisfied)		
21	How often have you felt that you were unable to control the important things in your life?		
		end_group	

	Worries	begin_group	
22	How worried are you about the following areas of your life?	note	
23	Health problems, illness	1 Not at all worried	
24	Problems at home and with relatives	2 Not very worried	
25	Accidents and disasters	3 Somewhat worried	
26	Not enough money for basic needs (such as food and clothing)	4 Very worried	
27	Not being able to educate all children	98 Refuse to answer	
28	Not enough money for other living expense	99 Don't know	
29	Not enough money for medicine and medical treatments		
30	Difficulty finding work		
31	Death of a family member		
32	Debts owed to other		
	Decision HH A	begin_group	
33	Please, indicate how much influence you, as the head of the household, have on the following decisions within your household:	note	<i>Enumerator Note: Select "Not Applicable" if this person is not the head of the household</i>
34	Food expenses within the household	0 No influence	
35	Education expenses within the household	1 Minor influence	
36	Health expenses within the household	2 Major influence	
37	Household finances and business decision-making	97 Not applicable	
		98 Refuse to answer	
		99 Don't know	
38	How to use your household's land and property		
	Decision HH B	begin_group	
39	Please, indicate how much influence your spouse has on the following decisions within your household:	note	<i>Select "Not applicable" if he/she has no spouse</i>
40	Food expenses within the household	0 No influence	
41	Education expenses within the household	1 Minor influence	
42	Health expenses within the household	2 Major influence	
43	Household finances and business decision-making	97 Not applicable	
44	How to use your household's land and property	98 Refuse to answer	
		99 Don't know	
		end_group	
45	To what extent do you agree or disagree with the following statement: <i>"A man should have the final word about decisions in the home"</i>	1 Completely agree 2 Mostly agree 3 Neither agree or disagree 4 Mostly disagree 5 Completely disagree 97 Not applicable 98 Refuse to answer 99 Don't know	
	Energy Use		
	Thank you for telling me about your activities, feelings and characteristics of your household. Now I would like to talk a bit more about the electricity and energy sources in your house	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
	Electricity	begin_group	
1	Do you have access to electricity of any source?	select_one yes_no2	
2	What is the main source of electricity in your house/household?	1 National grid 2 Solar Mini-grid 3 Generator 4 Stand-alone solar panel 95 Other	<i>Enumerator Note: Maximum of two sources of energy. Choose the most important ones</i>

3	Specify other	text	
	Generator	begin_group	
4	Does your household own a generator?	select_one yes_no2	
	Own Generator	begin_group	
5	Okay so you own a generator. Think about how often you turn it on. In a typical week, how many hours do you run the generator?	integer	<i>This next section will come up if the household owns a generator.</i>
6	You said you run the generator \${y3} hours a week. In a typical week, how much do you spend on fuel to run the generator.	integer	<i>Enumerator Note: I'm talking about the value of fuel that goes into the gen, not that is purchased.</i> <i>Please, write the response in '000. If the respondent says 200.000Le, please write 200</i>
	Shared Generator	begin_group	
7	You told me that a generator is your main source of power, but you don't own a generator.	note	
8	Do you have to pay anything to use this generator?	select_one yes_no2	
9	How much do you have to pay per week?	integer	<i>Enumerator Note: If they pay daily or per month, approximate to the cost per week.</i> <i>Please, write the response in '000. If the respondent says 200.000Le, please write 200</i>
10	What appliances do you power with the generator?	0 None 1 Mobile phones 2 Radio 3 Television 4 DVD player 5 Iron 6 Refrigerator/Freezer 7 Rechargeable torch 8 Music system 9 Tablet 10 Computer/laptop 11 Heater 12 Electric fan 13 Cooking stove 14 Sewing machine 15 Water pump 16 Welding machine 17 Blow dryer 18 Blender 19 Electric kettle 20 Microwave 21 Toaster 22 Shaving machine 23 Other large appliances for income purposes 24 Decoder/TV receiver 25 Lightning 95 Other 98 Refuse to answer 99 Don't know	<i>DO NOT READ OUT the options</i>

11	Specify other	text	
	Time Use of Appliances for Generator	begin_group	
12	I will ask you questions about the your usage of the appliances, both owned and shared, powered by the generator	note	
13	How many hours a week do you use the Mobile phone	integer	<i>Owned or shared</i>
14	How many hours a week do you use the Radio	integer	<i>Owned or shared</i>
15	How many hours a week do you use the Television	integer	<i>Owned or shared</i>
16	How many hours a week do you use the DVD player	integer	<i>Owned or shared</i>
17	How many hours a week do you use the Iron	integer	<i>Owned or shared</i>
18	How many hours a week do you use the Refrigerator/Freezer	integer	<i>Owned or shared</i>
19	How many hours a week do you use the Rechargeable torch	integer	<i>Owned or shared</i>
20	How many hours a week do you use the Music system	integer	<i>Owned or shared</i>
21	How many hours a week do you use the Tablet	integer	<i>Owned or shared</i>
22	How many hours a week do you use the Computer/laptop	integer	<i>Owned or shared</i>
23	How many hours a week do you use the Heater	integer	<i>Owned or shared</i>
24	How many hours a week do you use the Electric fan	integer	<i>Owned or shared</i>

25	How many hours a week do you use the Cooking stove	integer	<i>Owned or shared</i>
26	How many hours a week do you use the Sewing machine	integer	<i>Owned or shared</i>
27	How many hours a week do you use the Water pump	integer	<i>Owned or shared</i>
28	How many hours a week do you use the Welding machine	integer	<i>Owned or shared</i>
29	How many hours a week do you use the Blow dryer	integer	<i>Owned or shared</i>
30	How many hours a week do you use the Blender	integer	<i>Owned or shared</i>
31	How many hours a week do you use the Electric kettle	integer	<i>Owned or shared</i>
32	How many hours a week do you use the Microwave	integer	<i>Owned or shared</i>
33	How many hours a week do you use the Toaster	integer	<i>Owned or shared</i>
34	How many hours a week do you use the Shaving machine	integer	<i>Owned or shared</i>
35	How many hours a week do you use the Other large appliances for income purposes	integer	<i>Owned or shared</i>
36	How many hours a week do you use the Decoder/TV receiver	integer	<i>Owned or shared</i>
37	How many hours a week do you use the Lightning	integer	<i>Owned or shared</i>
	Stand-alone solar panel	begin_group	
38	Does your household have a stand-alone home solar system?	select_one yes_no2	
	Own Solar	begin_group	
39	How much did it cost to set up the home solar system?	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200.</i>
40	How much have you spent on the home solar system in the past month?	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200.</i>
	Shared Solar	begin_group	
41	You told me that your primary access to electricity is a stand-alone system ("solar PV"). But your household does not have one.	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
42	Do you have to pay anything to use this stand-alone system?	select_one yes_no2	
43	How much do you have to pay weekly for the use of the solar panel?	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200.</i>
44	What kind of appliances do you use with this stand-alone system?	0 None 1 Mobile phones 2 Radio 3 Television 4 DVD player 5 Iron 6 Refrigerator/Freezer 7 Rechargeable torch	<i>DO NOT READ OUT the options</i>

		8 Music system 9 Tablet 10 Computer/laptop 11 Heater 12 Electric fan 13 Cooking stove 14 Sewing machine 15 Water pump 16 Welding machine 17 Blow dryer 18 Blender 19 Electric kettle 20 Microwave 21 Toaster 22 Shaving machine 23 Other large appliances for income purposes 24 Decoder/TV receiver 25 Lightning 95 Other 98 Refuse to answer 99 Don't know	
	Time use of Solar	begin_group	
45	I will ask you questions about the your usage of the appliances, both owned and shared, powered by the Solar Panel	note	
46	How many hours a week do you use the Mobile phone	integer	<i>Owned or shared</i>
47	How many hours a week do you use the Radio	integer	<i>Owned or shared</i>
48	How many hours a week do you use the Television	integer	<i>Owned or shared</i>
49	How many hours a week do you use the DVD player	integer	<i>Owned or shared</i>
50	How many hours a week do you use the Iron	integer	<i>Owned or shared</i>
51	How many hours a week do you use the Refrigerator/Freezer	integer	<i>Owned or shared</i>
52	How many hours a week do you use the Rechargeable torch	integer	<i>Owned or shared</i>
53	How many hours a week do you use the Music system	integer	<i>Owned or shared</i>
54	How many hours a week do you use the Tablet	integer	<i>Owned or shared</i>
55	How many hours a week do you use the Computer/laptop	integer	<i>Owned or shared</i>
56	How many hours a week do you use the Heater	integer	<i>Owned or shared</i>
57	How many hours a week do you use the Electric fan	integer	<i>Owned or shared</i>
58	How many hours a week do you use the Cooking stove	integer	<i>Owned or shared</i>
59	How many hours a week do you use the Sewing machine	integer	<i>Owned or shared</i>
60	How many hours a week do you use the Water pump	integer	<i>Owned or shared</i>
61	How many hours a week do you use the Welding machine	integer	<i>Owned or shared</i>
62	How many hours a week do you use the Blow dryer	integer	<i>Owned or shared</i>
63	How many hours a week do you use the Blender	integer	<i>Owned or shared</i>
64	How many hours a week do you use the Electric kettle	integer	<i>Owned or shared</i>
65	How many hours a week do you use the Microwave	integer	<i>Owned or shared</i>
66	How many hours a week do you use the Toaster	integer	<i>Owned or shared</i>
67	How many hours a week do you use the Shaving machine	integer	<i>Owned or shared</i>
68	How many hours a week do you use the Other large appliances for income purposes	integer	<i>Owned or shared</i>
69	How many hours a week do you use the Decoder/TV receiver	integer	<i>Owned or shared</i>
70	How many hours a week do you use the Lightning	integer	<i>Owned or shared</i>

	Mini-grid Electricity	begin_group	
71	<i>Earlier you said that you have access to electricity powered by the mini-grid. I want to ask you more about that particular source now</i>	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
72	What appliances do you power with electricity from this off-grid source?	0 None 1 Mobile phones 2 Radio 3 Television 4 DVD player 5 Iron 6 Refrigerator/Freezer 7 Rechargeable torch 8 Music system 9 Tablet 10 Computer/laptop 11 Heater 12 Electric fan 13 Cooking stove 14 Sewing machine 15 Water pump 16 Welding machine 17 Blow dryer 18 Blender 19 Electric kettle 20 Microwave 21 Toaster 22 Shaving machine 23 Other large appliances for income purposes 24 Decoder/TV receiver 25 Lightning 95 Other 98 Refuse to answer 99 Don't know	<i>DO NOT READ OUT the options</i>
73	How much do you spend monthly on this energy source?	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200.</i>
74	As you may know, a solar mini grid was recently built in this town. Who do you think was most responsible for bringing this mini-grid to your community?	1 Government of Sierra Leone 2 United Nations 3 Traditional Authorities 4 Another International Organization 5 Local NGO 6 Grid Operator 95 Other 98 Refused to answer 99 Don't Know	
		end_group	
	Time use of Mini-grid	begin_group	
75	I will ask you questions about the your usage of the appliances, both owned and shared, powered by the Mini-Grid	note	
76	How many hours a week do you use the Mobile phone	integer	<i>Owned or shared</i>
77	How many hours a week do you use the Radio	integer	<i>Owned or shared</i>
78	How many hours a week do you use the Television	integer	<i>Owned or shared</i>
79	How many hours a week do you use the DVD player	integer	<i>Owned or shared</i>
80	How many hours a week do you use the Iron	integer	<i>Owned or shared</i>
81	How many hours a week do you use the Refrigerator/Freezer	integer	<i>Owned or shared</i>
82	How many hours a week do you use the Rechargeable torch	integer	<i>Owned or shared</i>
83	How many hours a week do you use the Music system	integer	<i>Owned or shared</i>
84	How many hours a week do you use the Tablet	integer	<i>Owned or shared</i>
85	How many hours a week do you use the Computer/laptop	integer	<i>Owned or shared</i>

86	How many hours a week do you use the Heater	integer	<i>Owned or shared</i>
87	How many hours a week do you use the Electric fan	integer	<i>Owned or shared</i>
88	How many hours a week do you use the Cooking stove	integer	<i>Owned or shared</i>
89	How many hours a week do you use the Sewing machine	integer	<i>Owned or shared</i>
90	How many hours a week do you use the Water pump	integer	<i>Owned or shared</i>
91	How many hours a week do you use the Welding machine	integer	<i>Owned or shared</i>
92	How many hours a week do you use the Blow dryer	integer	<i>Owned or shared</i>
93	How many hours a week do you use the Blender	integer	<i>Owned or shared</i>
94	How many hours a week do you use the Electric kettle	integer	<i>Owned or shared</i>
95	How many hours a week do you use the Microwave	integer	<i>Owned or shared</i>
96	How many hours a week do you use the Toaster	integer	<i>Owned or shared</i>
97	How many hours a week do you use the Shaving machine	integer	<i>Owned or shared</i>
98	How many hours a week do you use the Other large appliances for income purposes	integer	<i>Owned or shared</i>
99	How many hours a week do you use the Decoder/TV receiver	integer	<i>Owned or shared</i>
100	How many hours a week do you use the Lightning	integer	<i>Owned or shared</i>
	Energy for Cooking and Light in the Household	begin_group	
	<i>Now I want to ask you about the energy sources you use for cooking and light around the household</i>	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
101	Now I want you to think of how your household prepares food / meals. When preparing food, you need some way to heat up the pot. What is the MAIN method your household uses to heat up the pot when cooking food / meals?	select_one heat_pot	<i>Enumerator Note: Probe the response to find out the SOURCE OF ENERGY.</i>
102	Specify other	text	
103	In the last week did you use any OTHER energy source for cooking?	select_one yes_no2	
104	Which other source?	1 On grid electricity 2 Mini-grid Electricity 3 Kerosene 4 Collected Firewood 5 Purchased Firewood 6 Charcoal 7 Generator 8 Home solar system 95 Other 98 Refuse to answer 99 Don't know	
105	Specify other	text	
106	How much did you spend on Kerosene in the past month?	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200</i>
107	How much did you spend on Firewood in the past month?	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200</i>
108	How much did you spend on Charcoal in the past month?	integer	<i>Enumerator Note: Please, write the amount in '000. If they say 200.000, write 200</i>
109	How many hours did you spend last week collecting firewood for cooking?	integer	
110	<i>Now I want you to think about the way that light is provided in your house. Think about lighting in your household over the last week.</i>	note	

111	What is the main source of lighting in your house over the last week?	1 No light usage in any form 2 National Grid Electricity 3 Kerosene 4 Collected Firewood 5 Purchased Firewood 6 Solar Lantern 7 Solar stand-alone panel 8 Batteries 9 Generator 10 Candles 11 Phone light 12 Mini-grid electricity 95 Other 98 Refuse to answer 99 Don't know	<i>Note: by main source I mean source of lighting most used in the house</i>
112	Specify other	text	
113	Think about how often you used this lighting source. In a week, how many hours did you get light from this source?	integer	
114	In the last week did you use any other energy source for lighting?	select_one yes_no2	
115	What is your secondary source of lighting at home?	1 No light usage in any form 2 National Grid Electricity 3 Kerosene 4 Collected Firewood 5 Purchased Firewood 6 Solar Lantern 7 Solar stand-alone panel 8 Batteries 9 Generator 10 Candles 11 Phone light 12 Mini-grid electricity 95 Other 98 Refuse to answer 99 Don't know	
116	Specify other	text	
117	Think about how often you used this second lighting source. In a week, how many hours did you get light from this source?	integer	
118	Is your house wired?	select_one yes_no2	
119	<i>Now I will ask you about formal off grid (Mini-Grid) connections</i>	note	
	Mini-Grid Connection Application	begin_group	
120	Has anyone in this household ever applied for an electricity connection?	select_one yes_no2	
121	When did your household apply for this electricity connection?	date	
122	What is the current status of your application?	1 Approved but not connected 2 Rejected 3 Never submitted the application to the operator 4 Haven't heard back 5 Pending 6 Haven't completed the payments 95 Other 98 refused to answer 99 Don't know	

	Health Related Data	begin_group	
	<i>Now I want to ask you about the HEALTH CONDITIONS and behavior of you and your household members. Remember this survey is confidential and the information will only be used for research purposes.</i>	note	
	General Health Information	begin_group	
	<i>I am going to describe to you different sickness that people sometimes suffer from. After I describe each</i>	note	

	<i>sickness. Tell me if you have suffered from this illness in the last month (30 days)</i>		
	Malaria	begin_group	
1	READ: Sometimes people fall sick and they experience high temperature, headaches, vomiting and muscle pain. These symptoms are usually associated with Malaria.	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
2	Have you suffered from this illness or these symptoms in the past 30 days?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
3	For how many days did you suffer this illness?	integer	<i>Remember, I am only talking about the last 30 days</i>
4	Did you seek treatment for this sickness?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
5	Did you seek treatment for this sickness in this community?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
6	Within the communities, there are different people that can help you treat your problem. Where did you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic 8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
7	Specify other	text	
8	How much did you pay in total to treat this illness?	integer	<i>Enumerator Note: SELECT THE RANGES</i>
9	If you were to suffer from this illness again in the future would you seek treatment?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
10	Where would you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic 8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
11	Okay so you told me you have not suffered from this illness in the last 30 days. If you were to suffer from this illness in the future would you seek treatment?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
12	Where would you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic	

		8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
		end_group	
	Acute Respiratory Infections	begin_group	
13	READ: There are also times when you are sick that you cannot breathe properly, they breathe fast fast, you have runny nose, coughing, and sore throat.	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
14	Have you suffered from this illness or these symptoms in the past 30 days?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
15	For how many days did you suffer this illness?	integer	<i>Remember, I am only talking about the last 30 days</i>
16	Did you seek treatment for this sickness?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
17	Did you seek treatment for this sickness in this community?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
18	Within the communities, there are different people that can help you treat your problem. Where did you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic 8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
19	Specify other	text	
20	How much did you pay in total to treat this illness?	integer	<i>Enumerator Note: SELECT THE RANGES</i>
21	If you were to suffer from this illness again in the future would you seek treatment?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
22	Where would you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic 8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
23	Okay so you told me you have not suffered from this illness in the last 30 days. If you were to suffer from this illness in the future would you seek treatment?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	

24	Where would you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic 8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
		end_group	
	Dry Eye and/or Cataract	begin_group	
25	READ: There are also other times that your eyes itch, your eyes are tired, red and burn. It also can happen that your vision is blurred and cloudy, and you cannot see properly, specially at night. People usually call this "apolo"	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
26	Have you suffered from this illness or these symptoms in the past 30 days?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
27	For how many days did you suffer this illness?	integer	<i>Remember, I am only talking about the last 30 days</i>
28	Did you seek treatment for this sickness?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
29	Did you seek treatment for this sickness in this community?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
30	Within the communities, there are different people that can help you treat your problem. Where did you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic 8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
31	Specify other	text	
32	How much did you pay in total to treat this illness?	integer	<i>Enumerator Note: SELECT THE RANGES</i>
33	If you were to suffer from this illness again in the future would you seek treatment?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
34	Where would you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic	

		8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
35	Okay so you told me you have not suffered from this illness in the last 30 days. If you were to suffer from this illness in the future would you seek treatment?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
36	Where would you seek treatment for this sickness?	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop 5. Private Clinic 6. Maternal Care Health Post (MCHP) 7. NGO Clinic 8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy) 95. Other 98. Refused to Answer 99. Don't know	
		end_group	
		end_group	
	Women and Health	begin_group	
37	I am now interested on the health of women living on this household. Particularly, women that recently gave birth.	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
38	Have any woman from this household given birth to any child in the past year?	0. No 1. Yes 98. Refused to Answer	
39	Now I want you to think about this woman and her last pregnancy, and answer the following questions	note	<i>Enumerator Note: If this woman is in the house, ask her to join and answer/participate in the questions</i>
40	During the last pregnancy, did she receive any pre-natal care?	0. No 1. Yes 98. Refused to Answer	
41	During her last pregnancy, did she receive any post-natal care?	0. No 1. Yes 98. Refused to Answer	
42	From where did she receive pre-natal or post-natal care?	1. Hospital (District Headquarter) 2. Maternity Home 3. At home 4. CHC/PHU 5. Maternal and Child Health Care Post 6. CHP 7. Faith Based Organization/ Mission Clinic 8. Private Clinic 95. Other 98. Refused to answer 99. Don't know	
43	How many times did she visit a CHC for pre-natal or post-natal care during her last pregnancy?	integer	<i>Enumerator: add the pre-natal and the post-natal visits and write down the total amount of visits</i>
44	How many of these times were at night times?	integer	<i>After dark – Past 18.00hours (6pm)</i>

45	How much did she pay in total for her visit to the CHC for pre-natal or post-natal care during her last pregnancy?	integer	<i>We are also interested on any kind of informal payment.</i> <i>Enumerator Note: SELECT THE RANGES</i>
46	Where was the child delivered?	1. Hospital (District Headquarter) 2. Maternity Home 3. At home 4. CHC/PHU 5. Maternal and Child Health Care Post 6. CHP 7. Faith Based Organization/ Mission Clinic 8. Private Clinic 95. Other 98. Refused to answer 99. Don't know	
47	Specify other	text	
48	Was the child delivered during the day or during the night?	1. Day 2. Night 98. Refused to Answer 99. Don't know	
49	In the past year, did any women in this household have a pregnancy end up in a stillbirth?	0. No 1. Yes 98. Refused to Answer	
50	During delivery, women sometimes suffer complications and bear the risk of dying. Has someone in this household died during pregnancy/delivery in the past 12 months?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
51	What was the cause of death for this woman?	text	
52	Enumerator Note: Do not read out this question - answer based on your observation Who answered most of these questions? Were women of the household contributing to the answers?	1. Male respondent dominated all responses, women not present. 2. Male respondent dominated all responses, women present 3. Male respondent led answers but active contribution from women 4. Female respondent answered all questions 5. Female respondent same as main respondent	
		end_group	
	Child Health (<5 years)	begin_group	
53	I will now ask you about the health condition of the under-five that live in this household. Under-five refers to the children of an age of 5 or less living in this household. I will ask you questions about: \${child_05_1} and \${child_05_2}	note	
54	I will now ask you about the health condition of the under-five that live in this household. Under-five refers to the children of an age of 5 or less living in this household. I will ask you questions about: \${child_05_1}	note	
	Child 1	begin_group	
55	<i>Let's move to the first child, \${child_05_1}</i>	note	
56	Does \${child_05_1} have any disability?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	<i>Disability means either physical or social impairments and barriers that prevent people from having normal lives</i>
57	Has \${child_05_1} ever been vaccinated?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
58	Has \${child_05_1} received any of these vaccinations?	1. OPV0 2. BCG 3. 1 st DPT 4. 1 st OPV 5. 2 nd DPT 6. 2 nd OPV	<i>Enumerator Note: Ask the respondent to show you the yellow vaccination card for \${child_05_1}. Copy the information from there into the tablet</i>

		7. 3 rd DPT 8. 3 rd OPV 9. Pneumococcal 10. Rotavirus 1 11. Rotavirus 2 12. IPTi1 13. IPTi2 14. IPTi3 15. IPV 16. Yellow Fever 17. MCV 1 18. MCV2 95. Other 98. Refused to answer 99. Don't know	
59	Where did \${child_05_1} get the vaccinations?	1. Community health center 2. Hospital 3. Private clinic 4. Mobile unit 5. School 6. Home 95. Other 98. Refused to answer 99. Don't know	
60	Why was \${child_05_1} not vaccinated?	1. Child too young 2. Did not know about vaccines 3. Health center too far 4. Shortage of supply 5. Too expensive 6. Vaccines are useless 95. Other 98. Refused to answer 99. Don't know	
61	<i>I am going to describe to you different sickness that people sometimes suffer from. After I describe each sickness. Tell me if \${child_05_1} have suffered from this illness in the last month (30 days)</i>	note	
	Malaria	begin_group	
62	READ: Sometimes people fall sick and they experience high temperature, headaches, vomiting and muscle pain. These symptoms are usually associated with malaria	note	
63	Has \${child_05_1} had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
64	Was \${child_05_1} treated at the CHC for this condition?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
		end_group	
	Acure Respiratory Infections	begin_group	
65	READ: There are also times when you are sick that you cannot breathe properly, you have runny nose, coughing, and sore throat.	note	
66	Has \${child_05_1} had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
67	Whas \${child_05_1} treated at the CHC for this condition?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
		end_group	
	Dry Eye and/or Cataract	begin_group	
68	READ: There are also other times that your eyes itch, your eyes are tired, red and burn. It also can happen that your vision is blurred and cloudy, and you cannot see properly, specially at night. People usually call this "apolo"	note	
69	Has \${child_05_1} had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	

70	Whas \${child_05_1} treated at the CHC for this condition?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
		end_group	
		end_group	
	Child 2	begin_group	
	<i>Let's move to the second child, \${child_05_2}</i>	note	
71	Does \${child_05_2} have any disability?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	<i>Disability means either physical or social impairments and barriers that prevent people from having normal lives</i>
72	Has \${child_05_2} ever been vaccinated?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
73	Has \${child_05_2} received any of these vaccinations?	1. OPV0 2. BCG 3. 1 st DPT 4. 1 st OPV 5. 2 nd DPT 6. 2 nd OPV 7. 3 rd DPT 8. 3 rd OPV 9. Pneumococcal 10. Rotavirus 1 11. Rotavirus 2 12. IPTi1 13. IPTi2 14. IPTi3 15. IPV 16. Yellow Fever 17. MCV 1 18. MCV2 95. Other 98. Refused to answer 99. Don't know	<i>Enumerator Note: Ask the respondent to show you the yellow vaccination card for \${child_05_2}. Copy the information from there into the tablet</i>
74	Where did \${child_05_2} get the vaccinations?	1. Community health center 2. Hospital 3. Private clinic 4. Mobile unit 5. School 6. Home 95. Other 98. Refused to answer 99. Don't know	
75	Why was \${child_05_2} not vaccinated?	1. Child too young 2. Did not know about vaccines 3. Health center too far 4. Shortage of supply 5. Too expensive 6. Vaccines are useless 95. Other 98. Refused to answer 99. Don't know	
	<i>I am going to describe to you different sickness that people sometimes suffer from. After I describe each sickness. Tell me if \${child_05_2} have suffered from this illness in the last month (30 days)</i>	note	
	Malaria	begin_group	
76	READ: Sometimes people fall sick and they experience high temperature, headaches, vomiting and muscle pain. These symptoms are usually associated with Malaria	note	
77	Has \${child_05_2} had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	

78	Whas $\{child_05_2\}$ treated at the CHC for this condition?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
		end_group	
	Acure Respiratory Infections	begin_group	
79	READ: There are also times when you are sick that you cannot breathe properly, you have runny nose, coughing, and sore throat.	note	
80	Has $\{child_05_2\}$ had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
81	Whas $\{child_05_2\}$ treated at the CHC for this condition?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
		end_group	
	Dry Eye and/or Cataract	begin_group	
82	READ: There are also other times that your eyes itch, your eyes are tired, red and burn. It also can happen that your vision is blurred and cloudy, and you cannot see properly, specially at night. People usually call this "apolo".	note	
83	Has $\{child_05_2\}$ had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
84	Whas $\{child_05_2\}$ treated at the CHC for this condition?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
		end_group	
		end_group	
		end_group	
	Infant mortality	begin_group	
85	God willing, the pikins all stay healthy. Unfortunately, we know that sometimes the pikins pass away. In the past year, have any of the pikins in this house passed away?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
86	How many pikins have passed away in this household in the past year?	integer	
	Age of children- Infant mortality	begin_repeat	
87	What was the age of this pikin that passed away in the past year?	integer	
88	What was the cause of this pikin's death?	text	
		end_repeat	
		end_group	
		end_group	
	Education	begin_group	
1	<i>I am interested now in knowing about the education of children living in this household</i>	note	
2	I will now ask you about the educational status of children between 6-18 years of age. I will ask you questions about: $\{child_618_1\}$ and $\{child_618_2\}$	note	
3	I will now ask you about the educational status of children between 6-18 years of age. I will ask you questions about: $\{child_618_1\}$	note	
	Child 1	begin_group	

4	Let's move to the first child, \${child_618_1}.	note	Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer
5	Is \${child_618_1} currently enrolled in school?	0. No 1. Yes 98. Refused to Answer	
6	Which school is \${child_618_1} enrolled in?	text	
7	Is this school in this community?	0. No 1. Yes 98. Refused to Answer	
8	What grade is \${child_618_1} attending?	1. Nursery/ Pre- primary 2. 1 st primary 2. 2 nd primary 3. 3 rd primary 4. 4 th primary 5. 5 th primary 6. 6 th primary 7. 1 st JSS 8. 2 nd JSS 9. 3 rd JSS 10. 1 st SSS 11. 2 nd SSS 12. 3 rd SSS 13. Higher education 95. Other 98. Refused to answer 99. Don't know	
9	Specify other	text	
10	What is the highest grade \${child_618_1} achieved?	1. Nursery/ Pre- primary 2. 1 st primary 2. 2 nd primary 3. 3 rd primary 4. 4 th primary 5. 5 th primary 6. 6 th primary 7. 1 st JSS 8. 2 nd JSS 9. 3 rd JSS 10. 1 st SSS 11. 2 nd SSS 12. 3 rd SSS 13. Higher education 95. Other 98. Refused to answer 99. Don't know	
11	Specify other	text	
12	How much time does \${child_618_1} spend going to school (one way)?	1. Less than 30 min 2. Between 30 min and 1 hour 3. Between 1-2 hours 4. 2-3 hours 5. More than 3 hours	
13	How many days in the last <i>week</i> (excluding holidays) did \${child_618_1} miss school?	integer	
14	Did \${child_618_1} miss school because the teacher was absent?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
15	Children often help people in their families or other people with work on their farm. During the past month, did \${child_618_1} spend any time working on a family member or anyone else's farm?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
16	In general, how many hours does \${child_618_1} work on the farm during a typical <i>week</i> ?	integer	
17	Children can sometimes help with other work beside on the farm. They often help with many chores around the house. By chores I mean activities such as collecting firewood, fetching water, etc. During a typical <i>week</i> , how many hours does \${child_618_1} help with chores around the house?	integer	
18	Sometimes children help with work outside of the farm and household. For example, some school children help take care of a store or other business. In the past <i>month</i> , has \${child_618_1} helped out	0. No 1. Yes 98. Refuse to Answer 99. Don't know	

	with any non-farm activities, outside of the household?		
19	In general, how many hours does \${child_618_1} help out with these activities in a <i>week</i> (7 days)?	integer	
20	We all know that children like to play. By “play” I mean things like, playing games, hanging around with friends, or just chilling and not doing much of anything. In a typical <i>week</i> , how many hours does \${child_618_1} spent playing and hanging out?	integer	
21	Children spend much of their day studying at school. Think about when \${child_618_1} comes home from school. In the past <i>month</i> , has \${child_618_1} done any studying at home?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
22	In general, how many hours does \${child_618_1} spend studying at home in a <i>week</i> ?	integer	
23	When the day is done its time to sleep. On a typical <i>weekday</i> (by that I mean Monday through Friday), how many hours does \${child_618_1} sleep at night?	integer	
		end group	
	Child 2	begin group	
24	<i>Let's move to the second child, \${child_618_2}</i>	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
25	Is this \${child_618_2} currently enrolled in school?	0. No 1. Yes 98. Refused to Answer	
26	Which school is \${child_618_2} enrolled in?	text	
27	Is this school in this community?	0. No 1. Yes 98. Refused to Answer	
28	What grade is the \${child_618_2} attending?	1. Nursery/ Pre- primary 2. 1 st primary 2. 2 nd primary 3. 3 rd primary 4. 4 th primary 5. 5 th primary 6. 6 th primary 7. 1 st JSS 8. 2 nd JSS 9. 3 rd JSS 10. 1 st SSS 11. 2 nd SSS 12. 3 rd SSS 13. Higher education 95. Other 98. Refused to answer 99. Don't know	
29	Specify other	text	
30	What is the highest grade \${child_618_2} achieved?	1. Nursery/ Pre- primary 2. 1 st primary 2. 2 nd primary 3. 3 rd primary 4. 4 th primary 5. 5 th primary 6. 6 th primary 7. 1 st JSS 8. 2 nd JSS 9. 3 rd JSS 10. 1 st SSS 11. 2 nd SSS 12. 3 rd SSS 13. Higher education 95. Other 98. Refused to answer 99. Don't know	
31	Specify other	Text	

32	How much time does this \${child_618_2} spend going to school (one way)?	1. Less than 30 minutes 2. 30 – 60 minutes 3. 60 – 120 minutes 4. More than 120 minutes	
33	How many days in the last <i>week</i> (excluding holidays) did this \${child_618_2} miss school?	Integer	
34	Did \${child_618_2} miss school because the teacher was absent?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
35	Children often help people in their families or other people with work on their farm. During the past month, did \${child_618_2} spend any time working on a family member or anyone else's farm?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
36	In general, how many hours does \${child_618_2} work on the farm during a typical <i>week</i> ?	integer	
37	Children can sometimes help with other work beside on the farm. They often help with many chores around the house. By chores I mean activities such as collecting firewood, fetching water, etc. During a typical <i>week</i> , how many hours does \${child_618_2} help with chores around the house?	integer	
38	Sometimes children help with work outside of the farm and household. For example, some school children help take care of a store or other business. In the past <i>month</i> , has \${child_618_2} helped out with any non-farm activities, outside of the household?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
39	In general, how many hours does \${child_618_2} help out with these activities in a <i>week</i> (7 days)?	integer	
40	We all know that children like to play. By "play" I mean things like, playing games, hanging around with friends, or just chilling and not doing much of anything. In a typical <i>week</i> , how many hours does \${child_618_2} spent playing and hanging out?	integer	
41	Children spend much of their day studying at school. Think about when \${child_618_2} comes home from school. In the past <i>month</i> , has \${child_618_2} done any studying at home?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
42	In general, how many hours does \${child_618_2} spend studying at home in a <i>week</i> ?	integer	
43	When the day is done its time to sleep. On a typical <i>weekday</i> (by that I mean Monday through Friday), how many hours does \${child_618_2} sleep at night?	integer	
		end_group	
44	Enumerator Note: Do not read out this question - answer based on your observation Who answered most of these questions? Were women of the household or mothers of children contributing to the answers?	1. Male respondent dominated all responses, women not present. 2. Male respondent dominated all responses, women present 3. Male respondent led answers but active contribution from women 4. Female respondent answered all questions 5. Female respondent same as main respondent	
		end_group	
	Social Media, Political Attitudes and Political Knowledge	begin_group	
1	I am gonna now ask you about Politics and Social Media	note	<i>Enumerator Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
2	In the past 7 days, how many days have your listened to the radio?	integer	<i>Enumerator Note: By this I mean more than simply hearing the radio. I mean that you could actually tell what was being said and you were putting in some level of concentration to what was being said.</i>

3	Of course, many different types of programs play on the radio. For example, some programs play music while others play the news and current events. In the past 7 days, how many days have you listened to a program about the news and current events?	integer	<i>Enumerator Note: "news and current events" includes programs that talk about politics and more generally what is happening inside and outside Sierra Leone</i>
4	<i>Now I want to ask you a couple questions about the way you use your phone and use social media.</i>	note	
5	Do you own a cellphone?	0. No 1. Yes 98. Refused to Answer	<i>Enumerator note: Its okay if the phone actually belongs to someone else. What's important is that the respondent has frequent access to it.</i>
6	Can your phone get access to the internet?	0. No 1. Yes 98. Refused to Answer	
7	As you probably know, in order to use the internet on your phone, you have to buy a credit bundle , How much did you spend in the last month on internet credit?	integer	<i>Enumerator Note: SELECT THE RANGES</i>
8	How many MB do you have on your phone right now?	integer	
9	Each day, how much time do you spend browsing on the internet?	1. Less than 30 min 2. Between 30 min and 1 hour 3. Between 1 – 2 hours 4. 2 – 3 hours 5. More than 3 hours	
10	You told me you sometimes use the internet. Now I want to ask about how you use the internet	note	
11	Do you have WhatsApp?	0. No 1. Yes 98. Refused to Answer	
12	Think if you used WhatsApp yesterday. Approximately, how many messages did you write yesterday?	integer	
13	Facebook is another outlet that some people use on the internet. Do you have a facebook?	0. No 1. Yes 98. Refused to Answer	
14	Each day, how much time do you spend browsing on the facebook?	1. Less than 30 minutes 2. 30 minutes – 1 hour 3. 1 hour – 2 hours 4. 2 – 3 hours 5. > 3 hours	
15	Now I want to ask you a few questions about your interest in politics and politicians	note	
16	How interested are you in politics?	1. Very interested 2. Interested 3. Not too interested 4. Not interested 5. Not interested at all	
	Ward Calculation	calculate	
	Concilor Calculation	calculate	
17	We are in Ward $\{ward\}$. Who is the Local Councilor for Ward $\{ward\}$?	1. Correct 0. Incorrect	<i>Enumerator Note: Select 'Correct' if the respondent answers this question correctly, even if partially. Select 'Incorrect' if Incorrect or respondent does not know.</i> <i>Local Councilor of Ward $\{ward\}$ is $\{councilor\}$</i>
18	Who is the President of Sierra Leone? Select "Correct" if the respondent knows the name, even if partially	1. Correct 0. Incorrect	<i>President of Sierra Leone is: Julius Maada Bio.</i>
19	Who is the President of Nigeria? Select "Correct" if the respondent knows the name, even if partially	1. Correct 0. Incorrect	<i>President of Nigeria: Muhammadu Buhari</i>
20	Who is the President of USA? Select "Correct" if the respondent knows the name, even if partially	1. Correct 0. Incorrect	<i>President of USA: Donald Trump</i>

21	<p>I just have two final questions before I leave you. As I mentioned at the beginning of this survey, I am a research assistant working for the International Growth Center and Wageningen University in the Netherlands. I am not associated with the government or with any other political people in Sierra Leone. The question I will ask you is strictly for research purposes.</p> <p>What I want to know is: Did you pay your Local Tax last year? You know, that 5,000 LE tax. If you did, do you mind showing me the receipt?</p>	<p>0. No 1. Yes, with receipt 2. Yes, has NO receipt 98. Refuse to Answer 99. Don't know</p>	<p><i>Enumerator Note: Wait for respondent to get receipt. Be sure it is from this year or last year (2018).</i></p>
22	<p>You may have heard that the Mayor in Freetown wants transform Freetown by improving sanitation, transportation, and other services. To do so, she is asking all property owners to pay a tax.</p> <p>What if the FREETOWN GOVERNMENT wanted to similarly improve public services in your area, but wanted to collect property taxes to do so. Do you think this property tax to pay for public services would be a good idea or not a good idea?</p>	<p>1. A very good idea 2. A good idea 3. I wouldn't mind either way 4. A bad idea 5. A very bad idea 98. Refuse to answer</p>	
		end_group	
23	<p>Thank you for your time and collaboration. This is the end of the survey.</p>	note	
24	<p>Earlier you said you had a generator. Do you mind showing it to me before I leave?</p> <p>Enumerator: Write the model and Kwh of the generator</p>	text	<p><i>Enumerator Note: Write -98 if respondent refuses to show the generator to you</i></p>
25	Household Location	geopoint	
26	<p>ENUMERATOR: Please write here any comments/issues you think it needs to be communicated to the RA team from this survey</p>	text	

RREP

SCHOOL SURVEY MODULE

Respondent for School survey: please interview the Principal, if not available, interview or the Head Teacher.

Coordinates: GPS is recorded for each School on GPS device, see separate manual.

CONSENT TO PARTICIPATE IN INTERVIEW

My name is _____. I am an enumerator hired by the Rural Renewable Energy Project (RREP) of Wageningen University in the Netherlands. I would like to invite you to participate in a short survey. The RREP, aims to provide off-grid electricity to 94 communities across Sierra Leone. This evaluation will help us better understand the benefits of providing off-grid access to electricity in rural communities in Sierra Leone and thus help policy makers to take the right decisions in the future. The project is conducted by professionals working at Wageningen University, the Netherlands, International Growth Centre in the UK and UCLA and Yale University, USA. We will be interviewing about 5,700 people in Sierra Leone for this evaluation.

You will be asked a series of questions about yourself and this school. There are minimal risks to you from answering these questions. If you experience distress over the nature of some of the questions, you are free to skip any question. Through the course of the survey, we can take a break, stop and continue a bit later, or stop altogether anytime. You will not be penalized in any way for deciding to stop participation at any time. Declining will not affect chances of receiving an intervention or change your status with this project. There are no correct or incorrect responses, so please express your opinions freely.

The participation is anonymous, and you can refuse to give us any information including your name. No publication will include any of your personal details. Having said that, please note that evaluators will keep your information confidential to the extent possible and allowable by law. The survey should take about 40 minutes. Participation is purely voluntary and not rewarded. There are no costs of participation except your time.

If you have any questions regarding this research or your rights as a research study participant, you may contact the people listed on this Contact Sheet.

Hand over the sheet

Do we have your consent to proceed with the survey?

Intro	Visit Details	Choices	Comments
1	Enumerator Name		
2	Select the district you are in		
3	Select the chiefdom you are in		
4	Select the community you are in		
5	Write down the name of the GOVERNMENT or GOVERNMENT ASSISTED SCHOOL you are in		<i>*Note: Write the official name of the school</i>
6	What day of the week is today	1. Monday 2. Tuesday 3. Wednesday 4. Thursday 5. Friday 6. Saturday 7. Sunday	
7	Who is the respondent?	1. Principal 2. Head teacher 95. Other	
8	Other	Specify other	
INFORMED CONSENT			

	Question	Answers	Comments
S1	Section 1: School characteristics		
1	How many different administrations are in this school?		<i>*Enumerator Note: by different administrations we mean separate principals that manage different classes within the same structure (For example, one principal manages junior secondary while another takes care of senior secondary WITHIN same structure)</i>
2	How many children attend this school? <i>Note: Cross check with school records</i>	Integer	
3	How many teachers teach in this school? <i>Note: Cross check with school records</i>	Integer	
4	Select which grades are taught at this school	1. Pre-primary/nursery 2. Primary 3. Junior Secondary 4. Senior Secondary 95. Other	
5	What is the total number of classrooms in the school?	Integer	<i>* Classroom is a closed room with walls and ceiling.</i>
6	How many communities have children that attend this school?	Integer	<i>*Note: We are asking about how many other communities send their children to this school.</i>
7	What is the name of one of the communities?		<i>*Note: There will be many, go one by one with them.</i>

8	What is the chiefdom of this community?		
9	What is the section of this community?		
10	How many children from this community attend this school?	Integer	
11	The school records say X number of students attend school here. Of this, how many are boys?	Integer	<i>Note: X based on Question 2 in visit details Put '0' if no boys</i>
12	How many are girls?	Integer	<i>Note: Number of boys + girls should add up to total number of students (tablet will calculate this)</i>
13	How many children have disability?	Integer	<i>Note: Disability can be defined as condition that restricts everyday activities. - Examples, including but not limited to: Impairments in vision, hearing, speech, nervous system, limbs. People with difficulties understanding, talking, and communicating, dressing or washing by themselves.</i>
14	How many children who have a disability are boys?	Integer	
15	How many children who have a disability are girls?	Integer	<i>*Note: The number of boys and girls will have to add up otherwise the tablet will not let you go further</i>
16	The school records say X number of teachers teach here. Of this, how many are men?	Integer	<i>*Note: Put '0' if there are none</i>
17	How many are women?	Integer	<i>*Note: Number of male + women teachers should add up to total number of teachers (tablet will calculate this)</i>
18	Are students ever turned down when they apply for admission to the school?	0. No 1. Yes, permanently 2. Yes, added to waitlist 95. Other 98. Refuse to answer 99. Don't know	
19	Why are students turned down?	1. Classrooms are full 2. Waitlist children are called first 3. Poor performance of students 4. Underage	

		5. Mental illness/disability 95. Other 98. Refuse to answer 99. Don't know	
20	Specify Other		
21	How many teachers are full time staff?	Integer	<i>*Note: Teachers with pin-code</i>
22	How many teachers are full time staff?	Integer	<i>*Note: Those who are paid a stipend</i>
23	How many teachers are part time staff?	Integer	<i>*Note: Those who are getting paid but work less than 4 hours</i>
24	How many teachers are volunteer (part time) staff?	Integer	<i>*Note: Less than 4 hours a day</i>
25	How many teachers are volunteer (full time) staff?	Integer	<i>*Note: More than 4 hours a day</i>
S2	Section 2: Energy Access		
1	Does this school have access to electricity?	0. No 1. Yes 98. Refuse to answer 99. Don't know	<i>*Note: Of any source</i>
2	What is the main source of electricity?	1. On grid 2. Mini grid solar/UNOPS mini grid 3. Stand-alone solar 4. Generator 95. Other 98. Refuse to answer 99. Don't know	<i>*Note: If #1 = Yes *On grid refers to electricity provided by the NPA or similar connection.</i>
3	Specify other		
4	How many hours of electricity per day does the school get on average (source: National Grid)?	1. <1 hour 2. 1-3 hours 3. 3-5 hours 4. 5-10 hours 5. 10-15 hours 6. 15+ 98. Refused to answer 99. Don't know	<i>*Note: If it is exactly 3 hours, pick 1-3 hours. Similarly, if it is 10 hours, pick 5-10 hours. *Per energy source</i>
5	For how long have these cuts been? How many hours of electricity per day does the school get on average (source: UNOPS Mini-grid)?	1. <1 hour 2. 1-3 hours 3. 3-5 hours 4. 5-10 hours 5. 10-15 hours 6. 15+ 98. Refused to answer 99. Don't know	<i>*Note: If it is exactly 3 hours, pick 1-3 hours. Similarly, if it is 10 hours, pick 5-10 hours. *Per energy source</i>
6	How many hours of electricity per day does the school get on average (source: Generator)?	1. <1 hour 2. 1-3 hours 3. 3-5 hours 4. 5-10 hours 5. 10-15 hours 6. 15+	<i>*Note: If it is exactly 3 hours, pick 1-3 hours. Similarly, if it is 10 hours, pick 5-10 hours. *Per energy source</i>

		98. Refused to answer 99. Don't know	
7	How many hours of electricity per day does the school get on average (source: Stand-Alone Solar Panel)?	1. <1 hour 2. 1-3 hours 3. 3-5 hours 4. 5-10 hours 5. 10-15 hours 6. 15+ 98. Refused to answer 99. Don't know	<i>*Note: If it is exactly 3 hours, pick 1-3 hours. Similarly, if it is 10 hours, pick 5-10 hours.</i> <i>*Per energy source</i>
8	How much does the school spend for electricity per day (source: National Grid)?	Integer	<i>*Note: Write the amount in '000. E.g. if school spends 150.000Le, write 150</i>
9	How much does the school spend for electricity per day (source: UNOPS Mini-grid)?	Integer	<i>*Note: Write the amount in '000. E.g. if school spends 150.000Le, write 150</i>
10	How much does the school spend for electricity per day (source: Generator)?	Integer	<i>*Note: Write the amount in '000. E.g. if school spends 150.000Le, write 150</i>
11	How much does the school spend for electricity per day (source: Stand-Alone Solar Panel)?	Integer	<i>*Note: Write the amount in '000. E.g. if school spends 150.000Le, write 150</i>
12	How many days in the past month have there been power cuts in the school?	Integer	<i>*Note: Power cuts are times of the day where electricity provision is unexpectedly interrupted during a period of time</i>
13	For how long (in hours)?	Integer	
14	How is the school paying for the electricity connection and/or maintenance?	1. Subsidy from 'Free Education Policy' 2. Community contributions 3. For free from government or other NGO entities 4. School activities 95. Other 98. Refused to answer 99. Don't know	<i>*Note: We care about maintenance and operational, not setting new sources up</i>
15	Specify other		
16	Do you have electricity today?	0. No 1. Yes 98. Refuse to answer 99. Don't know	<i>*Note: select "Yes" even if they have had electricity only for a short period of time</i>
17	Did you have electricity yesterday?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
18	For how many hours did you have electricity yesterday?	1. <1 hour 2. 1-3 hours 3. 3-5 hours 4. 5-10 hours 5. 10-15 hours	<i>* If #1 = Yes</i>

		6. 15+ 98. Refused to answer 99. Don't know	
19	When you face issues with the electricity supply, what issues do you face?	1. Power outages 2. Wire/maintenance problems 3. Voltage issues (not enough power) 4. Never face problems 95. Other 98. Refuse to answer 99. Don't know	
20	Specify other		
21	Which of the areas in the school have electricity?	1. Principal's office 2. Staff rooms 3. Classrooms 4. Storage room 5. School quarters 6. Canteen 7. Laboratory 95. Other 98. Refuse to answer 99. Don't know	<i>*Note: Select all that apply</i>
22	What appliances do you have?	1. Light 2. Freezer/Refrigerator 3. Fan 4. Projector 5. A/C 6. Water cooler/dispenser 7. TV 8. DVD player 9. Laptop 10. Computer (desktop) 11. Tablets 12. Internet connection** 95. Other (Other)	<i>* Select all that apply</i> <i>**Internet connection used for instruction, not for personal use of the personnel</i>
23	Is the [APPLIANCE] working? <i>Enumerator note - check that the appliance actually works</i>	0. No 1. Yes 95. Other 98. Refuse to answer 99. Don't know	<i>* Repeat group per appliance</i>
24	Specify other		
25	What appliances would you like to buy if you had electricity? DO NOT READ THE RESPONSES	1. Light 2. Freezer/Refrigerator 3. Fan 4. Projector 5. A/C	<i>*Select all that apply</i> <i>If #1 = No (When school has no access to electricity)</i>

		6. Water cooler/dispenser 7. TV 8. DVD player 9. Laptop 10. Computer (desktop) 11. Tablets 12. Internet connection** 13. Printing machines 95. Other (Other)	
26	Specify other		
S3	Section 3: School time		
1	How many shifts does the school have for primary?	Integer	
2	How many shifts does the school have for JSS?	Integer	
3	How many shifts does the school have for SS?	Integer	
4	What time does shift (number of shifts) start for primary?	Time	<i>This is repeated by school type</i>
5	What time does shift (number of shifts) end for primary?	Time	<i>This is repeated by school type</i>
6	Do you have any shifts at night? After 18:00 or 6pm	0. No 1. Yes 95. Other 98. Refuse to answer 99. Don't know	
7	What is stopping the school from hosting evening/night shifts?	1. No electricity 2. No need for extra shifts (not enough students) 3. Don't have enough teachers 95. Other (Text) 98. Refuse to answer 99. Don't know	<i>*If #6 = No</i>
8	Specify other		
9	Is the evening/night shift normal study time or extra study time?	1. Normal study time 2. Extra study time 95. Other 98. Refuse to answer 99. Don't know	<i>* If # 6 = Yes</i> <i>* Extra study time implies time allotted over and above regular school hours</i>
10	Specify other		
11	Do the same teachers cover the evening/night shifts?	0. No 1. Yes (teacher covers both morning and night shifts within same day) 98. Refuse to answer 99. Don't know	<i>* If #6 = Yes</i>

12	Are the teachers compensated extra for the night shifts?	0. No 1. Yes 98. Refuse to answer 99. Don't know	<i>* If #6 = Yes</i>
13	Does the school do anything to generate revenue?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
14	What kind of activities?	1. For hosting community events 2. For hosting NGO events 3. For hosting events by political parties? 4. For hosting students performance, sport and clubs 95. Other 98. Refuse to answer 99. Don't know	<i>*If #13 = Yes</i> <i>*Select Multiple</i>
15	In the last month, how much total SSL did the school make from these activities in total?	Integer	
16	How many days did the school remain closed due to "lack of lighting" (on a weekly basis) in the past month?	Integer	<i>* Note: Explain as classrooms are too dark for children to see their textbooks or the blackboard. Emphasize on remaining close DUE TO LACK OF LIGHTING (either natural of electrical light)</i>
17	Are adult learning sessions offered at this school?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
18	When?	1. Morning time (6am – 12p) 2. Afternoon time(12pm – 5pm) 3. Evening time (5Pm – 8pm) 4. Night time (8pm or later) 95 Other	<i>*If #17 = Yes</i>
19	Other time:	Text	
S4	Section 4: Student Performance		
1	What is the total number of students that appeared for the public NPSE exams this past year? (school year 2017/ 2018)	Integer	<i>*Note: Students completing primary school undertake a National Primary School Examination, or "selective", which together with their continuous assessment profiles, determines</i>

			<i>whether they will continue their education at a secondary school</i>
2	How many students passed the NPSE exams this past year? (school year 2017/2018)	Integer	<i>*Note: Get total number from official records</i>
3	How many of these were female?	Integer	
4	How many of these were male?		
5	What is the total number of students that appeared for the public NPSE exams this past year? (school year 2018/ 2019)		<i>*Note: Students completing primary school undertake a National Primary School Examination, or "selective", which together with their continuous assessment profiles, determines whether they will continue their education at a secondary school</i>
6	How many students passed the NPSE exams this past year? (school year 2018/ 2019)	Integer	<i>*Note: Get total number from official records</i>
7	How many of these were female?	Integer	
8	How many of these were male?	Integer	
9	What is the total number of students that appeared for the public BECE exams this past year? (school year 2017/ 2018)	Integer	<i>*Note: Students completing junior secondary school undertake a Basic Education Certificate Examination (BECE), which together with their continuous assessment profiles, determines whether they will continue their education at general or specialist senior secondary schools or proceed to technical and vocational schools</i>
10	How many students passed the BECE exams this past year? (school year 2017/ 2018)	Integer	<i>*Note: Get total number from official records</i>
11	How many students who passed the BECE exams are female?	Integer	
12	How many were male?	Integer	
13	What is the total number of students that appeared for the public BECE exams this past year? (school year 2018/ 2019)	Integer	<i>*Note: Students completing junior secondary school undertake a Basic Education Certificate Examination (BECE), which together with their continuous assessment profiles, determines whether they will continue their education at general or specialist senior secondary schools or proceed to technical and vocational schools</i>

14	How many students passed the BECE exams this past year? (school year 2018/2019)	Integer	<i>*Note: Get total number from official records</i>
15	How many students who passed the BECE exams are female?	Integer	
16	How many were male?	Integer	
17	What was the total number of students that appeared for the public WASSCE exams this past year? (school year 2017/2018)	Integer	<i>*Note: Get pass % from official records maintained at the school</i> <i>Note: WASSCE is the West African Senior Schools Certificate Examination. Students in senior secondary school, at the end of their program take this exam. Those who pass this exam and meet the requirements of the University of Sierra Leone may continue their formal education for four years for a first degree.</i>
18	How many students passed the WASSCE exam this past year? (school year 2017/2018)	Integer	<i>Note: Get pass % from official records maintained at the school</i>
19	How many of these were female?	Integer	
20	How many of were male?	Integer	
21	What was the total number of students that appeared for the public WASSCE exams this past year? (school year 2018/2019)	Integer	<i>*Note: Get pass % from official records maintained at the school</i> <i>Note: WASSCE is the West African Senior Schools Certificate Examination. Students in senior secondary school, at the end of their program take this exam. Those who pass this exam and meet the requirements of the University of Sierra Leone may continue their formal education for four years for a first degree.</i>
22	How many students passed the WASSCE exam this past year? (school year 2018/2019)	Integer	<i>Note: Get pass % from official records maintained at the school</i>
23	How many of these were female?	Integer	
24	How many were male?	Integer	

COMMUNITY HEALTH CENTER (CHC) SURVEY MODULE

Respondent for CHC survey: please interview the Community Health Officer (CHO), If we not available, interview the Head Nurse.

Coordinates: GPS is recorded for each CHC on GPS device, see separate manual.

Intro	Visit Details	Choices	Comments
1	Enumerator Name		
2	Enumerator ID		
3	Date of Interview (DD/MM/YY)		
4	What day of the week is today?		
5	Time of interview (hh:mm)		
6	District		
7	Chiefdom		
8	Community		
9	CHC code		Preloaded
10	Who is the respondent?	1. CHO (Community Health Officer) 2. Head Nurse 95. Other	
11	When did this CHC open in this community?	Year and month of opening	

CONSENT TO PARTICIPATE IN INTERVIEW

My name is _____. I am an enumerator hired by the RREP (Rural Renewable Energy Project) impact evaluation project of Wageningen University in the Netherlands. I would like to invite you to participate in a short survey.

Before we begin, I would like to take a minute to explain why I am inviting you to participate and what I will be doing with the information you provide to me.

This evaluation is being conducted by evaluators and professionals working with the RREP impact evaluation project at Wageningen University, the Netherlands, International Growth Centre in the UK and UCLA and Yale University, United States of America. We will be interviewing about 5.700 people (which is 30 households across 190 communities) in Sierra Leone.

The RREP program, aims to provide off-grid electricity to over 90 communities across Sierra Leone. The evaluators will use the information collected in policy reports, as well as scientific articles that might be published and presented. No publications will include names or other identifiable information on participants. The participation is anonymous, and you can refuse to give us any information including your name. Participation should take about sixty minutes. Participation is on a purely voluntary basis and is not rewarded. There are no costs of participation except your time

You will be asked a series of questions about yourself and this community health centre. This evaluation will help us better understand the benefits of providing off-grid access to electricity in rural communities in Sierra Leone and thus help policy makers to take the right decisions in the future. Your community may not be directly benefitting from RREP. There are minimal risks to you from answering these questions. If you experience distress over the nature of some of the questions, you are free to skip any question that makes you feel uncomfortable.

We cannot promise that you will receive any benefits from participating in this study. The information we collect today is private and confidential. We will not share any personal details from the survey with anyone besides the research team. No names will be stored with survey responses and no names will be published from the study. Only evaluation team will have access to any data that could potentially identify you. Your responses will be numbered and the code linking your number with your name will only be available to the research team. Confidentiality Disclaimer: "Evaluators will keep your information confidential to the extent possible and allowable by law."

If at any time and for any reason, you would prefer not to answer any questions, please feel free not to. If at any time you would like to stop participating, please tell me. We can take a break, stop and continue a bit later, or stop altogether. You will not be penalized in any way for deciding to stop participation at any time. Declining will not affect chances of receiving an intervention or change your status with organizations. Ending participation at any time for any reason will not have any negative consequences. Refusal to answer any individual questions will not have any negative consequences. There are no correct or incorrect responses, so please express your opinions freely.

If you have any questions regarding this research or your rights as a research study participant, you may contact us at the phone number: Field Coordinator Gibrilla James, 077965679 or 076203569. If you have any questions about your rights as a participant in this research, you can contact the following Office of the Sierra Leone Ethics and Scientific Review Committee at the Ministry of Health and Sanitation, Directorate of Planning and Information, Fifth Floor, Youyi Building, Freetown, email: efoday@health.gov.sl. You can also contact Maarten Voors, contact for Principal Investigators of this study, maarten.voors@wur.nl and/or Hur Hassnain, the Lead Evaluator, hassnainh@unops.org and/or call Abu Jalloh, the Feedback and Monitoring Officer at +232-30914084.

May we have your permission to ask these questions, and would you be willing to participate?

Q#	Question	Answer	Comments
S1	PERSONNEL		
1	How many employees work in this CHC?	Integer	<i>When we say work, we mean people working on the CHC more than 4 hours per day.</i>
2	How many employees work in each position?	1. Nurse 2. Doctor 3. TBA 4. Midwife 5. Volunteer helper 6. Lab technician 7. CHO (Community Health Officer) 8. Maternal Child Health Aid 9. SECHN (State enrolled community health nurse) 95. Other 98. Refuse to answer 99. Don't know	
3	How many of these employees are female?	Integer	
4	How many of the employees are male?	Integer	
5	How many of these employees have a disability?	Integer	<i>Disability can be defined as condition that restricts everyday activities (can include impairments in vision, hearing, speech, nervous system, among others)</i>
Note	<i>Let me now ask you some questions about the CHO at this hospital:</i>		
6	How many years of experience does [CHO] have?	Integer	
7	What is the highest level of education the [CHO] has?	0. None 1. Primary 2. Secondary 3. SECHN training (State enrolled community health nurse) 4. MCH-Aid training 5. SRN training 6. CHO training 7. Public health training 95. Other 98. Refuse to answer 99. Don't know	

8	Is [CHO] a full-time paid employee?	0. No 1. Yes 98. Refuse to answer 99. Don't know	<i>*A full time employee is employed for at least 30 hours a week or 130 hours of service per month</i>
9	Think about yesterday, how many hours did [CHO] work at the CHC?	Integer	<i>* If yesterday was holiday, Sunday or non-working day, ask about day before yesterday</i>
10	Think about the day before yesterday, how many hours did [CHO] work at the CHC?	Integer	
11	Think about three days ago, how many hours did [CHO] work at the CHC?	Integer	
Note	<i>Let me now ask you some questions about the Head Nurse at this hospital:</i>		
12	How many years of experience does [HEAD NURSE] have?	Integer	
13	What is the highest level of education the [HEAD NURSE] has?	0. None 1. Primary 2. Secondary 3. SECHN training (State enrolled community health nurse) 4. MCH-Aid training 5. SRN training 6. CHO training 7. Public health training 95. Other 98. Refuse to answer 99. Don't know	
14	Is [HEAD NURSE] a full-time paid employee?	0. No 1. Yes 98. Refuse to answer 99. Don't know	<i>*A full time employee is employed for atleast 30 hours a week or 130 hours of service per month</i>
15	Think about yesterday, how many hours did [HEAD NURSE] work at the CHC?	Integer	<i>* If yesterday was holiday, Sunday or non-working day, ask about day before yesterday</i>
16	Think about the day before yesterday, how many hours did [HEAD NURSE] work at the CHC?	Integer	
17	Think about three days ago, how many hours did [HEAD NURSE] work at the CHC?	Integer	

S2	EQUIPMENT/DRUGS		
Note	<p><i>Thanks for telling me about the people working in this health centre. Now I want to know a little more about the equipment and drugs you have available here.</i></p>		
1	<p>Do you have any of the following equipment?</p> <p><i>Equipment that use electricity</i></p>	<ol style="list-style-type: none"> 1. Freezer 2. Refrigerator 3. Blood bank 4. Blood pressure machine (rechargeable) 5. Digital scales 6. Ultrasound equipment 7. Glucose monitor 8. Ventilator/respirator 9. Desktop computer 10. Washing machine 11. X-ray machine 12. Re-animation machine 13. Air conditioning 14. Patient monitor 15. Breathing controlling 95. Other 98. Refuse to answer 99. Don't know 	<p><i>* Do not select the equipment unless the respondent shows it to you</i></p>
2	<p>[For each selected equipment] Is [EQUIPMENT] working?</p>	<ol style="list-style-type: none"> 0. No 1. Yes 95. Other 98. Refuse to answer 99. Don't know 	<p><i>* Enumerator to test it with electricity</i></p>
Note	<p><i>Thanks for showing me the equipment you have in the health centre. Now, I will ask you to show me some of the drugs you have access to.</i></p>		
3	<p>If you have any drugs available at the moment in the CHC, please note them here</p>	<ol style="list-style-type: none"> 1. Antimalaria 2. ORS 3. Antibiotic 4. Metronidazole 5. Penicilin Injections 6. Ibuprophene 7. Paracetamol 8. Quinine Tabs 95. Other 98. Refuse to answer 99. Don't know 	<p><i>* select multiple</i></p>
4	<p>Which of these drugs are stored in freezer or refrigerator?</p>	<ol style="list-style-type: none"> 1. Antimalaria 2. ORS 3. Antibiotic 4. Metronidazole 5. Penicilin Injections 6. Ibuprophene 7. Paracetamol 8. Quinine Tabs 	<p><i>* Select multiple</i></p>

		95. Other 98. Refuse to answer 99. Don't know	
Note	<i>Now I will ask you about the vaccines that are administered in this CHC</i>		
5	Is there an immunization calendar that people should follow?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
6	Which types of vaccines do you administer in this CHC?	1. OPV0 2. BCG 3. 1st DPT 4. 1st OPV 5. 2nd DPT 6. 2nd OPV 7. 3rd DPT 8. 3rd OPV 9. Pneumococcal 10. Rotavirus 1 11. Rotavirus 2 12. IPTi1 13. IPTi2 14. IPTi3 15. IPV 16. Yellow Fever 17. MCV 1 18. MCV 2 95. Other 98. Refused to answer 99. Don't know	<i>* Select the ones that apply</i>
7	Which of these are stored in refrigeration?	1. OPV0 2. BCG 3. 1st DPT 4. 1st OPV 5. 2nd DPT 6. 2nd OPV 7. 3rd DPT 8. 3rd OPV 9. Pneumococcal 10. Rotavirus 1 11. Rotavirus 2 12. IPTi1 13. IPTi2 14. IPTi3 15. IPV 16. Yellow Fever 17. MCV 1 18. MCV 2 95. Other 98. Refused to answer 99. Don't know	
8	Which of these are stored in freezers?	1. OPV0 2. BCG	

		3. 1st DPT 4. 1st OPV 5. 2nd DPT 6. 2nd OPV 7. 3rd DPT 8. 3rd OPV 9. Pneumococcal 10. Rotavirus 1 11. Rotavirus 2 12. IPTi1 13. IPTi2 14. IPTi3 15. IPV 16. Yellow Fever 17. MCV 1 18. MCV 2 95. Other 98. Refused to answer 99. Don't know	
9	How is medical equipment decontaminated, cleaned before it is sterilized? Record all steps as applicable	1. Brush scrubbed with soap and water 2. Soaked in disinfectant 3. Cleaned with soap and water without scrubbing 4. Dry heat sterilization 5. Autoclave 6. Steam 7. Boiling 8. Chemical method 9. Sent out to be sterilized 10. Equipment is not sterilized 11. There is no medical equipment to sterilize 95. Other 98. Refuse to answer 99. Don't know	
S3	SERVICES / AVAILABILITY		
1	In the past month, what has been the official opening hours at this facility during weekdays (Monday – Friday)	From _____ to _____ 95. Other 98. Refused to answer 99. Don't know	<i>*Official means as determined by Sierra Leonean government authorities</i> <i>*Opening hours: Facility must be physically open with at least one medical professional in attendance</i>

	In the past month, what has been the official closing hours at this facility during weekdays (Monday – Friday)	From _____ to _____ 95. Other 98. Refused to answer 99. Don't know	<i>*Closing hours: Facility must be physically closed with no medical professional in attendance</i>
3	Is this facility open during weekends (Saturday AND Sunday)?	0. No 1. Yes 95. Other 98. Refused to answer 99. Don't know	
4	What are the working hours during weekends?	From _____ to _____ 95. Other 98. Refused to answer 99. Don't know	
5	In the last four weeks, how many full days (0-28) was the facility closed during the regular scheduled hours for each of the following reasons?	Write number of days: 00 for no days closed due to that reason or 95 or 98 or 99 1. Visiting villages for outreach activities 2. Supervising other facilities 3. Treating patients in their own home 4. Attending a meeting 5. Working in another public facility 6. On holiday 7. Submitting returns to DHMT (District Health Management Team) 95. Other 98. Refused to answer 99. Don't know	<i>*Closed: Facility must be physically closed AND/OR no medical professional in attendance</i>
6	Is there someone available to open the CHC 24-hours in case a patient comes for a visit during off hours?	0. No 1. Yes 95. Other 98. Refuse to answer 99. Don't know	
7	How many patients did you have in 2018? Enumerator: Ask this data by month and aggregate it. CHC should have records.	Integer	
8	How many patients did you have in 2018?	Integer	
9	How many of the patients in 2018 are male?	Integer	
10	How many patients are NEW patients in 2018?	Integer	

11	How many NEW patients in 2018 are male?	Integer	
12	How many patients have you had so far in 2019?	Integer	
13	How many of the patients in 2019 are male?	Integer	
14	What is the average waiting time for consultation for patients in this health facility?	<i>Time in hours and minutes.</i>	<i>*Enumerator Note: Once patients enter the facility, how much time do they have to wait till they are attended to?</i>
S4	ENERGY AVAILABILITY / USAGE		
1	Does the CHC have access to electricity?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
2	What is the source of electricity?	1. On grid (connected to the local utility grid) 2. Off grid or UNOPS mini grid 3. Stand-alone solar 4. Generator 95. Other 98. Refuse to answer 99. Don't know	<i>*On-grid (means electrical power system network comprised of generating plant, the transmission lines, substation, transformers, distribution lines and consumer) *If #1 = Yes</i>
3	How many days in the past month have there been blackouts in the CHC?	Integer	Explain blackouts as powercuts
4	How many hours of electricity per day did the CHC have on an average in the past month?	1. <1 hour 2. 1-3 hours 3. 3-5 hours 4. 5-10 hours 5. 10-15 hours 6. 15+ 98. Refused to answer 99. Don't know	<i>* If #1 = Yes * Per energy source</i>
5	How much does the CHC spend for electricity per day (from any source selected above)?	Integer 95. Other 98. Refuse to answer 99. Don't know	<i>* Per energy source</i>
6	What type of issues do you face with electricity supply?	1. Power cuts 2. Wire/maintenance problems 3. Voltage issues (not enough power) 4. Never face problems 95. Other	

		98. Refuse to answer 99. Don't know	
S5	SATISFACTION AND HEALTH FACILITY PERFORMANCE		
Note	<i>I will now ask you questions about your personal satisfaction and opinions about the health facility. Remember that this information is private and confidential and only the Research Team will have access to it</i>		
1	How satisfied are you with the physical facilities (buildings, equipment) at the facility you work in?	1. Very satisfied 2. Somewhat satisfied 3. Somewhat unsatisfied 4. Very unsatisfied 95. Other 98. Refuse to answer 99. Don't know	
2	Over the last 6 months, to what extent has the quality of the facility changed?	1. Much worse 2. Little worse 3. No change 4. Slightly better 5. Much better 95. Other 98. Refuse to answer 99. Don't know	
3	What are the main challenges/constraints/problems that your facility faces in health service delivery? Do not prompt answers	1. Inadequate funding / budget 2. Not enough authority to influence decisions 3. Lack of skilled staff 4. Staff shortages (not enough number of people) 5. Lack of community mobilization skills 6. Poor clinic management 7. Deficient equipment and drugs 8. Poor infrastructure/building 9. Poor staff quarters 10. Difficult to reach 11. Lack of electricity 12. Lack of clean water 13. Illegal practitioners 14. Late or no payments of personnel 95. Other 98. Refuse to answer 99. Don't know	<i>*select multiple</i>
S6	CONDITION OF BUILDING AND GENERAL OBSERVATIONS		
Note	<i>After you have completed the interview, assess the condition of the</i>		

	<i>building and answer the following questions based on your own observations.</i>		
1	Is the floor swept with no obvious dirt or waste?	0. No 1. Yes 95. Other 98. Refuse to answer 99. Don't know	<i>Note: For instance, if the area cluttered with broken equipment, papers or boxes scattered around untidily, then answer would be a NO.</i>
2	What is the material of the floor?	1. Mud 2. Wood 3. Cement or tiles 95. Other 98. Refuse to answer 99. Don't know	
3	What is the material of the walls?	1. Mud brick 2. Wood 3. Cement 95. Other 98. Refuse to answer 99. Don't know	
4	Are the walls reasonably clean?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
5	What is the material of the roof?	1. Thatch / straw 2. Corrugated iron / zinc 3. Cement 4. Plastic sheets / tarpaulin 95. Other 98. Refuse to answer 99. Don't know	
6	What was the smell in the health facility?	1. Clean, disinfected 2. Fairly clean 3. Unclean, dirty 4. Very unclean and musty 95. Other 98. Refuse to answer 99. Don't know	

Annex 3: Stakeholder Mapping

Category	Stakeholders	Engagement Objectives
Government of Sierra Leone	<ul style="list-style-type: none"> - Ministry of Energy (MOE) - Parliamentarians - Civil servants - Parliamentary committees - Sierra Leone Energy and Water Regulatory Commission (SLEWRC) 	<p><i>Inform national policy on:</i></p> <ul style="list-style-type: none"> - Subsidies and tariffs - Grid expansion - Private sector growth - Poverty reduction
Development Projects in Sierra Leone	<ul style="list-style-type: none"> - SOBA 3 - UNOPS' implemented Rural Renewable Energy Project - European Union-funded PRESSD project with WHH, Energy for Opportunity (ENFO), IBIS and COOPI 	<p><i>Inform projects on:</i></p> <ul style="list-style-type: none"> - How to improve entrepreneurship in Sierra Leone through increased access to productivity enhancing technologies - How to reduce poverty through grid and mini grid expansion
Policy Actors and Donors in Sierra Leone and Beyond	<ul style="list-style-type: none"> - DFID - Centre for Economic and Social Policy Analysis (CESPA) - USAID's Power for All - Power Africa - Tony Blair Institute (TBI) - International Growth Centre (IGC) - The World Bank - The European Union - The European Development Bank 	<p><i>Inform national and regional policy on:</i></p> <ul style="list-style-type: none"> - Subsidies - Grid expansion - Private sector growth - Poverty reduction
Private Sector	<p>Sierra Leone-based solar and power solutions organisations including:</p> <ul style="list-style-type: none"> - Renewable Energy Association of Sierra Leone (REASL) - West Africa Offgrid (WAO) - Easy Solar - BBOX and others - Microfinance Banks - Cross Boundary and Rockefeller Foundation Mini Grid Innovation Lab 	<p><i>Inform companies on:</i></p> <ul style="list-style-type: none"> - Consumer willingness to pay for productive technologies - Sales and marketing strategies based on new market data - Consumer income generation data - Refinement on investment and pricing strategies
Global Academic and Research Institutions	<ul style="list-style-type: none"> - Jameel Poverty Action Lab (JPAL) - Centre for Effective Global Action (CEGA) - Innovations for Poverty Action (IPA) 	<p>To further energy transition, poverty reduction</p>
Consumers	<ul style="list-style-type: none"> - Sierra Leonean entrepreneurs and farm households - Household not yet connected to the grid 	<p><i>Provide recommendations through partners on how to:</i></p> <ul style="list-style-type: none"> - Increase income through access to productive technologies - How to make productive use of electricity



GOVERNMENT OF SIERRA LEONE
Office of the Sierra Leone Ethics and Scientific Review Committee
Directorate of Training and Research
5th Floor, Youyi Building Brookfields, Freetown
Ministry of Health and Sanitation

15th May, 2019

To: Dr Niccolo Meriggi
Development Economics Department
Wageningen University
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Principal Investigator

Study Title: Impact Evaluation of the Rural Renewable Energy Project

Version: 08 May 2019

Collaborating Institutions:

- Wageningen University
- International Growth Centre
- Yale University
- University of California, Los Angeles

Submission Type: First protocol version submitted for review

Committee Action: Expedited Review

Approval Date: 14 May, 2019

The Sierra Leone Ethics and Scientific Review Committee (SLESRC) having conducted an expedited review of the above study protocol and determined that it presents minimal risk to subjects, **hereby grants ethical and scientific approval for it to be conducted in Sierra Leone**. The approval is valid for the period, **14 May, 2019 – 13 May, 2020**. It is your responsibility to obtain re-approval/extension for any on-going research prior to its expiration date. The request for re-approval/extension must be supported by a progress report.

For further enquiries please contact: efoday@health.gov.sl



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Review Comments:

- **Amendments:** Intended changes to the approved protocol such as the informed consent documents, study design, recruitment of participants and key study personnel, must be submitted for approval by the SLESRC prior to implementation.
- **Termination of the study:** When study procedures and data analyses are fully complete, please inform the SLESRC that you are terminating the study and submit a brief report covering the protocol activities. Individual identifying information should be destroyed unless there is sufficient justification to retain, approved by the SLESRC. All findings should be based on de-identified aggregate data and all published results in aggregate or group form. A copy of any publication be submitted to the SLESRC for its archive.


Professor Hector G. Morgan
Chair

For further enquiries please contact: efoday@health.gov.sl

Annex F: Knowledge Management Plan

A priority of this research project is to ensure that the findings are effectively shared with the relevant stakeholders, and inform decision making that leads to reducing (energy) poverty in Sierra Leone and beyond. The main anticipated outcome of our research project is to improve both the quality of, and access to, evidence that will enable development actors to understand how electrification can bring economic development. Specifically, we aim to provide evidence to our stakeholders that will help determine:

- a) The most inclusive and effective strategies to expand the grid and mini grids to achieve meaningful development and poverty reduction
- b) Whether existing or planned grid expansion strategies may in fact be detrimental to social welfare and inclusive poverty reduction

While we value the independent quality assurance and global profile that comes with publishing our findings in peer-reviewed journal articles, we understand that this alone will not be the most effective way to engage with our primary stakeholders in Sierra Leone. We will repackage our evidence to communicate our research clearly to our audiences through a variety of different means, including:

- A brief research summary to share findings with non-specialist audiences
- Infographics to disseminate through established social media channels, designed in such a way that they will be shared beyond the existing followers led by the UNOPS Communications Team.
- Lessons learned paper

Qualitative Data Collection WP2 Baseline: Protocols of Implementation

Key Informant Interviews (KII) were conducted with 13 people, including the three mini-grid operators and key actors from Education, Energy, Environment Control and Health Authorities. KII were administered to respondents with large experience and first-hand information on the related topics relevant to the evaluation. KII included some of the primary stakeholders of the programme, as their insights and opinion are very much needed to adequately evaluate the impact of the intervention.

Focus Group Discussions (FGDs) were conducted to gain additional information on the different outcome domains that cannot be grasped in quantitative data, and sharpen and enhance insights into impact pathways and to assess the quality of the intervention. Additionally, due to the social dynamics of FGDs, they are useful instruments to provide insights into sensitive topics and cultural norms and dynamics. This helps understand possible changes in gender roles resulting from the intervention, including shifts in decision-making, household food-security and nutrition, division of workload and control over income and assets.

1. Selection of Respondents

A. KIIs

Ministry and Operators

Both the Head of Renewable Energy and Energy Efficiency and the Monitoring and Evaluation (M&E) Manager of the Ministry of Energy were interviewed for this evaluation. Their views were sought because they are both highly involved in the supervision of the RREP project and are thus well-positioned to offer an overview. Furthermore, interviews were conducted with the three mini-grid operators of the sites – Winch Energy, PowerGen (formerly Off-Grid Power) and Energiciti (a subsidiary of Ghana-based Blackstar). Interviews with both Winch Energy and Energiciti were conducted over the phone, since their representatives were in the US and the UK respectively at the time of the interviews.

Schools and CHCs

During WP2 baseline survey activities, KIIs with Health Officers and School Principals/Head Teachers were conducted across the four administrative regions of Sierra Leone. The communities were selected to be geographically, demographic and socio-culturally diverse as to be representative of the country's population, and it was made sure that interviews were not conducted on the same day as the survey activities as to not exhaust respondents. In CHCs, in 3 out of 4 cases the respondent was CHO, while in the last case the CHO was not around and instead an SECHN was interviewed. The same was the case for schools, where one of the interviews was conducted with a volunteer teacher instead of the Head Teacher. Within each village a school was chosen randomly or according to whether there was staff around at the time of arrival. This resulted in only primary school staff being interviewed. An overview of KII dates, districts, respondent role and gender is given in the partial transcripts.

B. FGDs

4 FGDs were conducted, one in each of the geographic regions. Again, communities were chosen to be representative of the population, thus mostly overlapped with the communities for the KIIs. Each FGD was conducted with about eight respondents for a total of 33 respondents, since one of the FGDs had 9 respondents because the paramount chief was present at the time of the discussion and was believed to be able to provide valuable insights to the discussion. In three out of four FGDs, there was also an interpreter external to the participants present. Respondents included, insofar as possible, the following:

- Town Chief (1)
- Mammy queen (1)
- Youth leader (1)
- Community elders/Traditional authorities (3) (including pastors or Imams)
- Business owners, users of the medical facility or members of PTAs.

2. Protocols of Fieldwork Conduct and Questionnaires

A. KII

Ministry and Operators

In-depth semi-structured interviews with the Head of Renewable Energy and Energy Efficiency and the Monitoring, Evaluation (M&E) Manager of the Ministry of Energy were conducted in person. Those respondents signed an informed consent form and agreed to have the interviews tape-recorded. While an interview guide was followed (Annex 1) the interviewer adopted a conversational approach, asking follow-up questions on aspects that while not outlined in the interview guide, naturally arose from the discussion. Notes were taken with pen and paper to create a visual bond with the interviewees. Similarly, the interview with PowerGen was conducted in person after obtaining the informed consent of the participant and followed an interview guide (Annex 2) but also asked for further clarifications on other issues not included in the guide. Interviews with Winch Energy and Energiciti were conducted over the phone. A consent form was read to both interviewees and sent via email, and was duly signed and returned. These interviews were also recorded and notes were taken on a laptop for speed. The same interview guide used for PowerGen was also used for Energiciti and Winch Energy.

Schools and CHCs

Informed consent was obtained by all respondents, as well as permission to record the interview. Interviews were conducted in English. Notes were taken on a laptop to speed up the note-taking process and limit distraction of participant (as opposed to taking handwritten notes) and testimonies were captured as much as possible in people's exact words, written in first person. The interviews had a semi-structured nature, based on an interview guide (Annex 3 and 4) while following a natural flow of conversation, resulting in discussion of topics not included in the guide as well. Interviews took between 25 and 45 minutes.

FGDs

FGDs were conducted during WP2 baseline survey activities. Town Chiefs were notified a day in advance and were asked to contact all required participants as well as an interpreter. When all

participants were gathered, they were asked to sit in a circle as to minimize the perceived distance between facilitator and respondents. Informed consent was obtained from all FGD participants, as well as permission to be recorded. FGDs were assisted by an interpreter who was asked to translate the questions and answers from English to local languages. A roster of participants was filled in on paper, including names, occupation and gender, but names were not included in laptop-written notes and the sheet with names was left at the FGD location. Same as during the interviews, a guide was followed (Annex 5) while allowing for deviations. The facilitator monitored and guided the participants through the topics and questions to be covered, making sure all participants had contributions, actively intervening in case participants overruled others and probing for reactions from 'quieter' participants. Extended notes were taken on a laptop, in first person and in respondents' exact words insofar as possible. FGDs lasted between 60 and 90 minutes.

3. Data Analysis

After having conducted the interviews and focus groups, notes were reviewed, edited and expanded as soon as possible. Voice recordings were used to detect gaps or misinterpretations. This resulted in partial transcripts. Thematic analysis was conducted on these transcripts using the qualitative data analysis software Atlas.ti. This included breaking up the text into smaller parts by coding meaningful units and comparing these units across the interviews to detect themes and derive conclusions.

4. Problems

A. KIIs

In one case the Head Teacher was not present so the interview was conducted with one of the volunteer teachers, who had less of an idea about topics such as student attendance and could not provide insights into teacher attendance. In other cases interviews got interrupted because of school children disturbing the interview by entering the room or being noisy.

Interviews with Winch Energy and Energiciti were conducted over the phone. This meant that at times the connection was not very strong and some parts of the conversation were disturbed. Interviewees were asked to summarise what they had said whenever the connection was lost but some spontaneous reflections might have been lost as a result.

FGDs

Focus Groups were sometimes chaotic, in that it took long to gather all the (needed) participants, to seat everyone in a way that everybody could hear each other and to get participants engaged to start the discussion. Moreover, in some cases not all respondents were around so replacements had to be found on the spot. For example, not in all cases were there three community elders present. Another issue is that participants sometimes left in the middle of the discussion due to other obligations, this happened in two cases. The need for interpreters also brings certain challenges, for example, in some cases they started answering the questions instead of only translating. In one case, the interpreter was also a respondent, making him less neutral, which might bias the interpretation of answers given by the other respondents.

Annex 1: Interview Guide Ministry of Energy

General Information

- 1) In your view, what are some of the constraints on Sierra Leone's economic growth?
 - a. Is limited access to electricity one of them?
 - b. If yes, how so?

- 2) Is access to electricity problematic in Sierra Leone?
 - a. Is it more problematic in rural communities or in cities?
 - b. How many rural communities do you think do not have access to electricity overall? Are there more rural communities that have access to electricity or that don't have/have very limited access to electricity?
 - c. Does access to electricity in rural communities vary from North to South, East to West of Sierra Leone?
 - d. What areas are most challenging in terms of access to electricity? Why are these areas more challenging?

- 3) Do you think that vulnerable groups such as women and young people are more affected by limited access to electricity? If so, in what way?

Economic Growth

- 4) Do people in rural communities generally live of subsistence farming?

- 5) What are some of the problems, if any, that limited access to electricity poses to rural communities in terms of farming?

- 6) What effects could an increase in access to electricity have on the agriculture in rural communities?

- 7) Which other occupations, other than farming, do men have in rural communities? What about women?

- 8) What are some of the obstacles that people in communities encounter in setting up a business?
 - a. Is access to electricity one of them?

9) Do you think that increased access to electricity will increase trade? How so?

Health

10) What are some of the most common diseases affecting people in rural communities?

11) Where do people from rural communities go if they need medical attention?

a. Do most communities have a community health centre?

b. Do those community health centres usually have electricity?

c. What are some of the challenges that health centres that do not have electricity face in providing appropriate healthcare?

d. Are there any medicines that must be stored in fridges?

e. How do those communities that have limited access to electricity store these medicines safely?

12) Do people in rural communities usually have access to vaccines?

f. Who provides these vaccines?

g. Where do people in rural communities go to get vaccines?

h. Are there any vaccines that must be stored in fridges? How do those communities that have limited access to electricity store these vaccines safely?

13) Are there any challenges in terms of receiving appropriate healthcare that women face more than men? And young people more than adults?

14) In communities that do not have access to electricity what do people cook with?

a. Do you know if there are any side effects to using charcoal stoves?

b. Do you think that this affects women more than men?

Education

15) Do you think that increased access to electricity will improve education outcomes? How so?

16) In some rural communities school attendance is quite low. What are some of the reasons for this?

a. Is limited access to electricity one of the reasons?

- b. In what way does scarce access to electricity impact on school attendance?
 - c. Are boys skipping school more than girls? If so, why?
- 17) Do teachers also miss school sometimes? What are some of the reasons for this?
- a. Is limited access to electricity one of the reasons?
 - b. In what way does scarce access to electricity impact on teachers' attendance?
 - c. Are female teachers missing school more than male teachers? If so, why?

CO2 Emissions

- 18) In communities that do not have access to clean electricity, what are some of the alternatives that community people use?
- a. Does the use of generators have an impact on the environment?
 - b. What are the alternatives to using generators in communities that do not have access to electricity?
- 19) What are some of the steps undertaken by this government to increase access to clean electricity?
- 20) What are some other effects that this project could produce?

Project collaboration

- 21) The United Nations Office for Project Services (UNOPS) is implementing a US\$40+ million Rural Renewable Energy Project (RREP). Could you tell me more about this project?
- a. What goal is the project set to achieve? How is it planning on doing so?
 - b. How many will directly benefit from this project? Will more people benefit from this project indirectly?
 - c. What role does the Ministry of Energy play in this project?
- 22) How has your collaboration with UNOPS been? Is there anything that you would like to change in the future?
- 23) For this project, do you work with the three private sector operators involved in the RREP at all? If yes, what is your collaboration like? Is there anything that you would like to change in the future?

- 24) What are the Ministry's plans for the future of the project?
- 25) How will the Ministry of Energy ensure the sustainability of this project?
- a. Will the Ministry set aside funds for the maintenance of the mini-grids?
 - b. Will the Ministry appoint a focal person to ensure the sustainability of the project in the future?
 - c. What other plans does the Ministry have for the sustainability of the project?

Annex 2: Interview Guide Grid Operators

General Information

- 1) Is access to electricity problematic in Sierra Leone?
 - a. How many rural communities do you think do not have access to electricity overall? Are there more rural communities that have access to electricity or that don't have/have very limited access to electricity?
 - b. Does access to electricity in rural communities vary from North to South, East to West of Sierra Leone?
 - c. What areas are most challenging in terms of access to electricity? Why are these areas more challenging?

- 2) How do you choose in which communities to install mini grids usually?

- 3) What are some of the issues that you have witnessed in communities that do not have access to electricity?

Challenges in Installing mini-grids

- 4) What are some of the technical challenges that you encounter in installing mini grids in rural communities?
 - a. How difficult are those to solve?

- 5) How do community authorities and residents react when you install mini grids?

- 6) What are some of the expectations that communities have when you install mini grids?

- 7) How aware are people about connection fees/the costs that they will incur if they want to benefit from the mini grid?

- 8) What do communities expect as access to electricity increases?

- 9) At what stage of the process are you with WP2?
 - a. What is the current state of financing for WP2?
 - b. At what stage of the construction are you?

- 10) Are you satisfied with how the preparation for WP2 is going?
- 11) What are some of the challenges you are facing in implementing WP2?

The project

- 12) The United Nations Office for Project Services (UNOPS) is implementing a US\$40+ million Rural Renewable Energy Project (RREP). Could you tell me more about this project?
 - a. Where is the project being implemented?
 - b. What goal is the project set to achieve? How is it planning on doing so?
 - c. How many will directly benefit from this project? Will more people benefit from this project indirectly?
 - d. What role do you play in this project?
- 13) What is the impact that you are hoping this project will have?
 - a. What effects could this project have on agriculture in rural communities?
 - b. What effects can it have on businesses?
 - c. On health centres?
 - d. On schools?
 - e. Do you think that this project will increase trade? How so?
 - f. Do you think that this project will reduce CO2 emissions? How so?
 - g. What are some other effects that this project could produce?
- 14) Who selected the communities where you will install the mini grids? Why were these selected?
- 15) Will all members of the communities where you are installing the mini grids benefit from the project equally or will only a few people have access to electricity? Do you think it will affect people with different types of occupations differently? Please explain.
- 16) Do you think that women and men will benefit from access to electricity differently? If yes, in what ways?

Progress of WP1

17) In phase 1 of the project (Work Package 1, WP1), how many communities were provided electricity? And health centres?

- a. Which communities were provided electricity?
- b. Which health centres?
- c. Did you meet your target of communities and health centres during the implementation of WP1?

18) In the communities targeted in WP1, have you observed an increased use of electricity? Please explain.

19) In what ways, if any, are communities in WP1 benefitting from increased access to electricity from your observations?

- a. What effects is increased access to electricity having on agriculture in the communities targeted in WP1?
- b. What effects is it having on businesses?
- c. On health centres?
- d. On schools?
- e. Do you think that access to electricity is increasing trade in those communities? How so?
- f. Do you think that increased access to electricity is reducing CO2 emissions in the communities in WP1? How so?
- g. What are some other effects that access to electricity is producing?

20) Are all members of the communities where you have installed mini grids in WP1 benefitting from the project equally or are only a few people having access to electricity? Do you think access to electricity is affecting people with different types of occupations differently? Please explain.

21) Do you think that women and men are benefit from access to electricity differently in WP1 communities? If yes, in what ways?

22) Are you satisfied with how WP1 is going? What are some of the achievements you are most proud of?

23) What are the major challenges you have faced in implementing WP1?

24) What lessons can be learned from the implementation of WP1? What could be improved in the future?

Project collaboration

25) How has your collaboration with UNOPS been? Is there anything that you would like to change in the future?

26) How has your collaboration with the Ministry of Energy been? Is there anything that you would like to change in the future?

Future Plans

27) What is your business model? With whom do you currently implement your projects?

28) With whom are you thinking of implementing projects in the future?

29) What are your commercial plans for the future?

30) Is there any specific project/business you are planning to start/implement to increase the commercial viability of your operations?

31) Is there any exciting/innovative project that you are planning on implementing in the future?

Annex 3: Interview Guide CHC

CHC general information

- 1) How many people work in this facility?
- 2) Does the CHC currently have access to electricity?

Quality of health care provided

- 3) In your opinion, what are the characteristics of a good health clinic?

Discuss qualified staff, infrastructure (safety, fire safety), quality of care provision (waiting times, number of patients treated), availability of appliances, cold chain, drug availability, vaccine availability, opening hours, light, records kept, distance to nearest PHU

- 4) What do you think about the quality of this clinic at the moment?
- 5) In what ways would the quality of the clinic improve if it gets access to electricity?
- 6) What sort of diseases are most prevalent in the community?
- 7) How well do you feel your clinic is able to deal with these diseases?
- 8) How can access to electricity help in dealing with these diseases?

Women's and children's health

- 9) What sort of health issues do women, specifically, usually visit this clinic for?
- 10) How well do you feel this clinic is able to deal with these women's health issues?
- 11) What sort of health issues do babies and children have in this community?
- 12) In what ways can access to electricity help in dealing with these issues?

Health seeking

- 13) For what types of diseases do adults visit traditional healers before visiting the CHC?
- 14) For what types of diseases do adults take their children to traditional healers before visiting the CHC?

Annex 4: Interview Guide School

General school information

- 1) How many people work in this school?
- 2) Does the school have access to electricity?

Quality of education

- 3) In your opinion, what are the characteristics of a good school?

Discuss qualified staff, infrastructure (safety, fire safety), number of students per class, availability of appliances, availability of learning materials, sanitation, cancellation of classes, number and organisation of shifts, light, records kept

- 4) What do you think about the quality of this school at this moment?
- 5) How do you feel the quality could be improved?
- 6) In what ways would the quality of the school change if it gets access to electricity?

Student attendance

- 7) How often does an average student miss school?
- 8) What are the most common reasons for students skipping school?
- 9) How do you think improving the quality of the school as discussed before would impact student attendance?
- 10) Do you think students are better able to study better when there is access to electricity?
- 11) Do you think having access to electricity would change student performance?

Teacher attendance

- 12) How often do teachers miss school?
- 13) What are the most common reasons teachers miss school?
- 14) How do you think improving the quality of the school as discussed before would impact teacher attendance?

Annex 5: Focus Group Discussion Guide

FGD Participants Roster

Position	Abbreviation	Main Occupation	Gender	Consented to being recorded
Town Chief				
Mammy queen				
Community elder/traditional authority				
Community elder/traditional authority				
Community elder/traditional authority				
Youth Chairman				
Business owner/PTA member/..				
Business owner/PTA member/..				

Income and Assets

- 1) If your community gets electricity, how do you think this can improve agricultural production?
- 2) If you think about the last harvest of rice/cocoa/coffee/cassava, where you able to sell any of these products in the market?
- 3) Think about a typical couple in this community. They have 4 children. Two boys (age 6 and age 11) and two girls (age 4 and 9). They live under the same roof and eat from the same pot. They are a typical family that is busy with agricultural activities in this community.
- 4) Do some members of the household get more or less to eat than others?

- 5) If your main occupation is not growing crops, what other types of occupations do people have in this community? (list of businesses in the community) What types do men have, what types do women have?
- 6) Do you think these opportunities will change when electricity comes? How?
- 7) Imagine you want to open a business. What are possible obstacles in doing so?
- 8) Is there any financial assistance available when trying to open a business?
- 9) Typically, what would your average day look like? Describe in detail (M/F).
- 10) How could access to electricity impact these activities?
- 11) Who is responsible for caring for the children?
- 12) Think of a couple in the community where the husband helps with caring for the children and the wife works outside the home. What kind of reputation does each of them have in the community?
- 13) Think of appliances people might have at their homes, such as a fan, a fridge, a radio, or cooking utensils. How many of you have a fan/fridge/radio?
- 14) If your community gets access to electricity, which of these would you buy first? And next?
- 15) Imagine a husband/wife wants to buy a freezer/fan/.. How easy or difficult would it be for him/her to buy [appliance] without his wife's/her husband's support?

Health

- 16) Think of health problems people in this community can have. What are characteristics of a good health clinic in dealing with these problems?
- 17) Does the clinic in this community meet any of these characteristics?

- 18) (How) Do you think the clinic would improve if it got access to electricity?
- 19) If you are feeling sick, where do you usually seek treatment? For what types of diseases would you go to traditional healers/herbalists? For what types would you go to the health centre?
- 20) What about when your children are sick?

Education

- 21) Should all children be sent to school?
- 22) Until what grade should they go to school?
- 23) What are possible reasons to end their education before attaining that grade?
- 24) Under what conditions would some of the children do paid work? And work in the home?
- 25) In what ways could access to electricity help children with their education?

CO2 Reduction

- 26) Think about the following products: diesel/petrol, batteries, kerosene and charcoal.
- 27) To meet the needs of these products for the past two weeks, how much would Abdul and Aissata have spent on each of them?
- 28) What type of cooking stoves are typically used in this community?
- 29) If there was an alternative to these stoves, who would decide on buying a new stove?

Final notes:

Executive summary

This report was compiled drawing from interviews conducted with the Ministry of Energy, the three mini-grids operators, representatives from schools and CHCs in four communities across the different regions of Sierra Leone, and with four times eight residents from treatment communities in focus group discussions. The first part gives an outline of general findings from the interviews and focus group discussions conducted, while the second part looks at what expectations those interviewed have for WP2 within the four domains – household and income assets, healthcare, education and CO2 reductions. It finds that:

- Sierra Leone's development is hindered by limited access to energy. It is estimated that only 15-18% of people in the country have access to electricity, and 2% in rural areas.
- According to the mini-grid operators, the east and north of the country are likely to have more issues in accessing electricity due to population distribution and different value chains.
- All three grid-operators say that they are in the permitting and leasing stage of WP2 and that they are satisfied with how the preparation for WP2 is going.
- Among challenges faced, the time necessary to pass regulations and obtain land leases are common to all operators.
- All mini-grids operators are also worried they will not be able to maintain low costs and ensure quality for both WP2 and WP1.

Progress with WP1

- Overall, community authorities and residents in treatment communities are happy with the building of mini-grids, however, there are concerns on over-surveying and long delays in between project phases. Residents in control communities complain about being excluded from the project.
- Residents in WP1 community feel tariffs to connect are too high and feel that mini-grid operators do not engage with local authorities to listen to their complaints.
- WP1 communities have not started using very large amounts of electricity yet. Among those who did start benefiting from electrification, most have used it either for entertainment purposes or to store cold drinks to sell.
- The collaboration between UNOPS, the Ministry of Energy and the mini-grid operators has been good, but can be improved in terms of communication on pricing and instalment of power assets.

Outcome domain: Household Income and Assets

- Electrification could improve agricultural production in a number of ways, most importantly the following: establishment of storage facilities and cooling rooms for crops, meat and fish, as well as rice mills, processing machines, drying facilities and irrigation systems, resulting in opportunities for income generation due to longer shelf life of food products.
- Electrification could generate a range of new business opportunities, most importantly the sales of cold drinks. Other business opportunities relate to food catering, cattle rearing, food processing such as fruit juice shops, entertainment centres where football games or movies can be broadcasted, barbering, tailoring printing and scanning shops, discos and bars.
- Residents in WP2 communities have general expectations that electrification will generate investment opportunities.
- Residents in WP2 villages aspire to acquire new appliances for home use after having access to electricity, including freezers, televisions, AC and fans.

Outcome domain: Improved Health

- CHC staff agree that the most important indicators of a good healthcare system are infrastructure, drug availability, electricity, water and sanitation, qualified staff and security. Most of those were not currently met by CHCs.
- The greatest impact that access to electricity could have in the CHCs is to provide light, which could replace the use of phone or torch lights. Those require charging or batteries, which are expensive and can run out mid-procedure.
- Light could also allow staff to attend to patients after dark, and most especially for those coming to the clinic at night to give birth or receive treatment after a road accident.
- Better lighting could mean that CHC staff will be able to detect childbirth complications earlier and treat them or refer the patient to the regional hospital when the problem ensues. This could thus lead to lower maternal and infant mortality.
- Staff could be incentivised to perform well and stay in the clinic if electrification is provided because they would feel more comfortable, secure and protected from thieves. They could also use the electricity to charge their personal electric appliances, which could be used to call an ambulance if needed.
- Electrification could facilitate the usage of equipment such as blood pressure machines, which could improve diagnoses of common diseases. HB machines, oxygen plants and vacuum extractors would improve child deliveries.
- Freezers would allow safe storage of vaccines and drugs, while microscopes would enable treatment of complicated malaria or TB cases.
- Staff believe communities would be more inclined to seek treatment in the CHC after electrification. However, some community members say that they would still go to traditional healers before going to a CHC for certain types of diseases such as oedema, STIs and HIV.

Outcome domain: Education

- School staff agree that the most important indicators for the provision of quality education are decent infrastructure (space, classrooms, electricity), availability of water and sanitation, qualified and certified teachers and learning materials. Most of those are not currently met.
- Electrification would allow students, especially those whose parents cannot afford to buy batteries for torchlights, to go to schools during evenings to read and study and allow the set-up of a library in the school.
- Electrification would allow the introduction of different appliances in schools, such as televisions, laptops and printers, as well as photocopy machines, laminating machines and printers. Especially televisions are believed to provide opportunities for alternative learning methods to develop. However, there is scepticism on the extent to which these appliances could actually be used.
- Having light in schools could improve security and deter thieves from breaking into schools and stealing learning materials or registers.
- Overall, electrification was expected to make it more comfortable for students and teachers to go to school, although the above mentioned problems still deter teachers from attending.
- The main reasons for student absenteeism is children working in the home or on the farm during school time, occurrence of traditional events in the community, migration and parent's unfavourable attitudes to education.

Gender dynamics

- Respondents at the Ministry of Energy and mini-grid operators feel electrification could have stronger effects on women than on men, since women carry out the majority of domestic unpaid work and benefit strongly from the introduction of electricity-powered appliances such

as washing machines, electric stoves, microwaves and refrigerators. This could lead women to engage in income generating activities.

- Women are usually deemed responsible to take care of children, men only step in in case their wife is sick, busy or visiting family.
- There is a general consensus among respondents that women can work outside the home as long as it benefits the household in terms of income generation and as long as the woman is known to be serious and trustworthy. However, for some male respondents it is deemed unacceptable for a woman to do work outside the home.
- Respondents report that decisions on the purchase of electricity-powered assets are always negotiated between husband and wife and that none of them can make decisions by themselves. However, for women to buy a certain appliance, she would usually require explicit permission of the husband.

Outcome Domain: CO2 reduction

- Community residents say that spending for two weeks' worth of batteries is around 16,000 SLL. Those are used for torchlights or other appliances such as radios. Spending for oil to power the generators is around 50,000 SLL, assuming powering a freezer and light bulbs.
- Firewood is the preferred method for cooking, charcoal being perceived as only for the rich.
- Community members feel that female petty traders would benefit from electric stoves as they could run their business while cooking at the same time. However, one of the mini-grids operators says that it is quite rare for communities to use electricity for cooking, if not with microwaves, which usually only rich people have.
- The most important CO2 reductions would be a result of many gensets being taken offline, with people using solar power instead. Gensets use a large amount of fossil fuel, with more fuel being used to transport it to those communities.
- While there are initial CO2 emissions in building the mini-grids, if the system is well maintained large savings in carbon emissions would ensue.
- There are large electrical commercial and technical losses from wire transmission infrastructures – fuel is burnt without the energy being used.
- Traditional lamps used in these communities, which use kerosene, are polluting but also harmful and dangerous.

Qualitative Data Collection WP2 Baseline: Results

This document starts by outlining general findings from interviews with all key informants as well as focus group participants on the progress of WP2, as well as the progress of WP1. Next, findings for each of the outcome domains of the RREP are discussed.

The Ministry of Energy and the three mini-grid operators said that one of the main constraints on Sierra Leone's development is limited access to energy. It was estimated that only 15-18% of the country currently have access to electricity, with only 2% of the population in rural communities having access to some form of electricity. The same respondents also said that the east and north of the country are likely to be more problematic in terms of access to electricity. According to one of the operators, this is largely dependent on population centres – since there are more people living closer to the coast, in the northwest and in the south than there are in the northern districts, this has caused some concentration of where the energy access is. Additionally, this might also be related to the differences in value chains in each area, which might affect access to electricity and the usage that is made of it.

With regards to WP2, all three grid-operators said that they are in the permitting and leasing stage of the process. One of the operators expressed concern over attracting funding to the project due to scepticism on the part of funders who do not trust that people in rural communities will be able to pay for their electricity usage, despite evidence showing otherwise. Another said that some of the mini-grid sites had ongoing land leases issues and could not yet go forward with the installation on them but was otherwise ready to commence installation for WP2. The same respondents said they were satisfied with how the preparation for WP2 is going, albeit admitting that they face some challenges. Among those, one of the obstacles operators face concern regulations, which often take a long time to be approved and slow down the process. Additionally, balancing costs as private companies and keeping low tariffs while ensuring quality was often raised during the interviews as a concern for both the construction of the mini-grids for WP2 and for the implementation of WP1.

“Communities have expectations, we set expectations, the government has expectations that we move fast, despite the fact that the entire system isn't moving faster. [T]here's a disconnect between those and the realities of what everyone is bringing to the table.” –
Energiciti

Progress with WP1

Reflecting on WP1, private sector operators said that community authorities and residents are generally happy and excited when mini-grids are built in their communities, with electricity representing such a big change in their lives. The Ministry of Energy, however, noted that often times, the residents of nearby communities where mini-grids are not being installed complain and enquire about why they have been excluded from the project. Another issue that was raised by one of the mini-grid operators was that there is a long delay between the first time developers visit each community to inform them of the project and the completion of the installation of the mini-grids, which could require up to two years. This could mean that the communities may be “less enthusiastic” about the project, having grown impatient over time. In addition, there might also be a tendency to over-survey

these communities throughout the process, which could lead to fatigue. Nonetheless, the installation seems to be perceived as a form of desirable development and as a way of generating local jobs.

While the mini-grids operators thought that communities were aware of the connection fees and the costs that they will incur if they want to benefit from the mini grid, according to the Ministry of Energy, customers in WP1 are complaining that they are paying too much and tariffs are too high. This was raised as an issue, in addition to the fact that mini-grid operators do not engage with the local authorities to listen to their complaints, by both the Head of Renewable Energy and Energy Efficiency and by the M&E manager. All mini-grid operators said they were concerned about tariffs and costs and were somewhat aware that some customers might feel like the costs for enjoying the electricity are too high. One operator said that they were worried that there might be political pressure on the tariffs, which in their view would make the project unsustainable. Another operator also noted that they thought UNOPS and DFID should provide more subsidies so as to lower the tariffs for community residents.

“In some areas, these operators... you can buy credit and after two days you finish this credit. There are a lot of other issues currently experienced by customers, they are calling us, explaining the challenges. Even writing letters.” – Ministry of Energy

While the project is still very young, mini-grid operators identified some trends in WP1 communities. The main one is that those communities have not necessarily started using a very large amount of electricity yet, but the operators believe this is normal and might require some time. Among those who did start benefiting from the electrification in their area, they mostly use it either for entertainment purposes, such as power for televisions and sound systems, or to store cold drinks to sell. However, according to one operator, the latter sometimes presents issues because the freezers that are bought are used ones that consume a very large amount of electricity and are very inefficient, which might make it harder for people to keep up on their bills, might discourage some people from utilising the mini-grids and lead them to go back to gensets.

“In at least one of our communities from WP1 someone got a freezer and now sells cold drinks. Now you have a little restaurant forming. It’s a business and it’s a simple one at first but it’s one that may blossom and add economic value to the town.” – PowerGen

Another aspect that was discussed in the interviews was the collaboration between UNOPS, the Ministry of Energy and the three mini-grid operators. All respondents were happy about UNOPS’ leadership, particularly in creating an enabling environment and liaising with the different parties to ensure that the project runs smoothly. Two of the mini-grids operators had reservations over the decision of UNOPS to install the power assets in WP1 rather than subsidising the developer, who could have used the subsidy to build their own technology. This, in their view, slowed down the process, given that they were often not satisfied with the way the assets were installed and had to go back and forth to fix some of the issues. This problem should be resolved in WP2, where the developers will be responsible for installing the power assets – from civil works to procurement and construction. Regarding the collaboration between the mini-grid operators and the Ministry of Energy, the operators said that in spite of the “poor bandwidth” of the Ministry of Energy and its occasional delays and oversights, the collaboration has been good. One operator noted that the Ministry of Energy often

seemed unengaged and that email communication was not always smooth. On the other hand, the Ministry of Energy seemed to be quite diffident of the three mini-grid operators, especially with regards to the calibration of the meters.

“We want UNOPS to provide us certain equipment so that we can do the calibration of these meters at random to ensure that these tariffs that these people are paying for are actually based on this.” – Ministry of Energy

Outcome Domain: Household Income and Assets

Agricultural production, non-agricultural activities and household asset ownership were addressed in FGDs. When discussing how electrification could impact agricultural production, most respondents emphasized their need of storage facilities and ‘cooling rooms’ for their crops as well as meat and fish. Having light in storage rooms would prevent rats from eating crops, and having freezers or refrigerators would enable storage of a range of products (rice, cassava leaf, cucumber, tomato, pear, mango, eggs, fish, chicken, beef). Without these facilities, respondents said they had to throw away large amounts of leftover meat due to rotting. Cold storage and ensuring that products do not spoil and have a longer shelf-life was also one of the main benefits that the project would have according to both the mini-grid operators and the Ministry. Thus respondents emphasized earning opportunities from being able to store products and sell them over time instead of having to sell all products fresh and throwing the rest away. Moreover, it could also be a way to ensure that more people have access to healthy food, including in schools.

Another benefit identified was mechanised and electrified solutions that can improve yields such as the mechanical processing of food. An example was milling, which is typically done using gensets today but could become cheaper and cleaner if done with electricity powered by solar. Additionally, one grid operator discussed mechanised irrigation, which may increase the number of crops that one community member could work on at one time.

“You have a refrigerator where you can keep your peppers and you can keep your produce for longer, you can take it to markets and you can make more money for them instead of just selling them to your local places.” – Ministry of Energy

“There’s a statistic that half of the food in Africa rots in the field. I would assume that there’s more that rots in the value chain. But wherever it is spoiling with cold storage it won’t as quickly and therefore it will feed more people.” – Energiciti

During the FGDs, issues related to food security were discussed. Respondents reported engaging in mixed farming as much as possible as to reduce crop dependence. When asked how food is divided among household members, respondents had varying answers. While some suggested the lion's share would go to the elderly, the husband or the son, others claimed the children and women would always have priority since they are home most often and are unable to provide food for themselves if the husband does not provide them with anything. Others swore that whatever amount of food there is available, it would always be shared equally.

Respondents identified a range of new business opportunities that electrification would bring. Having freezers and refrigerators was mentioned most often as an opportunity enabling sales of cool water, ginger beer and other drinks. This was mostly perceived to be beneficial to women, since the majority of them are petty traders. With regards to the effects that this project could have in terms of new businesses, the Ministry and the three mini-grid operators agreed that the most obvious ventures will be the storing of cold drinks and fish in freezers for sale.

Electricity would also enable preservation of prepared food, meat or fish, which would allow caterers and cattle rearers to work more efficiently, gain more income and new businesses to open. In relation to cattle rearing, respondents also mentioned how having freezers would enable storage of vaccines for cattle, and vaccinate without hesitation about whether the vaccine is still effective. Respondents suggested that one person could invest in a refrigerator or freezer and that others would be able to rent fridge space. Moreover, according to respondents processing facilities could be set up, allowing production of fruit juice. Another recurring business opportunity was the set-up of entertainment centers, where owners would buy a TV and show football games or movies.

Others aspired to open a barbing shop which could be opened in the evenings, so that daily farm work could be combined with additional income generation. Other shop types were shops for electric appliances and maintenance, like phone chargers, pharmacies, laundry centers and tailoring shops. The Ministry of Energy and the three mini-grid operators also said that businesses that might start, in their view, include discos and bars, printing and scanning shops and barbers that use hair clippers. Those are all activities that might already exist in these communities and possibly rely on gensets, or home solar systems, but that they think will be cheaper, more profitable and cleaner following the installation of the mini-grids. Furthermore, FGDs participants suggested community gatherings, trainings or workshops could also be organized during evenings, as well as social activities or sports games.

There was also a general expectation by residents that having electricity would attract investment opportunities, although it was not very clear how. This was confirmed by one mini-grid operator who observed that as the profile of the community rises due to the electrification, there is an expectation among residents that more investment into their community will follow. This is somewhat justifiable according to another mini-grid operator who suggested that the government could use those communities as development hubs to which good roads can be built since there would be a reason people would want to go to that community.

Ownership of and aspiration for appliances were discussed during FGDs as well. For women, most either already owned or aspired to buy a freezer or refrigerator, to sell cold drinks or prepared food. All respondents said they would like to have a television, either for personal use or to open an entertainment centre. One of the respondents also mentioned electric stoves and kettles, since preparing breakfast for her children in the morning was very time consuming and sometimes would result in the children being late to school. Other recurring appliances were fans and AC. In some cases, (amplifiers for) musical instruments/musical equipment and electric stoves were mentioned as well. Most participants did not own any of these.

Outcome Domain: Improved Health

KII with health staff in CHCs and FGDs shed light on the following topics: what users perceived as indicators of good clinic quality, how they perceived quality of their own facility, how they believed it would change after electrification, how well staff is able to treat the most common health problems, perceptions on how treatment could change after electrification and health seeking by residents in the community.

The most important indicators of good health care delivery according to CHC staff were infrastructure, drug availability, electricity, water and sanitation, qualified staff and security. Most of these requirements were not met. Other problems related to lack of mobility, availability of (working) equipment, cleanliness, lack of accommodation for staff, lack of certified staff members and incentives for volunteer staff, and lack of financial capacity to buy drugs in times of shortages, to pay for transport in case of outreach or to buy fuel for a generator.

The greatest impact that access to electricity can have in the CHCs lies in the provision of light. Without electricity, staff need to use phone lights or torch lights requiring batteries which they cannot afford to buy. Light also enables the conduct of routine treatments after dark and causes the CHC to stay open 24 hours a day. This was found to be most impactful for treatment of patients coming in from road accidents or for child deliveries.

“Minor surgeries that we do could be done during the night as well. We do these when people come in from road accidents, abscesses or hysterectomies. If we could do these patients would not have to travel as far.” - CHC Staff Member in Bo District

Regarding deliveries, one of the respondents mentioned sometimes torch lights batteries would expire in the middle of a delivery forcing them to conduct it in the dark. Allowing staff to see better also implies complications during childbirth can be detected more easily and staff can either take prompt action on time if they are able to deal with the complications, or refer the case to the regional hospital earlier. This could thus lead to lower maternal and infant mortality. One staff member said:

“In the night hours, sometimes we have night deliveries so with light we would be able to see when women are giving birth. If we don't have light, how are we supposed to work? There's also equipment that needs electricity. For example, HB machines to check the level of blood or microscopes. For now we need to use only sunlight.” - CHC Staff member in Koinadugu District

However, some of the respondents during FGDs mentioned that they felt that they were sometimes being referred to the regional hospitals while they should not have been.

Electrification could also provide incentives to staff to stay in the clinic and do well, since staff mentioned having light would make their quarters more comfortable, they feel more secure and protected from thieves, and electricity would enable them to use and charge electric appliances like personal computers or mobile phones. The latter would also imply the clinic is connected with the outer world and able to call an ambulance in case a patient needs to be moved to the regional hospital.

The Ministry of Energy also noted the staffing in the clinics is a problem in communities where there is no reliable electricity because most of the staff deployed there come from larger cities and find it very difficult to stay and work if there is little comfort and no access to electricity.

KIIs also showed electrification could allow the use of equipment that would improve treatment of common health problems. According to staff freezers would allow safe storage of vaccines and drugs (footnote: note that for drugs, staff reported only oxytocin was stored in refrigeration. Other drugs kept by CHCs do not in fact require refrigeration, although they are sometimes found to be kept in fridges still). For child deliveries, staff mentioned HB machines, oxygen plants and vacuum extractors would allow them better to deal with certain problems instead of referring patients to another hospital. Microscopes would enable treatment of complicated malaria or TB cases. Anecdotally, one of the mini-grid operators said that in one of the clinics they power in Ghana a woman's life was saved because of an ultrasound, which would not have been possible without electricity. Other machines mentioned included blood pressure machines, desktops that could be used for data entry and analysis and incinerators for safe trash disposal.

Staff believed residents in the CHC catchment would be more inclined to seek treatment in the CHC after electrification. Especially during nighttime, not having light was perceived as an impediment for patients to come, especially those who need to travel a further distance on a motorbike, and women. However, people seeking treatment with traditional healers for certain types of diseases such as oedema, malaria and especially STIs and HIV, as well as beliefs in witchcraft as explanation for these diseases were perceived as persistent factors for people not seeking health care in the CHC. Indeed, FGDs confirmed residents prefer seeking help from traditional healers before going to the CHC for some cases, such as fractured legs or oedema. In other cases respondents reported first seeking treatment in the CHC and only moving to the traditional healers when they did not see improvement or feel as if the CHC staff is not invested in the case. One female respondent said:

“My child from time to time shouted and acted scared. I took the baby to the hospital and they could not diagnose any sickness. When I brought it to the traditional healer the child was healed.” - FGD Respondent

Sensitization for these issues and outreach activities were commonly reported by staff.

Outcome Domain: Education

KII with Head Teachers/Principals and FGDs addressed indicators of good quality schools, how staff perceived quality of their own school and how they believed it could change after electrification, and possible reasons for low student and teacher attendance rates.

Important indicators of good quality schools as perceived by staff were qualified, certified and motivated teachers, availability of learning materials, good infrastructure (sufficient space and classrooms, state of the building) and water and sanitation. Other factors mentioned were accessibility of disabled students in the school, availability of staff quarters, transport facilitation to school, availability of sports fields, having electricity, security and the provision of meals for students. Teachers

were mainly unhappy with the state of the buildings, the lack of sufficient learning materials, overcrowding of classrooms, lack of water and sanitation, lack of trained and qualified teachers.

According to the respondents, having electricity would allow students to come to the schools in the evenings, especially during the rainy season, and study there due to the availability of light. This would benefit students whose parents cannot afford to buy batteries for torchlights to read and study at home, as well as teachers when they want to read teaching materials. This would also allow the set-up and use of a library in the school. Also a number of appliances could be introduced, such as televisions, which could be used to show pictures or the news. Respondents thought this would incentivize students to pay attention better because it implies more variation in teaching methods. Moreover, it would improve their English language skills. However, it was not always clear how respondents would use televisions for learning purposes. While two of the mini-grid operators agreed that schools would benefit from access to electricity because they would be able to use laptops and projectors, the third said that they were unconvinced that that was actually the case:

“Many grid developers will say: “We provide electricity so that communities can use laptops and computers”, but I think the reality of the situation is that if we provide electricity to a school, the school doesn't have much disposable income, so they use the electricity for lighting and phone charging and don't necessarily go out and buy laptops. I think that is potentially a little bit of a myth.” – Winch Energy

Furthermore, having light in schools would improve security and deter thieves from breaking into the school and stealing learning materials or registers. Respondents also mentioned they would like to learn how to work with computers and teach this to students as well. For the Head Teacher, a personal computer would help with data entry on supplies of textbooks, student lists etc. Other machines mentioned were photocopy machines and laminating machines, as well as printers which could be used to print out exams. Respondents also mentioned having a freezer would enable provision of cold drinks to students and would facilitate provision of lunch. More generally, electrification was perceived to make it more comfortable for students to come and for teachers to stay in the schools, because of the availability of light and possibility of charging appliances like phones. FGD participants confirmed having light in the schools could encourage their children to study there at nighttime.

When asked about student attendance rates, most respondents said student attendance was high. Reasons for not attending school mentioned were distance to school (especially during the rainy season), sickness, parents moving to another town and the occurrence of traditional events in the community. Some respondents also said parent attitudes were problematic, because some of them do not believe in education and do not care to help the students do their homework. Especially in the months April, May and June students whose parents are farmers would start doing farm work one day a week, and during the rest of the year students also work at home sometimes to carry water or food or take care of younger children. Teachers believed having a more attractive environment in the schools could help incentivize students to attend school.

Teacher attendance was perceived to be mostly dependent on the teacher's status (volunteer or certified). Volunteer teachers miss school more often because of trainings and because their motivation is lower. Respondents perceived finding qualified and motivated staff as a big problem.

Furthermore, distance to school and availability of accommodation and allowances for teachers were found to deter teachers from attending school. The Ministry of Energy voiced the concern that in communities where there was no access to electricity not many qualified teachers would be willing to teach, resulting in mostly unqualified teachers holding lessons in rural communities. Furthermore, one mini-grid operator said that from their experience in Ghana, even those qualified teachers who teach in rural communities, will tend not to live in that community if it does not have access to electricity. It follows that they will live in nearby towns so they can have electricity at night, partly for comfort and partly because they will need light at night to prepare lessons. This in turn may lead to a much higher level of teacher absence, which has a significant impact on the education of children in rural communities.

Gender dynamics

It is worth noting that both the Ministry of Energy and the mini-grid operators felt that this project is of great importance to the development of Sierra Leone, not only with regards to the four outcomes set out by UNOPS but also in terms of gender equality. All those respondents, in fact, agreed that scarce access to electricity affects women more than men, since women carry out the majority of the domestic unpaid work, which could be substituted by electronic appliances such as washing machines, stoves, microwaves and refrigerators. Better electrification in rural communities could thus play a considerable part in reducing the burden on women in terms of domestic work, which in turn may allow them to embark on profitable enterprises.

Regarding time use and division of work load, the FGDs showed an unequal division of work in the home. Although some male respondents reported to take up to 50% of the care of children, women were always perceived as being responsible for them, implying they have to cook their meals, prepare them for school, wash and iron their uniforms and take care of them when coming home from school. One of the (female) respondents said:

“Among us there is understanding that caring for children is normally women’s business. So if you see a man taking responsibility of children he will not be taken very seriously.” - FGD Participant

In most cases men reported to only help take care of the children in case their wife was sick, too busy, visiting her elders or if there was a marital conflict. In other cases, however, responsibilities were shared as to ‘keep the peace in the household’. Women were deemed responsible to take care of the husband when he gets home after farming, while the majority of them reported being involved in petty trading during the entire day already. Concerning food security, while women were usually reported to be the breadwinners, men were deemed responsible to bring food to the table on a daily basis. When discussing whether it is acceptable for a woman to do work outside the home, for example in another community, opinions were divided. For most of the respondents, a woman could work outside the home as long as she is providing income for the family and if she has a good reputation (some terms used were ‘a sober minded person’ and ‘a serious person’). In some cases a house maid would be hired to take care of the children while she works. Others preferred their wife to stay home altogether, because she needs to take care of the children. In discussing decision-making on household assets, most respondents said decisions were always negotiated between wife and husband. Some

women reported to have bought a fridge from their own money when their husband did not support them in buying one. In other cases, men clearly had the final word in this type of decision and it was emphasized that a wife could only convince her husband by talking to him 'very politely'.

Outcome Domain: CO2 reduction

FGDs provided information about energy consumption and cooking facilities. Respondents used batteries mostly for torchlights and sometimes for other appliances such as radios. Spendings for two weeks' worth of batteries were reported to be around 16,000 SLL, which was perceived as a high amount. Spendings on oil, for those with a generator, would go up to 50,000 SLL, assuming powering a freezer and light bulbs requires 5 liters of fuel per day with an oil price of 10,000 SLL per liter.

Most of the respondents reported using firewood for cooking purposes, as charcoal was perceived as being only for rich people. Those who did use charcoal reported spending 15,000 SLL on one bag, which would last for between 1 and 2 weeks. For cooking purposes, mostly cold pots or pots made from clay were used. Clay pots cost around 20,000 SLL and cold pots 35,000 SLL, and can be used between five and six months. Respondents mentioned that having an electric stove would make it easier for female petty traders to run their business while cooking at the same time, since the stove could be put near the business area. However, one of the mini-grids operators explained that they do not expect clean cooking to have an important impact in the reduction of CO2 emissions, as it is quite rare to see electricity being used for cooking, if not with microwaves, which usually only relatively wealthy people have.

Important CO2 reductions, in the operators' views, will be seen as a number of gensets are taken offline, with people opting to use solar power instead, which is also cheaper. One operator explained that while there are initial CO2 emissions that come with the construction of the mini-grids, in the long run, if the system is well maintained there will be a very large saving in carbon emissions. In fact, if the amount of fossil fuel that is used to operate gensets is added to the fuel that is used to transport it, the offset could be enormous. Simultaneously, according to the same operator, the electrical commercial and technical losses from wire transmission infrastructures are very high, which means that a large amount of fuel is being burnt without the energy being actually used. The Ministry of Energy also noted that community residents also use traditional lamps – a piece of cloth soaked in kerosene and then lit – that emit smoke which is not only polluting but also harmful and dangerous.

“At the moment we are using kerosene. That not only impacts the environment, it's also very dangerous in some of these communities. A lot of people burnt houses and these are because of these kerosene lamps. The kerosene falls on the floor and there you go, there's hardly any water to wash it off.” – Ministry of Energy

Recommendations

Recommendations for RREP stakeholders were developed based on the findings of this report.

1. UNOPS:

To

- a) Better explain neighbouring (control) communities, what the purpose of the project is and that while they have not been selected for electrification for the pilot, they can benefit indirectly and in the future
- b) Communicate with communities with regards to what they can expect from the project in terms of support they will receive so as to better manage expectations (e.g., no street lighting will be provided)
- c) Subsidise tariffs to ensure that communities can truly benefit from the project

2. Government/Ministry of Energy

To

- a) Improve communication with operators and ensure leases are granted in a timely manner
- b) Prioritise sensitization policies on the importance of seeking appropriate healthcare rather than traditional medicine
- c) Provide schools and clinics with additional support and equipment so that electricity can truly be utilised at its best
- d) Incentivise qualified teachers to work in rural communities and decrease barriers for them to attend school, such as distance from the school
- e) Support women in the transition towards the labour market in order for them to really benefit from electrification
- f) Ensure that tax policies are conducive to renewable energy use (i.e. prioritising subsidies for renewable energy over fossil fuels)

3. Mini-grid operators

To

- a) Increase transparency on tariffs towards project beneficiaries and engage with the Ministry of Energy on the calibration of prices
- b) Improve communication services for clients to address questions and complaints

4. Researchers in the design and implementation phases of renewable electrification interventions

To

- a) Combine electrification efforts with appliance subsidies for the following types of equipment: drying facilities, refrigerators, processing machines, rice mills, irrigation systems etc.
- b) Develop a strong understanding in terms of which appliances can benefit women in particular, as well as to provide additional support in how they should use or fix appliances
- c) Take into account the trade-offs in terms of costs of connecting to the renewable source and costs of non-renewable energy sources