



**Rural Renewable Energy Project (RREP) in Sierra Leone**

**Midline Impact Evaluation Report**

**Work Package 1**

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# 1. Executive Summary

## 1.1 Project Background

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 USD40+ million Rural Renewable Energy Project (RREP). RREP – funded by the UK Foreign, Commonwealth & Development Office (FCDO)<sup>1</sup> – is an ambitious electrification project that aims to provide access to off-grid solar electricity in up to 94 communities in Sierra Leone. RREP implementation is being conducted in multiple phases; this report provides the Midline impact evaluation of the first project phase, Work Package 1, consisting of 54 mini-grids across 12 of Sierra Leone's 16 districts.

## 1.2 Methodology

This report uses data collected during the Baseline (2019) and Midline (2021) surveys, to assess the short run results of RREP's Work Package 1. To evaluate the impact of the RREP on key development outcomes, we compare a representative sample of households in RREP communities (communities where mini-grids have been installed) with a representative sample of households in statistically similar communities where no mini-grid was installed. The mini-grids in RREP communities became operational between late 2019 and early 2020, after the June 2019 Baseline data collection. Since then, in RREP villages, 60 percent of baseline respondents got connected to the mini-grid. We can thus also assess the impact of taking a connection. Health centres in RREP communities were electrified before the Baseline survey was conducted.<sup>2</sup>

Comparison communities were selected using Propensity Score Matching (PSM), a statistical method used to help select similar communities. For details on this process, see the Sampling Methodology (Annex O) and [Section 3.7](#). Prior to electrification, the RREP and comparison communities were on average similar on many key metrics of interest. However, some differences remain. For example, at baseline the RREP communities had higher levels on some wealth indicators, such as total livestock ownership and ownership of electrified assets. To account for such baseline differences, we use a difference-in-differences estimation strategy, comparing the changes in RREP and non-RREP communities over time, rather than looking at a simple differences across these types of villages. This estimation strategy is described in detail in Methodology [Section 3.7](#). That section also presents example figures and tables which describe how difference-in-differences results can be interpreted.

The data collection for this Midline report was conducted between March 22nd and April 14th, 2021. Annexes B and C contain a map and timeline of the survey implementation. At that time, the Covid-19 pandemic posed an on-going risk to enumerators, respondents, and other community members. Strict precautions were taken to prevent any infection, including multiple PCR tests for all field personnel, hygiene kits distributed to enumerators, and repeated safety briefings. For a detailed accounting of Covid-19 risks and precautions, see [Section 3.1](#) and Annexes F, G, and I.

## 1.3 Main Findings

In comparing the data from the Baseline and Midline surveys, we found that households in RREP communities are beginning to benefit from electrification. There were high connection rates to the RREP mini-grids: 60.1 percent of respondents in RREP communities were connected to the mini-grid, and CHCs using RREP

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<sup>1</sup> Formerly the UK Department for International Development (DfID).

<sup>2</sup> Of the 54 health clinics in Work Package 1, 50 were electrified in 2017, and the remainder in 2018. For all clinics in our sample, we collect administrative data covering the period before and after electrification.

mini-grids had reliable access to electricity: 90.1 percent received more than ten hours per day of electricity. We observe some first order effects of electrification on the transition from more traditional sources of energy to the (cleaner) electricity produced by the mini-grids and having higher access to light in [Section 4.2](#), as well as on investments in certain electrical assets such as freezers that have really significant productive uses in [Section 4.5](#). However, this high utilization has not yet led to large shifts in our key indicators. As detailed in [Sections 4.3](#), we found that rice harvested and sold in RREP communities increased relatively faster than in comparison communities from Baseline to Midline. We did not find significant changes for other crops. In [4.4](#), we present evidence suggesting that households in RREP communities were more likely to be wage employed than households in comparison communities. [Sections 4.5](#) and [4.6](#) present our findings on assets and consumption. These results indicate that comparison communities are "catching up" with RREP communities in the number and type of assets and livestock they own, as well as in their food consumption.

[Sections 5](#) and [6](#) present our findings from the school and CHC surveys, respectively. Every CHC in an RREP community has access to electricity, but many schools are yet to be electrified. These sections, as well as the qualitative report in [Section 7](#), provide evidence that electrification will greatly improve the ability of CHCs and schools to perform their functions. CHCs were much more likely to have light at night, which assuages a common complaint among staff at un-electrified CHCs. Schools in RREP communities had significantly higher school attendance compared to the comparison communities, which may lead to improved educational attainment and test scores for these students in the future.

The benefits of rural electrification take time to manifest. However, these intermediary results from the Midline survey are promising. We conclude in [Section 8](#) by offering recommendations to UNOPS and other stakeholders for how best to improve the implementation of the RREP moving forward.

## 1.4 Results

The data summarized in this section were derived from a representative sample of 2,797 households across the 54 RREP and 54 comparison communities in Sierra Leone who were interviewed at Midline. Of this sample 1,534 respondents were in RREP communities. Not all of the respondents surveyed during Baseline were available for the Midline follow-up: 383 households had either moved away or dissolved, and 39 households did not consent to participate in the follow up. These 422 households represented a 13.6 percent attrition rate from the Baseline sample. As discussed in [Section 3.5](#), attrition was slightly higher within RREP communities: 56.2 percent of attrition occurred from communities with an RREP mini-grid.

### 1.4.1 Energy Access and Use

As of May 2021, all WP1 RREP communities had a mini-grid installed and operational for at least 7 months. The varies by community due to the staggered electrification date of RREP communities, some sites had been electrified for longer, up to 21 months.<sup>3</sup>

Of the 1,407 respondents in RREP communities who were surveyed in 2021, 846 respondents (about 60 percent) were connected to the mini-grid in their community. The typical connection fee was SLL150,000; 90.0 percent of connected households paid this amount to be connected. On average it was the more wealth households that invested in getting connected to the mini-grid. Compared to households that are not connected to the mini-grids in the same communities, connected households were at baseline:

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<sup>3</sup>The first WP1 community to be electrified was Bumpah Town, Bo, in July 2019. The most recent was Kukuna Town, Kambia, in October 2020. Source: UNOPS

- More likely to have a male household head
- Have relatively more adults living in the household
- More likely to be self-employed
- Own more electrical assets (e.g. freezers, mobile phones, radios, electric fans, stereo systems, televisions, etc.).
- Spend more on food and are less likely to be skip meals.<sup>4</sup>

To assess the impact of electrification, we conduct our analysis on two levels: first, we compare respondents in RREP communities as a whole to those in comparison communities. Second, we assess the impacts for connected households in RREP communities.<sup>5</sup> By focusing on households which are connected to the mini-grid, these results provide more direct insight into the effects of mini-grid access.

In rural Sierra Leone, household CO<sub>2</sub> emissions come almost entirely from lighting and cooking. Prior to electrification (at baseline), the primary lighting sources were battery-powered lamps and solar lanterns for 90 percent of respondents, with 1.8 percent respondents reporting the use of diesel generators. Energy used for cooking was primarily through either firewood or charcoal for 99 percent of respondents prior to electrification. RREP community residents are quickly transitioning from more traditional fossil fuel energy sources to mini-grids. We find that respondents in RREP communities change energy use: households in RREP communities are more likely to have access to light and less likely to use diesel generators for lighting. The same holds when we restrict the analysis to connected households. Connected households are also less likely to cook with charcoal and more likely to cook using energy from the mini-grid.<sup>6</sup>

However, it will take time for this transition to have a substantial impact on the environment (e.g. reduced CO<sub>2</sub> emissions) and livelihoods (e.g. allow people to adopt more “productivity enhancing technologies”). We do not yet see a significant reduction in the use of other high-emissions energy sources, such as kerosene or firewood for both cooking and lighting. This is not surprising so soon after electrification: the energy transition to “cleaner technologies” requires time and investment in information and other marketing/financing strategies. Cleaner appliances for lighting and cooking can be expensive, and the investment necessary represents a substantial hurdle for cash-strapped households. Should appliances for cleaner lighting and cooking become more abundant/accessible and get cheaper (possibly through temporary subsidization), uptake should increase if evaluated over a longer duration of time [9].

To assess the impact of electrification, we focus on four questions within the key domains of change.<sup>7</sup>

1. How does increased access to electricity affect incomes and assets?
2. How does increased access to electricity affect the incidence and severity of certain health conditions?
3. How does increased access to electricity affect education?
4. How does increased access to electricity affect CO<sub>2</sub>e emission?

<sup>4</sup>All of these results are statistically significant. See Table 3 in Section 4.1.

<sup>5</sup>The second form of analysis, called the local average treatment effect, is discussed in more detail in the Methodology section, Section 3.7.

<sup>6</sup>See Table 4 in Section 4.2.

<sup>7</sup>See Section 4 of Annex A for details on the domains of change.

## 1.4.2 Income and Assets

Agriculture is central to the rural economy. On average, respondents spend more time working on their farms than any other activity.<sup>8</sup> More than 80 percent of all households were engaged in agriculture. Of these households, 85 percent grew rice and cassava, the main staple crops in Sierra Leone. In [Section 4.3](#), we analyze agricultural activity in detail.

While the majority of households farm, a substantial minority also work in non-farming self-run businesses or in formal wage employment. Summary data on these activities are presented in [Section 4.4](#). The most common self-run businesses were petty traders. About one-third of self-run businesses required electricity to operate; the most common uses of electricity in business were for lighting, freezers, and televisions.

In the period between the Baseline and Midline surveys, we did not observe substantial changes in labor and income due to RREP. Given the short timeline and the disruptions to business activities across all communities caused by the Covid-19 pandemic, it is not surprising that few effects are observed at this early stage.

An important finding however, is that households in RREP communities sowed and harvested, but did not sell, more rice on average than comparison households. This is the only crop for which there were significant changes in agricultural behavior. This could be indicative of the fact that they are not as income constrained as non RREP households and hence are not induced to sell their rice harvests for additional income. There is some evidence that access to wage employment may be removing income constraints and enabling households in RREP villages to hold onto their rice harvests

Among the agricultural indicators considered for this evaluation, we found that rice sowed and harvested is significantly higher for households in RREP villages, and households connected to the mini-grid. We did not observe a significant difference between households in RREP and comparison communities in the amount of cassava planted, harvested and sold; the amount of rice sold; the amount of coffee planted or harvested; or the amount of cocoa planted. We also found no significant difference in non-agricultural employment trends between households in RREP communities and comparison communities. We did find evidence suggesting that households in RREP communities were more likely to be wage employed.<sup>9</sup>

It is important to note however that these results on employment and income are to be considered as intermediary, as the time between mini-grids becoming operational and the Midline survey was in some communities limited. Analysis of future rounds of data collection should allow for assessment of longer-term trends in income generating activities, as more households get connected. However, investments in complements to electrification (e.g. providing increased access to credit or capital for investments in small enterprises, or incentives to health workers to work longer hours or the establishment of double shifts at CHCs to fully capitalise on the lighting at night) may be needed to induce changes in livelihoods.

We did find some significant changes in livestock and electrified asset ownership. Households connected to RREP mini-grids saw a significant negative effect on the number of livestock owned, which suggests comparison households may have begun to catch up to households in RREP communities. As livestock are the main form of liquid savings in rural communities, these connected households may have sold animals to get connect to the grid and purchase electrified assets. For example, rates of ownership of productive electrical

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<sup>8</sup>Among traveling, leisure, household chores, self-employed business, and wage-employed business. See [Table 15, Section 4.4.1](#).

<sup>9</sup>These results are displayed in [Table 13 in Section 4.4](#). The evidence on wage employment was weak: this result was only significant at the 10 percent level, and was not robust to alternate specifications as seen in [14](#)

assets such as freezers were significantly higher in connected households living in RREP communities. Figures on livestock and asset ownership are presented and discussed in [Section 4.5](#).

### **1.4.3 Gender Equality**

We found strong evidence of gender inequality. Fewer female-headed households in RREP communities were connected to the mini-grids than male-headed households. This may be related to differences in income and wages described in the Baseline report. At Midline, the average profit for men per month in self-employed businesses was about twice the average profit for women. This earnings gap can be explained by differences in occupations. For instance, we find that women were more likely to work in low earning occupations such as petty trading (39.4 percent report self-employed) compared to men (23.8 percent).

### **1.4.4 Disability**

There were no differences in the effects of electrification for those with disabilities. Respondents with disabilities in RREP communities were no more or less likely to be connected to the mini-grids, nor were they significantly less likely to use cleaner energy sources in their homes. There were substantial income and asset differences between disabled and abled members of RREP communities, but these persisted from Baseline. For example, disabled heads of household were less likely to be self-employed than abled heads of household (24.6 percent against 32.0 percent). Households whose head was disabled also owned, on average, fewer electrical assets than households whose head did not have a disability (2.2 against 2.5). We disaggregate summary statistics for disabled and abled households for all domains of interest.

### **1.4.5 Schools**

We surveyed Government and/or Government-Assisted schools in RREP and comparison communities. The schools in RREP sites have had the opportunity to connect to the mini-grid. Unlike the CHCs, the schools are expected to pay for electricity connections. Just 38 of schools in RREP communities had invested in connecting to the mini-grid. This implies that to evaluate the full impact of electrification on educational outcomes, a longer evaluation window is needed. We did find however that, RREP communities had significantly higher school attendance compared to the comparison communities, this could be a signal of improved educational attainment and test scores for these students in the future, but these may not manifest without the necessary complementarities at the school level such better resources, teacher incentives etc.

### **1.4.6 Community Health Clinics**

The majority of community health clinics in our sample were electrified in 2017 to enable Ebola containment efforts. Since then, the RREP has electrified every CHC in the WP1 RREP communities. We surveyed CHC workers in both the Baseline and Midline, and collected data from the patient registers back to 2016. The findings from these data are detailed in Section 6.

The RREP has had substantial positive effects on electricity access in RREP CHCs, relative to comparison clinics. Among RREP CHCs, 90 percent had at least 10 hours of electricity per day. Among comparison CHCs, just 37.3 percent had light for so many hours per day. About 9.5 percent of RREP clinics had fewer than 10 hours of light per day, whereas a substantial percentage had absolutely no light, 52.9 percent. By

providing light throughout the day, the RREP mini-grids enabled clinics to remain open and deal with emergency patients, such as births and traumatic injuries, at night.

## 1.5 Recommendations

Section 8 makes five recommendations targeted at both policymakers and UNOPS for continuation of work on the RREP and future projects. The findings contained in this report emphasize the importance of assessing the impacts of electrification over the longer-term.

**Recommendation 1:** The benefits of rural electrification take time to manifest. Changes on farm, off farm, and further up the value chain require investment. Households have lack savings to invest in multiple important appliances needed to start new economic activities. Lack of access to credit markets, poor public infrastructure, and technological familiarity all take time to catch up to improvements in energy infrastructure.

This impact evaluation of WP 1 communities will conclude with the Endline survey in early 2022. Changes and improvements in the RREP communities will likely continue beyond this point. Because longer-term impact evaluations are likely, we will include recommendations in our Endline report for ongoing progress in surveying, sampling, and analyses.

**Recommendation 2:** While we observe high rates of connection to mini-grids, self-employed individuals in RREP communities are not more likely to use electricity in their business relative to self-employed individuals in comparison communities. Therefore, we recommend pursuing a deeper understanding of the barriers to the adoption of (productive) electrified assets, and design interventions that could help people in RREP communities overcome these barriers.

As often reported in the literature, electricity is an "enabler", and therefore one should not be discouraged or skeptical about the importance of access to electricity for (economic) development[10, 1, 5, 6]. Rather, now that the investment in the infrastructure has been made, it is important to focus on how to best design programmes that help people residing in RREP communities take full advantage of electricity and fully leverage on the investment in the infrastructure. For the benefit of other electrification programmes in Sierra Leone and elsewhere, it is important to rigorously test and document the impact of these programmes.

**Recommendation 3:** Similarly, schools and Community Health Clinics have increased access to electricity. Therefore, they now are "enabled" to operate specific devices that might increase the quality of the infrastructures. For instance, CHCs can have fridges and allow the storage of vaccines, and computers can be operated in schools to allow e-learning. In addition, both CHCs and schools could now operate longer hours. While this may improve the quality of the health and educational infrastructure, we recommend investigating complementary factors which may be necessary for reaping the benefits of electrification. For instance, one might want to think about how to install night shifts at CHCs, now that the electricity makes the lighting at night possible allowing CHCs to operate and serve patients after it gets dark. This would require coordination with relevant government counterpart to fully exploit the potential of electrification programmes.

**Recommendation 4:** Based on focus group discussions, people find the tariff structure rather unclear, and the cost of the unit of electricity too expensive. The attached qualitative report provides more detailed analysis of these concerns. It is recommended to engage in an information campaign clarifying the tariff structure. UNOPS and the mini-grid operators should take steps to re-iterate the tariff and service fees

with community members and listen to their complaints to see if the tariff can be reduced. While UNOPS and other stakeholders may not be able to change the price per unit of electricity, it might be worthwhile to provide incentives for the distribution and adoption of energy efficient devices, so that energy efficient devices can become more affordable to beneficiaries with the result of also making electricity units more affordable.

**Recommendation 5:** As UNOPS hands over the RREP mini-grids to operator companies, we recommend to increase the quantity and detail of communication with key stakeholders in these communities. This will ensure there are no misconceptions regarding the scope and goals of the project. Throughout the impact evaluation, we observed confusion in RREP communities about the operators responsibilities and the tariffs and fees for mini-grid use. Surrounding communities also expressed confusion and disappointment because their communities were not selected for the RREP. Communication will ease any potential future difficulties.

## 2. Introduction

This section provides the background of the RREP project and the Midline data collection assessing the impact of the RREP programme on beneficiary communities. Sections 2.1 and 2.2 provides background to the RREP and the Sierra Leone country context. Section 2.3 discusses the Covid-19 situation and its impact on the RREP evaluation. Section 2.4 outlines the guiding principles of the impact evaluation being conducted. The Theory of Change of the RREP is presented and discussed in Section 2.5. Sections 2.6 and 2.7 present the governance structure and goals of the Midline evaluation. Data ownership is discussed in Section 2.8.

### 2.1 Background to The Rural Renewable Energy Project

In an effort to support the GoSL towards universal access to electricity, UNOPS is implementing the USD40+ million 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 targets large rural towns (often chiefdom headquarter towns) throughout the country that are regional focal points for economic and social life. The provision of off-grid solar electricity takes place in different phases. In Work Package 1/1+, 54 community health centres across the country were provided with electricity. In Work Package 2, 43 additional mini-grids constructed and managed by private sector operators, all to be finalised and handed over by the end of June 2021. It is anticipated that Work Package 1+ and Work Package 2 will lead to more households becoming connected to electricity. A full field plan for Work Package 1 can be found in Annex C.

Three private sector operators are currently involved in operations and maintenance for the 54 existing sites, and to operate, maintain and co-invest in 43 additional, larger mini-grids the RREP. These companies were brought in through a competitive international tender. 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, which also heads 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.

The expected impact of the project is that it will improve Sierra Leone's economic development through an increase in access to rural renewable 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 CO<sub>2</sub> 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 intended outcome of the project is to improve rural renewable energy access through private sector involvement. It is estimated that approximately 346,015 direct and unique beneficiaries in rural Sierra Leone will be connected to electricity. The definition of 'Direct and Unique Beneficiaries' include to count the beneficiaries once in order to avoid double counting (e.g. a household beneficiary may also be a CHC beneficiary). These beneficiaries will access connections through households, reaching 166,944 people; CHCs, reaching 114,666 people; schools, reaching 27,253 teachers and children; commercial and productive uses reaching 11,106 people; and the WP6 grants programme reaching 26,046 people.

Direct Beneficiaries		
Beneficiary Type	# of connections	Direct & unique beneficiaries
School	130 schools	27,253
Households	24,126 households	166,944
CHC	97 CHC	114,666
Commercial/productive user	2,171	11,106
Matching Grant (WP6)		26,046
<b>TOTAL direct beneficiaries</b>		<b>346,015</b>

The project also has indirect beneficiaries. This number is calculated as the remaining number of people in the catchment areas who are expected to benefit from the increase in services, improvement in service delivery, and increased income. These numbers are estimated as follows:

Indirect Beneficiaries	
Estimated catchment population (94 sites)	719,991
Direct beneficiaries	346,015
<b>TOTAL indirect beneficiaries</b>	<b>373,976</b>

This report is part of an impact evaluation of the RREP programme. The impact evaluation was initially designed to focus on the effect of increased access to electricity through the implementation of Work Packages 1/1+ and 2. However, the evaluation team now seeks to extend the scope of work to evaluate Work Package 6.

Following the installation of RREP mini-grids, a number of additional Work Packages will support work on non-generation infrastructure, private investment, and additional monitoring and evaluation.

Work Package 6 will be providing productive-use assets targeted to entrepreneurs with the assistance of the implementation partner Easy Solar. The evaluation of WP 1/1+ and 2 in combination with WP6 enables UNOPS, FCDO, and other stakeholders to assess the returns from private sector development alongside an electrification project. There is currently limited understanding of the benefits of private sector development in productive use assets alongside rural electrification projects. An expanded evaluation of Work Package 6 will offer the opportunity to separate and measure the effects of a) increased access to electricity, and b) increased access to electricity and returns from productive use of electricity.

The evaluation team intends to test if the development benefits of electricity are greater when rural entrepreneurs have increased access to productivity enhancing technologies that require electricity. Electricity is an enabling technology; the impact of electrification is conditional on the use of other productive technologies. To realize the productive potential of expanded access to electricity, access to these technologies is necessary. Although, such an extension would not require substantial modifications to the data collection plan for the impact evaluation team, it would require modifications in the implementation of WP6 activities and the randomization of some activities. Unfortunately, despite some attempts at coordinating this extension, the opportunity has not materialized yet.

## 2.2 Country Context

Sierra Leone is one of the world's poorest countries, ranking 182th out of 189 countries in the Human Development Index in 2020.<sup>10</sup> Poverty is widespread with more than 53 percent of the population living below the national poverty line.<sup>11</sup> 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.<sup>12</sup>

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.<sup>13</sup>

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.<sup>14</sup> 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.<sup>15</sup>

In Sierra Leone, only 2.5 percent of the population in rural areas have access to electricity.<sup>16</sup> Poor access to electricity is recognised as a binding constraint to long-term economic growth in Sierra Leone.<sup>17</sup> 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. By 2023 the Government plans to:

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.

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<sup>10</sup>UNDP

<sup>11</sup>World Bank

<sup>12</sup>The New Direction

<sup>13</sup>UNICEF Situation Analysis 2019

<sup>14</sup>UNDP

<sup>15</sup>UNICEF Situation Analysis 2019

<sup>16</sup>World Bank SE4ALL

<sup>17</sup>Rural Renewable Energy Project Brief, UNOPS, 2018

7. Ensure rural electrification is carried out through engagement and involvement of key stakeholders, including the private sector.

The GoSL approved in 2019 the Electricity and Water Regulatory Commission's (EWRC) mini-grid regulations. 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.

### **2.3 Covid-19 in Sierra Leone**

The first case of Covid-19 was reported in Sierra Leone on 31 March 2020. Since then, there have been a total of almost 4,100 cases of Covid-19 in the country as of early May, with 79 reported deaths. The first public notice from the Government was on 19 March 2020 when the country announced that all commercial flights would be suspended effective 21 March 2020, until further notice. This was lifted on 22 July 2020, four months later.

As cases rose, the Government enforced two three-day curfews from 5 April through midnight on 7 April 2020, and from 3 May through midnight 5 May 2020. Shortly following the first lockdown, on 9 April the Government enforced an initial two-week curfew and inter-district travel ban for 76 days until June 24.

On 24 June the inter-district travel ban was lifted after 79 days, but other safety measures on social distancing and a nationwide curfew from 10pm to 7am throughout the country were put into place subject to review. When the airport re-opened on 22 July, precautionary steps were taken from the government to enforce contact tracing on every individual coming into Sierra Leone.

The Government shifted curfew timings in the country and the curfew was eventually fully lifted on 26 October for a trial period of four weeks. After these four weeks, the Government announced that the curfew from 11pm to 5am would continue until otherwise advised and has remained in place throughout the new year in 2021. On 25 January, 2021 the Government placed restrictions for an initial two weeks on travel in and out from Western Area with mandatory Covid-19 testing. This restriction on travel was lifted once the two weeks finished.

## 2.4 Impact Evaluation of the RREP

This report provides results of the Midline survey which forms part of the RREP Impact Evaluation. This report will focus only on the WP1/1+ sites, as construction of the mini-grids has not yet been completed on WP2 RREP sites. The purpose of the impact evaluation is to understand how information and knowledge gained can help shape the policies in the energy sector and improve collaborations with other organizations outlined above that are seeking opportunities to expand in Sierra Leone. It will also enable stakeholders to quantify impacts and expand such interventions into other communities within Sierra Leone.

The Midline survey aims 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 RREP mini-grids were installed with households in similar communities where no mini-grids have been 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. [Section 3.7](#) describes how the difference-in-differences methodology measures causal effects of the RREP between beneficiary and non-beneficiary units at Baseline, Midline and Endline.

The Impact Evaluation will enable RREP stakeholders to:

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

The primary objective of the Impact Evaluations is to understand: What is the impact of mini-grids 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 CO<sub>2</sub>e emission?

The impact evaluation will investigate the effects of RREP on across gender, 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.

Timeline of Key Activities	
Key Evaluation Activity	Key Timelines
<b>Baseline WP1/1+</b>	
<i>Develop methodology</i>	March – April 2019
<i>Design sampling</i>	April – May 2019
<i>Deliver inception report</i>	May 2019
<i>Data collection</i>	June – July 2019
<i>Deliver Baseline report</i>	August 2019
<b>Midline WP1/1+</b>	
<i>Deliver inception report</i>	January – March 2021
<i>Data collection</i>	March – April 2021
<i>Deliver Midline assessment report</i>	May 2021
<b>Endline WP1/1+</b>	
<i>Deliver inception report</i>	November 2021
<i>Data collection</i>	January – February 2022
<i>Deliver Endline assessment report</i>	March 2022

#### 2.4.1 Impact of Covid-19 on Timelines

As a result of Covid-19, the Midline assessment was rescheduled from the originally planned Autumn 2020 to the Spring of 2021. Due to the high degree of uncertainty of when it would be safe to continue data collection in person, the Impact Evaluation team at WUR agreed with the UNOPS team to regularly re-assess when to resume operations. This allowed for all communities of WP1/1+ to be electrified and included in the measurement of impact at Midline.

After monitoring the evolution of the Covid-19 outbreak in Sierra Leone and observing a reduction in the number of cases before the end of December 2020, the teams agreed to resume data collection in January 2021. However, during the Christmas season a large number of people travelled to Sierra Leone from countries with higher Covid-19 cases. As a result, the number of cases started increasing again and the Government imposed restrictions on inter-district movements. This caused a further delay.

After considering all Covid-19 related risks posed to the enumerators and to the people residing in the project communities, and seeing a substantial reduction in cases, the team decided in March 2021 that the enumerators should be deployed to the field for data collection. A very cautious approach with strict safety protocols was implemented to ensure the safety of all involved. These details are included below, and in Annexes F, G, and J.

#### 2.4.2 Guiding Principles

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.<sup>18</sup> 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.

**RELEVANCE: IS THE INTERVENTION DOING THE RIGHT THINGS?** The project has an approved

<sup>18</sup>OECD

result framework which is the basis of managing, comparing and capturing the desired results (at the output, outcome and impact levels) of the project. As adopted in the methodology of the impact evaluation, it intends to assess/calculate the achievements of the project impacts. The impact evaluation study, through the Baseline, Midline and Endline surveys, will assess whether the desired changes/outcomes are realized and serving the purpose of the target groups i.e. whether the interventions carried out targeting each result is relevant and acted rightly or deflected from the targets.

**COHERENCE: HOW WELL DOES THE INTERVENTION FIT?** The evaluation strategy includes the collection of data both from the RREP communities (i.e. people those are benefited by the project interventions) and comparison communities (i.e. people those are not covered through the project interventions). Survey data is collected separately for WP1/1+ sites and WP2 sites. All the comparisons, comparison vs mini-grid and WP1/1+ and WP2, made on the basis of this four type of datasets will provide an option to see how the planned project interventions in the target sites and groups fit to ensure the optimum results for the target groups.

**EFFECTIVENESS: IS THE INTERVENTION ACHIEVING ITS OBJECTIVES?** Again, the effectiveness criteria is explicitly addressed through the 'difference-in-difference' model of the evaluation. This model will provide an opportunity to analyse the extents to which the project interventions achieved its objectives across the different beneficiary groups of the project.

**EFFICIENCY: HOW WELL ARE RESOURCES BEING USED?** Through the impact evaluation, all the resources utilized for ensuring the results of the project will be assessed to justify the rationales e.g. whenever we collect survey datasets from the CHCs, schools, businesses and households, it will be triangulated with the information related to resources (for an example-financial information and timeline) in order to see how the project ensured the best utilization of resources (competitiveness of prices etc.) to ensure the objectives.

**IMPACT: WHAT DIFFERENCE DOES THE INTERVENTION MAKE?** The achievements of the project impact indicators will be calculated through this impact evaluation study which is the core objective. It includes to assess the impacts of the project in terms of changes in the household income, improved health and education, reduced CO<sub>2</sub>e etc. The changes will be determined by comparing the results between mini-grid and comparison sites and WP1/1+ and WP2 sites (though this report will only be assessing the WP1/1+ sites).

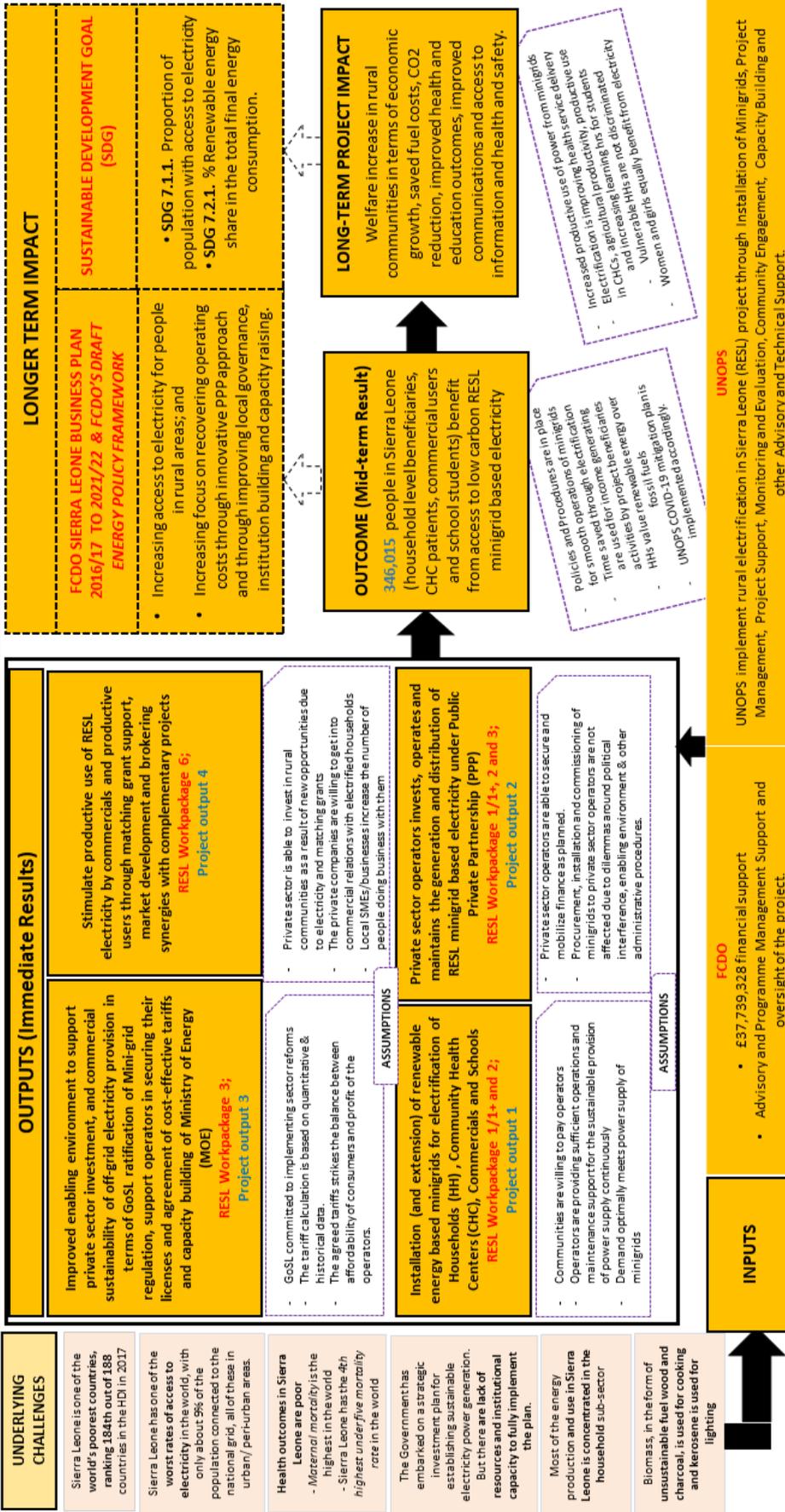
**SUSTAINABILITY: WILL THE BENEFITS LAST?** The project has an already set up economic model which assumes the discounted benefits (monetisable values) of the project within the life of the project and after 13 years of implementation. The evaluation strategy contains methodology to determine the benefits of the project through the life of the project which will serve as the basis to calculate the mid-term and longer-term benefits of the project as well.

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.

## **2.5 RREP Theory of Change**

The Theory of Change (ToC) of the mini-grids created under RREP, below, describes the mechanisms through which access to electricity is expected to impact the desired outcomes. The ToC describes how the inputs of the project are expected to lead to improved outcomes and, ultimately, positively impact the targeted population.

# RESL THEORY OF CHANGE (2016 to 2022)



The components of the theory of change are:

- *Challenges*: Sierra Leone faces key development challenges relates to low access to energy and under-development
- *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.

We provide details on the RREP outputs, outcomes, and assumptions in the following sections.

### **2.5.1 Outputs**

- 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.
- 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.
- Improved environment to support private sector investment, and commercial sustainability of off-grid electricity provision.
- Increased demand for electricity provided through stimulation of private sector development. This sparks interest for private firms to explore business opportunities in rural areas.

### **2.5.2 Outcome**

The evaluation team will collect information needed to assess the outcomes based on key outcome indicators. RREP outcome target: *“360,000 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.”*

### **2.5.3 Assumptions**

The impact assessment team will continually reassess the underlying assumptions of the ToC. For example, the ToC assumes that the following will take place over the course of the project:

#### **Output Level Assumptions**

- Private sector operators are able to secure and mobilize finance as planned.
- Procurement, installation of mini-grids and commissioning to private sector operators is not affected significantly above the tolerance level due to dilemmas.
- Communities are willing to pay operators.

- Operators are providing sufficient operations and maintenance.
- Demand optimally meets power supply of mini-grids.
- Communities have strong relationship with operators.
- The targeted businesses are able to co-invest.
- Conditions specified in productive use strategy and call for proposals are met.
- The private companies are willing to get into commercial relations with people in the mini-grid catchment areas.
- Local SMEs/businesses increase the number of people doing business with them in their communities.

### **Outcome Level Assumptions**

- Increased productive use of power from mini-grids.
- Electrification is improving the health service delivery in CHCs and increasing learning hrs for school going children.
- Vulnerable HHs are not discriminated.
- Women and girls equally benefit from electricity.
- UNOPS Covid-19 mitigation plan is implemented accordingly.

### **Impact Level Assumptions**

- Policies and Procedures are in place for smooth operations of mini-grids.
- Time saved through electrification will be used for income generating activities by women and men.
- Electrical appliances yield better results.
- Students use their extra time available to study.
- HHs value renewable energy over fossil fuels.

Understanding whether these assumptions are correct and where they might fail will be critical to assessing the impact of the RREP.

#### **2.5.4 Key Stakeholders**

The key stakeholders and end users of this report include the Government of Sierra Leone, in particular the Ministry of Energy (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.)

## **2.6 Governance of Midline**

UNOPS coordinates the design and management of the study for the impact evaluation of the RREP. The Impact Evaluation Team led by Wageningen University and Research (WUR) and its partners, including

Yale University and the International Growth Centre (IGC) was selected by UNOPS for the implementation of the RREP impact Evaluation.

Qualifications of the Impact Evaluation team lead by WUR are Annexed to this document (see Annex E for competencies of key personnel).

Overview of Midline Governance	
Partner Name	Roles and Responsibilities
Wageningen University and Research	<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> <ul style="list-style-type: none"> <li>• Development and finalization of data collection tools</li> <li>• Training interviewers and piloting research tools</li> <li>• Analysis for primary data and reporting</li> <li>• Data collection, processing and cleaning</li> <li>• Secondary data collection</li> <li>• Sharing key findings and lessons learned</li> <li>• Quality assurance and data quality</li> <li>• Validation workshops</li> </ul>
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> <ul style="list-style-type: none"> <li>• Development and finalization of data collection tools</li> <li>• Evaluation design</li> <li>• Training of enumerators</li> <li>• Analysis of all Baseline, Midline, and Endline data</li> <li>• Support with reporting</li> <li>• Data cleaning</li> <li>• Development of infographics</li> </ul>
International Growth Centre	<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> <ul style="list-style-type: none"> <li>• Inputs into research design, methodology, data collection tools.</li> <li>• Data analysis from a local context</li> <li>• Facilitate building the evidence base for maximum policy impact.</li> <li>• Liaise with stakeholders (e.g., GoSL, UNOPS, FCDO, Inensus), and between Key Personnel and field teams.</li> </ul>

Though many of the duties overlap across the three main actors of this project, the more specific responsibilities are outlined in the table on the previous page. Each partner's tasks are fitted to their expertise, and regular reporting and communication between the partners enables sharing these expertises. The project

team will also be updating the UNOPS throughout the main phases of the project.

UNOPS together with the Impact Evaluation team engaged the M&E department of the MoE in Sierra Leone as one of the key stakeholders to coordinate design and implementation of the Baseline study for the RREP. The MoE assists with reporting and provides more detailed insight on the use of mini-grids and the implications for future complementary policies. UNOPS will work closely with FCDO during the entire evaluation process and will be updated when milestones have been completed. Feedback from UNOPS is taken with the utmost consideration to allow a diversification of perspective within the project to ensure no bias from the reporting team. Throughout the Impact Evaluation process to date the Government has been engaged and its recommendations are included in the evaluation approach. The Project Board is regularly updated on all the activities under the M&E workstream of the project.

RREP and the Impact Evaluation team have no potential conflicts of interest with any of the acting partners. If a conflict of interest does arise, it will be reported and discussed with UNOPS about how it would affect the quality of the data and overall sustainability of the project. The partner who shows to be the conflict of interest would be removed from the Impact Evaluation team in discussion with the Project Board.

## **2.7 Purpose of Midline**

The purpose of the Impact Evaluation is to estimate the effects of the mini-grids on community welfare and development. As mentioned in section 1.4, the Midline data collection will measure the target population's current socio-economic status across the four key domains of change, and will be compared with the Baseline data that was collected more than 18 months ago. The four domains of change are:

1. Household Income and Assets
2. Improved Health
3. Education
4. CO<sub>2</sub> Reduction

Research Questions and Structure	
Key Research Questions	Report Section Addressing Questions
<b>1. Does increased access to electricity increase incomes and assets?</b>	
<ul style="list-style-type: none"> <li>• Agricultural production</li> <li>• Non-agricultural activities</li> <li>• Livestock and land ownership</li> <li>• Household assets ownership</li> </ul>	Sections 4.2, 4.3, and 4.4
<b>2. Does increased access to electricity reduce incidence of these health conditions?</b>	
<ul style="list-style-type: none"> <li>• Acute respiratory infection (ARI)</li> <li>• Cataracts and itchy eye</li> <li>• Other disabilities</li> <li>• Other disease prevalence</li> <li>• Neonatal and under-five mortality</li> <li>• Maternal death</li> </ul>	Section 4.6
<b>3. Does increased access to electricity increase school attendance?</b>	
<ul style="list-style-type: none"> <li>• Higher student attendance</li> <li>• Improved literacy</li> </ul>	Section 4.7
<b>4. Does increased access to electricity reduce CO<sub>2</sub>e emissions?</b>	
<ul style="list-style-type: none"> <li>• Household fossile fuel consumption</li> </ul>	Section 4.8

The Midline data will also be compared against the Endline survey data to assess the dynamics of the medium-term impacts of the RREP’s mini-grids. For a detailed overview of the methodology see Section 3. The Impact Evaluation Team will be learning from the data collection process if there are modifications needed and will adapt accordingly while updating the appropriate partners in RREP.

In Work Package 1 (WP1), 54 stand-alone solar photovoltaic (sPV) systems were constructed between September 2017 and February 2018 providing electricity access to the clinic and school. Access to electricity was made available to households in July 2019. The Midline survey can assess the short run (one year and six months) impacts of RREP in WP1 sites.

Annex C contains the field plan for the Midline survey, presenting the list of both RREP beneficiary communities (Treatment) and comparison communities not benefiting from RREP directly (Control). It is worth mentioning that the field plan presented in Annex C was based on the Government’s current Covid-19 restrictions and UNOPS’ and WUR’s risk analysis and had been subject to changes upon approval from UNOPS. Any changes were discussed with and communicated to UNOPS team.

Findings will be disseminated to stakeholders for insight into what short run changes have taken place in communities as a result of the RREP. Both of these areas will serve to provide further insights for policy makers. (See Annex K: Knowledge Management Plan for further details.)

## 2.8 Data Ownership

UNOPS is the sole owner of all intellectual property, products, processes and documents that are developed for the Midline report and the Impact Evaluation. UNOPS has a perpetual license to use this intellectual property as it sees fit.<sup>19</sup>

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<sup>19</sup>UNOPS

### **3. Methodology**

This section provides an overview of the methodology and data sources developed and used by the impact evaluation team lead by WUR during the Midline assessment. [Section 3.1](#) details the impact of Covid-19 on the Midline. The first subsection 3.1.1 describes the training mechanisms that were taken. Section 3.1.2 explains the the field work through the new Covid-19 additions. [Section 3.2](#) describes the approach to delivering the field work. [Section 3.3](#) provides an overview of data cleaning processes. [Section 3.4](#) explains the different streams of evidence employed to feed into the analysis. Section 3.4.1 explains the approach to measuring the impact of the thematic impact domains. Section 3.4.2 briefly covers the analytical approach used to report on Midline findings. We present details on how the Midline results are reported in [Section 3.5](#). [Section 3.6](#) discusses steps taken to promote inclusion and ethics. Finally, [Section 3.7](#) presents the difference-in-differences methodology used to evaluate and present results.

#### **3.1 Impact of Covid on the Midline**

The evaluation team reviewed the methodology and approach in light of COVID-19. While the approach and processes related to data collection will be adapted, the overarching methodology will remain constant. The team will be employing a Difference-in-Difference estimation strategy for the assessment of the impact of RREP. (Please see Theory of Change Figure 1.)

The research plan timeline has changed as indicated above. The research processes, both training and field work, were also adapted to ensure better social distancing, hand-washing, and COVID-19 risk mitigation.

##### **3.1.1 Training**

The team selected a training venue large enough for the 80+ enumerators, supervisors, and coordinators to socially distance. The seating arrangements inside the training venue were sufficient for all participants to be seated at least 2 meters distance apart. All attendees were provided with three reusable cloth masks; mandatory masking was enforced throughout the training period. Outside of the entrance of the training venue, a veronica bucket filled with a water and disinfectant mixture was placed and maintained to enable all participants to wash their hands throughout the day. At the beginning of the training, a COVID-19 safety training was provided, based on an informational sheet on COVID-19 from WHO (Annex I). In addition, the team provided fliers provided by UNOPS on how to make safer choices and how to wear a mask properly. At the end of the training, the enumerators selected for field work were tested for COVID-19 to ensure everyone is negative before leaving Freetown. All tests returned negative.

##### **3.1.2 Field Work**

The research team provided more substantial transport and daily subsistence allowances to the enumerators, in order to mitigate the number of people the field team will be interacting with. Prior to field work beginning, the enumerators were given additional reusable cloth masks, hand sanitizer and Dettol to be taken to the field with them. They were instructed to maintain social distance from all participants and conduct any in person interviews outside.

## 3.2 Approach to Delivering Fieldwork

In addition to the field work undertaken with the relevant Covid-19 precautions, 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 relied upon several secondary data sources both in an effort to construct a representative comparison 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 comparison 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 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)* Data was collected through interviews with key actors from Education, Energy, Environment Control and Health Authorities. KIIs were undertaken because these respondents had large experience and first-hand information on the related topics. Among them were some of the primary stakeholders of the programme, so their insights and opinions are very much needed to adequately evaluate the impact of the intervention.

*Focus Group Discussions (FGD)* FGDs were conducted in communities to collect more in-depth information from a reduced number of individuals that is otherwise not collected through quantitative methods. During FGDs, a facilitator helped the flow of the discussion, and monitored and guided the participants through the topics and questions covered. Due to the social dynamics of the FGD, participants usually feel more encouraged to reveal essential information.

## 3.3 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 2.6: Inclusion and Ethics.

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 were 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 Slack, 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 Slack 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.

### 3.4 Approach to Measuring Midline

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) CO<sub>2</sub> emissions.

#### 3.4.1 Measuring Thematic Impact Domains

This Midline 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) CO<sub>2</sub>e 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.

#### 3.4.2 Description of Key Indicators

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

##### **Domain 1: Household Income and 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 both can we obtain accurate assess 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 is 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 measured at Baseline and once again at Midline ownership of electrified assets, so that we may gauge how electrification affects the adoption of electrified assets over time.

## **Domain 2: Improved Health** Relation of Key Indicators to Outcome Domain

Electricity has the potential to drastically improve health outcomes. This report will layout the measurements of 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 Set 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 CO<sub>2</sub>e 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** 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.

### **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.

**Domain 4: CO<sub>2</sub> 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 CO<sub>2</sub> emissions. Electricity should reduce reliance on these “dirty” fuels.

**Key Indicator B: Cooking Facility** Home cooking is a leading are of CO<sub>2</sub> 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.

## 3.5 Approach to Reporting Midline Findings

### 3.5.1 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.

**Interview Language Bias and 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 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 mini-grid and comparison communities respond to questions in a different way. There is no reason to expect that we will have more measurement error in mini-grid compared to comparison 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 mini-grid and comparison and therefore create no bias.

### 3.5.2 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 household from this list. (See Annex O 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 mini-grid and comparison communities. We can test for this pattern by regressing RREP status on non-response in a given variable. If there are differences across these groups, we can analyse which kinds of people are not responding so that we can better interpret our findings.

### 3.5.3 Attrition

Not all households which were surveyed in the Baseline round were available for the Midline survey. Of the 3,230 households surveyed in Jun 2019, 383 people were unavailable in 2021. Of these, 281 households lived in comparison communities and 102 lived in mini-grid communities. Attrition had multiple causes: some households had entirely moved away from the community they lived in during the Baseline. Other households had “dissolved” through a marriage with another household. From the households surveyed at Midline, an additional 39 respondents did not consent to be surveyed again; 18 from comparison communities and 21 from RREP communities. Accounting for attrition and non consent we reach a sample of 2,808 from a sample of 3,230 at Baseline for an attrition rate of 13.6 percent. This provides an 86.4 percent response rate.

Attrition could pose a threat to our identification strategy if we observed differential attrition by mini-grid status. We find that households in RREP communities are less likely to be unavailable for the survey; these results are presented in the regression table below. This could bias the results, leading us to overestimate or underestimate the effect of electrification.

One potential cause of this divergence in attrition is that households in comparison communities are harder to track due to inferior access to mobile phones and mobile phone charging. Higher response rates in RREP communities might thus be a first order effect of the intervention. However, this non-random attrition can bias our results, and we correct for this using inverse probability weighting<sup>20</sup>.

Of the 383 households that attrited, we followed up with 180 households by phone. About half of the 180 households reported moving to a different community within the same district or outside the district. This itself could be an effect of the RREP intervention, where households may decide to move to electrified communities. However, those who reported moving households appear balanced across RREP and comparison communities, i.e. households in comparison communities were not more likely to have moved.

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<sup>20</sup>Inverse Probability Weighting is a technique of re-weighting the sample to account for biases emerging from non-response from specific sub samples. It involves generating sampling weights for each respondent, as a function of variables that predict response. And then assigning these weights to each regression estimation. It will hence up-weight those respondents that are more likely to drop out in the Midline Survey

Table 1: Attrition at Midline

	(1) Attrited	(2) Non consent
RREP	-0.0994*** (0.0225)	0.00206 (0.00717)
N	3230	2847
N Clusters	108	108
Control Mean	0.166	0.013

Regression with district FE, clustered SE in parentheses.

### 3.6 Inclusion and Ethics

A detailed inclusion and ethics approach is applied to the impact evaluation, taking into account FCDO's commitment to human rights-based approaches of participation and inclusion, non-discrimination, equality, and accountability. WUR staff have 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 concerns 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). This approval is included in Annex M.

#### 3.6.1 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 SurveyCTO software on smartphones/tablet and was sent to the server through 3G. Other than usage analytics and crash reports SurveyCTO software does not send or communicate any survey data information back to SurveyCTO 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).

### **3.6.2 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. The exact wording of the informed consent is included Annex H. The training instructions for the informed consent are included in Annex G. During training, each enumerator was tested on the informed consent multiple times by WUR staff. Enumerators also passed a test which asked about standards for consent and non-consent. As discussed in Section 3.5.3, 39 respondents did not consent to participate. In all cases, the survey was immediately terminated.

In addition to consent, 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.

### **3.6.3 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 household questionnaire covers sensitive topics, including sections on household income, health, time use, and spousal decision-making. Substantial efforts are made to ensure that respondents only answer questions they are comfortable answering and that they understand they have the right to refuse to answer any question in the survey. Enumerators are trained to emphasize this right throughout the survey, and to administer the survey with non-aggressive body language. For details on enumerator training, please see Annexes F and G.

Additionally, the survey instrument was designed to take as little time as possible from the respondent during interviews as to not be a burden on the respondent. Many respondents participate in the survey while working on their farm or in their business; enumerators are trained to be as non-disruptive to the respondents as possible. The team also recruited field staff who as far as possible spoke the appropriate local language to ensure that the respondents feel comfortable.

### **3.6.4 Withdrawal from Study**

All study participants have the right to withdraw from the study at any point. Respondents are regularly informed of this right, and are free to terminate a survey at any point while being reassured that they will receive absolutely no negative effects from withdrawing from the study. 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.

### 3.7 Difference-in-Differences Estimation

Difference-in-differences (DID) is a statistical technique which simulates an experimental design to determine the differential effect of an event on one group by comparing it to a similar group which was not affected. In this report, we refer to the "RREP" or "mini-grid" group of communities, in which mini-grids were installed and became operational, and "comparison" communities, which will not receive UNOPS mini-grids but were chosen because of their similarity to the RREP communities.<sup>21</sup>

In the Baseline survey, we examined both groups prior to the commissioning of the RREP mini-grids. We assume that key differences between the two groups will follow *parallel trends*. This assumption implies that, absent the RREP mini-grids, we expect that the change in, for example, fuel consumption between the Baseline and Endline surveys will be the same in both RREP and comparison communities. Any observed difference over time can be attributed to the mini-grids provided to RREP communities.

Throughout the following sections of this report, we will provide difference-in-differences results in the form of regression tables. Each of the difference-in-difference tables will be presented in the same manner as the example below in Table 2, using faux data. Column 1 reports the sample size that is captured in the regression estimation. Here, for each agricultural item for sowed, harvested and planted the same sample size was given of 1,000 respondents. Column 2 presents the unconditional mean in the comparison communities in 2019, while column 3 presents the difference between RREP and comparison households in 2019 conditional on districts and other effects on the mean, with standard errors in parentheses underneath the coefficient. The sign on the coefficient and significance levels in column 3 will be telling of what Baseline differences there were between the RREP communities (column 3) and comparison communities (column 2). Column 4 reports the coefficient of the year variable of Midline indicative of the time period after electrification, it is the change from 2019 to 2020 for both RREP and comparison households, and then column 5 reports the interaction of the year change (2019-2020) and mini-grid status (being electrified or not). The coefficient in column 5 is what will be determining if electrification is making an impact over time between the RREP and comparison communities. This sign on the coefficient is important because it will show if the impact is more or less in the RREP communities. If the sign is negative, that might mean that electrification is not having a positive effect on the RREP communities, or it could be the case that comparison communities are actually catching up to the RREP communities for the variable of interest. If the sign is positive this might mean that the electricity is positively affecting the mini-grid communities at the percentage the coefficient reports. The stars next to the coefficients denote statistical significance. Statistical significance relating to this estimation (in column 5) means that electrification is making some sort of impact on the RREP communities compared to the comparison communities. For example, in row 1 for "Rice sowed in Kgs", in column 5 the coefficient is 4.87\*. The star shows that in RREP communities after electrification happened, rice sowed had increased significantly, at the 10 percent level.

Not all households in RREP villages connect to mini-grids (see [sec:sum-conn]Section 4.1 for more details connected households vs not connected household). Hence the comparison above, does not tell us the actual effect of having access to electricity for a household. In the results, in addition to comparing respondents in RREP to non RREP villages, we also report the impacts of electrification for those households that got connected. The Difference-in Differences then compare those households in RREP communities who connected to the mini-grid and those in non RREP/comparison households. The tables follow a similar format to the one discussed above.

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<sup>21</sup>The evaluation team used census data provided by Statistics Sierra Leone in the algorithm that helped match RREP and comparison communities. The dataset used for this algorithm used demographic variables, population size, structure quantity and type, and household-level asset variables. See Annex O for details on the matching procedure.

Table 2: Difference in Differences Example of Agricultural Output

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Agricultural Output</i>					
Rice sowed in Kgs	1000	60	-3.01 (3)	7.34*** (1)	4.87* (2)
Rice Harvested in Kgs	1000	234	-8.46 (22)	41.57*** (8)	4.23 (11)
Rice sold in Kgs	1000	28	-3.93 (6)	7.64*** (2)	-0.78 (3)
Cassava sowed in sticks	1000	859	-38.74 (173)	399.09*** (96)	129.26 (126)
Cassava Harvested in Kgs	1000	367	-88.36 (64)	34.83 (29)	-50.94 (48)
Cassava Sold in Kgs	1000	268	-70.90 (56)	13.11 (21)	-43.36 (37)
Trees of cocoa sowed	1000	2	-1.00 (0.8)	2.87*** (0.7)	-1.73** (0.8)
Coco Harvested in Kgs	1000	64	-60.90** (22)	1.72 (3)	-7.00 (6)
Trees of coffee sowed	1000	5	-3.99 (2)	3.76* (1)	-1.80 (2)
Coffee Harvested in Kgs	1000	28	-21.73** (8)	1.13 (2)	-5.11 (5)

This is an example of a Difference in Difference estimation uses on all agricultural production from 2019 as the *pre* period and from 2020 as the *post* period. Includes district fixed effects and clustered standard errors at the village level.

## 4. Data Summary and Results

In March and April of 2021, the impact evaluation team interviewed members of 2,797 households in 108 communities across 14 of Sierra Leone's 16 districts. On average, each interview lasted just under 80 minutes, and covered diverse topics related to aspects of household life. For a copy of the survey instrument used in households interviews, please see Annex H. This impact evaluation aims to produce a holistic view of the effects of electrification on rural welfare and livelihood.

This section presents and summarizes the data collected in the Midline survey across all areas of interest. The data are then compared with data from the Baseline, conducted in June 2019, and using the methodology outlined in [Section 3.7](#), we assess the effects of the RREP mini-grids on the households in those communities.

[Section 4.1](#) presents summary statistics and results on household connections to the mini-grids in RREP communities. [Section 4.2](#) discusses household energy use, specifically for lighting and cooking. [Sections 4.3](#) and [4.4](#) address household income through agricultural and non-agricultural employment, respectively along with a break down of their time use during working hours. In [Section 4.5](#), we present data and results on assets such as livestock, land, and electrical appliances. Food security and household consumption is in [Section 4.6](#). Lastly, [Section 4.7](#) addresses childrens' education.

### 4.1 Connection to Minigrids

During the Midline survey we observe and record if households in RREP communities actually secured connections to the mini-grid. We find that of the 1,407 respondents in RREP communities which we re-sampled at Midline, 846 (60.1 percent) were connected, and 561 reported not being connected. It is likely that certain types of households selected into receiving the connections. It is possible that households that were already richer, or had more assets managed to get the connection. To investigate this we look at the following balance table. In [Table 3](#), columns 1-3 summarize the characteristics of connected households, and columns 4-6 summarize those not connected to mini-grids. Column 7 reports estimates from regressing each outcome on an indicator for being connected to the mini-grid using the Baseline sample. We find that connected households are less likely to be female headed, and to be larger households on average. They are also more likely to be self employed, have more electric assets, spend more on food, and less likely to be food insecure.

This suggests that richer households select in to electrification which may bias our results. Average intent-to-treat (ITT) estimates do not tell us the actual effect of having access to electricity: they examine the entire sample of households in RREP communities, whether or not those households have connected to the mini-grid. Therefore the complier sample, i.e those who secured connections to the mini-grid, provides more direct insight into the effects of mini-grid access.

Table 3: Baseline Differences for Households who are connected and those not connected to the Mini-grid in RREP Communities

	Connected			Not Connected			Difference (7)
	Mean (1)	N= 846 Median (2)	SD (3)	Mean (4)	N= 561 Median (5)	SD (6)	
<i>Household Demographics</i>							
Female Headed Households	0.408		0.492	0.490		0.500	-0.078** (0.03)
Respondent has any disability	0.278		0.448	0.280		0.450	0.013 (0.03)
Number of adults	2.790		2.094	2.385		1.776	0.481*** (0.15)
Number of children 0-5	1.024		1.197	1.063		1.093	-0.082 (0.06)
<i>Employment</i>							
Head employed in business	0.426		0.495	0.329		0.470	0.098*** (0.03)
Hours worked if business employed	5.700	5	4.124	5.557	5	3.879	0.395 (0.44)
Revenue from business in 1000s SLL	636.640	300	1087.262	756.867	300	1386.115	-127.759 (176.11)
Head Wage Employed	0.109		0.312	0.089		0.285	0.016 (0.02)
Hours worked in wage employment	5.758	6	2.978	5.486	5	3.018	0.013 (0.63)
Wage Income	771.305	500	1562.301	778.087	595	1448.143	-59.928 (337.81)
<i>Assets</i>							
Total Quantity of Electric Assets	2.610	2	3.192	1.670	1	2.206	1.496*** (0.29)
Number of Radios Owned	0.747	1	0.826	0.554	0	0.680	0.240*** (0.06)
Number of Mobile Phones Owned	1.280	1	1.717	0.848	1	1.140	0.643*** (0.14)
If owns land	0.731		0.444	0.673		0.469	0.052 (0.03)
If owns Livestock	0.678		0.467	0.672		0.470	0.026 (0.03)
<i>Food Security</i>							
Food expenditures '000 SLL	179.746	150	124.943	152.435	130	107.753	30.949*** (7.06)
Ate less preferred food at least one day in the last week	0.463		0.499	0.517		0.500	-0.074** (0.03)

Columns 1 to 3 report summary stats for connected households and 4 to 6 for not connected using baseline data from 2019. Column 7 reports the coefficient from regressing each outcome on an indicator for connected, the regression includes district fixed effects and clustered standard errors at the village level. The regression is weighted using Inverse Probability Weights.

## 4.2 Energy Access and Use

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 CO<sub>2</sub>e emission to the extent that households replace existing “dirty” household cooking and lighting technologies with clean solar-electrified technologies.

### 4.2.1 Fuel consumption

Households consume fuel for both cooking and lighting. Different fuel sources have different CO<sub>2</sub>e 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 1 shows that a large majority of households use wood and charcoal as either a primary or secondary source of cooking energy. 75.6 percent of households get their primary or secondary source of cooking energy from collected firewood, while another 13.4 percent purchase charcoal, and 9.3 percent purchase firewood. When looking from Baseline to Midline it shows that each of the sources have slightly decreased.

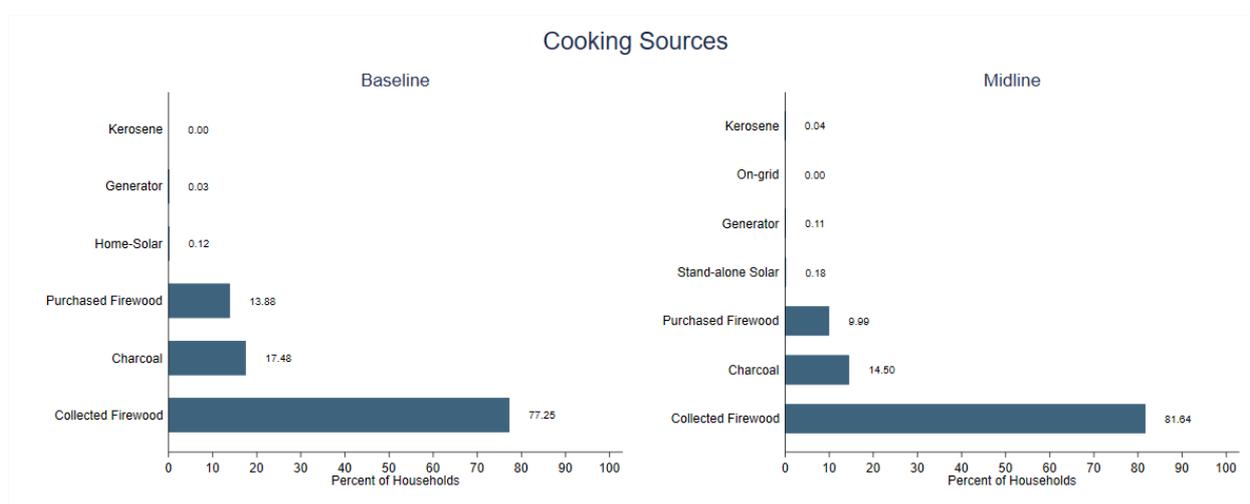


Figure 1: Cooking Sources at Baseline Midline

Table 4 reports the summary statistics for the type of fuel sources that households are using for cooking. For all households it is seen that the most commonly used fuel source is collected firewood which has increased from 77.2 percent at Baseline to 81.6 percent at Midline. Following firewood, the next most common source is charcoal which goes down from 17.6 percent at Baseline to 14.5 percent for all households at Midline. At Midline, a larger percentage of male headed households (83.5 percent) are using collected firewood compared to female headed households (78.8 percent). This could be indicative of barriers to firewood collection for women. Female headed households are similarly likely to use charcoal when compared to males at about 14.5 percent. Respondents with and without disability are similarly distributed when it comes to fuel sources for cooking.

Table 4: Summary Statistics: Fuel Sources for Cooking

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Mini Grid	3230	0.000	0	0	1	2795	0.008	0	0	1
Kerosene	3230	0.000	0	0	0	2795	0.000	0	0	1
Collect Firewood	3230	0.772	1	0	1	2795	0.816	1	0	1
Purchase Firewood	3230	0.139	0	0	1	2795	0.100	0	0	1
Charcoal	3230	0.176	0	0	1	2795	0.145	0	0	1
Generator	3230	0.000	0	0	1	2795	0.001	0	0	1
Home Solar	3230	0.001	0	0	1	2795	0.002	0	0	1
<i>Female Headed Households</i>										
Mini Grid	1308	0.001	0	0	1	1114	0.013	0	0	1
Kerosene	1308	0.000	0	0	0	1114	0.000	0	0	0
Collect Firewood	1308	0.732	1	0	1	1114	0.788	1	0	1
Purchase Firewood	1308	0.160	0	0	1	1114	0.117	0	0	1
Charcoal	1308	0.178	0	0	1	1114	0.147	0	0	1
Generator	1308	0.000	0	0	0	1114	0.000	0	0	0
Home Solar	1308	0.002	0	0	1	1114	0.003	0	0	1
<i>Male Headed Households</i>										
Mini Grid	1922	0.000	0	0	0	1681	0.004	0	0	1
Kerosene	1922	0.000	0	0	0	1681	0.001	0	0	1
Collect Firewood	1922	0.799	1	0	1	1681	0.835	1	0	1
Purchase Firewood	1922	0.125	0	0	1	1681	0.089	0	0	1
Charcoal	1922	0.174	0	0	1	1681	0.143	0	0	1
Generator	1922	0.001	0	0	1	1681	0.002	0	0	1
Home Solar	1922	0.001	0	0	1	1681	0.001	0	0	1
<i>Respondent has any disability</i>										
Mini Grid	839	0.001	0	0	0	736	0.008	0	0	1
Kerosene	839	0.000	0	0	0	736	0.000	0	0	0
Collect Firewood	839	0.779	1	0	1	736	0.822	1	0	1
Purchase Firewood	839	0.138	0	0	1	736	0.103	0	0	1
Charcoal	839	0.169	0	0	1	736	0.135	0	0	1
Generator	839	0.000	0	0	1	736	0.001	0	0	1
Home Solar	839	0.001	0	0	1	736	0.003	0	0	1
<i>Respondent has no disability</i>										
Mini Grid	2390	0.000	0	0	0	2058	0.008	0	0	1
Kerosene	2390	0.000	0	0	0	2058	0.000	0	0	1
Collect Firewood	2390	0.769	1	0	1	2058	0.814	1	0	1
Purchase Firewood	2390	0.140	0	0	1	2058	0.099	0	0	1
Charcoal	2390	0.178	0	0	1	2058	0.149	0	0	1
Generator	2390	0.000	0	0	1	2058	0.001	0	0	1
Home Solar	2390	0.001	0	0	1	2058	0.001	0	0	1

Summary statistics for cooking fuel are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Figure 2 shows the different types of lighting that households report using at Baseline and Midline. At Midline, the most common type of lighting for the entire sample is a solar lantern at 40.3 percent, followed closely with a battery powered lamp at 32 percent. The next most commonly used type of lighting is the UNOPS solar mini-grid with 25.6 percent of the sample.

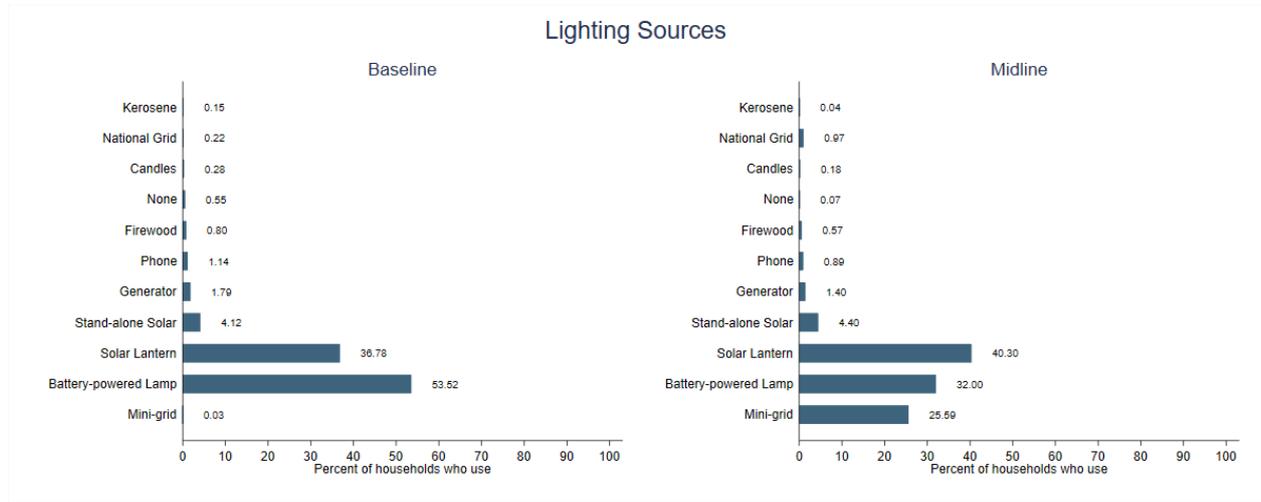


Figure 2: Lighting Sources for Households

Table 5 reports the summary statistics with the entire sample broken down by the same disaggregations as previously reported. The most common light source for all households in the sample would be a solar lantern which has increased from Baseline (36.8 percent) to Midline (40.3 percent). Following closely would be a battery powered light which has decreased from Baseline (53.4 percent) to Midline (32 percent), and then the UNOPS mini-grid up from no usage at Baseline to 25.6 percent at Midline. The primary source of light are very similar for male headed and female headed households: solar lanterns(41.7 percent), battery (30 percent),mini-grid (25.3 percent) for male headed households and solar lanterns(38.2 percent), battery (35 percent),mini-grid (25.9 percent) for female headed households. Similarly based on disability status there isn't much variation: solar lanterns(41.3 percent), battery (31 percent),mini-grid (27.2 percent) for households with the respondent having a disability and solar lanterns(40 percent), battery (32.3 percent),mini-grid (25 percent) for households with the respondent having no disability.

Table 5: Summary Statistics: Light Sources

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
No Light	3230	0.006	0	0	1	2795	0.001	0	0	1
National Grid	3230	0.002	0	0	1	2795	0.010	0	0	1
Mini Grid	3230	0.000	0	0	1	2795	0.256	0	0	1
Kerosene	3230	0.001	0	0	1	2795	0.000	0	0	1
Firewood	3230	0.008	0	0	1	2795	0.006	0	0	1
lantern	3230	0.369	0	0	1	2795	0.403	0	0	1
Solar panel	3230	0.041	0	0	1	2795	0.044	0	0	1
Battery	3230	0.535	1	0	1	2795	0.320	0	0	1
Generator	3230	0.018	0	0	1	2795	0.014	0	0	1
Candle	3230	0.003	0	0	1	2795	0.002	0	0	1
Phone Light	3230	0.011	0	0	1	2795	0.009	0	0	1
<i>Female Headed Households</i>										
No Light	1308	0.006	0	0	1	1114	0.000	0	0	0
National Grid	1308	0.002	0	0	1	1114	0.015	0	0	1
Mini Grid	1308	0.000	0	0	0	1114	0.259	0	0	1
Kerosene	1308	0.002	0	0	1	1114	0.001	0	0	1
Firewood	1308	0.009	0	0	1	1114	0.006	0	0	1
lantern	1308	0.369	0	0	1	1114	0.382	0	0	1
Solar panel	1308	0.034	0	0	1	1114	0.035	0	0	1
Battery	1308	0.537	1	0	1	1114	0.350	0	0	1
Generator	1308	0.016	0	0	1	1114	0.006	0	0	1
Candle	1308	0.003	0	0	1	1114	0.004	0	0	1
Phone Light	1308	0.009	0	0	1	1114	0.010	0	0	1
<i>Male Headed Households</i>										
No Light	1922	0.005	0	0	1	1681	0.001	0	0	1
National Grid	1922	0.003	0	0	1	1681	0.006	0	0	1
Mini Grid	1922	0.001	0	0	1	1681	0.253	0	0	1
Kerosene	1922	0.001	0	0	1	1681	0.000	0	0	0
Firewood	1922	0.007	0	0	1	1681	0.005	0	0	1
lantern	1922	0.369	0	0	1	1681	0.417	0	0	1
Solar panel	1922	0.046	0	0	1	1681	0.050	0	0	1
Battery	1922	0.533	1	0	1	1681	0.300	0	0	1
Generator	1922	0.019	0	0	1	1681	0.019	0	0	1
Candle	1922	0.003	0	0	1	1681	0.001	0	0	1
Phone Light	1922	0.013	0	0	1	1681	0.008	0	0	1
<i>Respondent has any disability</i>										
No Light	839	0.005	0	0	1	736	0.001	0	0	1
National Grid	839	0.001	0	0	1	736	0.008	0	0	1
Mini Grid	839	0.000	0	0	1	736	0.272	0	0	1
Kerosene	839	0.001	0	0	1	736	0.000	0	0	0
Firewood	839	0.008	0	0	1	736	0.005	0	0	1
lantern	839	0.343	0	0	1	736	0.413	0	0	1
Solar panel	839	0.048	0	0	1	736	0.041	0	0	1
Battery	839	0.547	1	0	1	736	0.310	0	0	1
Generator	839	0.010	0	0	1	736	0.007	0	0	1
Candle	839	0.006	0	0	1	736	0.003	0	0	1
Phone Light	839	0.014	0	0	1	736	0.014	0	0	1
<i>Respondent has no disability</i>										
No Light	2390	0.006	0	0	1	2058	0.000	0	0	1
National Grid	2390	0.003	0	0	1	2058	0.010	0	0	1
Mini Grid	2390	0.000	0	0	1	2058	0.250	0	0	1
Kerosene	2390	0.001	0	0	1	2058	0.000	0	0	1
Firewood	2390	0.008	0	0	1	2058	0.006	0	0	1
lantern	2390	0.378	0	0	1	2058	0.400	0	0	1
Solar panel	2390	0.039	0	0	1	2058	0.045	0	0	1
Battery	2390	0.531	1	0	1	2058	0.323	0	0	1
Generator	2390	0.021	0	0	1	2058	0.017	0	0	1
Candle	2390	0.002	0	0	1	2058	0.001	0	0	1
Phone Light	2390	0.010	0	0	1	2058	0.007	0	0	1

Summary statistics for light source are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Table 6 reports the summary statistics for energy consumption of the household, discussing the amount spent on charcoal, firewood, generator fuel or their home solar system if they have one. We look at disaggregation by the gender of the head of household, and the disability status of the respondent who is often the household head, as recorded at Baseline. All of the summary statistics tables will follow a similar layout: the first 5 columns show data from Baseline in 2019, and columns 6-10 report data from the Midline for the year 2020. Column 1 (column 6) presents the sample size for each outcome, column 2 (column 7) reports the average, Column 3 (column 8) reports the median, while columns 4 (column 9) and 5 (column 10) report the minimum and maximum values recorded. In the first few rows statistics for each outcome are reported for the entire sample, then as mentioned previously, the following will report the same products for female headed households, male headed households, the respondent having any disability and finally the respondent having no disability.

At Baseline households spend a lot more on generator fuel (5,337 SLL) than at Midline (2,226 SLL); and also decrease expenditures on firewood from 4,266 SLL to 3,864 SLL. However they increase expenses for Charcoal from 2,496 SLL per month to 4694 SLL; and 1,018 SLL to 2,051 SLL for solar. Female headed households spend on average 876 SLL on generator fuel which is a lot less than the 3,121 SLL spent by male headed households, similarly for home solar systems female headed households spend 1,030 SLL compared to male headed households who spend 2,728 SLL. Households where the respondent has no disability, spend more than those with a disability on average on Charcoal and generator fuel.

Table 6: Summary Statistics: Energy Expenditure

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Monthly expenditure on Charcoal '000s of SLL'	3230	2.496	0	0	300	2794	4.694	0	0	200
Monthly expenditure on Firewood '000s of SLL'	3221	4.266	0	0	500	2794	3.864	0	0	600
Monthly expenditure on generator fuel '000s of SLL'	3229	5.337	0	0	840	2795	2.226	0	0	1750
Monthly expenditure on home solar system '000s of SLL'	3227	1.018	0	0	2000	2795	2.051	0	0	1500
<i>Female Headed Households</i>										
Monthly expenditure on Charcoal '000s of SLL'	1308	3.026	0	0	120	1114	4.447	0	0	200
Monthly expenditure on Firewood '000s of SLL'	1305	4.725	0	0	150	1114	4.161	0	0	240
Monthly expenditure on generator fuel '000s of SLL'	1308	3.291	0	0	480	1114	0.876	0	0	336
Monthly expenditure on home solar system '000s of SLL'	1305	0.390	0	0	200	1114	1.030	0	0	1000
<i>Male Headed Households</i>										
Monthly expenditure on Charcoal '000s of SLL'	1922	2.135	0	0	300	1680	4.857	0	0	140
Monthly expenditure on Firewood '000s of SLL'	1916	3.954	0	0	500	1680	3.666	0	0	600
Monthly expenditure on generator fuel '000s of SLL'	1921	6.730	0	0	840	1681	3.121	0	0	1750
Monthly expenditure on home solar system '000s of SLL'	1922	1.445	0	0	2000	1681	2.728	0	0	1500
<i>Respondent has any disability</i>										
Monthly expenditure on Charcoal '000s of SLL'	839	1.974	0	0	300	736	3.391	0	0	100
Monthly expenditure on Firewood '000s of SLL'	837	3.797	0	0	500	736	4.438	0	0	600
Monthly expenditure on generator fuel '000s of SLL'	839	3.493	0	0	840	736	0.516	0	0	90
Monthly expenditure on home solar system '000s of SLL'	838	0.288	0	0	2000	736	2.745	0	0	1500
<i>Respondent has no disability</i>										
Monthly expenditure on Charcoal '000s of SLL'	2390	2.680	0	0	300	2057	5.162	0	0	200
Monthly expenditure on Firewood '000s of SLL'	2383	4.433	0	0	500	2057	3.660	0	0	300
Monthly expenditure on generator fuel '000s of SLL'	2389	5.987	0	0	840	2058	2.839	0	0	1750
Monthly expenditure on home solar system '000s of SLL'	2388	1.275	0	0	2000	2058	1.804	0	0	1000

Summary statistics for energy expenditures are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Tables 7, 8 report Difference-in Difference estimates on main energy sources for lighting and cooking similar to the example presented earlier in the report. The first column reports the sample size for those who reported planting certain types of crops, column 2 reports the average in households in the comparison communities in 2019 and column 3 is the average difference between households in RREP and comparison

communities in 2019. Column 4 represents the added effect of the year 2020, and column 5 presents the interaction between the year and RREP status. The coefficients in column 5 indicate whether or not electrification created some sort of effect on the agricultural output. Table 8 reports results for the complier households, i.e households located in RREP communities which are connected to mini-grids in the Mid-line. For the rest of the report when the difference-in-difference estimations are presented, both the tables (the full sample intent to treat (ITT), and complier (LATE) sample) will be discussed together for overall significance of variables.

In Table 8 connected households are 1.4 percentage points less likely to report having no light. They are less likely to use a solar lantern when compared to 2019 usage rates, and the results show that households not connected to the mini-grid catch up over time so overall lantern usage rates are now similar. The same pattern holds for solar panels. For battery powered torch lights connected households are more likely to use it now than in 2019, but overall likelihood of usage is still lower when compared to households not connected to the mini-grid. Likelihood of UNOPS mini-grid usage goes up in households in RREP communities by 5 percentage points (Table 7), and by 8.3 percentage points in connected households (Table 8). These households are 1.5 percentage points more likely to use a Mini-grid as an energy source for cooking; and connected households are 2.5 percentage points more likely. Households in non RREP communities are slowly increasing charcoal usage, hence reducing differences between households in RREP and comparison communities when it comes to charcoal usage.

When it comes to expenditure on energy sources, households in RREP communities spend 8,768 SLL less on average than households in comparison communities in 2021 compared to 2019, and accounting for baseline differences they spend about 2,780 SLL less on average on generator fuel. Connected households spend 13,242 SLL less on average than non connected households in 2021 compared to 2019, and accounting for baseline differences they spend about 4,473 SLL less on average on generator fuel. Connected households also spend 4,279 SLL less on home solar systems than non connected households on average. This suggests that connection to the mini-grid shifts the expenditure allocations for households; this is important because generator fuel constitutes a large amount of expenditure by households as seen in 6. This might free up resources for other kinds of productive investments for households.

Table 7: Difference in Differences on Energy Use

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Light Source</i>					
No Light	2997	0.006	0.008 (0.01)	0.001 (0.00)	-0.010 (0.01)
National Grid	2997	0.002	0.004 (0.00)	0.000 (0.00)	0.014* (0.01)
Mini Grid	2997	0.000	0.002 (0.01)	0.001 (0.00)	0.518*** (0.04)
Kerosene	2997	0.001	-0.001 (0.00)	-0.002* (0.00)	0.002 (0.00)
Firewood	2997	0.008	-0.003 (0.00)	-0.003 (0.00)	0.002 (0.00)
lantern	2997	0.369	0.165*** (0.03)	0.221*** (0.04)	-0.380*** (0.05)
Solar panel	2997	0.041	0.034* (0.02)	0.029*** (0.01)	-0.061*** (0.02)
Battery	2997	0.535	-0.229*** (0.03)	-0.245*** (0.03)	0.069 (0.05)
Generator	2997	0.018	0.010 (0.01)	0.004 (0.01)	-0.018** (0.01)
Candle	2997	0.003	0.003 (0.00)	-0.001 (0.00)	-0.001 (0.00)
Phone Light	2997	0.011	0.014*** (0.00)	0.001 (0.00)	-0.005 (0.01)
<i>Cooking Energy Source</i>					
Mini Grid	2997	0.000	0.001 (0.00)	-0.000 (0.00)	0.015*** (0.00)
Kerosene	2997	0.000	0.000 (0.00)	0.001 (0.00)	-0.001 (0.00)
Collect Firewood	2997	0.772	-0.110** (0.04)	0.019 (0.02)	0.050* (0.03)
Purchase Firewood	2997	0.139	0.055* (0.03)	-0.029* (0.01)	-0.023 (0.03)
Charcoal	2997	0.176	0.118*** (0.03)	0.002 (0.02)	-0.072*** (0.02)
Generator	2997	0.000	0.001 (0.00)	0.001 (0.00)	-0.002 (0.00)
Home Solar	2997	0.001	0.001 (0.00)	0.001 (0.00)	-0.002 (0.00)
<i>Expenditure on Energy Sources</i>					
Monthly expenditure on Charcoal '000s of SLL'	2997	2.496	1.927** (0.82)	2.545*** (0.82)	-0.355 (1.11)
Monthly expenditure on Firewood '000s of SLL'	2992	4.266	1.957 (1.19)	0.390 (0.73)	-1.319 (1.14)
Monthly expenditure on generator fuel '000s of SLL'	2997	5.337	5.985*** (2.02)	0.061 (1.48)	-8.757*** (2.42)
Monthly expenditure on home solar system '000s of SLL'	2996	1.018	-1.128 (1.14)	2.327 (2.09)	-2.676 (2.09)

Difference in Difference estimation uses electricity use from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects and clustered standard errors at the village level. The regression is weighted using Inverse Probability Weights.

Table 8: Difference in Differences on Energy Use(Connected Households in RREP Communities)

	N (1)	Mean in Not Connected HHs in 2019 (2)	Connected vs Not Connected in 2019 (3)	Post (4)	Post × Connected (5)
<i>Light Source</i>					
No Light	2878	0.006	0.012** (0.01)	0.001 (0.00)	-0.014* (0.01)
National Grid	2878	0.002	0.005 (0.01)	0.001 (0.01)	0.024* (0.01)
Mini Grid	2878	0.000	0.001 (0.02)	0.003 (0.01)	0.839*** (0.02)
Kerosene	2878	0.001	-0.002 (0.00)	-0.002 (0.00)	0.004 (0.00)
Firewood	2878	0.008	-0.004 (0.01)	-0.003 (0.01)	0.003 (0.01)
lantern	2878	0.369	0.279*** (0.04)	0.220*** (0.03)	-0.629*** (0.06)
Solar panel	2878	0.041	0.054*** (0.02)	0.029* (0.01)	-0.099*** (0.03)
Battery	2878	0.535	-0.376*** (0.04)	-0.246*** (0.03)	0.119** (0.06)
Generator	2878	0.018	0.018 (0.01)	0.004 (0.01)	-0.032* (0.02)
Candle	2878	0.003	0.005 (0.00)	-0.001 (0.00)	-0.003 (0.01)
Phone Light	2878	0.011	0.018* (0.01)	0.001 (0.01)	-0.004 (0.01)
<i>Cooking Energy Source</i>					
Mini Grid	2878	0.000	0.001 (0.01)	-0.000 (0.01)	0.025** (0.01)
Kerosene	2878	0.000	0.000 (0.00)	0.001 (0.00)	-0.001 (0.00)
Collect Firewood	2878	0.772	-0.159*** (0.04)	0.019 (0.03)	0.063 (0.05)
Purchase Firewood	2878	0.139	0.082*** (0.03)	-0.028 (0.02)	-0.031 (0.04)
Charcoal	2878	0.176	0.192*** (0.03)	0.003 (0.03)	-0.120** (0.05)
Generator	2878	0.000	0.001 (0.00)	0.001 (0.00)	-0.003 (0.00)
Home Solar	2878	0.001	0.003 (0.00)	0.001 (0.00)	-0.004 (0.01)
<i>Expenditure on Energy Sources</i>					
Monthly expenditure on Charcoal '000s of SLL'	2877	2.496	3.222** (1.41)	2.558** (1.18)	-0.700 (2.05)
Monthly expenditure on Firewood '000s of SLL'	2873	4.266	2.940* (1.77)	0.402 (1.48)	-1.911 (2.58)
Monthly expenditure on generator fuel '000s of SLL'	2877	5.337	8.812*** (2.99)	0.070 (2.50)	-13.272*** (4.35)
Monthly expenditure on home solar system '000s of SLL'	2877	1.018	-1.864 (1.71)	2.308 (1.43)	-4.276* (2.50)

Difference in Difference estimation uses electricity use from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects.

### 4.3 Agriculture

This section presents findings on agricultural production and income. The measure of agricultural production focuses on two key staple crops (rice and cassava) and two cash crops (coffee and cocoa). In future reports, the analysis will be expanded to other common crops that will give more information about how the land is being used per each crop.

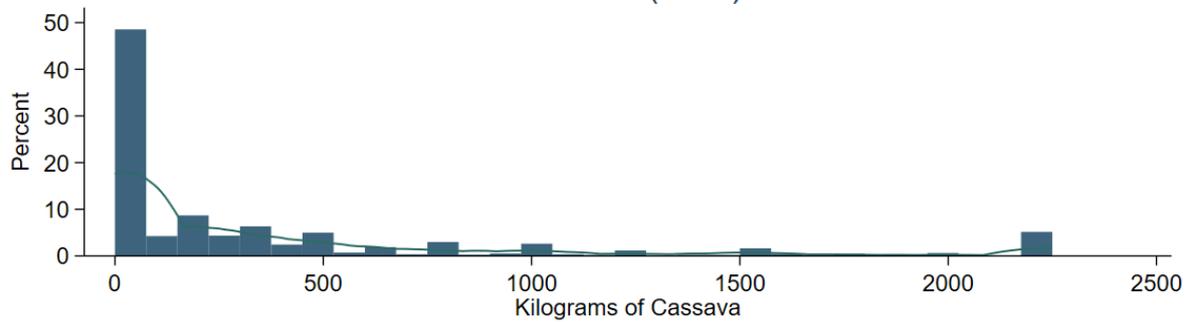
In the Baseline survey, collected in June 2019, the household survey requested data on agricultural production for the 2018 calendar year. At the time of that data collection, the staple crops had not been harvested due to seasonality. Therefore, the research team gathered data on harvesting and selling of these crops for the year 2018, which was previously reported in the Baseline reports. In this report, we compare changes in agricultural production for 2019 to 2020. Data for both of these years was collected in the Midline survey. Since the data from the year 2019 is now available, and to maintain consistency with the remainder of the report on the timing of the Baseline data, this section uses Midline data covering the year 2019. Throughout Section 4.2, we refer to the sowed, harvested and sold during the year of 2019 as "Baseline".

Below are the kilogram distributions from Baseline and Midline for cassava (Figure 3) and rice (Figure 4) harvested and sold. Figure 3 shows the overall distribution of how much was harvested at Baseline and at Midline, and there was a minor decrease in quantities harvested overall. Cassava has a small distribution of what they took to the market to sell, but it seems as though many keep some of their harvest for household consumption. When we look at the same indicators for rice, Figure 4 on rice harvested and sold, there is a slight increase from Baseline to Midline of about 50kgs. There is also a larger distribution on the quantities being harvested in the Midline than in Baseline. Figure 4 shows that most of the sample does not sell their rice, instead keeping their harvest for household consumption or for planting in the next season.

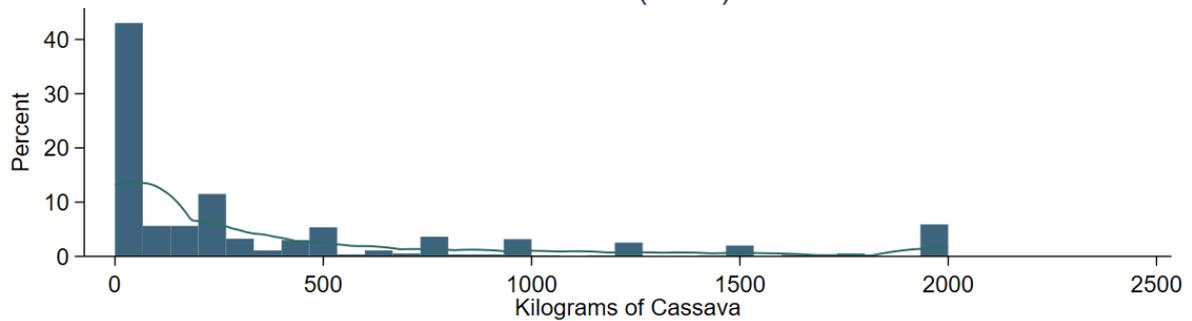
Figure 3: Distribution of Cassava Harvested and Sold at Baseline and Midline

### Distribution of Cassava Harvested

Baseline (2019)

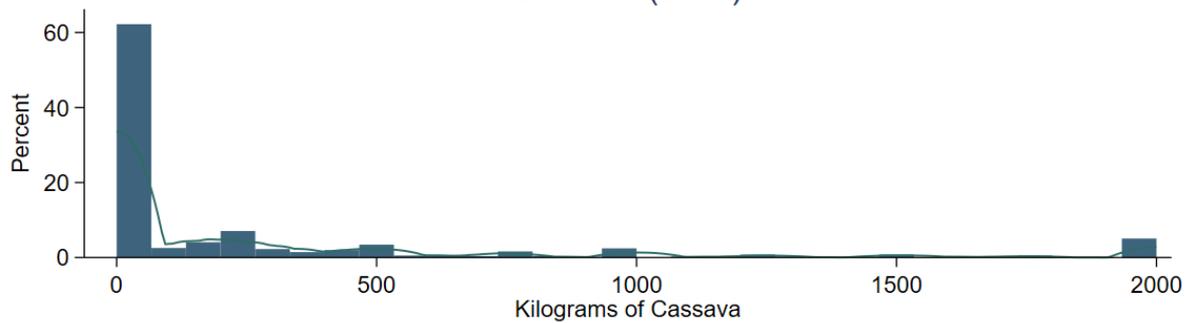


Midline (2020)



### Distribution of Cassava Sold

Baseline (2019)



Midline (2020)

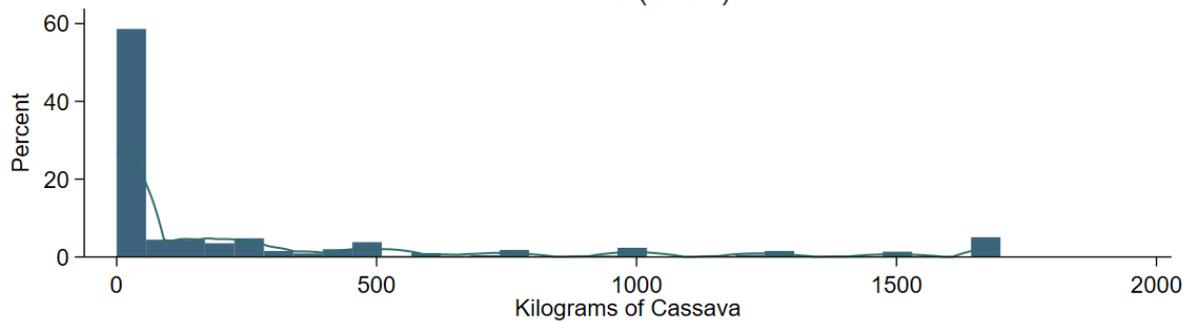
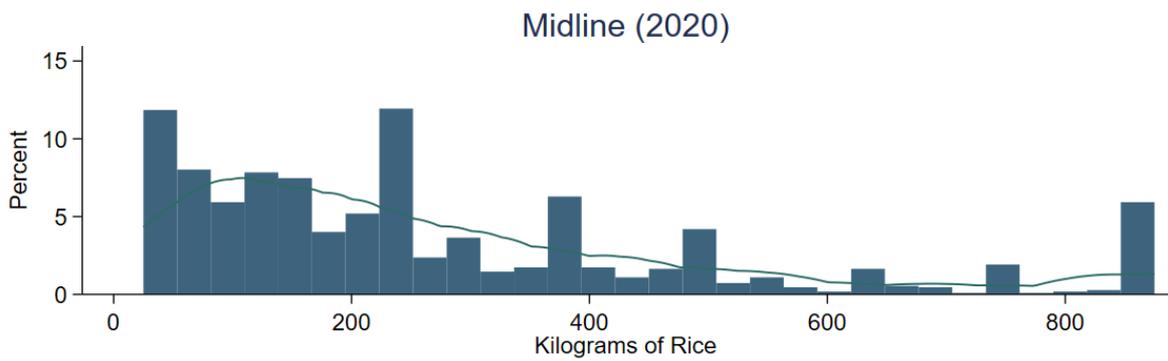
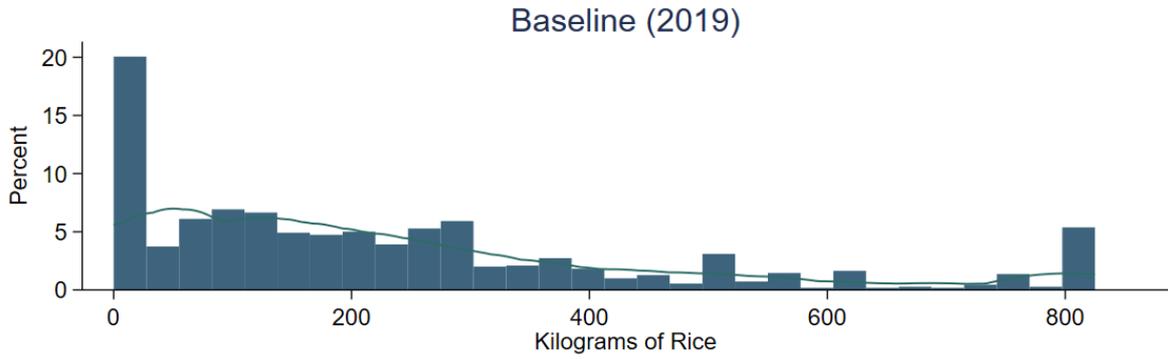


Figure 4: Distribution of Rice Harvested and Sold at Baseline and Midline

### Distribution of Rice Harvested



### Distribution of Rice Sold

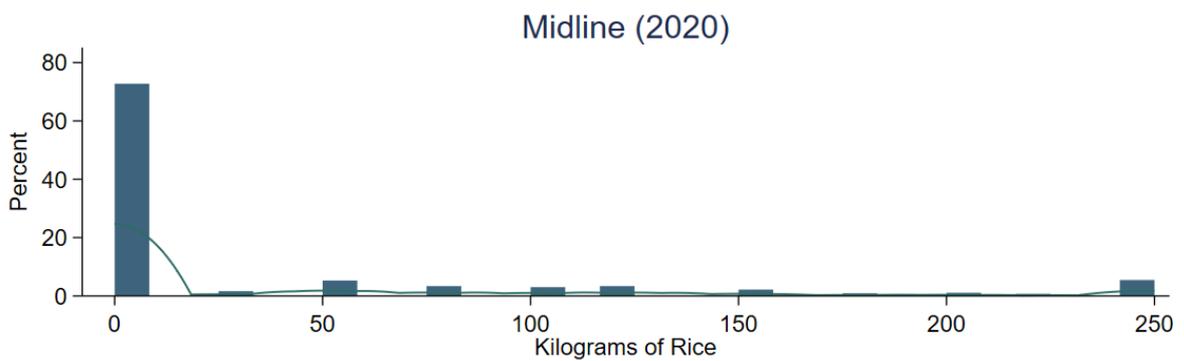
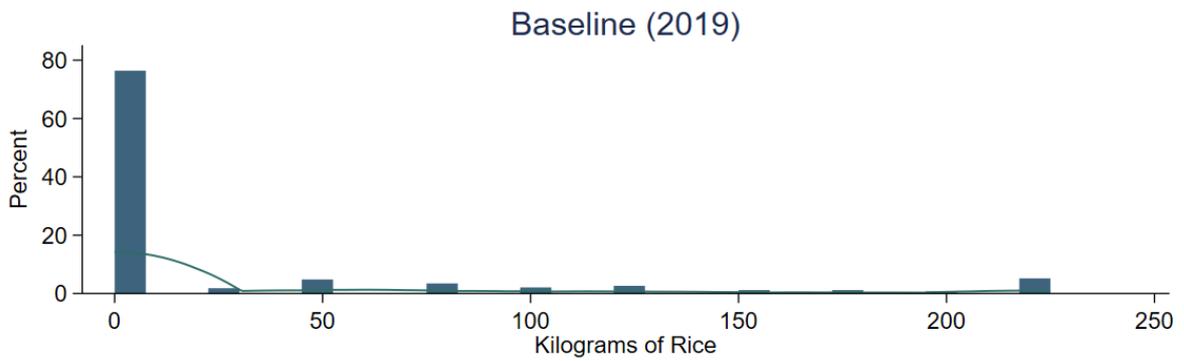


Figure 5 displays the average amount of kilograms of rice and cassava harvested and sold during the years 2019 and 2020 by RREP and comparison communities. In both Baseline and Midline, quantities harvested were substantially higher than quantities sold for both rice and cassava, though the disparity is larger for rice than it is for cassava. Rice harvested and sold in RREP and comparison communities increased from Baseline to Midline, whereas for cassava there is an increase in quantities harvested for RREP communities, but decrease in quantities sold. In the comparison communities there is an overall increase for both cassava harvested and sold.

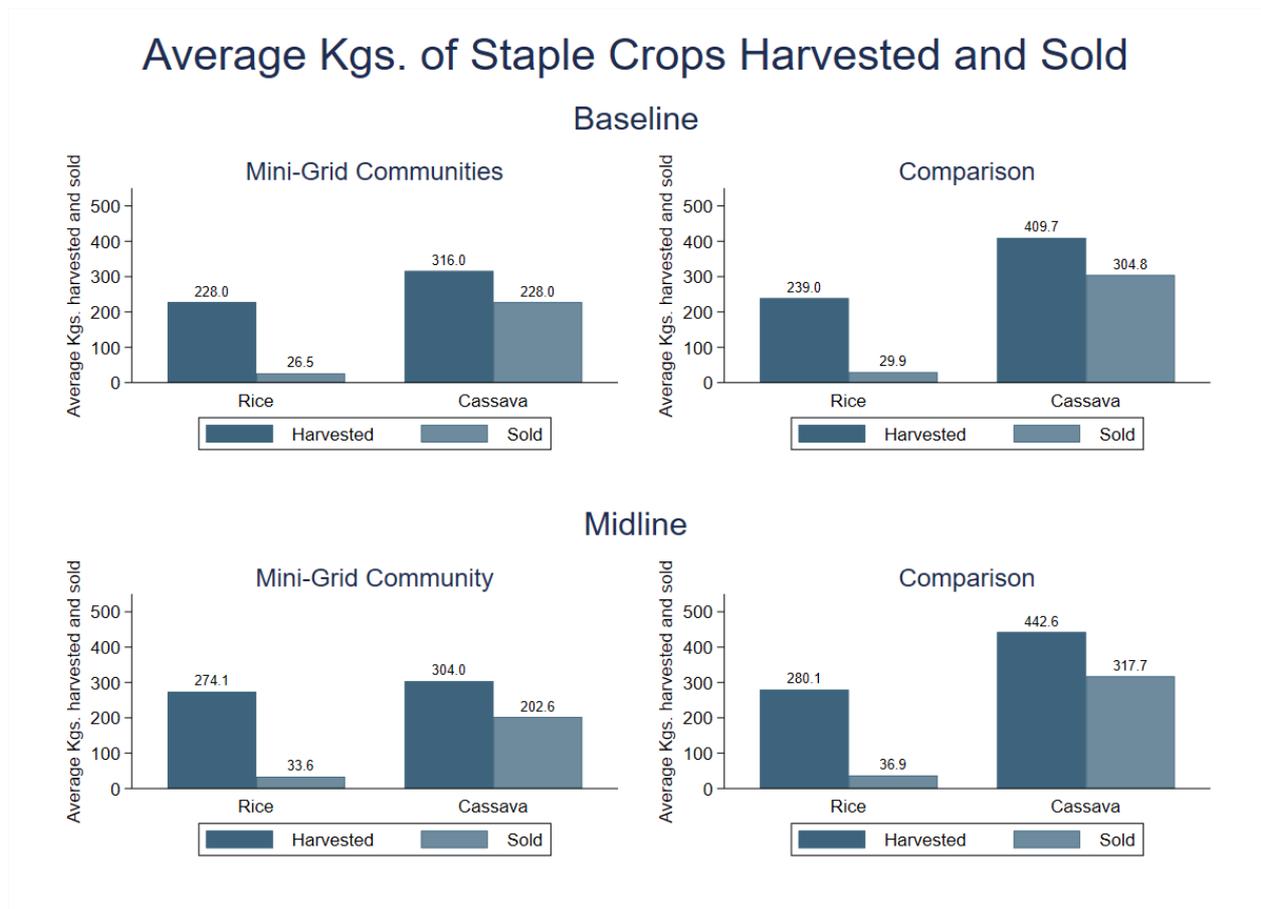


Figure 5: Average Kgs. of Rice and Cassava Harvested and Sold for Baseline and Midline by RREP Status

Table 9 reports the proportion of households participating in each activity for each crop, disaggregated by gender and disability status. We find that there are more households who are growing staple crops (rice and cassava) than those who are growing cash crops (cocoa and coffee). This is to be expected, given that a lot of agriculture constitutes subsistence farming. This is a common trend from both waves of the survey. In all agricultural products the quantities for sowing, harvesting and selling have increased from Baseline to Midline, aside from cassava sold, cocoa and coffee harvested where the average has remained roughly the same.

For the full sample, rice sowed had increased from 61.9 kgs on average to 71.8 kgs, rice harvested increased from 233.9 kgs on average to 277.3 kgs and rice sold had increased on average from 28.4 kgs to 35.5 kgs. The large difference between the quantities harvested and sold for rice may be because the households are keeping most of their harvest for household consumption and for planting in the next season. Among all crops, cassava is the most planted crop, which remains consistent throughout all subsets of the sample. This may be because cassava is a cheaper agriculture product in comparison to other crops. Cassava sowed had

increased from an average of 806.7 sticks to 1,259.7 sticks, kgs harvested on average increased from 366.2 kgs to 375.5 kgs, and cassava sold on average at Baseline was 269.3 kgs while at Midline the average sold was 262.1 kgs. The last few rows report trees of cocoa and coffee sowed. For cocoa at Baseline there was an average of 111.1 trees sowed, and at Midline this increased to an average of 130.4 trees. The amount in kgs harvested on average went from 53.8 kgs to 50 kgs. Coffee trees sowed on average at Baseline were 73.2 trees, and at Midline this increased to an average of 88.7 trees sowed. Harvesting remained the same from Baseline to Midline.

For female headed households, the average amount of sticks sown for cassava at Baseline in 2019 was 800.4 sticks while at Midline in 2020 this average increased to be 1,267.6 sticks. The amount of cassava harvested in kgs decreased slightly from 296.1 kgs to 291.3 kgs. Quantity sold had a similar decrease from 216.2 kgs to 193 kgs. Sowed rice increased on average from 57 kgs to 64.5 kgs, harvesting rice had an average increase from 207.4 kgs to 240.7 kgs and the quantity sold of rice increased on average from 24 kgs to 27.9 kgs. Cocoa and coffee trees sowed have increased (80.7 to 100 for cocoa and 47 to 85.8 for coffee), but the quantities harvested from the trees has had a slight decrease (51.9 kgs to 41 kgs for cocoa and 24.1 kgs to 15.6 kgs for coffee).

After female headed households, the table reports the products for all male headed households. For all goods, there is an overall increase in sowing, harvesting and selling from Baseline to Midline. Rice sowed increased from 64.6 kgs to 75.7 kgs on average, harvested rice increased on average from 248.2 to 297 kgs, and rice sold on average increased from 30.7 kgs to 39.6 kgs. Cassava sticks sowed increased from Baseline on average from 810.3 to 1,255.1 sticks at Midline, the kgs harvested increased from 407 kgs to 425.6 kgs. The quantity of cassava sold on average increased from 300.3 kgs to 302.3 kgs. Cocoa sowed had increased from 123.2 trees on average to 143.2 but had a small decrease on average of their harvest from 54.6 kgs to 53.7 kgs. The trees for coffee sowed and kgs harvested from Baseline. remained fairly constant.

The last two sections report on the respondents who had any disability and did not have any disability. We observe that those households which did not report a disability consistently sowed, harvested and sold more at Midline than those with a disability. The averages remain around the same quantities as previously mentioned in the other sections of Table 9.

Table 9: Summary Statistics: Agricultural Output

	Baseline (2019)					Midline (2020)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Rice sowed in Kgs	1098	61.933	50	0	200	1098	71.801	63	13	175
Rice Harvested in Kgs	1098	233.911	175	0	825	1098	277.336	200	25	875
Rice sold in Kgs	1098	28.358	0	0	225	1098	35.499	0	0	250
Cassava sowed in sticks	1106	806.670	200	0	6000	1106	1259.708	300	0	9000
Cassava Harvested in Kgs	1106	366.234	100	0	2250	1106	375.547	150	0	2000
Cassava Sold in Kgs	1106	269.335	0	0	2000	1106	262.071	0	0	1700
Trees of cocoa sowed	214	111.112	30	0	700	207	130.440	60	0	700
Coco Harvested in Kgs	214	53.804	1	0	450	207	49.957	3	0	450
Trees of coffee sowed	164	73.177	0	0	800	163	88.736	0	0	800
Coffee Harvested in Kgs	164	24.451	0	0	200	163	24.429	1	0	200
<i>Female Headed Households</i>										
Rice sowed in Kgs	384	57.012	50	0	200	384	64.525	50	13	175
Rice Harvested in Kgs	384	207.350	150	0	825	384	240.690	175	25	875
Rice sold in Kgs	384	23.991	0	0	225	384	27.897	0	0	250
Cassava sowed in sticks	407	800.447	150	0	6000	407	1267.582	300	0	9000
Cassava Harvested in Kgs	407	296.143	50	0	2250	407	291.339	100	0	2000
Cassava Sold in Kgs	407	216.240	0	0	2000	407	192.998	0	0	1700
Trees of cocoa sowed	61	80.689	0	0	600	61	100.016	50	0	700
Coco Harvested in Kgs	61	51.852	2	0	450	61	40.984	3	0	450
Trees of coffee sowed	46	46.957	0	0	600	46	85.826	0	0	600
Coffee Harvested in Kgs	46	24.087	0	0	200	46	15.565	1	0	110
<i>Male Headed Households</i>										
Rice sowed in Kgs	714	64.580	50	0	200	714	75.714	75	13	175
Rice Harvested in Kgs	714	248.196	200	0	825	714	297.045	250	25	875
Rice sold in Kgs	714	30.707	0	0	225	714	39.587	0	0	250
Cassava sowed in sticks	699	810.293	200	0	6000	699	1255.123	400	0	9000
Cassava Harvested in Kgs	699	407.046	150	0	2250	699	424.578	150	0	2000
Cassava Sold in Kgs	699	300.250	0	0	2000	699	302.289	0	0	1700
Trees of cocoa sowed	153	123.242	40	0	700	146	143.151	60	0	700
Coco Harvested in Kgs	153	54.582	1	0	450	146	53.705	3	0	450
Trees of coffee sowed	118	83.398	0	0	800	117	89.880	0	0	800
Coffee Harvested in Kgs	118	24.593	0	0	200	117	27.915	1	0	200
<i>Respondent has any disability</i>										
Rice sowed in Kgs	291	58.290	50	0	200	291	70.215	50	13	175
Rice Harvested in Kgs	291	206.649	150	0	825	291	253.918	200	25	875
Rice sold in Kgs	291	25.129	0	0	225	291	32.775	0	0	250
Cassava sowed in sticks	269	760.561	200	0	6000	269	1125.093	350	0	9000
Cassava Harvested in Kgs	269	356.227	100	0	2250	269	355.204	150	0	2000
Cassava Sold in Kgs	269	257.007	0	0	2000	269	239.870	0	0	1700
Trees of cocoa sowed	52	79.981	0	0	700	51	85.765	25	0	550
Coco Harvested in Kgs	52	49.404	2	0	450	51	50.333	9	0	450
Trees of coffee sowed	44	74.159	0	0	800	44	105.341	0	0	600
Coffee Harvested in Kgs	44	28.159	0	0	200	44	22.114	1	0	150
<i>Respondent has no disability</i>										
Rice sowed in Kgs	806	63.325	50	0	200	806	72.370	63	13	175
Rice Harvested in Kgs	806	244.044	175	0	825	806	286.042	225	25	875
Rice sold in Kgs	806	29.560	0	0	225	806	36.495	0	0	250
Cassava sowed in sticks	837	821.489	200	0	6000	837	1302.971	300	0	9000
Cassava Harvested in Kgs	837	369.450	100	0	2250	837	382.085	150	0	2000
Cassava Sold in Kgs	837	273.297	0	0	2000	837	269.205	0	0	1700
Trees of cocoa sowed	162	121.105	44	0	700	156	145.045	70	0	700
Coco Harvested in Kgs	162	55.216	1	0	450	156	49.833	3	0	450
Trees of coffee sowed	120	72.817	0	0	800	119	82.597	0	0	800
Coffee Harvested in Kgs	120	23.092	0	0	200	119	25.286	1	0	200

Summary statistics for agricultural output are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

In Table 10 Column 3 suggests that households in RREP communities were not different from comparison households in 2019 except that they sowed less cocoa and harvested less coffee; and sowed and harvested less rice when looking at the transformed data in the lower panel. Column 4 suggests that for households in both RREP and comparison communities quantities sold and harvested either increased or didn't change in 2020 when compared to 2019. Column 5 finds that households in RREP communities sowed and harvested more rice on average than households in comparison communities in 2020 vs 2019, statistically significant at the 5 percent level. When looking at columns 3-5 together we see that households in RREP communities sow and harvest the same amounts as households in comparison communities after catching up to cover the pre electrification difference.

Table 10: Difference in Differences Agricultural Output

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Agricultural Output</i>					
Rice sowed in Kgs	1095	61.933	-3.473 (3.99)	7.421*** (1.65)	5.457** (2.58)
Rice Harvested in Kgs	1095	233.911	-3.714 (24.47)	41.615*** (8.31)	8.131 (12.31)
Rice sold in Kgs	1095	28.358	-3.352 (6.30)	8.273*** (2.76)	-0.640 (3.51)
Cassava sowed in sticks	1103	806.670	-54.535 (161.77)	401.382*** (91.91)	98.784 (120.66)
Cassava Harvested in Kgs	1103	366.234	-87.840 (65.31)	34.448 (29.31)	-56.914 (51.33)
Cassava Sold in Kgs	1103	269.335	-73.913 (59.11)	14.026 (21.77)	-47.255 (39.99)
Trees of cocoa sowed	210	111.112	-40.925* (23.47)	32.283** (15.63)	-30.590 (21.36)
Coco Harvested in Kgs	210	53.804	-42.902 (29.69)	-0.811 (6.10)	-5.617 (8.25)
Trees of coffee sowed	162	73.177	14.246 (26.17)	12.771 (11.74)	5.026 (18.34)
Coffee Harvested in Kgs	162	24.451	-16.292* (9.47)	1.592 (2.61)	-5.539 (6.12)
<i>Agricultural Output IHS transformed</i>					
Rice sowed	1095	3.961	-0.367** (0.16)	0.620*** (0.09)	0.397*** (0.14)
Rice Harvested	1095	4.936	-0.472** (0.22)	0.789*** (0.12)	0.508*** (0.18)
Rice sold	1095	1.245	-0.233 (0.24)	0.235* (0.12)	0.046 (0.15)
Cassava sowed	1103	4.723	-0.248 (0.30)	1.388*** (0.17)	0.337 (0.22)
Cassava Harvested	1103	3.661	-0.484 (0.32)	0.434** (0.17)	-0.130 (0.32)
Cassava Sold	1103	2.681	-0.472 (0.35)	0.375** (0.15)	-0.348 (0.28)
Cocoa sowed	210	3.102	-0.044 (0.38)	0.997*** (0.26)	-0.695* (0.39)
Coco Harvested	210	2.155	-0.596 (0.64)	0.403** (0.19)	-0.270 (0.24)
Coffee sowed	162	2.111	0.103 (0.49)	0.213 (0.22)	0.449 (0.45)
Coffee Harvested	162	1.627	-0.776* (0.41)	0.165 (0.14)	0.038 (0.29)

Difference in Difference estimation uses agricultural output from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects and clustered standard errors at the village level. The regression is weighted using Inverse Probability Weights. The IHS transformation refers to the Inverse-Hyperbolic Sine transformation that accounts for the skewness in the data.

Table 11: Difference in Differences Agricultural Output(Connected Households in RREP Communities)

	N (1)	Mean in Not Connected HHs in 2019 (2)	Connected vs Not Connected in 2019 (3)	Post (4)	Post × Connected (5)
<i>Agricultural Output</i>					
Rice sowed in Kgs	1095	61.933	-6.111 (7.29)	7.421 (5.41)	9.597 (10.29)
Rice Harvested in Kgs	1095	233.911	-6.530 (34.12)	41.615 (25.33)	14.301 (48.16)
Rice sold in Kgs	1095	28.358	-5.910 (9.81)	8.273 (7.29)	-1.125 (13.85)
Cassava sowed in sticks	1103	806.670	-92.038 (283.91)	401.382* (225.84)	167.550 (410.65)
Cassava Harvested in Kgs	1103	366.234	-138.584* (76.93)	34.448 (61.19)	-96.534 (111.27)
Cassava Sold in Kgs	1103	269.335	-116.640* (66.63)	14.026 (53.01)	-80.150 (96.38)
Trees of cocoa sowed	210	111.112	-65.397 (41.77)	32.128 (33.06)	-46.994 (58.09)
Coco Harvested in Kgs	210	53.804	-68.694*** (23.18)	-0.932 (18.34)	-7.429 (32.23)
Trees of coffee sowed	162	73.177	22.609 (54.75)	12.684 (43.45)	7.942 (74.52)
Coffee Harvested in Kgs	162	24.451	-25.854** (12.61)	1.692 (10.01)	-8.758 (17.17)
<i>Agricultural Output IHS transformed</i>					
Rice sowed	1095	3.961	-0.367** (0.16)	0.620*** (0.09)	0.397*** (0.14)
Rice Harvested	1095	4.936	-0.472** (0.22)	0.789*** (0.12)	0.508*** (0.18)
Rice sold	1095	1.245	-0.233 (0.24)	0.235* (0.12)	0.046 (0.15)
Cassava sowed	1103	4.723	-0.248 (0.30)	1.388*** (0.17)	0.337 (0.22)
Cassava Harvested	1103	3.661	-0.484 (0.32)	0.434** (0.17)	-0.130 (0.32)
Cassava Sold	1103	2.681	-0.472 (0.35)	0.375** (0.15)	-0.348 (0.28)
Cocoa sowed	210	3.102	-0.044 (0.38)	0.997*** (0.26)	-0.695* (0.39)
Coco Harvested	210	2.155	-0.596 (0.64)	0.403** (0.19)	-0.270 (0.24)
Coffee sowed	162	2.111	0.103 (0.49)	0.213 (0.22)	0.449 (0.45)
Coffee Harvested	162	1.627	-0.776* (0.41)	0.165 (0.14)	0.038 (0.29)

Difference in Difference estimation uses agricultural output from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects. The regression is weighted using Inverse Probability Weights. The IHS transformation refers to the Inverse-Hyperbolic Sine transformation that accounts for the skewness in the data.

In Table 11, connected Households sow and harvest more rice on average, and sow less cocoa in comparison to not connected households in 2020 when compared to 2019. A similar story is seen with rice sowed and harvested as in the previous table, connected households catch up over time, neutralizing earlier differences.

## 4.4 Non-agricultural Income

Electricity can be an engine of structural change, shifting rural economies from agrarian subsistence towards non-agricultural enterprises. We capture Midline measures of non-agricultural employment and existing uses of electricity, investigating how these outcomes differ across gender and disability status and between RREP and comparison communities.

There appear to be two types of small business owners in the data. One with reasonable investment costs and revenues, the other with high investment costs that aren't reasonable for a small business. These businesses also earned profits that were very low compared to the costs. These might be businesses who earn their costs back over a longer period, such as traders who buy their goods in bulk and sell it over a few months. In the data, these businesses spent more than 2,000,000 SLL but earned less than a million per month. The results presented do not include these outliers.

Figure 6 shows the average monthly profits across all self-employed individual's is 303,700 SLL. The median profit per month is 150,000 SLL. This is a substantial increase from Baseline to Midline where Baseline had an average of 85,200 SLL with a median of 50,000 SLL overall. <sup>22</sup>

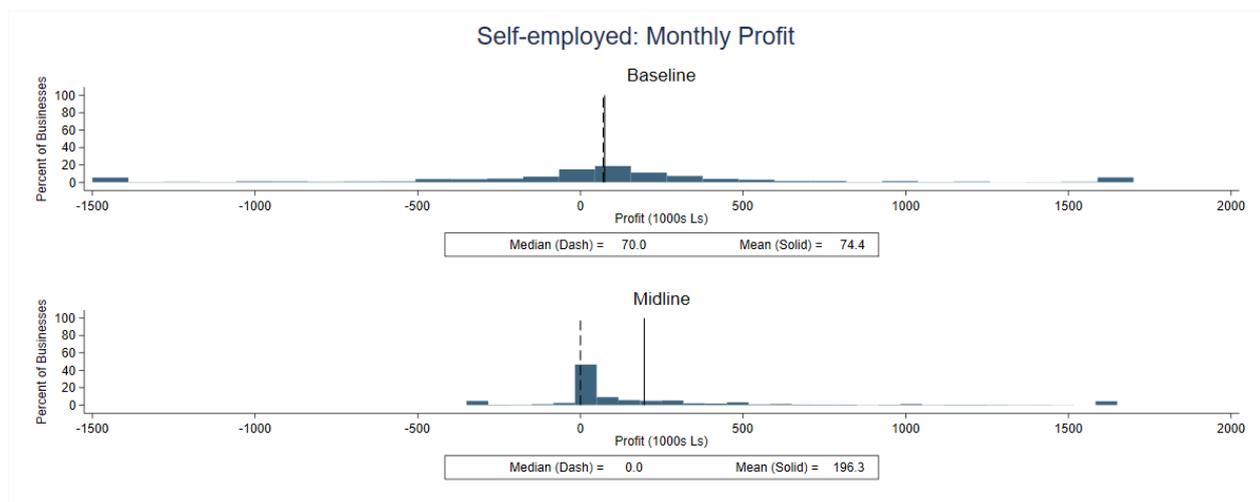


Figure 6: Self-Employed Monthly Profit Distribution Baseline Midline

Figure 7 shows the distribution of the number of hours per day worked by the self-employed, showing from Baseline and from Midline. Self-employed individuals work an average of 2 hours per day and 50 percent of self-employed individuals work more than 4 hours per day, which is a lower than what was reported at Baseline for hours worked per day.

<sup>22</sup>The questions for revenue, cost and profits at Baseline and Midline were asked in a different manner due to the amount of noise that came from Baseline data. It seemed as though during surveying the research team was not collecting these figures in the most precise manner, thus modifying the question to more accurately capture the answer happened. This can be seen with the stretched tails in the Baseline data, and how the Midline data is more tightly displayed.



Figure 7: Self-Employed Hours Worked Baseline Midline

Figure 8 and Figure 9 add nuance to our understanding of the performance of entrepreneurs at Baseline. Figure 8 shows the percent of self-employed individuals who work in each business type at both Baseline and Midline, and Figure 9 breaks down average business profits by business type at Baseline and Midline. 55.5 percent of all self-employed classify themselves as “petty traders” which is an increase from Baseline, where generating profits is particularly difficult. Petty traders report an average profit of 211,63 SLL per month. The most lucrative self-owned business type is driving a taxi, with reported profits of 646,670 SLL. Barber shops have the least amount of profit generated at an average of 7,500 SLL per month.

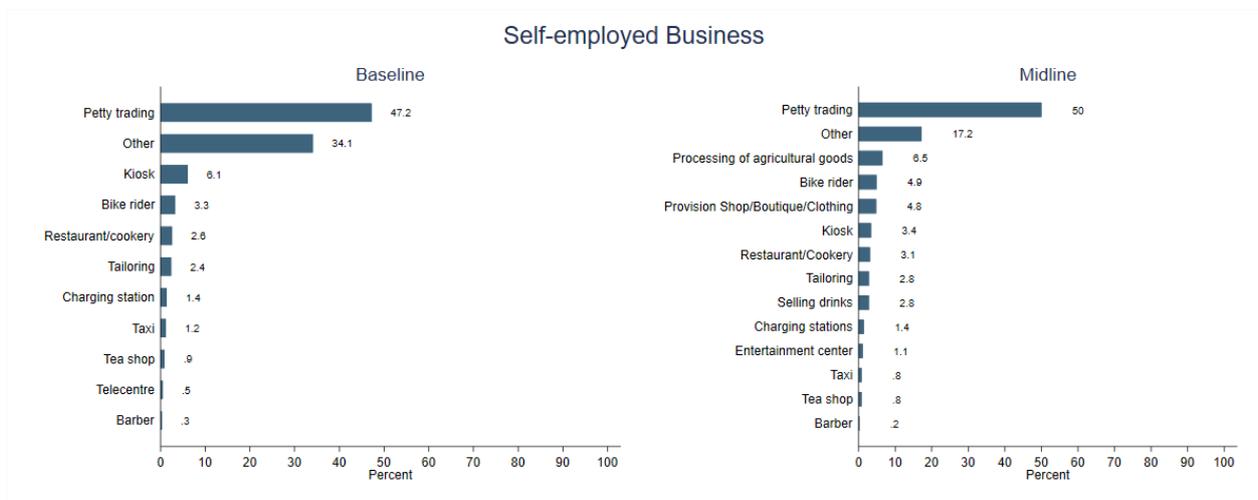


Figure 8: Self-Employed Businesses at Baseline Midline

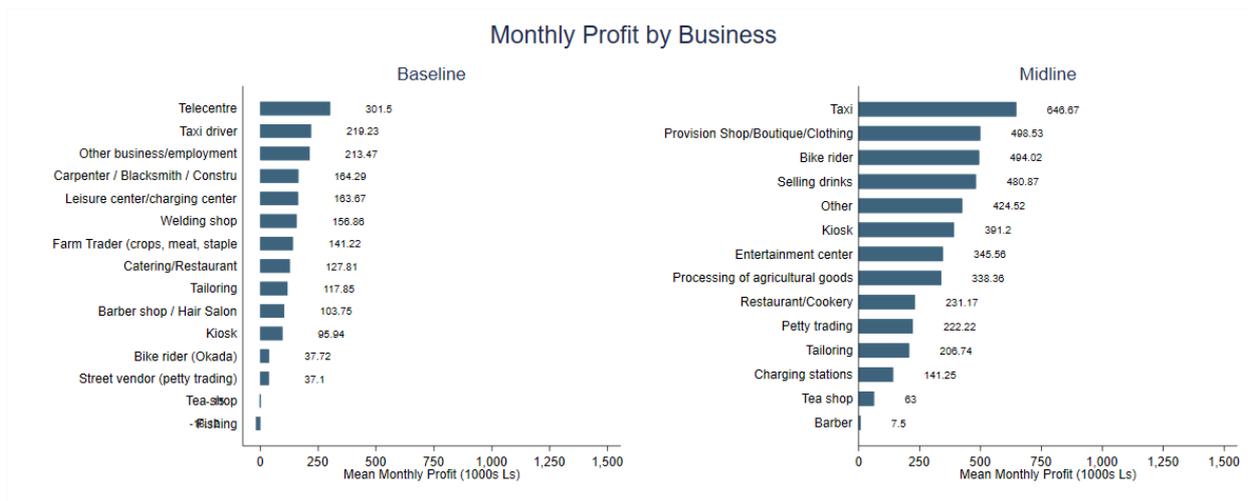


Figure 9: Monthly Profit by Business at Baseline Midline

We also look at gendered differences in self-employment patterns. While on average self-employed individuals do not claim much profit, profits differ considerably by gender. Figure 10 reports business profits by gender at Baseline and Midline.<sup>23</sup> The mean profit for men is about 243,020 SLL per month, while women report a profit of 146,860 SLL per month. This can be further explained by the types of businesses that women run. Profits for both genders have increased substantially since the Baseline. This is due to both increases in revenues and decreases in costs.

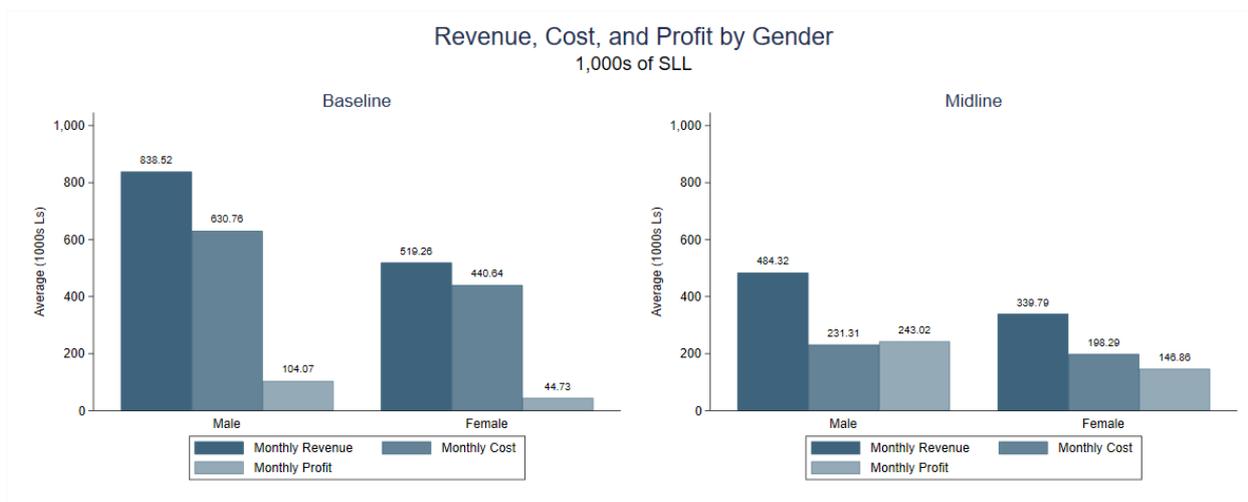


Figure 10: Revenues, Costs, and Profits by Gender at Baseline Midline

Gendered differences are also present when comparing the proportion of employed people who are self-employed to the proportion employed for a wage. Figure 11 shows that women are more likely to respond that they are self-employed (39.2 percent) compared to men (23.7 percent), but women are less likely to take up outside employment (4.5 percent) than men (12.8 percent). Self employment for men have decreased while the formal employment for them increased, whereas for females this remained somewhat constant from Baseline to Midline.

<sup>23</sup>Baseline data does not include all adult members of household. Employment data was only collected for the head of household and their spouse.

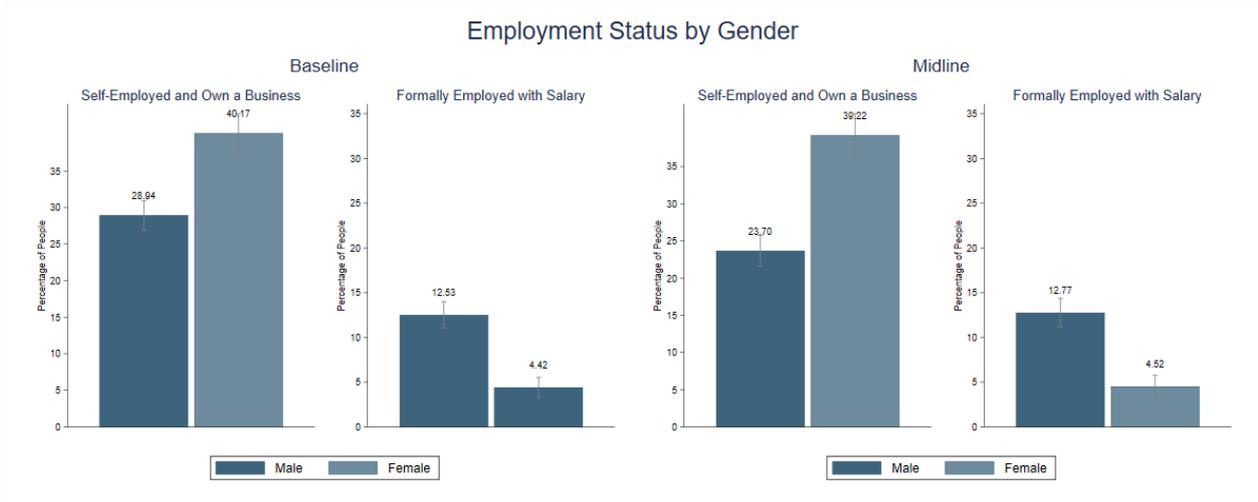


Figure 11: Employment Status by Gender at Baseline Midline

Figure 12 and Figure 13 show that employment patterns from the entire sample also differ by disability status. People with disabilities are less likely to be formally employed than they are to be self-employed. For those who are self-employed, the percentages of people with disabilities are quite low. This pattern is consistent across nearly all disability sub-categories.

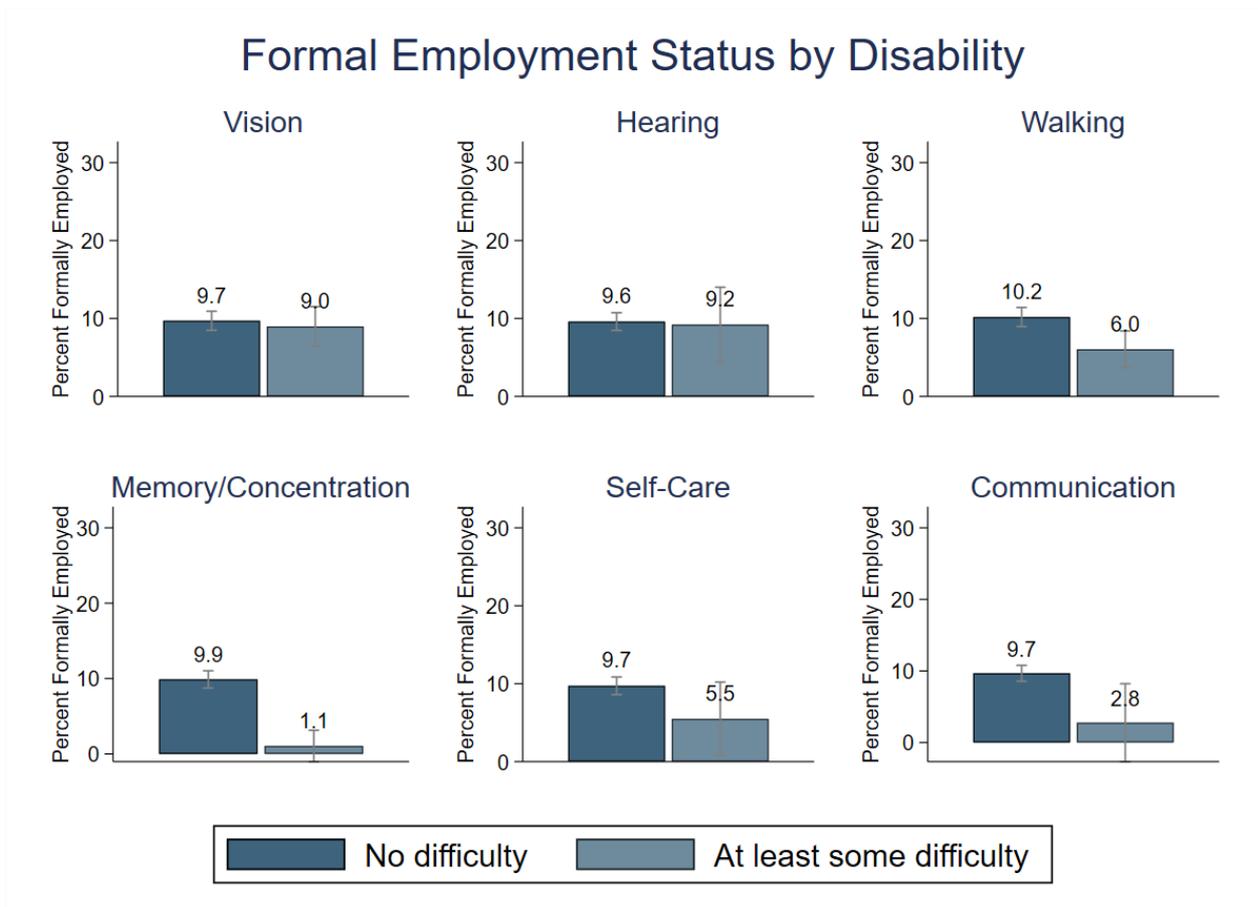


Figure 12: Formal Employment Status by Disability

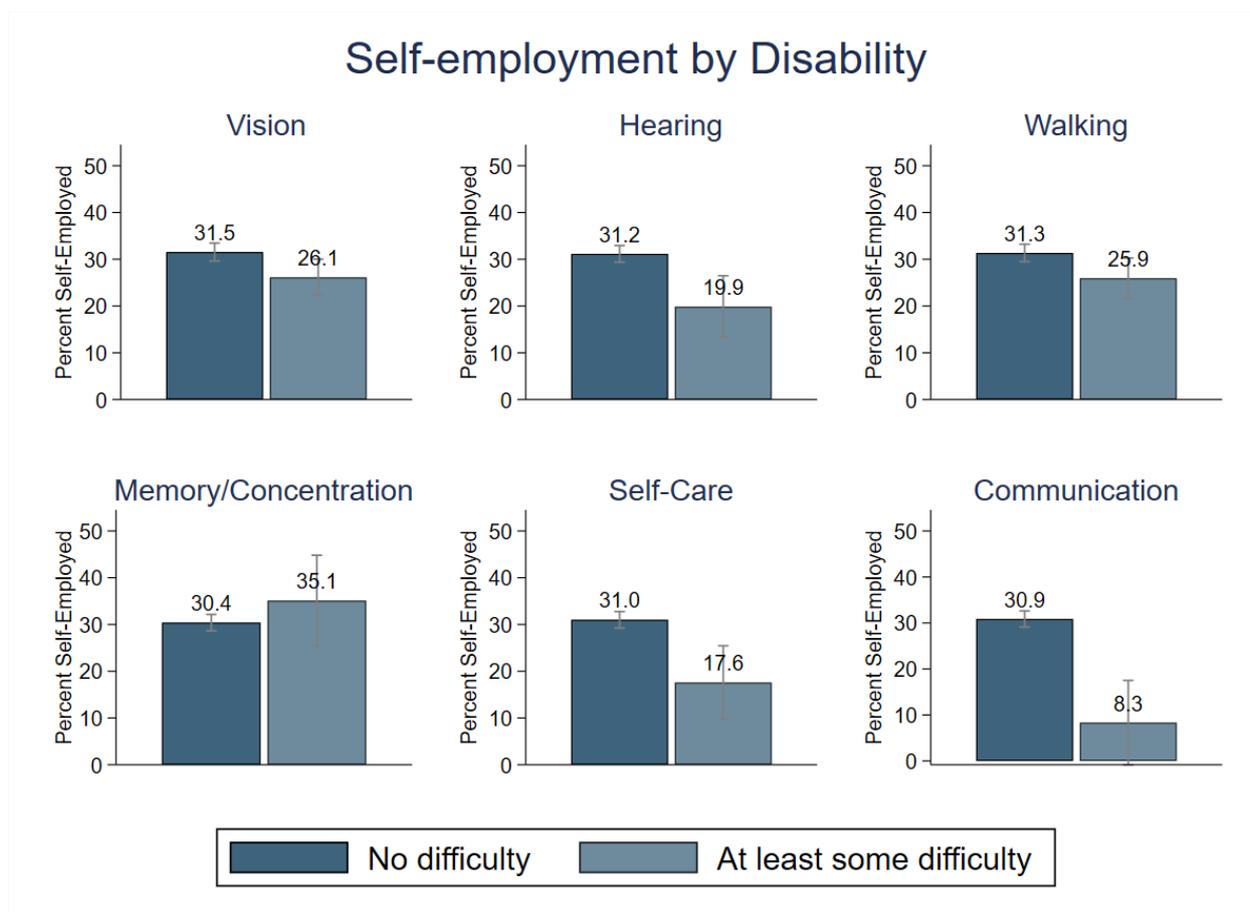


Figure 13: Self Employment Status by Disability

Table 12 reports the summary statistics on all forms of employment by total sample, female and male headed households and by disability status of the respondent. As seen in column 2, 33.4 percent of the households at Baseline were self-employed, worked on average 5.7 hours each day and earned profits of 74,557 SLL on average a month. Whereas looking at the wage-employed there was a drastically lower amount of the respondents at 9.3 percent of the households. They did work slightly higher number of hours per day (5.9 hours), and they earned an income per month on average 829,433 SLL, which was substantially higher than the self-employed. Moving to the Midline data (columns 6-10) the amount of self-employed began to decrease.

Only 30 percent of the households reported being self-employed, worked 4 hours on average per day, and earned 198,212 SLL on average in profits per month. The profits did seem to increase, but this could be from the costs that self-employed workers were incurring had decreased drastically. There are 9.5 percent of the head of households reporting being wage-employed who are working on average 3.7 hours per day and earning an income of 561,044 SLL on average per month.

As shown in the descriptive figures, there are more women who report being self-employed than being formally employed (39.4 percent compared to 4.5 percent). Hours worked are higher for those working with an organization than who are self-employed (4.17 compared to 3.5 hours per day on average). There is a smaller percentage of males who report being self-employed compared to women (23.8 percent), but a larger share being formally employed (12.8 percent). Those who are disabled are less likely to be self-employed (24.6 percent disabled, 32 percent non-disabled) or formally employed (9 percent disabled, 9.6

percent non-disabled) compared to the respondent having no disability.

Table 12: Summary Statistics: Non Agricultural Employment

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Head employed in business	3228	0.336	0	0	1	2772	0.300	0	0	1
Hours worked if self employed	1062	5.737	6	0	13	1244	3.993	2	0	18
Revenue from business in 1000s SLL	859	681.133	300	0	7000	1243	417.482	120	0	2800
Cost from Business in 1000s SLL	874	536.569	250	0	4000	1243	217.179	50	0	1500
Profit from Business in 1000s SLL	844	74.557	70	-1500	1700	1244	198.212	8	-350	1650
Business uses electricity	1104	0.215	0	0	1	832	0.320	0	0	1
Head Wage Employed	3226	0.093	0	0	1	2773	0.095	0	0	1
Hours worked in wage employment	295	5.952	6	0	13	369	3.700	4	0	12
Wage Income in 1000s SLL	268	829.433	645	0	10200	356	561.044	250	0	7525
Wage work uses electricity	300	0.263	0	0	1	832	0.320	0	0	1
<i>Female Headed Households</i>										
Head employed in business	1307	0.402	0	0	1	1104	0.394	0	0	1
Hours worked if self employed	516	5.710	5	0	13	607	4.173	3	0	18
Revenue from business in 1000s SLL	425	520.409	200	0	7000	610	342.571	120	0	2800
Cost from Business in 1000s SLL	435	441.513	200	0	4000	611	199.908	50	0	1500
Profit from Business in 1000s SLL	421	44.907	50	-1500	1700	605	148.075	25	-350	1650
Business uses electricity	529	0.178	0	0	1	435	0.313	0	0	1
Head Wage Employed	1308	0.044	0	0	1	1105	0.045	0	0	1
Hours worked in wage employment	56	5.786	6	0	13	68	3.473	3	0	12
Wage Income in 1000s SLL	51	712.784	500	0	10000	65	479.292	150	0	2000
Wage work uses electricity	58	0.190	0	0	1	435	0.313	0	0	1
<i>Male Headed Households</i>										
Head employed in business	1921	0.292	0	0	1	1668	0.238	0	0	1
Hours worked if self employed	546	5.762	6	0	13	637	3.823	2	0	18
Revenue from business in 1000s SLL	434	838.523	300	0	7000	633	489.671	105	0	2800
Cost from Business in 1000s SLL	439	630.759	300	0	4000	632	233.876	50	0	1500
Profit from Business in 1000s SLL	423	104.066	100	-1500	1700	639	245.681	0	-350	1650
Business uses electricity	575	0.249	0	0	1	397	0.327	0	0	1
Head Wage Employed	1918	0.126	0	0	1	1668	0.128	0	0	1
Hours worked in wage employment	239	5.991	6	0	13	301	3.751	4	0	12
Wage Income in 1000s SLL	217	856.848	700	0	10200	291	579.304	300	0	7525
Wage work uses electricity	242	0.281	0	0	1	397	0.327	0	0	1
<i>Respondent has any disability</i>										
Head employed in business	838	0.300	0	0	1	731	0.246	0	0	1
Hours worked if self employed	244	5.425	5	0	13	293	3.860	2	0	17
Revenue from business in 1000s SLL	206	734.374	255	0	7000	295	343.338	100	0	2800
Cost from Business in 1000s SLL	209	566.459	200	0	4000	296	186.486	44	0	1500
Profit from Business in 1000s SLL	203	106.113	100	-1500	1700	293	151.885	0	-350	1650
Business uses electricity	255	0.220	0	0	1	180	0.267	0	0	1
Head Wage Employed	838	0.084	0	0	1	732	0.090	0	0	1
Hours worked in wage employment	70	6.165	6	0	13	91	4.248	4	0	12
Wage Income in 1000s SLL	68	779.574	738	0	10200	90	619.283	500	0	2500
Wage work uses electricity	70	0.257	0	0	1	180	0.267	0	0	1
<i>Respondent has no disability</i>										
Head employed in business	2389	0.350	0	0	1	2040	0.320	0	0	1
Hours worked if self employed	818	5.830	6	0	13	951	4.034	2	0	18
Revenue from business in 1000s SLL	653	664.337	300	0	7000	948	440.554	150	0	2800
Cost from Business in 1000s SLL	665	527.174	250	0	4000	947	226.773	55	0	1500
Profit from Business in 1000s SLL	641	64.563	70	-1500	1700	951	212.485	20	-350	1650
Business uses electricity	849	0.213	0	0	1	652	0.334	0	0	1
Head Wage Employed	2387	0.096	0	0	1	2040	0.097	0	0	1
Hours worked in wage employment	225	5.886	6	0	13	278	3.521	3	0	12
Wage Income in 1000s SLL	200	846.385	582	0	10200	266	541.338	250	0	7525
Wage work uses electricity	230	0.265	0	0	1	652	0.334	0	0	1

Summary statistics for non agricultural employment are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Table 13 shows the difference-in-differences estimation on the Non-Ag Employment sample for the ITT, and Table tab:nonagdid1 underneath shows the regression on the complier sample. Table 13 and 14 are consistent in that households in RREP communities are less likely to be self-employed although this result is not statistically significant. They are however more likely to be wage-employed but this is not robust to estimation on the complier population.

Table 13: Difference in Differences Non Ag Employment

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Non Agricultural Employment</i>					
Head employed in business	2986	0.336	0.097*** (0.03)	-0.030 (0.02)	-0.013 (0.03)
Hours worked if self employed	1147	5.737	-0.087 (0.32)	-1.991*** (0.35)	0.487 (0.47)
Revenue from business in 1000s SLL	1045	681.133	120.036 (134.42)	-201.217* (113.09)	-136.050 (133.30)
Cost from Business in 1000s SLL	1053	536.569	83.955 (61.69)	-292.109*** (47.93)	-57.227 (73.27)
Profit from Business in 1000s SLL	1038	74.557	67.846 (66.66)	169.666*** (56.84)	-92.286 (71.35)
Business uses electrcity	963	0.215	0.082** (0.04)	0.068* (0.04)	0.054 (0.06)
Head Wage Employed	2986	0.093	0.008 (0.01)	-0.006 (0.01)	0.027* (0.01)
Hours worked in wage employment	331	5.952	-0.438 (0.44)	-2.851*** (0.43)	1.009 (0.62)
Wage Income in 1000s SLL	311	829.433	-20.455 (198.94)	-276.612* (141.86)	10.482 (221.19)
Wage work uses electricity	563	0.263	0.106 (0.07)	0.051 (0.06)	0.046 (0.08)

Difference in Difference estimation uses non agricultural employment from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects and clustered standard errors at the village level. The regression is weighted using Inverse Probability Weights.

Table 14: Difference in Differences Non Ag Employment(Connected Households in RREP Communities)

	N (1)	Mean in Not Connected HHs in 2019 (2)	Connected vs Not Connected in 2019 (3)	Post (4)	Post × Connected (5)
<i>Non Agricultural Employment</i>					
Head employed in business	2866	0.336	0.172*** (0.04)	-0.029 (0.04)	-0.037 (0.06)
Hours worked if self employed	1110	5.737	-0.118 (0.68)	-1.987*** (0.58)	0.722 (0.92)
Revenue from business in 1000s SLL	1014	681.133	97.132 (169.36)	-201.974 (137.86)	-120.294 (216.49)
Cost from Business in 1000s SLL	1021	536.569	149.779 (107.26)	-291.393*** (87.15)	-109.896 (137.49)
Profit from Business in 1000s SLL	1007	74.557	34.176 (96.33)	168.806** (77.33)	-69.677 (122.43)
Head Wage Employed	2867	0.093	0.006 (0.03)	-0.006 (0.02)	0.049 (0.04)
Hours worked in wage employment	314	5.952	-0.861 (0.98)	-2.835*** (0.80)	1.623 (1.25)
Wage Income in 1000s SLL	296	829.433	-59.496 (365.93)	-278.833 (296.20)	44.311 (462.77)

Difference in Difference estimation uses non agricultural employment from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects. The regression is weighted using Inverse Probability Weights.

Figure 14 shows the electricity use by business type from Baseline and Midline. There is about a 1 percent increase from Baseline (83.4 percent) to Midline (85 percent) in the use of lighting. At Midline a considerable amount of businesses report using electricity for freezing (37.2 percent) or refrigeration (8.3 percent), but it is unclear to what extent this use of electricity can really be considered productive. If freezing and refrigeration were being used to transport agricultural products to 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 is not likely to be significantly improving 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. Beyond lighting and cooling, electricity is mainly used for entertainment and communication, with 11.7 percent of businesses charging phones, 17.7 percent powering televisions, 16.9 percent powering radios, 13.6 percent powering charging devices, 9.3 percent powering fridges, and 9.3 percent powering other devices. At Baseline, 11.02 percent of businesses used televisions, 9.35 percent used fans, 10.48 percent used radios, 13.60 percent used charging devices, 9.33 percent used fridges, 9.38 percent used other devices, 1.70 percent used computers, 2.84 percent used welding, and 1.42 percent used razors.

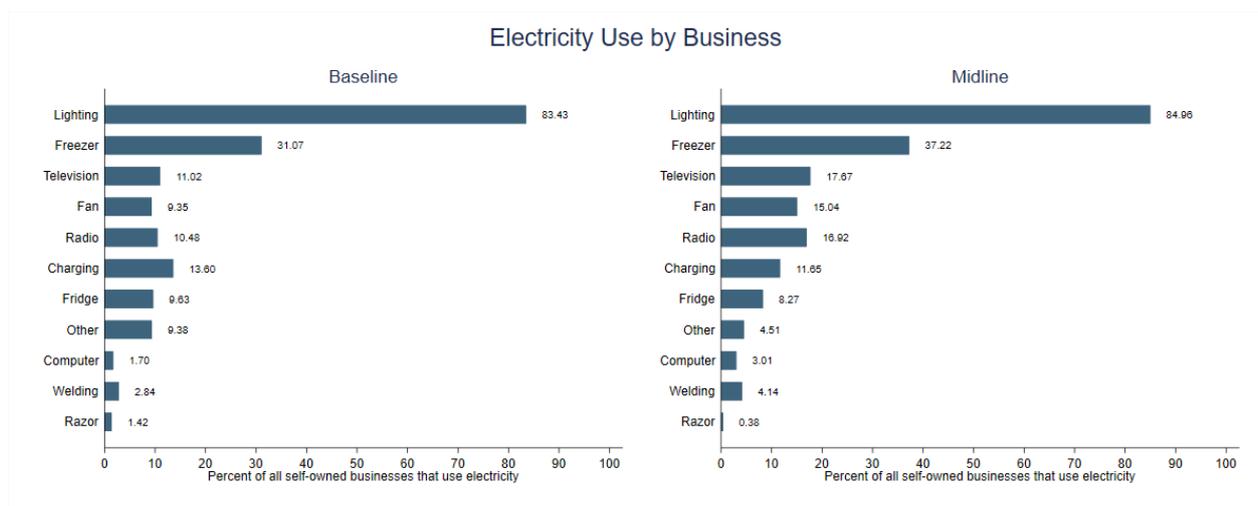


Figure 14: Electricity Use by Business Full Sample at Baseline Midline

#### 4.4.1 Time Use

Time use was collected during both the Baseline and Midline data collections. These questions were intended to map out the entire working day hours for the respondent to see if they begin to use their personal time differently across the evaluation periods. These questions asked the respondent to recount their day from 8am through 6pm, breaking each activity into two hour slots. Table 15 reports the summary statistics, describing the activities the respondents reported to be doing during those hours. For all households, it seems as though the respondents are not changing their daily activities drastically but there is a slight drop in all productive activities and a slight increase in hours spent on leisure. This could be due the COVID-19 pandemic and the mobility restrictions. Female headed households report spending more hours on average on households chores than male headed households across both survey waves. They also spend more hours on business activities than males but spend less time on wage work and on their farms and also have lesser leisure time on average. Households with a respondent having a disability spend fewer hours on average on the farm, business and wage work; but have more leisure hours than households where the respondent reports no disability. This heterogeneity by gender and disability status is important to consider while evaluating the impact of electrification on time-use patterns for different sub-groups.

Table 15: Summary Statistics: Time Use

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Average hours spent by respondent on leisure per day	3230	2.933	2	0	12	2795	3.088	2	0	12
Average hours spent by respondent on chores per day	3230	1.172	0	0	12	2795	1.126	0	0	12
Average hours spent by respondent on farm per day	3230	4.549	4	0	12	2795	3.976	4	0	12
Average hours spent by respondent on business per day	3230	2.030	0	0	12	2795	1.948	0	0	12
Average hours spent by respondent on wage per day	3230	0.448	0	0	12	2795	0.388	0	0	12
<i>Female Headed Households</i>										
Average hours spent by respondent on leisure per day	1308	2.771	2	0	12	1114	2.779	2	0	12
Average hours spent by respondent on chores per day	1308	2.294	2	0	12	1114	1.913	2	0	12
Average hours spent by respondent on farm per day	1308	3.697	1	0	12	1114	3.376	2	0	12
Average hours spent by respondent on business per day	1308	2.380	0	0	12	1114	2.308	0	0	12
Average hours spent by respondent on wage per day	1308	0.197	0	0	12	1114	0.212	0	0	12
<i>Male Headed Households</i>										
Average hours spent by respondent on leisure per day	1922	3.044	2	0	12	1681	3.292	2	0	12
Average hours spent by respondent on chores per day	1922	0.409	0	0	9	1681	0.604	0	0	12
Average hours spent by respondent on farm per day	1922	5.128	6	0	12	1681	4.374	5	0	12
Average hours spent by respondent on business per day	1922	1.792	0	0	12	1681	1.710	0	0	12
Average hours spent by respondent on wage per day	1922	0.619	0	0	12	1681	0.505	0	0	12
<i>Respondent has any disability</i>										
Average hours spent by respondent on leisure per day	839	3.792	3	0	12	736	3.648	2	0	12
Average hours spent by respondent on chores per day	839	1.234	0	0	9	736	1.146	0	0	12
Average hours spent by respondent on farm per day	839	3.773	2	0	12	736	3.423	2	0	12
Average hours spent by respondent on business per day	839	1.911	0	0	12	736	1.929	0	0	12
Average hours spent by respondent on wage per day	839	0.344	0	0	12	736	0.269	0	0	12
<i>Respondent has no disability</i>										
Average hours spent by respondent on leisure per day	2390	2.632	2	0	12	2058	2.888	2	0	12
Average hours spent by respondent on chores per day	2390	1.151	0	0	12	2058	1.119	0	0	12
Average hours spent by respondent on farm per day	2390	4.819	5	0	12	2058	4.171	4	0	12
Average hours spent by respondent on business per day	2390	2.072	0	0	12	2058	1.956	0	0	12
Average hours spent by respondent on wage per day	2390	0.485	0	0	12	2058	0.431	0	0	12

Summary statistics for time use are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Table 16 shows the difference-in-difference estimation on Time Use for the entire sample and Table 17 shows the effects on the complier sample. In both tables, the average number of hours spent on leisure has a negative sign indicating that RREP and connected households are spending less time on leisure on average in 2021 compared to 2019 when compared to Non RREP households. But columns 3-5 suggest that the comparison communities are beginning to spend more leisure time than they previously were, catching up to the RREP community levels of leisure time. In column 3 the sign for connected and RREP households for hours spent working on their business is positive and statistically significant, which remains consistent in column 5. This may be indicating that RREP households are shifting leisure hours to business activities, though nothing is statistically significant. This is mentioned with caution, as tracking personal time changes may be difficult it is too soon to fully capture the effect of electrification on respondents time allocations for different activities.

Table 16: Difference in Differences Time Use

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Time Use</i>					
Average hours spent by respondent on leisure per day	2997	2.933	0.378** (0.17)	0.336* (0.19)	-0.425* (0.25)
Average hours spent by respondent on chores per day	2997	1.172	0.378*** (0.10)	0.093 (0.07)	-0.225* (0.12)
Average hours spent by respondent on farm per day	2997	4.549	-1.509*** (0.34)	-0.789*** (0.19)	0.350 (0.27)
Average hours spent by respondent on business per day	2997	2.030	0.613*** (0.23)	-0.140 (0.13)	0.174 (0.21)
Average hours spent by respondent on wage per day	2997	0.448	-0.066 (0.09)	-0.119* (0.07)	0.107 (0.11)

Difference in Difference estimation uses time use from from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects and clustered standard errors at the village level. The regression is weighted using Inverse Probability Weights.

Table 17: Difference in Differences Time Use(Connected Households in RREP Communities)

	N (1)	Mean in Not Connected HHs in 2019 (2)	Connected vs Not Connected in 2019 (3)	Post (4)	Post × Connected (5)
<i>Time Use</i>					
Average hours spent by respondent on leisure per day	2878	2.933	0.664*** (0.25)	0.338 (0.21)	-0.743** (0.36)
Average hours spent by respondent on chores per day	2878	1.172	0.594*** (0.17)	0.095 (0.15)	-0.355 (0.25)
Average hours spent by respondent on farm per day	2878	4.549	-2.441*** (0.35)	-0.799*** (0.30)	0.587 (0.52)
Average hours spent by respondent on business per day	2878	2.030	0.928*** (0.31)	-0.137 (0.26)	0.340 (0.45)
Average hours spent by respondent on wage per day	2878	0.448	-0.096 (0.15)	-0.118 (0.13)	0.161 (0.22)

Difference in Difference estimation uses time use from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects. The regression is weighted using Inverse Probability Weights.

Figure 15 displays the at Baseline and Midline the percentages of self-employed businesses who are using electricity in the RREP and comparison communities. In both RREP and comparison communities the usage of lighting has increased from Baseline to Midline, and there is a larger percentage of businesses who report light usage in comparison communities (86.8 percent) compared to RREP communities (84 percent). The usage of freezers and refrigerators are higher in RREP communities which indicate that the access to electricity may be assisting for the use of larger productive use assets.

## 4.5 Livestock, Land and Asset Ownership

### 4.5.1 Livestock

Livestock is sometimes referred to the “savings account” of the rural economy [4, 11]. If electrification raises incomes – either through agricultural production or non-agricultural employment – households may invest some of this additional income in livestock. At Baseline, we captured pre-mini-grid levels of livestock ownership, and similar variables collected at Midline enable us to identify short-term electrification effects. We collect data on the total number of animals owned, as well as the number of each type of animal owned. Animal ownership is defined as the right to kill or sell an animal. We also ask about the share of the household’s animals which are (at least) jointly shared by women.

Figure 16 shows the different types of animals owned by households at Baseline and Midline. The most common animal owned are chickens (a low-cost livestock), and has increased since Baseline to be 89.6

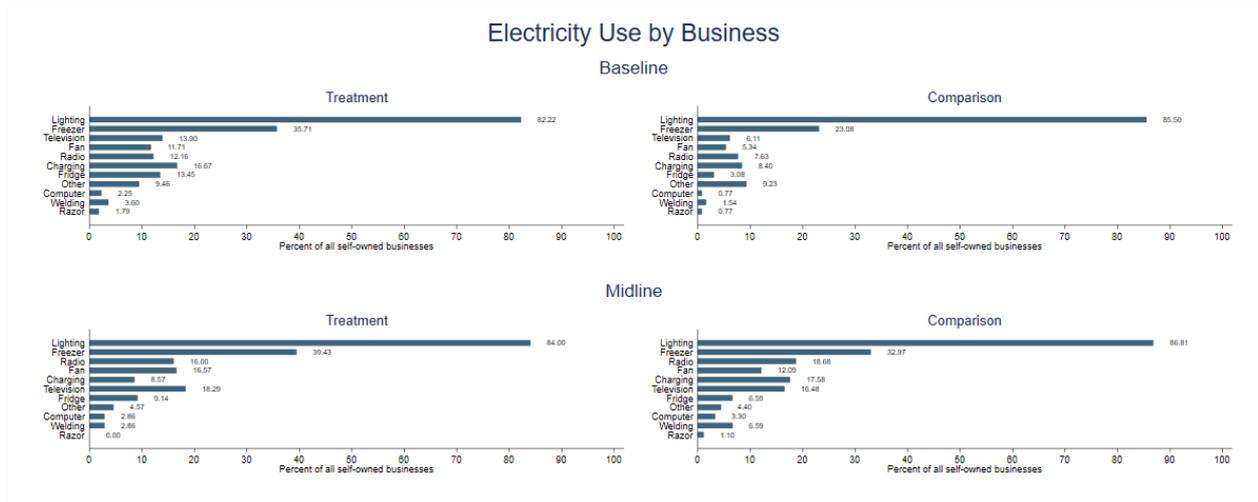


Figure 15: Electricity Use by Business at Baseline Midline by RREP Status

percent of households owning. The highest return livestock animal are cattle; rates of cattle ownership have slightly increased since Baseline, from 3.9 percent to 5.0 percent.

Table 18 reports the livestock ownership summary statistics for all households. We observe an increase in the percent of households which own livestock from Baseline to Midline (65.4 percent to 75.0 percent), with a slight decrease in the percent of livestock owned or shared by women (64.3 percent at Baseline to 63.8 percent in Midline). The most commonly owned livestock are chickens, at an average of 6.7 chickens owned by households. Male headed households own more livestock (9.3 animals on average) than female headed households (8.5 animals on average). From other measures of income, we have observed that male-headed households often have higher incomes. It is therefore intuitive that more male headed households own livestock compared to women, since livestock can be seen as high value investments. Among the respondents who reported having any sort of disability, the most common livestock owned were chickens with an average of 6.9 per respondent, this quantity slightly decreases for respondents who report not having a disability with 6.7 chickens on average per respondent, though there is a substantially higher portion of the sample who report not having a disability.

Table 18: Summary Statistics: Livestock Ownership

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Owns any livestock	3230	0.654	1	0	1	2792	0.749	1	0	1
Percent of livestock owned or shared by women	2092	0.643	1	0	1	2074	0.639	1	0	1
Total livestock owned	3226	6.107	3	0	40	2793	8.999	6	0	50
Number owned pig	3230	0.057	0	0	42	2795	0.078	0	0	20
Number owned duck	3230	0.168	0	0	25	2795	0.352	0	0	50
Number owned cow	3230	0.185	0	0	50	2795	0.224	0	0	50
Number owned chick	3230	4.221	1	0	75	2795	6.729	5	0	100
Number owned sheep	3230	0.503	0	0	30	2795	0.601	0	0	30
Number owned goat	3230	1.020	0	0	50	2795	1.184	0	0	45
<i>Female Headed Households</i>										
Owns any livestock	1308	0.648	1	0	1	1114	0.763	1	0	1
Percent of livestock owned or shared by women	836	0.780	1	0	1	842	0.741	1	0	1
Total livestock owned	1306	5.584	3	0	40	1113	8.520	6	0	50
Number owned pig	1308	0.015	0	0	10	1114	0.087	0	0	20
Number owned duck	1308	0.187	0	0	25	1114	0.285	0	0	18
Number owned cow	1308	0.085	0	0	28	1114	0.111	0	0	43
Number owned chick	1308	4.101	2	0	75	1114	6.585	5	0	65
Number owned sheep	1308	0.424	0	0	20	1114	0.539	0	0	15
Number owned goat	1308	0.783	0	0	30	1114	0.988	0	0	15
<i>Male Headed Households</i>										
Owns any livestock	1922	0.658	1	0	1	1678	0.740	1	0	1
Percent of livestock owned or shared by women	1256	0.551	1	0	1	1232	0.569	1	0	1
Total livestock owned	1920	6.463	4	0	40	1680	9.316	6	0	50
Number owned pig	1922	0.085	0	0	42	1681	0.072	0	0	15
Number owned duck	1922	0.155	0	0	24	1681	0.396	0	0	50
Number owned cow	1922	0.252	0	0	50	1681	0.298	0	0	50
Number owned chick	1922	4.302	0	0	71	1681	6.825	4	0	100
Number owned sheep	1922	0.558	0	0	30	1681	0.643	0	0	30
Number owned goat	1922	1.182	0	0	50	1681	1.314	0	0	45
<i>Respondent has any disability</i>										
Owns any livestock	839	0.677	1	0	1	734	0.743	1	0	1
Percent of livestock owned or shared by women	560	0.705	1	0	1	541	0.661	1	0	1
Total livestock owned	839	6.443	4	0	40	736	8.837	6	0	50
Number owned pig	839	0.043	0	0	42	736	0.030	0	0	9
Number owned duck	839	0.197	0	0	24	736	0.379	0	0	20
Number owned cow	839	0.113	0	0	50	736	0.141	0	0	15
Number owned chick	839	4.721	2	0	71	736	6.887	5	0	95
Number owned sheep	839	0.496	0	0	30	736	0.538	0	0	12
Number owned goat	839	0.942	0	0	50	736	0.990	0	0	14
<i>Respondent has no disability</i>										
Owns any livestock	2390	0.646	1	0	1	2057	0.752	1	0	1
Percent of livestock owned or shared by women	1531	0.620	1	0	1	1532	0.631	1	0	1
Total livestock owned	2386	5.977	3	0	40	2056	9.056	6	0	50
Number owned pig	2390	0.062	0	0	42	2058	0.095	0	0	20
Number owned duck	2390	0.158	0	0	25	2058	0.342	0	0	50
Number owned cow	2390	0.210	0	0	50	2058	0.253	0	0	50
Number owned chick	2390	4.038	0	0	75	2058	6.671	4	0	100
Number owned sheep	2390	0.506	0	0	30	2058	0.624	0	0	30
Number owned goat	2390	1.042	0	0	50	2058	1.254	0	0	45

Summary statistics for livestock are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

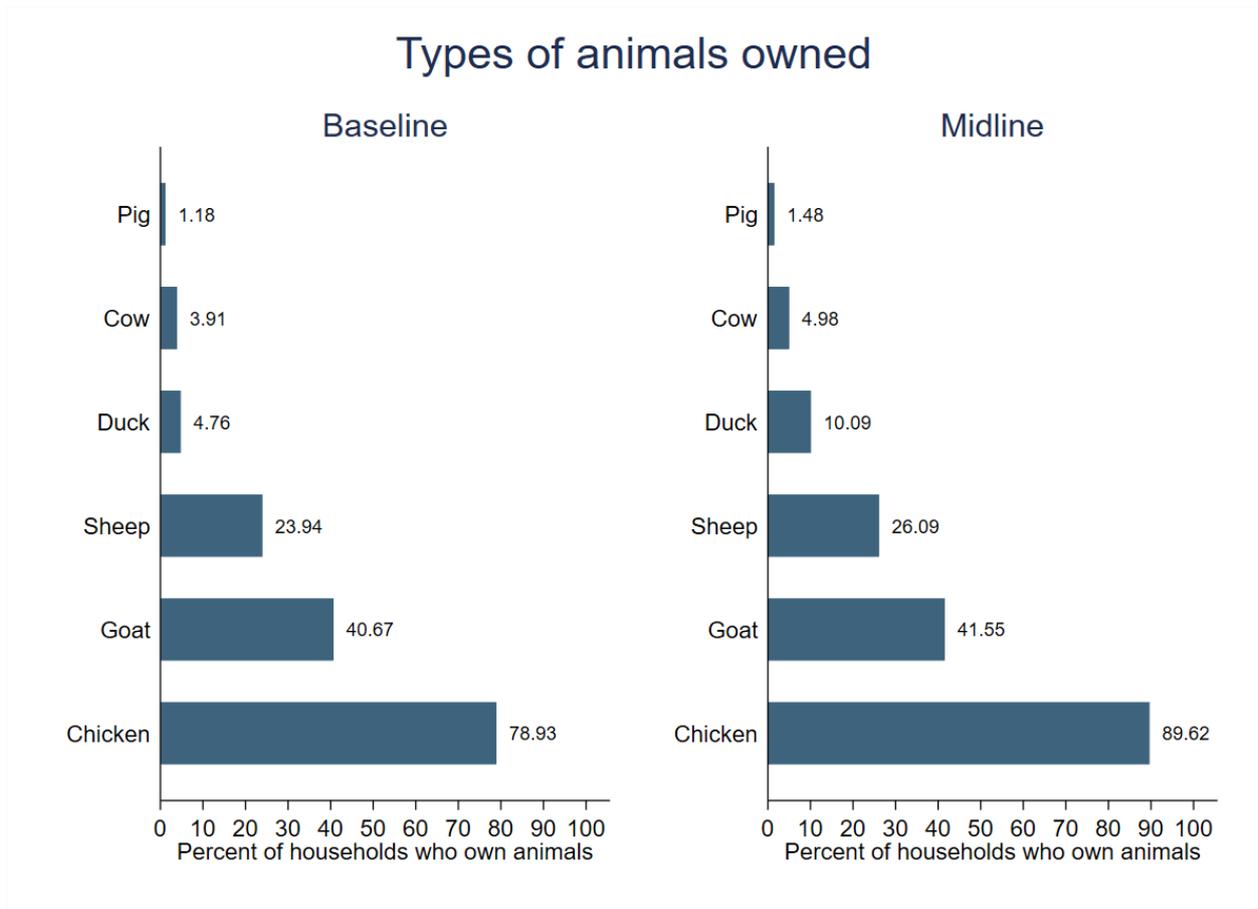


Figure 16: Types of Animals Owned at Baseline Midline

#### 4.5.2 Electrified Assets

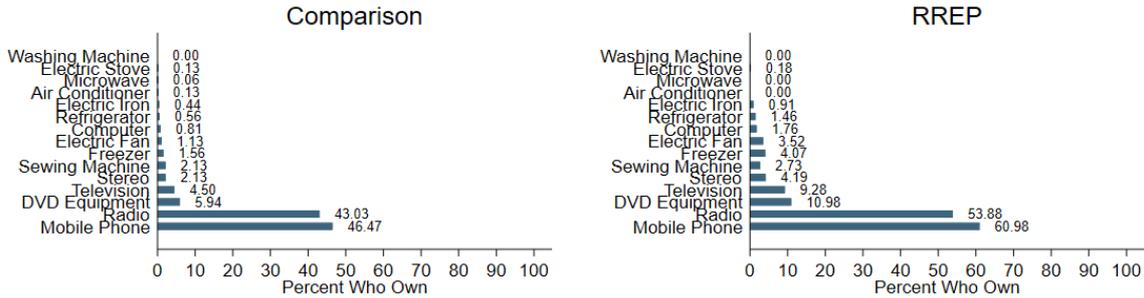
We expect to see substantial effects of community electrification on the ownership of electrified assets. In comparison communities, there was comparatively little reason for households to invest in assets which they cannot power between the Baseline and Midline surveys. In RREP communities, however, households were electrified in the interim, enabling them to use assets. In the Baseline report, we discussed findings from Focus Group Discussions that respondents were most looking forward to watching television and powering their DVD players. This was motivated by a desire to have closer families and for children to stay at home more often.

When asked about what people were most looking forward to when their communities were electrified there was a general expectation that businesses would open but not always a clear articulation of how this would manifest itself. In communities where generators were owned, they were often used in ‘cinemas’ to show sports games, air compressors, or fridges. Maintenance was main concern for generator owners, as they often had to travel to a large city to service it at a high cost.

Figure 17 shows ownership of electrified assets. Communication and entertainment items dominate the list of commonly owned assets. The most popular electrified assets are phones and radios, followed by DVD equipment, televisions, and stereos. Baseline ownership of productive assets, such as freezers, refrigerators, and electric stoves, is low.

# Electrified Asset Ownership

## Baseline



## Midline

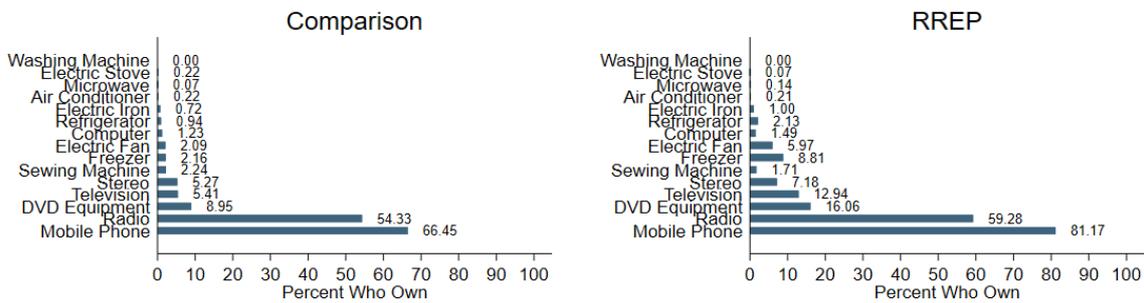


Figure 17: Electrified Asset Ownership by Phase and RREP Status

Table 19 reports the summary statistics of electrified asset ownership at Baseline and Midline which has been previously displayed in the descriptive figure. For all households the average of total quantity electrified assets owned has increased since Baseline with an average of 2.5 assets at Midline compared to 1.8. The most common asset that is owned is a mobile phone. Households are reporting on average owning 1.28 mobile phones at Midline, which has increased from 0.896 mobile phones at Baseline. Male headed households own on average slightly more electrified asset than women do (2.7 male owned, 2.1 female owned), and respondents reporting to not have a disability own on average more than those who reported having a disability. Across all disaggregations reported inside this summary statistics table, respondents state owning a mobile phone more often than any other asset.

Table 19: Summary Statistics: Electrical Asset Ownership

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Total Quantity of Electric Assets	3230	1.778	1	0	31	2795	2.452	2	0	29
Washing machine	3230	0.000	0	0	0	2795	0.000	0	0	0
Stove (electric)	3230	0.002	0	0	1	2795	0.002	0	0	2
Microwave	3230	0.000	0	0	1	2795	0.001	0	0	1
Air conditioner	3230	0.001	0	0	2	2795	0.004	0	0	4
Iron (electric)	3230	0.007	0	0	2	2795	0.009	0	0	2
Refrigerator	3230	0.011	0	0	2	2795	0.017	0	0	3
Computer	3230	0.013	0	0	3	2795	0.016	0	0	3
Electric fan	3230	0.031	0	0	4	2795	0.060	0	0	9
Freezer	3230	0.031	0	0	4	2795	0.064	0	0	4
Stereo system	3230	0.036	0	0	5	2795	0.072	0	0	5
Television	3230	0.080	0	0	4	2795	0.108	0	0	4
Video/DVD equipment	3230	0.092	0	0	5	2795	0.135	0	0	4
Radio	3230	0.578	0	0	6	2795	0.684	1	0	13
Mobile phone	3230	0.896	1	0	21	2795	1.280	1	0	15
<i>Female Headed Households</i>										
Total Quantity of Electric Assets	1308	1.429	1	0	30	1114	2.098	1	0	20
Washing machine	1308	0.000	0	0	0	1114	0.000	0	0	0
Stove (electric)	1308	0.000	0	0	0	1114	0.000	0	0	0
Microwave	1308	0.000	0	0	0	1114	0.001	0	0	1
Air conditioner	1308	0.000	0	0	0	1114	0.004	0	0	2
Iron (electric)	1308	0.005	0	0	1	1114	0.008	0	0	1
Refrigerator	1308	0.011	0	0	2	1114	0.013	0	0	1
Computer	1308	0.006	0	0	1	1114	0.005	0	0	1
Electric fan	1308	0.028	0	0	4	1114	0.036	0	0	6
Freezer	1308	0.027	0	0	2	1114	0.071	0	0	3
Stereo system	1308	0.023	0	0	4	1114	0.043	0	0	3
Television	1308	0.055	0	0	3	1114	0.077	0	0	3
Video/DVD equipment	1308	0.074	0	0	5	1114	0.107	0	0	3
Radio	1308	0.409	0	0	6	1114	0.570	0	0	5
Mobile phone	1308	0.791	0	0	21	1114	1.162	1	0	9
<i>Male Headed Households</i>										
Total Quantity of Electric Assets	1922	2.016	1	0	31	1681	2.686	2	0	29
Washing machine	1922	0.000	0	0	0	1681	0.000	0	0	0
Stove (electric)	1922	0.003	0	0	1	1681	0.003	0	0	2
Microwave	1922	0.001	0	0	1	1681	0.001	0	0	1
Air conditioner	1922	0.002	0	0	2	1681	0.004	0	0	4
Iron (electric)	1922	0.009	0	0	2	1681	0.010	0	0	2
Refrigerator	1922	0.011	0	0	2	1681	0.019	0	0	3
Computer	1922	0.017	0	0	3	1681	0.024	0	0	3
Electric fan	1922	0.034	0	0	3	1681	0.077	0	0	9
Freezer	1922	0.034	0	0	4	1681	0.059	0	0	4
Stereo system	1922	0.045	0	0	5	1681	0.091	0	0	5
Television	1922	0.097	0	0	4	1681	0.128	0	0	4
Video/DVD equipment	1922	0.104	0	0	4	1681	0.153	0	0	4
Radio	1922	0.693	1	0	5	1681	0.759	1	0	13
Mobile phone	1922	0.967	1	0	20	1681	1.358	1	0	15
<i>Respondent has any disability</i>										
Total Quantity of Electric Assets	839	1.696	1	0	31	736	2.217	2	0	20
Washing machine	839	0.000	0	0	0	736	0.000	0	0	0
Stove (electric)	839	0.002	0	0	1	736	0.000	0	0	0
Microwave	839	0.000	0	0	1	736	0.000	0	0	0
Air conditioner	839	0.000	0	0	2	736	0.003	0	0	2
Iron (electric)	839	0.008	0	0	2	736	0.007	0	0	1
Refrigerator	839	0.012	0	0	2	736	0.018	0	0	1
Computer	839	0.010	0	0	3	736	0.004	0	0	1
Electric fan	839	0.024	0	0	3	736	0.041	0	0	6
Freezer	839	0.026	0	0	4	736	0.048	0	0	2
Stereo system	839	0.032	0	0	5	736	0.054	0	0	3
Television	839	0.072	0	0	4	736	0.098	0	0	3
Video/DVD equipment	839	0.073	0	0	4	736	0.109	0	0	3
Radio	839	0.583	0	0	5	736	0.647	1	0	5
Mobile phone	839	0.855	1	0	20	736	1.190	1	0	7
<i>Respondent has no disability</i>										
Total Quantity of Electric Assets	2390	1.807	1	0	31	2058	2.536	2	0	29
Washing machine	2390	0.000	0	0	0	2058	0.000	0	0	0
Stove (electric)	2390	0.001	0	0	1	2058	0.002	0	0	2
Microwave	2390	0.000	0	0	1	2058	0.001	0	0	1
Air conditioner	2390	0.001	0	0	2	2058	0.004	0	0	4
Iron (electric)	2390	0.007	0	0	2	2058	0.010	0	0	2
Refrigerator	2390	0.011	0	0	2	2058	0.017	0	0	3
Computer	2390	0.014	0	0	3	2058	0.021	0	0	3
Electric fan	2390	0.034	0	0	4	2058	0.068	0	0	9
Freezer	2390	0.033	0	0	4	2058	0.069	0	0	4
Stereo system	2390	0.038	0	0	5	2058	0.078	0	0	5
Television	2390	0.083	0	0	4	2058	0.112	0	0	4
Video/DVD equipment	2390	0.098	0	0	5	2058	0.144	0	0	4
Radio	2390	0.575	0	0	6	2058	0.697	1	0	13
Mobile phone	2390	0.910	1	0	21	2058	1.312	1	0	15

Summary statistics for

electric assets are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Table 20 presents the difference-in-difference estimation on land, assets and livestock between the RREP and comparison communities over time. Table 21 reports the estimation for only those households in RREP communities who are connected to the solar mini-grid. Across both tables we find fairly consistent results. Households owning any livestock and total quantity of livestock owned has decreased in RREP communities relative to comparison communities. This may be indicative of households looking to invest away from agriculture and livestock with the surplus from electricity access.

Most notable are the negative results on total number of electrical appliances owned and on the the number of radios and mobile phones owned. These results are related: radios and mobile phones are the two most commonly owned assets in the entire sample, as they do not require constant electricity to operate and their batteries last for a long time. This result does not imply that households in RREP communities own fewer of these assets in 2021 than they did in 2019; it indicates that rates of ownership for comparison communities increased relatively faster than those rates in RREP communities.

Because mobile phones and radios are commonly purchased even when households do not have regular access to electricity, households in RREP communities may have become “saturated” with these assets prior to electrification. As seen in Figure 17, rates of radio and mobile phone ownership increased in both sets of communities from 2019 to 2021. The significant results in Table 21 show that these rates increased faster in comparison communities than for households in RREP communities.

The change in ownership of freezers is also significant but positive, indicating that the rate of freezer ownership by households in RREP communities increased relatively more than in comparison communities. This is consistent with theory. Freezers require more regular electricity access to operate, compared to radios or mobile phones, and draw more electricity. It would be difficult to operate a freezer in the comparison communities, but the mini-grids in RREP communities offer the opportunity to operate productive assets such as these. In Section 4.4, we presented survey data and qualitative results indicating that many business owners see selling cold drinks as a potentially lucrative market. The significant increased rates of freezer ownership indicate that these entrepreneurs may be realizing their plans.

Table 20: Difference in Differences Land, Assets and Livestock

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Land Ownership</i>					
If owns land	2991	0.685	0.019 (0.04)	0.368** (0.17)	-0.246 (0.21)
Land Owned in acres	2907	6.792	-0.148 (1.32)	-2.209** (1.11)	0.085 (1.45)
<i>Livestock</i>					
Owns any livestock	2996	0.654	0.052* (0.03)	0.114*** (0.03)	-0.059* (0.03)
Percent of livestock owned or shared by women	2075	0.643	-0.017 (0.03)	-0.032 (0.04)	0.047 (0.05)
Total livestock owned	2996	6.107	2.108*** (0.48)	3.459*** (0.44)	-1.726*** (0.60)
Number owned pig	2997	0.057	0.210 (0.16)	0.071** (0.03)	-0.266 (0.17)
Number owned duck	2997	0.168	0.185** (0.09)	0.245*** (0.06)	-0.186* (0.10)
Number owned cow	2997	0.185	0.152 (0.11)	0.007 (0.06)	0.037 (0.09)
Number owned chick	2997	4.221	1.045** (0.49)	2.878*** (0.37)	-1.285** (0.57)
Number owned sheep	2997	0.503	0.282*** (0.10)	0.116* (0.06)	-0.079 (0.09)
Number owned goat	2997	1.020	0.550*** (0.14)	0.297*** (0.10)	-0.340** (0.14)
<i>Electrical Assets</i>					
Total Quantity of Electric Assets	2997	1.778	1.333*** (0.23)	0.700*** (0.10)	-0.388* (0.20)
Electric fan	2997	0.031	0.054*** (0.01)	0.022** (0.01)	0.009 (0.02)
Freezer	2997	0.031	0.046*** (0.01)	0.011* (0.01)	0.038*** (0.01)
Stereo system	2997	0.036	0.045** (0.02)	0.035*** (0.01)	-0.008 (0.02)
Television	2997	0.080	0.098*** (0.02)	0.018* (0.01)	0.001 (0.02)
Video/DVD equipment	2997	0.092	0.100*** (0.02)	0.031*** (0.01)	-0.008 (0.02)
Radio	2997	0.578	0.262*** (0.05)	0.157*** (0.03)	-0.161*** (0.05)
Mobile phone	2997	0.896	0.684*** (0.13)	0.402*** (0.06)	-0.238* (0.13)

Difference in Difference estimation uses land, livestock and asset ownership from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects and clustered standard errors at the village level. The regression is weighted using Inverse Probability Weights.

Table 21: Difference in Differences Land, Assets and Livestock(Connected Households in RREP Communities)

	N (1)	Mean in Not Connected HHs in 2019 (2)	Connected vs Not Connected in 2019 (3)	Post (4)	Post × Connected (5)
<i>Land Ownership</i>					
If owns land	2872	0.685	0.069 (0.30)	0.367 (0.25)	-0.434 (0.43)
Land Owned in acres	2790	6.792	0.579 (1.57)	-2.204* (1.31)	-0.681 (2.27)
<i>Livestock</i>					
Owens any livestock	2876	0.654	0.112*** (0.04)	0.114*** (0.03)	-0.124** (0.06)
Percent of livestock owned or shared by women	2009	0.643	-0.008 (0.05)	-0.031 (0.04)	0.055 (0.06)
Total livestock owned	2877	6.107	3.592*** (0.86)	3.470*** (0.72)	-2.986** (1.25)
Number owned pig	2878	0.057	0.040 (0.06)	0.070 (0.05)	-0.128 (0.09)
Number owned duck	2878	0.168	0.357** (0.17)	0.246* (0.14)	-0.361 (0.25)
Number owned cow	2878	0.185	0.313 (0.23)	0.008 (0.19)	-0.008 (0.33)
Number owned chick	2878	4.221	1.554** (0.68)	2.882*** (0.57)	-1.939** (0.99)
Number owned sheep	2878	0.503	0.435*** (0.17)	0.118 (0.14)	-0.107 (0.24)
Number owned goat	2878	1.020	0.917*** (0.27)	0.301 (0.22)	-0.585 (0.39)
<i>Electrical Assets</i>					
Total Quantity of Electric Assets	2878	1.778	2.167*** (0.27)	0.709*** (0.22)	-0.647* (0.39)
Electric fan	2878	0.031	0.094*** (0.03)	0.023 (0.03)	0.007 (0.05)
Freezer	2878	0.031	0.071*** (0.03)	0.011 (0.02)	0.065* (0.04)
Stereo system	2878	0.036	0.077*** (0.03)	0.035 (0.02)	-0.017 (0.04)
Television	2878	0.080	0.160*** (0.04)	0.019 (0.03)	-0.001 (0.05)
Video/DVD equipment	2878	0.092	0.162*** (0.04)	0.032 (0.03)	-0.014 (0.05)
Radio	2878	0.578	0.450*** (0.07)	0.159** (0.06)	-0.289*** (0.11)
Mobile phone	2878	0.896	1.083*** (0.14)	0.406*** (0.11)	-0.366* (0.20)

Difference in Difference estimation uses land, livestock and asset ownership from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects. The regression is weighted using Inverse Probability Weights.

## 4.6 Food Security, Consumption

Table 22 reports the summary statistics by all disaggregations on household food expenditures. The values are reported in a timeframe of the week preceding the Baseline and Midline surveys. The survey instrument in this section followed the format of “In the past 7 days how much in leones did you spend on staples?” for each of the food categories. For average comparisons from Baseline to Midline it is shown in column 2 and column 7. These show that, across the entire sample, households have on average increased their total food expenditures by around 25,000 SLL. Households spend more on staple goods, fish and other goods, and spending less on vegetables, meat and fruit. These values remain consistent for all female and male headed households, although male headed households spend relatively more in total and on staple goods than female headed households. Respondents who stated they do not have a disability are spending on average more in total food expenditures than those who have any disability, which may be because they are more likely to be employed so they have more of an income that they can spend on food.

Table 22: Summary Statistics: Food Expenditure

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Food expenditures '000 SLL in the past week	3230	159.338	135	0	996	2795	185.283	165	0	1793
Amount spent on staple in 1000s of SLL in the past week	3174	61.722	50	0	350	2792	73.883	68	0	491
Amount spent on vegetable in 1000s of SLL in the past week	3177	30.555	20	0	196	2792	28.116	25	0	290
Amount spent on fish in 1000s of SLL in the past week	3173	8.648	0	0	100	2792	36.523	35	0	560
Amount spent on meat in 1000s of SLL in the past week	3182	32.404	30	0	140	2788	9.918	0	0	700
Amount spent on fruit in 1000s of SLL in the past week	3176	5.369	0	0	70	2790	3.926	0	0	132
Amount spent on other in 1000s of SLL in the past week	3158	23.457	20	0	140	2793	33.121	30	0	343
<i>Female Headed Households</i>										
Food expenditures '000 SLL in the past week	1308	149.275	126	0	996	1114	181.315	164	0	990
Amount spent on staple in 1000s of SLL in the past week	1285	56.807	48	0	350	1112	72.040	66	0	350
Amount spent on vegetable in 1000s of SLL in the past week	1283	29.907	20	0	196	1112	27.577	24	0	190
Amount spent on fish in 1000s of SLL in the past week	1282	8.059	0	0	100	1112	36.037	35	0	265
Amount spent on meat in 1000s of SLL in the past week	1285	31.054	28	0	140	1109	8.804	0	0	250
Amount spent on fruit in 1000s of SLL in the past week	1280	4.890	0	0	70	1109	4.165	0	0	132
Amount spent on other in 1000s of SLL in the past week	1274	21.499	17	0	140	1113	33.024	30	0	290
<i>Male Headed Households</i>										
Food expenditures '000 SLL in the past week	1922	166.186	141	0	956	1681	187.912	167	0	1793
Amount spent on staple in 1000s of SLL in the past week	1889	65.065	50	0	350	1680	75.102	70	0	491
Amount spent on vegetable in 1000s of SLL in the past week	1894	30.994	21	0	196	1680	28.473	25	0	290
Amount spent on fish in 1000s of SLL in the past week	1891	9.048	0	0	100	1680	36.845	35	0	560
Amount spent on meat in 1000s of SLL in the past week	1897	33.319	30	0	140	1679	10.653	0	0	700
Amount spent on fruit in 1000s of SLL in the past week	1896	5.693	0	0	70	1681	3.769	0	0	76
Amount spent on other in 1000s of SLL in the past week	1884	24.782	20	0	140	1680	33.186	29	0	343
<i>Respondent has any disability</i>										
Food expenditures '000 SLL in the past week	839	147.679	126	0	956	736	178.312	161	0	1333
Amount spent on staple in 1000s of SLL in the past week	824	57.799	49	0	350	735	70.798	65	0	289
Amount spent on vegetable in 1000s of SLL in the past week	826	27.980	20	0	196	735	27.761	24	0	150
Amount spent on fish in 1000s of SLL in the past week	821	6.719	0	0	100	735	34.908	35	0	345
Amount spent on meat in 1000s of SLL in the past week	824	30.632	30	0	140	733	9.161	0	0	700
Amount spent on fruit in 1000s of SLL in the past week	823	4.901	0	0	70	734	3.299	0	0	50
Amount spent on other in 1000s of SLL in the past week	816	22.517	16	0	140	734	32.701	29	0	170
<i>Respondent has no disability</i>										
Food expenditures '000 SLL in the past week	2390	163.450	138	0	996	2058	187.803	166	0	1793
Amount spent on staple in 1000s of SLL in the past week	2349	63.097	50	0	350	2056	74.988	69	0	491
Amount spent on vegetable in 1000s of SLL in the past week	2350	31.467	21	0	196	2056	28.239	25	0	290
Amount spent on fish in 1000s of SLL in the past week	2351	9.325	0	0	100	2056	37.111	35	0	560
Amount spent on meat in 1000s of SLL in the past week	2357	33.032	30	0	140	2054	10.193	0	0	360
Amount spent on fruit in 1000s of SLL in the past week	2352	5.536	0	0	70	2055	4.152	0	0	132
Amount spent on other in 1000s of SLL in the past week	2341	23.786	20	0	140	2058	33.283	30	0	343

Summary statistics for Food Expenditure are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Table 23 describes the food security measures taken from Baseline and Midline of all respondents disaggregated by gender and disability. As was seen for food expenditures, each of the questions on food security were asked to respondents about the last week at the time of surveying. Overall on average, 46.2 percent of total households ate less preferred food at least one of the days of the last week, 41.3 percent reduced portion size for members of their household, 29.5 percent asked others for help with food and 13.9 percent of households went one or more days without any meals. There is a higher percentage of female headed households experiencing this constraint more often than the male headed households, and those who have disabilities have more of a food constraint than those who do not have a disability.

Table 23: Summary Statistics: Food Security

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Ate less preferred food at least one day in the past week	3230	0.480	0	0	1	2795	0.462	0	0	1
Reduced portion sizes for any member of household in the past week	3230	0.436	0	0	1	2795	0.414	0	0	1
Asked relative or friend for help with food at least once in the past week	3230	0.328	0	0	1	2795	0.295	0	0	1
Went one or more days with no meals in the past week	3224	0.153	0	0	1	2795	0.139	0	0	1
<i>Female Headed Households</i>										
Ate less preferred food at least one day in the past week	1308	0.489	0	0	1	1114	0.495	0	0	1
Reduced portion sizes for any member of household in the past week	1308	0.454	0	0	1	1114	0.431	0	0	1
Asked relative or friend for help with food at least once in the past week	1308	0.369	0	0	1	1114	0.328	0	0	1
Went one or more days with no meals in the past week	1305	0.161	0	0	1	1114	0.145	0	0	1
<i>Male Headed Households</i>										
Ate less preferred food at least one day in the past week	1922	0.473	0	0	1	1681	0.441	0	0	1
Reduced portion sizes for any member of household in the past week	1922	0.424	0	0	1	1681	0.403	0	0	1
Asked relative or friend for help with food at least once in the past week	1922	0.300	0	0	1	1681	0.273	0	0	1
Went one or more days with no meals in the past week	1919	0.147	0	0	1	1681	0.135	0	0	1
<i>Respondent has any disability</i>										
Ate less preferred food at least one day in the past week	839	0.544	1	0	1	736	0.492	0	0	1
Reduced portion sizes for any member of household in the past week	839	0.483	0	0	1	736	0.410	0	0	1
Asked relative or friend for help with food at least once in the past week	839	0.391	0	0	1	736	0.318	0	0	1
Went one or more days with no meals in the past week	837	0.164	0	0	1	736	0.141	0	0	1
<i>Respondent has no disability</i>										
Ate less preferred food at least one day in the past week	2390	0.457	0	0	1	2058	0.452	0	0	1
Reduced portion sizes for any member of household in the past week	2390	0.419	0	0	1	2058	0.415	0	0	1
Asked relative or friend for help with food at least once in the past week	2390	0.306	0	0	1	2058	0.286	0	0	1
Went one or more days with no meals in the past week	2386	0.149	0	0	1	2058	0.138	0	0	1

Summary statistics for Food Security are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Table 24 reports the difference-in-difference estimation of food consumption and food security measures from Baseline to Midline. Table 25 reports the same outcomes for the complier population. Overall, the households in RREP communities have negative coefficients on food expenditures. Amount spent on meat has dropped significantly at the 1 percent, fruit at the 5 percent, and vegetables at the 10 percent level suggesting that the households are more willing to consume less preferred foods right now. This suggests that access to electricity might push households to substitute out of food expenditures. While we don't have data on non-food expenditure it is likely that households are diverting funds away from food.

While households in RREP communities are spending less on food, they don't do worse than households in comparison communities on food security measures. This could suggest that while they are spending less on certain foods they may not be reducing quantities consumed. It is possible that food commodities become cheaper in these communities as a result of electricity access, resulting from efficiency gains in food storage.

Table 24: Difference in Differences Consumption and Food Expenditure Outcomes

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Consumption Expenditure</i>					
Food expenditures '000 SLL in the past week	2997	159.338	22.362*** (7.77)	28.769*** (5.67)	-5.025 (10.26)
Amount spent on staple in 1000s of SLL in the past week	2968	61.722	4.617 (3.54)	13.144*** (3.22)	-1.455 (4.61)
Amount spent on vegetable in 1000s of SLL in the past week	2969	30.555	5.502** (2.47)	-1.258 (1.75)	-3.020 (2.85)
Amount spent on fish in 1000s of SLL in the past week	2967	8.648	4.088** (1.57)	26.914*** (1.45)	2.522 (2.71)
Amount spent on meat in 1000s of SLL in the past week	2970	32.404	4.425*** (1.58)	-19.882*** (1.35)	-5.522** (2.14)
Amount spent on fruit in 1000s of SLL in the past week	2968	5.369	3.450*** (0.91)	-0.372 (0.50)	-2.056* (1.17)
Amount spent on other in 1000s of SLL in the past week	2960	23.457	4.569** (1.86)	9.844*** (1.52)	-0.023 (2.44)
<i>Consumption Expenditure IHS Transformation</i>					
Food Expenditures in the past week	2997	5.506	0.043 (0.06)	0.210*** (0.05)	0.050 (0.08)
Expenditure on staples	2968	4.437	-0.024 (0.08)	0.191*** (0.07)	0.039 (0.10)
Expenditure on vegetables	2969	3.424	0.341*** (0.12)	0.428*** (0.10)	-0.229* (0.12)
Expenditure on fish	2967	1.127	0.405*** (0.14)	2.921*** (0.10)	-0.220 (0.16)
Expenditure on meat	2970	3.906	0.073 (0.06)	-2.597*** (0.10)	-0.201 (0.15)
Expenditure on fruit	2968	1.069	0.555*** (0.13)	0.030 (0.10)	-0.392** (0.19)
Expenditure on other foods	2960	3.186	0.282* (0.14)	0.806*** (0.12)	-0.131 (0.16)
<i>Food Security</i>					
Ate less preferred food at least one day in the past week	2997	0.480	0.013 (0.03)	-0.027 (0.04)	0.013 (0.05)
Reduced portion sizes for any member of household in the past week	2997	0.436	0.076** (0.03)	-0.019 (0.04)	-0.045 (0.05)
Asked relative or friend for help with food at least once in the past week	2997	0.328	0.031 (0.03)	-0.022 (0.04)	-0.034 (0.05)
Went one or more days with no meals in the past week	2994	0.153	-0.012 (0.02)	-0.028 (0.02)	0.023 (0.03)

Difference in Difference estimation uses consumption and food security from from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects and clustered standard errors at the village level. The regression is weighted using Inverse Probability Weights.

Table 25: Difference in Differences Consumption and Food Expenditure Outcomes(Connected Households in RREP Communities)

	N (1)	Mean in Not Connected HHs in 2019 (2)	Connected vs Not Connected in 2019 (3)	Post (4)	Post × Connected (5)
<i>Consumption Expenditure</i>					
Food expenditures '000 SLL in the past week	2878	159.338	39.842*** (9.75)	28.946*** (8.17)	-12.132 (14.22)
Amount spent on staple in 1000s of SLL in the past week	2852	61.722	9.746** (4.61)	13.194*** (3.85)	-4.708 (6.71)
Amount spent on vegetable in 1000s of SLL in the past week	2853	30.555	9.908*** (2.58)	-1.231 (2.15)	-5.981 (3.75)
Amount spent on fish in 1000s of SLL in the past week	2853	8.648	6.499*** (2.25)	26.946*** (1.88)	4.145 (3.28)
Amount spent on meat in 1000s of SLL in the past week	2855	32.404	7.141*** (2.08)	-19.877*** (1.74)	-8.965*** (3.03)
Amount spent on fruit in 1000s of SLL in the past week	2852	5.369	5.726*** (0.99)	-0.356 (0.83)	-3.519** (1.45)
Amount spent on other in 1000s of SLL in the past week	2846	23.457	7.560*** (2.13)	9.883*** (1.77)	-0.269 (3.09)
<i>Consumption Expenditure IHS Transformation</i>					
Food Expenditures in the past week	2878	5.506	0.120 (0.07)	0.211*** (0.06)	0.030 (0.11)
Expenditure on staples	2852	4.437	0.010 (0.10)	0.192** (0.09)	0.014 (0.15)
Expenditure on vegetables	2853	3.424	0.589*** (0.10)	0.430*** (0.09)	-0.413*** (0.15)
Expenditure on fish	2853	1.127	0.660*** (0.13)	2.922*** (0.11)	-0.366* (0.19)
Expenditure on meat	2855	3.906	0.125 (0.13)	-2.598*** (0.11)	-0.332* (0.19)
Expenditure on fruit	2852	1.069	0.909*** (0.14)	0.032 (0.11)	-0.653*** (0.20)
Expenditure on other foods	2846	3.186	0.477*** (0.10)	0.807*** (0.09)	-0.235 (0.15)
<i>Food Security</i>					
Ate less preferred food at least one day in the past week	2878	0.480	0.032 (0.04)	-0.027 (0.04)	0.009 (0.06)
Reduced portion sizes for any member of household in the past week	2878	0.436	0.137*** (0.04)	-0.019 (0.04)	-0.089 (0.06)
Asked relative or friend for help with food at least once in the past week	2878	0.328	0.058 (0.04)	-0.022 (0.03)	-0.064 (0.06)
Went one or more days with no meals in the past week	2875	0.153	-0.033 (0.03)	-0.028 (0.03)	0.050 (0.04)

Difference in Difference estimation uses consumption and food security from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects.

## 4.7 Education Outcomes

This section describes our findings on children’s education in the surveyed communities, and initial impacts of the RREP project on education outcomes of interest. At Baseline and Midline, the household survey instrument asked detailed questions about enrolment, attendance, and time use for children between the ages of six and eighteen.

Table 26 reports the summary statistics for the households with school-aged children. Across our sample, we observe a slight reduction in the percentage of households with children whose children are enrolled in school, but a slight increase in the average number of hours spent studying per day. We also observe a decrease in the average number of hours spent working on household chores and working on the household farm, across all households. These patterns hold for male and female headed households.

Table 26: Summary Statistics: Children's Education

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>All Households</i>										
Any child enrolled in school	2209	0.942	1	0	1	2232	0.891	1	0	1
Average days enrolled children missed school	2081	0.275	0	0	7	1988	0.369	0	0	6
Average hours spent studying in a day	2001	1.078	1	0	4	1831	1.107	1	0	9
Average hours spent doing chores in a day	2165	0.986	1	0	5	2172	0.282	0	0	4
Average hours spent working on the farm in a day	2188	0.553	0	0	7	2172	0.382	0	0	10
Average hours spent working on household business	2200	0.186	0	0	3	2183	0.217	0	0	1
<i>Female Headed Households</i>										
Any child enrolled in school	913	0.935	1	0	1	897	0.878	1	0	1
Average days enrolled children missed school	854	0.319	0	0	7	787	0.431	0	0	5
Average hours spent studying in a day	819	1.078	1	0	4	722	1.077	1	0	5
Average hours spent doing chores in a day	891	0.967	1	0	5	869	0.256	0	0	4
Average hours spent working on the farm in a day	904	0.490	0	0	7	869	0.344	0	0	5
Average hours spent working on household business	911	0.198	0	0	3	871	0.248	0	0	1
<i>Male Headed Households</i>										
Any child enrolled in school	1296	0.947	1	0	1	1335	0.900	1	0	1
Average days enrolled children missed school	1227	0.245	0	0	7	1201	0.328	0	0	6
Average hours spent studying in a day	1182	1.077	1	0	4	1109	1.127	1	0	9
Average hours spent doing chores in a day	1274	1.000	1	0	5	1303	0.300	0	0	4
Average hours spent working on the farm in a day	1284	0.597	0	0	7	1303	0.407	0	0	10
Average hours spent working on household business	1289	0.178	0	0	3	1312	0.197	0	0	1
<i>Respondent has any disability</i>										
Any child enrolled in school	538	0.942	1	0	1	575	0.897	1	0	1
Average days enrolled children missed school	507	0.292	0	0	7	515	0.457	0	0	6
Average hours spent studying in a day	489	1.098	1	0	4	461	1.126	1	0	9
Average hours spent doing chores in a day	529	1.009	1	0	5	563	0.273	0	0	4
Average hours spent working on the farm in a day	532	0.569	0	0	7	563	0.385	0	0	9
Average hours spent working on household business	536	0.176	0	0	3	565	0.227	0	0	1
<i>Respondent has no disability</i>										
Any child enrolled in school	1671	0.942	1	0	1	1656	0.889	1	0	1
Average days enrolled children missed school	1574	0.270	0	0	7	1473	0.338	0	0	5
Average hours spent studying in a day	1512	1.071	1	0	4	1370	1.101	1	0	6
Average hours spent doing chores in a day	1636	0.979	1	0	5	1608	0.286	0	0	4
Average hours spent working on the farm in a day	1656	0.548	0	0	7	1608	0.381	0	0	10
Average hours spent working on household business	1664	0.189	0	0	3	1617	0.214	0	0	1

Summary statistics for education are disaggregated by gender of the household head and disability status of the respondent as measured at baseline.

Despite the Covid-19 pandemic reducing travel and social activity, schools in Sierra Leone remained open through much of 2020. Tables 27 and 28 present the difference-in-differences results for the education variables of interest. Across the sample, between the Baseline and Midline, we see a statistically significant decrease in the proportion of children being enrolled in school (column 4). This matches our expectations of Covid-19 effects. When looking at mini-grid connection effects, however, most significant effects fall away. Between RREP and comparison communities, there is no significant difference in the number of households which enroll their children in school, nor the number of days of school missed over the past week.

The only significant result between the RREP and comparison communities is for children's time-use. For households in the RREP communities, and for complier households, we find a significant decrease in the amount of time spent studying, and a statistically similar increase in the amount of time spent working on the household's farm. This indicates that children whose household gains access to electricity tend to study less, work in the family business less, and work on their family's farm relatively more than households in comparison communities.

Table 27: Difference in Differences Education Outcomes

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Childs Education</i>					
Any child enrolled in school	2211	0.942	0.021* (0.01)	-0.044*** (0.01)	-0.013 (0.02)
Average days enrolled children missed school	2025	0.275	0.119* (0.07)	0.104 (0.09)	-0.083 (0.11)
Average hours spent studying in a day	1907	1.078	0.173*** (0.06)	0.108* (0.06)	-0.181* (0.10)
Average hours spent doing chores in a day	2159	0.986	-0.047 (0.07)	-0.710*** (0.05)	0.037 (0.08)
Average hours spent working on the farm in a day	2171	0.553	-0.219*** (0.07)	-0.240*** (0.06)	0.162** (0.08)
Average hours spent working on household business	2182	0.186	0.087** (0.03)	0.071** (0.03)	-0.093** (0.04)

Difference in Difference estimation uses education statistics from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects and clustered standard errors at the village level. The regression is weighted using Inverse Probability Weights.

Table 28: Difference in Differences Education Outcomes(Connected Households in RREP Communities)

	N (1)	Mean in Not Connected HHs in 2019 (2)	Connected vs Not Connected in 2019 (3)	Post (4)	Post × Connected (5)
<i>Childs Education</i>					
Any child enrolled in school	2148	0.942	0.042 (0.03)	-0.044** (0.02)	-0.030 (0.04)
Average days enrolled children missed school	1968	0.275	0.189* (0.10)	0.104 (0.09)	-0.132 (0.15)
Average hours spent studying in a day	1849	1.078	0.286*** (0.08)	0.108 (0.07)	-0.300** (0.12)
Average hours spent doing chores in a day	2099	0.986	-0.070 (0.07)	-0.710*** (0.06)	0.056 (0.10)
Average hours spent working on the farm in a day	2110	0.553	-0.368*** (0.09)	-0.241*** (0.07)	0.278** (0.13)
Average hours spent working on household business	2120	0.186	0.117*** (0.04)	0.071** (0.04)	-0.128** (0.06)

Difference in Difference estimation uses education statistics from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects. The regression is weighted using Inverse Probability Weights.

## 5. Schools

This section describes the data collected from all Government and/or Government-Assisted schools in WP1 communities. The data was collected in conjunction with both the Baseline (2019) and Midline (2021) data collections for the academic school years 2018/2019 and 2019/2020.

### 5.1 Data Collection

The school survey was administered to either the school Principal or the Head Teacher<sup>24</sup> who had sufficient knowledge of the school and had access to all records. The survey instrument is included in Annex P. We collected data from all Government and/or Government-Assisted schools in both RREP and comparison sites, varying the number of schools per community and per wave of data collection.<sup>25</sup> This included information on the total number of students, disaggregated by gender and disability status, total number of teachers by gender, electricity access and all the national exam information for the NPSE, BECE and WASSACE.

#### 5.1.1 Effects of Covid-19

The Covid-19 pandemic caused Sierra Leone to close in many different areas, the education system included. From April to July 2020 school going children were not allowed to be at school in person as per precautionary measures the government had put in place for the safety of everyone. This happened to be right before the national exams were supposed to be taken and were therefore postponed until further notice. The government then set a time for all of the students to take the exams, although at designated times to adhere to Covid-19 guidelines. These exams were then taken at the end of July/early August for all levels at the staggered scheduled. Since the Midline data collection happened in early 2021, this meant the school records were accessible, though it should be noted that changes seen over time may have further implications due to the substantial break in schooling for students from Covid-19.

### 5.2 Exam Analysis

Table 29 reports the summary statistics for the Baseline and Midline school attendance disaggregated by gender. At Baseline the disaggregation of disability status was not collected, and was quickly resolved for the Midline data collection which is shown in rows 4 and 5 and columns 6-10. On average schools have increased attendance by about 10 students, the increase is driven by the amount of girls attending school being higher during Midline than at Baseline. This could be because when conducting the Midline data collection, the evaluation team did survey more Government and/or Government-Assisted schools, who enroll more girls on average. There is a small amount of disabled students who attend the schools, on average 2 females with a maximum of 20 per school and 2 males with a maximum of 30 per school. Below the attendance, Table 29 reports the averages of national exam outcomes at Baseline and Midline for all schools. The national exams are restricted to certain grades in schools, and is conditional on those who took the exam. Over time it seems that on average the same amount of students are sitting for the national exams, as well as those who are passing the exam. More boys pass exams than girls (14.4 boys compared to 13.6 girls).

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<sup>24</sup>If neither were available, the enumerator would find another teacher of that school who was able to provide all needed information including records.

<sup>25</sup>During the Baseline data collection, there were some communities that we did not collect any school information on. These data were then captured during the Midline data collection, except for the national exam records for the previous academic year. This will be resolved during the Endline data collection to obtain full records for all schools.

Table 29: Summary Statistics: School Outcomes

	Baseline (2019)					Midline (2021)				
	N (1)	Mean (2)	Median (3)	Min (4)	Max (5)	N (6)	Mean (7)	Median (8)	Min (9)	Max (10)
<i>Attendance</i>										
Number of students attending	198	356.672	312	25	1885	201	366.468	329	45	1752
Number of boys attend	198	188.005	163	19	1161	201	188.587	163	17	983
Number of girls attend	198	168.667	148	6	761	201	177.881	158	27	779
Number boy disabled students attend	0					201	2.836	2	0	30
Number girl disabled students attend	0					201	2.731	2	0	20
<i>Exam Outcomes</i>										
Number students sit for NPSE	127	33.000	27	0	156	136	34.191	29	0	212
Number students sit for NPSE	127	33.000	27	0	156	136	34.191	29	0	212
Number of students pass NPSE	127	28.031	21	0	140	136	28.037	25	0	157
Number of females pass NPSE	125	13.200	9	0	75	136	13.618	12	0	89
Number of males pass NPSE	125	14.904	12	0	68	136	14.419	12	0	68
Number of students pass BECE	63	48.968	35	0	230	62	61.339	56	0	224
Number of students pass WASSACE	25	14.840	0	0	250	28	8.071	2	0	58

Summary statistics for school related indicators base on data from baseline 2019 and midline 2021.

Table 30 below reports the difference-in-difference estimation on all the Government and/or Government-Assisted schools. As seen in column 3 the average number of students are higher in RREP communities than comparison communities, which remains consistent when interacting over time as seen in column 5. RREP communities are seen to have more students attending their schools (significant at the 5 percent level). However, only 38 schools in the sample are connected to the mini-grid and hence these results are preliminary at best. This could imply that RREP schools may be able to reap the full benefits of electrification over time, but further investigation would have to ensue in combination with other investments such as improvements to infrastructure, quality of teachers, and learning materials for example.

Table 30: Difference in Differences School Outcomes

	N (1)	Mean in Control in 2019 (2)	RREP vs Non RREP in 2019 (3)	Post (4)	Post × RREP (5)
<i>Attendance</i>					
Number of students attending	200	356.672	24.420 (41.53)	-6.577 (12.47)	36.935** (18.35)
Number of boys attend	200	188.005	13.973 (23.25)	-7.987 (8.53)	20.614* (10.84)
Number of girls attend	200	168.667	10.447 (19.12)	1.410 (5.60)	16.321* (9.48)
Number boy disabled students attend	101		0.796 (0.57)	0.000 (0.00)	0.000 (0.00)
Number girl disabled students attend	101		0.435 (0.59)	0.000 (0.00)	0.000 (0.00)
<i>Exam Outcomes</i>					
Number students sit for NPSE	132	33.000	11.161** (5.09)	0.906 (2.39)	2.972 (3.24)
Number students sit for NPSE	132	33.000	11.161** (5.09)	0.906 (2.39)	2.972 (3.24)
Number of students pass NPSE	132	28.031	9.387* (5.06)	-1.181 (3.07)	4.042 (4.13)
Number of females pass NPSE	131	13.200	4.446 (2.78)	-0.365 (1.71)	2.240 (2.51)
Number of males pass NPSE	131	14.904	5.736** (2.59)	-0.811 (1.55)	1.303 (2.06)
Number of students pass BECE	63	48.968	-16.851 (18.06)	5.687 (10.13)	9.417 (11.98)
Number of students pass WASSACE	27	14.840	-55.351 (41.89)	-41.738 (35.69)	48.949 (37.78)

Difference in Difference estimation uses school data from 2019 as the pre period and from 2020 as the post period. Includes district fixed effects and clustered standard errors at the village level.

## 6. Community Health Clinics

This section presents a summary of data collected from CHCs in the WP1 communities. These data were collected between the duration of the Baseline and Midline data collections for two different sources of information on the clinic qualities and many of the health registers for the years of 2016, 2019, 2020 and 2021.

### 6.1 Data Collection

We have collected data on the clinics from two sources: interviews with the Community Health Officer (CHO)<sup>26</sup> of the clinic, and data from the standardized health registers on which each CHC keeps records.

The CHO surveys were conducted at both Baseline (2019) and Midline (2021), during the same data collection period as the household and school surveys covered above. In these surveys, the respondents are asked about CHC operations, conditions, capacities, and equipment. The survey instrument is included in Annex I. While the CHO survey was administered, five health registers were collected to be able to assess the full utilization of the clinic and compare across RREP and non-RREP sites.

### 6.2 CHC Electrification Timeline

The majority of community health clinics in our sample were electrified in 2017 to enable Ebola containment efforts. Since then, the RREP has electrified every CHC in the WP1 RREP communities. Of the 54 RREP clinics in Work Package 1, 50 were electrified between April and October 2017, and 4 were electrified in early 2018.<sup>27</sup> By identifying the date of electrification, we can analyze conditions prior to and following that date.

We have collected register data for the entirety of 2016, 2019, 2020, and the first two months of 2021. The 2016 data provide a baseline, which describes the state of the CHCs prior to electrification. This baseline can then be compared to the register data collected for years after 2019, and differential changes between the RREP and comparison villages are identified. This difference-in-differences methodology mirrors what was used to analyze the household data, and is described in [Section 3.7](#).

Electrification may be a necessary but not sufficient condition to bring about the positive changes we seek. If not accompanied by other investments in infrastructure, productive appliances, training and incentives for clinic staff, or proper materials, electrification may be used for nothing more than phone charging and light at night. If electricity access is the only infrastructure that improves, outcomes may remain stagnant due to lack of investment in needed areas.

Because all RREP CHCs were electrified prior to the Baseline survey in June 2019, we do not have survey data collected prior to the mini-grid commissioning. Therefore any descriptives between the Baseline and Midline surveys will look at trends over this time period.

### 6.3 Monthly Register Data

For each clinic-month, we collected data stored in a number of documents for the years of 2016, 2019, 2020 and 2021 totaling to 38 months, including:

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<sup>26</sup>Or other in-charge if the clinic has no CHO or the CHO is not present.

<sup>27</sup>UNOPS — RREP Results Matrix

- Above five year old treatment register
- Under five year old treatment register
- Under two year old EPI register
- Family planning register
- Mother and neonate register

Many clinics do not consistently have access to their older monthly registers. For example, while every clinic in our sample provided their mother and neonate register for February 2021, 64 clinics (about two-thirds) were unable to provide that register for February 2016. A similar pattern exists for all of the register types. This is often due to the paper records degrading over time, getting lost, or being discarded.

### 6.3.1 Effects of Covid-19

The effects of the Covid-19 pandemic are visible in the CHC data. All CHCs were electrified at least two years prior to the first reported cases of Covid-19 in Sierra Leone; therefore the effects of the pandemic are visible throughout all clinics and months following electrification.

With the onset of Covid-19, we expect changes in how many people visit the CHCs. Covid-19 effects on CHC utilization are not straightforward. First, as more community members become sick or worry that they might become sick, they may seek medical treatment at the clinics. We expect this effect would increase the rate of CHC utilization. Second, individuals who are concerned about catching Covid-19 may postpone or avoid treatment at clinics, in the worries of becoming infected there similar to when Ebola hit Sierra Leone. We expect this would depress the rate of CHC utilization during the Covid-19 crisis.

## 6.4 Electricity Use

At both Baseline and Midline, the CHO survey instrument collected data on electricity use and electrified assets in the clinics. These assets included patient care devices, such as oxygen plants and automatic external defibrillators, assets for cleaning, such as sterilizers, and storage equipment, such as refrigerators and freezers.

Unlike the households in the comparison communities, comparison CHCs are relatively likely to have access to electricity due to NGOs or other organizations donating solar freezers or other items, according to KIIs. Forty-seven percent of comparison CHCs have access to electricity; of these, 86 percent use a stand-alone solar panel system.

Figure 18 below displays the number of hours the CHC has during the day between RREP clinics and the comparison clinics. Among RREP CHCs, 90 percent have at least 10 hours of electricity per day. Among comparison CHCs, just 37.3 percent have light for so many hours per day. About 27 percent of RREP clinics have less than 15 hours of light per day, whereas a substantial percentage have absolutely no light, 52.9 percent.

In Figure 19 below, we focus on the Midline survey results of electric asset use, by RREP status. For many assets, the RREP communities have higher rates of ownership. Notably, RREP communities are substantially more likely than comparison communities to own refrigerators (82.7 percent, compared to 60.8 percent), freezers (52.8 percent, compared to 37.3 percent), and desktop computers (20.8 percent, compared to 7.8 percent).

## Hours of Electricity per Day Any Source

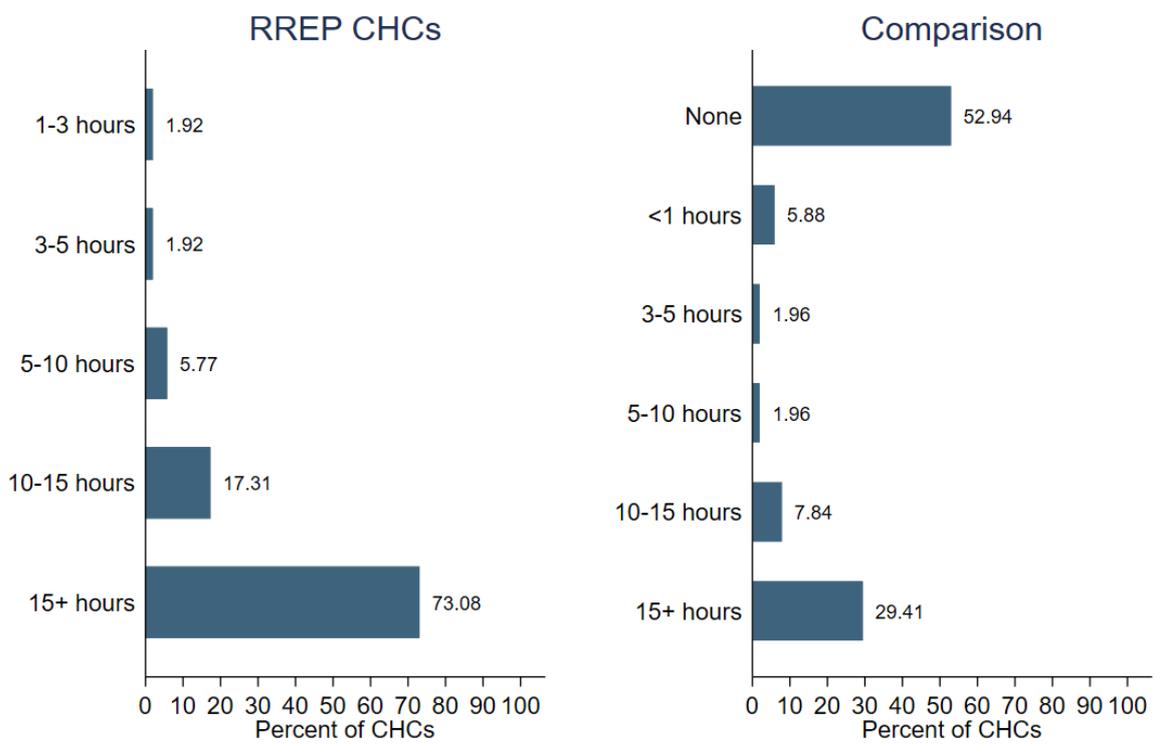


Figure 18: Electricity Hours in CHCs by RREP Status at Midline

## Electricity Use by CHCs 2021, by RREP status

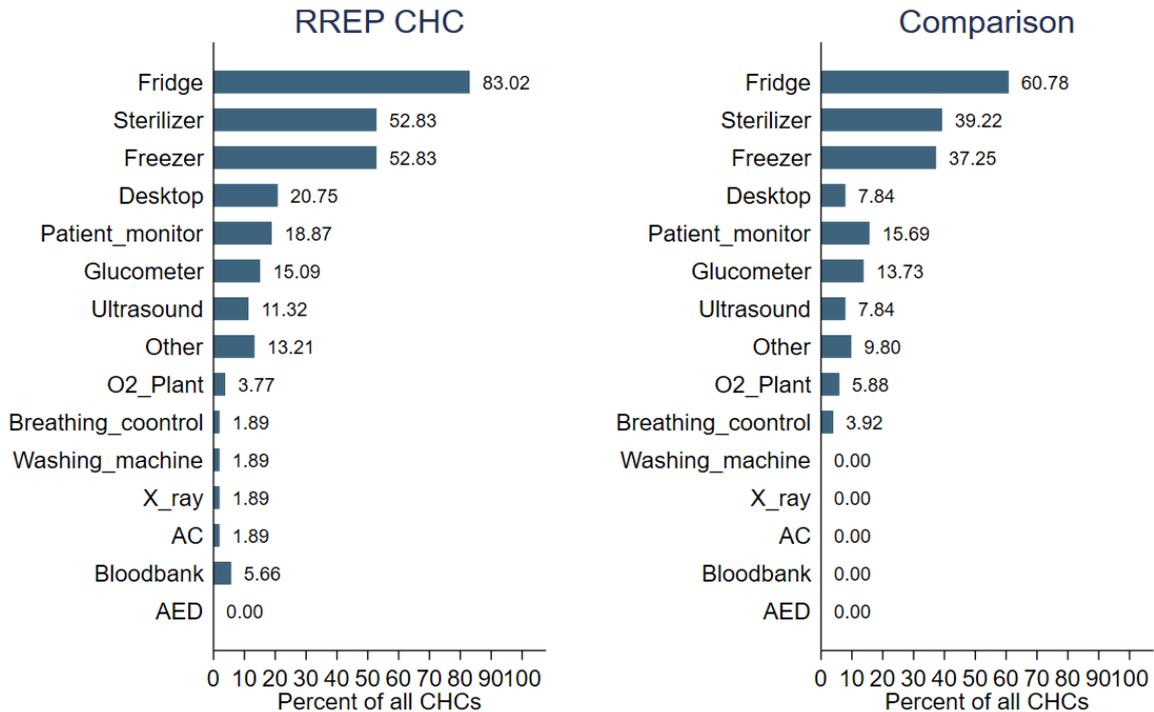


Figure 19: Electricity Usage by CHCs by RREP Status at Midline

This may be explained by how CHCs prioritize the equipment they purchase, and how much electricity a particular piece of equipment requires to operate. When a CHC gains access to consistent electricity (through a mini-grid, for example), they may prefer to purchase and operate a freezer rather than a blood pressure machine. Additionally, of the communities in the comparison community which have access to electricity, all but 86 percent use a stand-alone solar panel system. While this system may be enough to operate a blood pressure machine, it provide insufficient power to operate a refrigerator or freezer consistently.

### 6.4.1 Register Analysis

The monthly data were averaged into quarters per year. Each tick in Figure 20 represents three months, the first tick is January, February and March in 2016 averaged together to get the total patient visits. The next data point averages April, May and June 2016, and so on until January and February of 2021. Figure 20, and all following figures of the registers, shows a regression estimate between RREP communities (the red line in all figures) and the comparison communities (the blue line). This regression tests for statistically significant differences between the utilization of in electrified and non-electrified CHCs. The confidence intervals are displayed for both types of communities indicating if there was any significant change that occurred over the time period when electrification (the solar mini-grids were placed) interacted with time in the communities. Due to more 2016 data being missing, the confidence intervals for that year are quite large, indicating our substantial uncertainty. This is not necessarily an indication that CHCs are struggling, but rather that more information will be needed before we can provide more definite conclusions as to how

electrification impacts clinic utilization. The dashed line separates out the year 2016 and 2019 because all CHCs were electrified after the year 2018.

Figures 20 present the monthly register data for the Above Five Total New Patients and the disaggregation between female and male new patients. A new patient is classified as a person coming into the clinic for the first time for a new symptom. A patient visiting one week for a fever, and the next week for a broken foot, would be classified as two separate new patients. Figure 20 indicates that 2016 RREP communities have higher utilization since 2016, though this finding is not statistically significant. We also see comparison CHCs begin to catch up with RREp clinics in 2021. Women are more likely to go to a CHC as a new patient than men are, though the difference is not substantial.

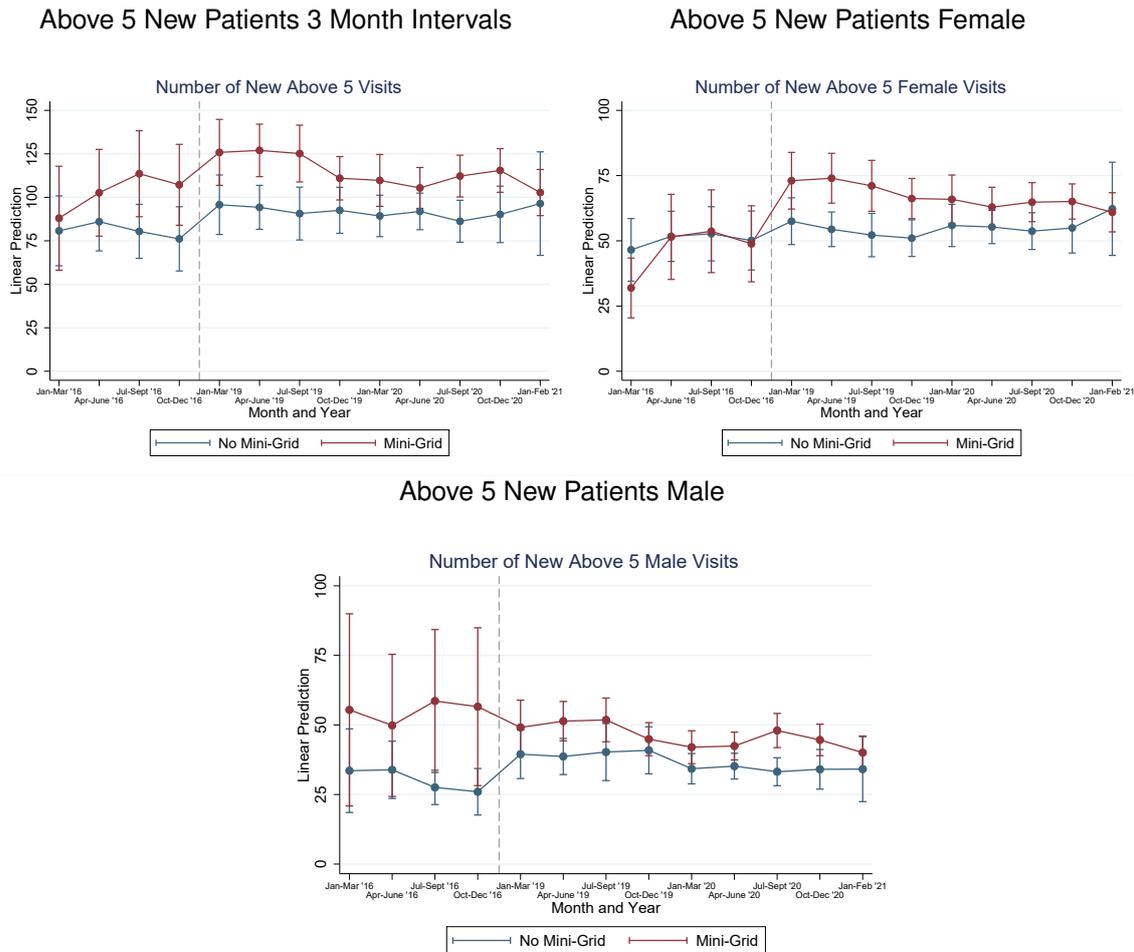
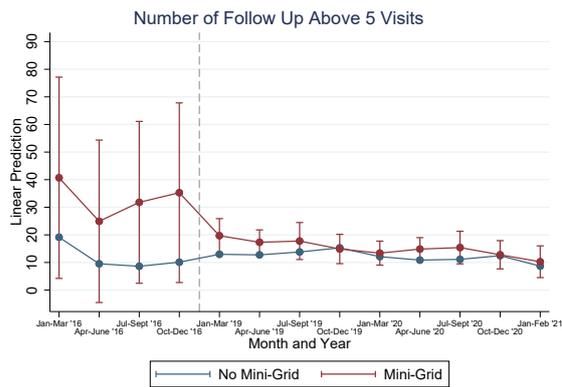


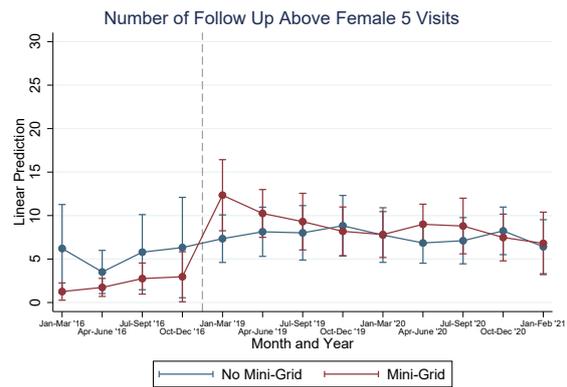
Figure 20: Above 5 Total New Patients, Female New Patients and Male New Patients

Figure 21 below displays the regression estimate for follow-up visits by above-five patients. A followup patient is classified as someone who came to the clinic once again for the exact same reason as they previously came to the clinic for. A patient who visits once for their broken foot is counted as a new patient. Their second and all subsequent visits for the broken foot are classified as follow-up visits. As with new patient visits, the RREP clinics generally have higher clinic utilization, though this result is not statistically significant.

Above 5 Follow Up Patients 3 Month Intervals



Above 5 Follow Up Patients Female



Above 5 Follow Up Patients Male

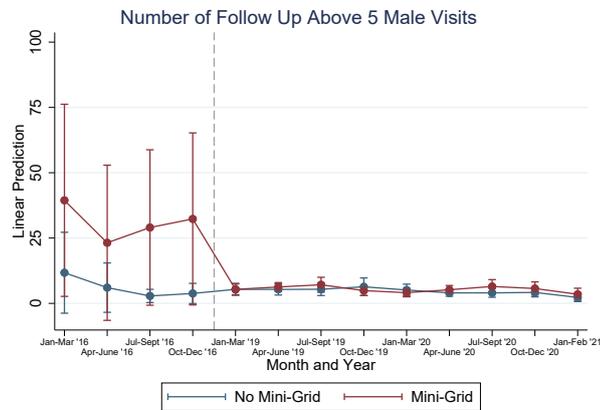


Figure 21: Above 5 Total Follow Up Patients, Female Follow Up Patients and Male Follow Up Patients

Figure 22 below reports the regression estimates for Under 5 Total New Patients over time. The data for under 5 patients for the year 2016 are noisier than the other years. As with adults, the RREP clinics have higher clinic utilization across all time periods, though the gap narrows substantially from 2019 throughout 2021. We find no statistically significant differences for any group.

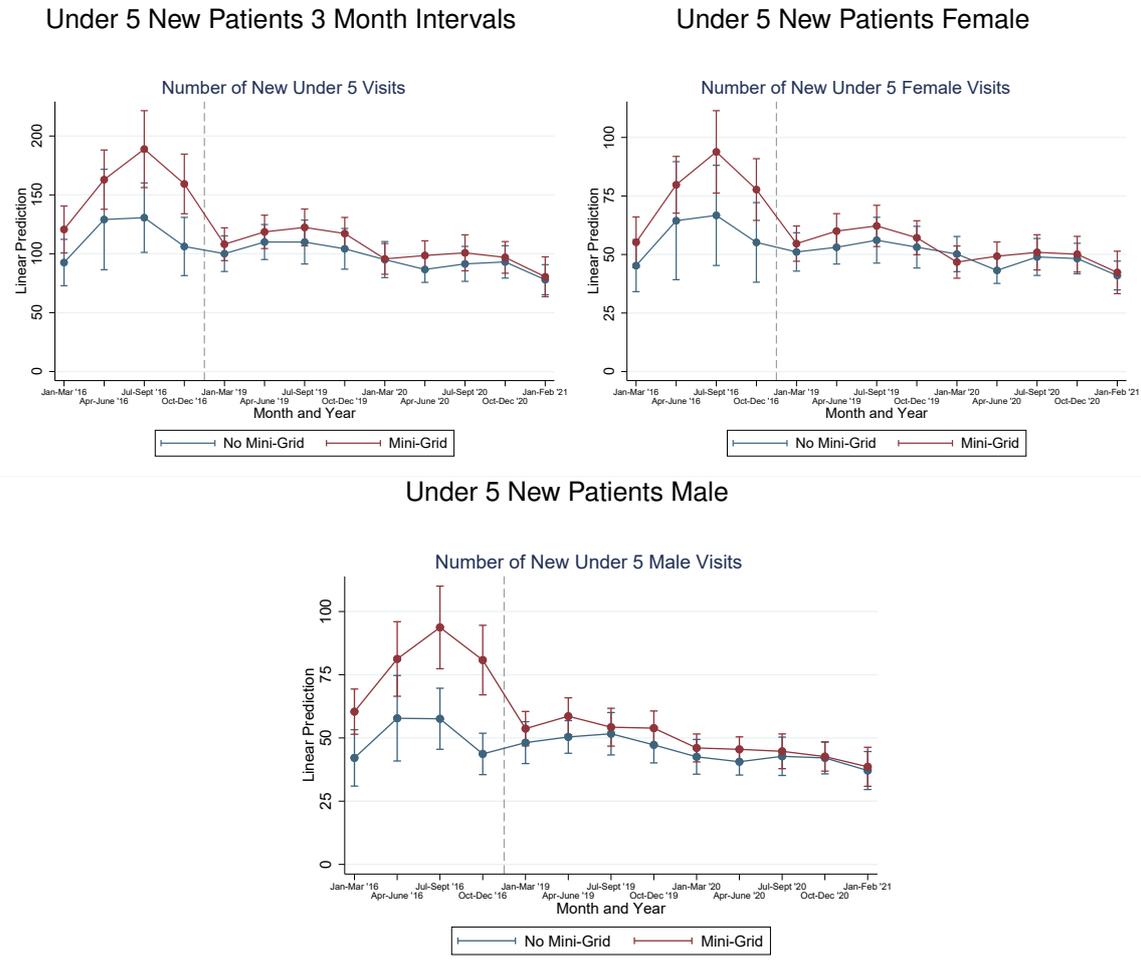


Figure 22: Under 5 Total New Patients, Female New Patients and Male New Patients

In Figure 23 below, we show a regression on data from the Family Planning register. The family planning is taken by total patients, then disaggregated by female and male patients. As with all previous figures, the RREP clinics are having more utilization throughout the timeline, though there are no statistically significant differences.

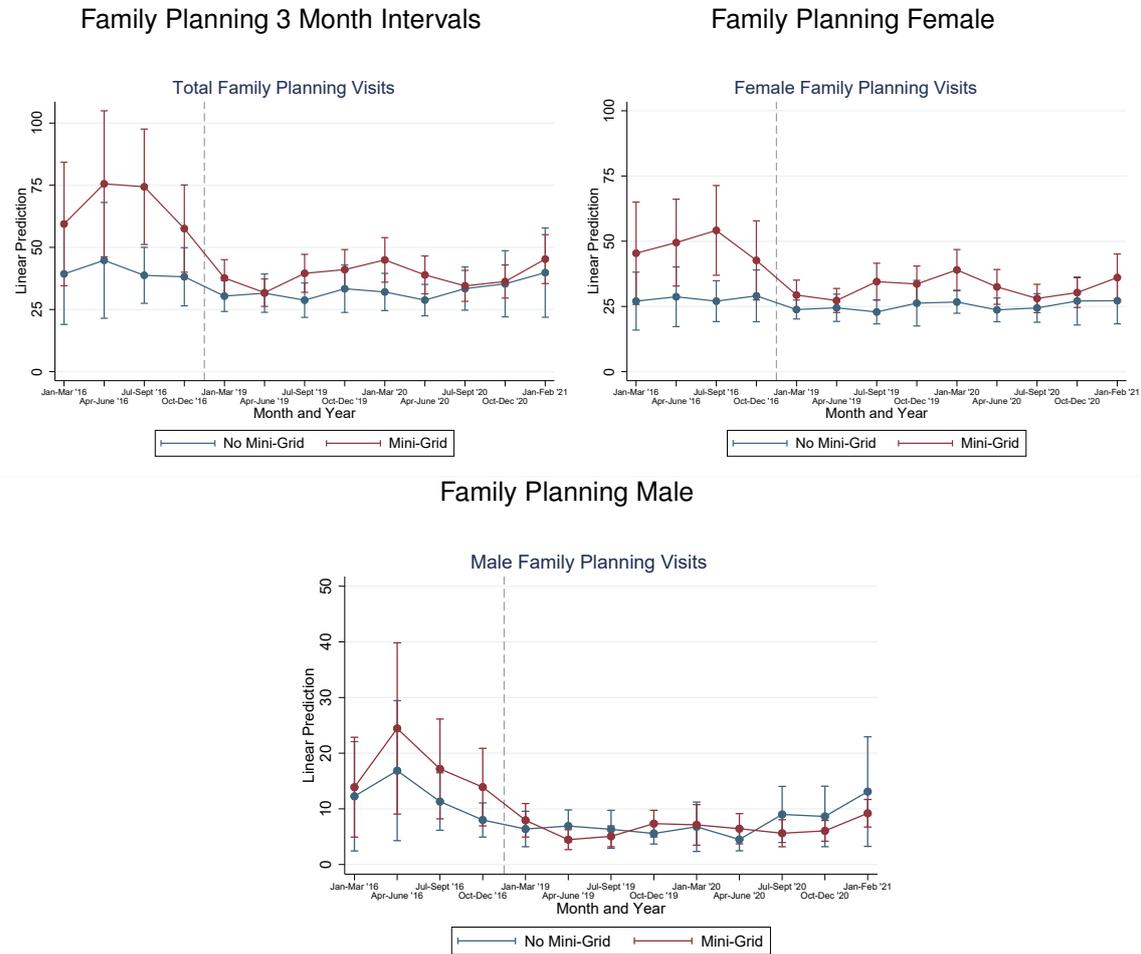


Figure 23: Total Family Planning Vists, Female and Male Family Planning Visits

As presented in all other figures, Figure 24 below is the regression estimation between RREP clinics and comparison clinics. This figure shows data for Total Vaccinations, Total Antenatal Care Visits (ANC) and Total Prenatal Care Visits (PNC). Across all regressions there is slight variation among the RREP sites and comparison for utilization, though none are statistically significant.

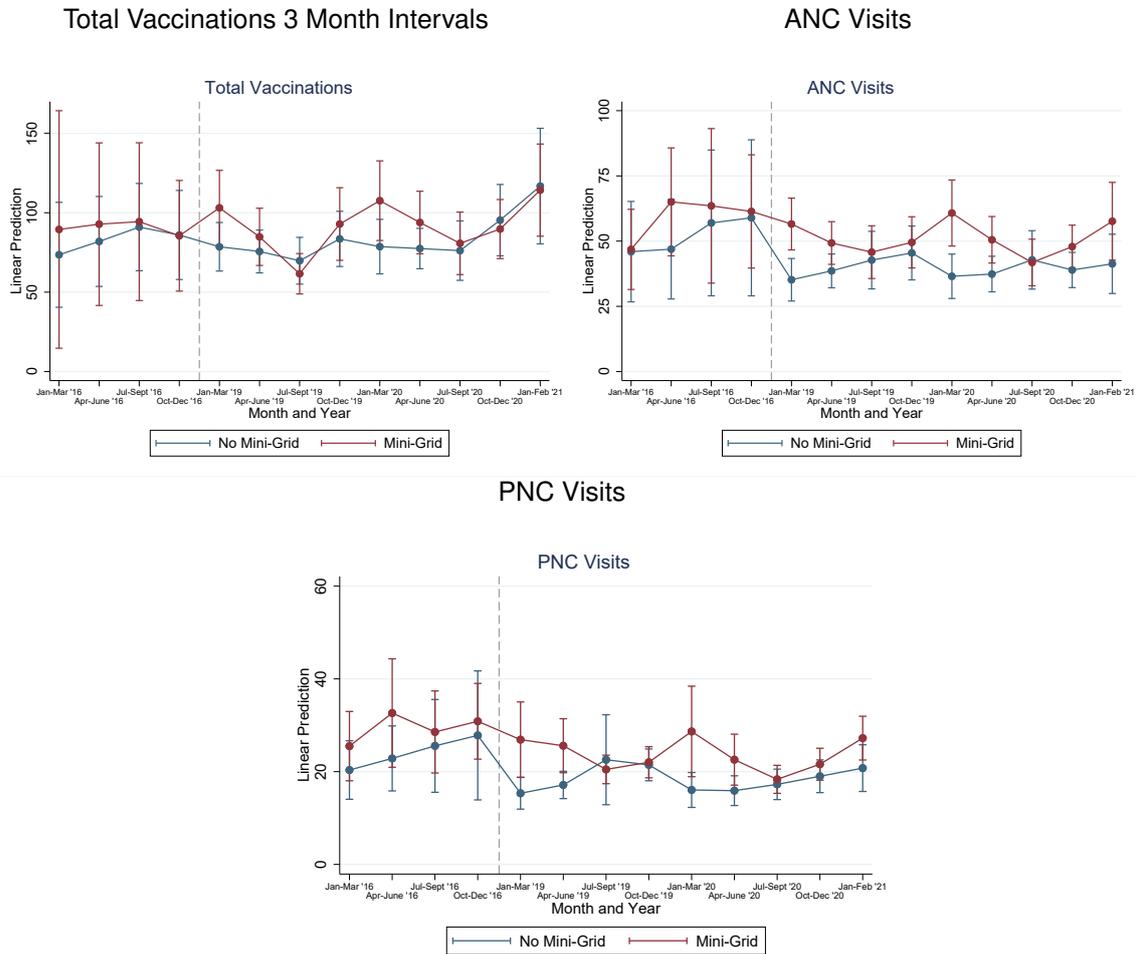


Figure 24: Total Vaccinations, Total ANC Visits, Total PNC Visits

The lack of significant differences suggests that clinic electrification is not sufficient to increase utilization. Electricity access must be accompanied by improvements in infrastructure, training, incentives, and appliances. Without these, it is difficult for clinics to take full advantage of the benefits of electrification. Other investments will have to be made for overall utilization of the clinics to increase, and to reap all the benefits that electrification opens up.

## 7. Qualitative Report

This section provides qualitative insight into the progress of the WP1 Midline of the Rural Renewable Energy Project (RREP). The findings in this report are compiled from more than two dozen interviews and focus group discussions (FGDs). Over the course of March and April 2021, the Impact Evaluation team interviewed:

1. Representatives from the Ministry of Energy,
2. Representatives of the three mini-grid operators (PowerGen, PowerLeone and Winch Energy),
3. Representatives from schools and CHCs in 10 communities across the different regions of Sierra Leone,
4. Four times six residents from RREP communities, and
5. Two times six residents from comparison communities.

Below will show the breakdown of interviews for KIIs and FGDs:

Key Informant Interviews	
Quantity	Interviewee
Head of Renewable Energy and Energy Efficiency	1
Winch Energy	1
PowerGen	1
Energyciti (Power Leone)	3
School Principals	1
Community Health Centre	7
<b>TOTAL KIIs</b>	<b>14</b>

Focus Group Discussions		
Participant	Quantity of FGDs	Number of people involved
Town Chief, Stakeholders	1	6
Mammy Queen, Stakeholders	1	6
Youth Leaders, Business Leaders	1	6
Police, Medical Staff	1	6
Community Elders	1	6
Town Chief, Mammy Queen, Stakeholders	1	6
<b>Total</b>	<b>6</b>	<b>36</b>

First, this will outline general findings from the KII and FDG conversations. The second part looks at what expectations those interviewed have for WP1 within the four domains – household and income assets, healthcare, education and CO2 reductions. The conclusion provides recommendations for RREP stakeholders. This section finds that:

1. According to the mini-grid operators, the entire country varies when moving from the north to the south and the east to the west. They believe that communities surrounding major cities (i.e. Bo, Kenema, Makeni) have better access to electricity, whereas more rural communities are likely to have more issues in accessing electricity due to population distribution and different value chains.
2. The most common difficulties facing operators are delays in passing regulations, obtaining land leases, and transferring mini-grid responsibility between UNOPS and themselves.
3. All mini-grid operators are worried that the grids do not have the intended capacity to provide RREP communities with constant stable light and are needing to modify their work to tailor this.

### **7.0.1 Outcome domain: Household Income and Assets**

1. Electrification could improve agricultural production in a number of ways, most importantly the following:
  - Allowing the establishment of storage facilities and cooling rooms for crops, meat and fish,
  - Enabling the addition of processing machines such as rice mills and drying facilities,
  - And possible addition of irrigation systems assisting in mechanized farming
2. Electrification could generate a range of new business opportunities, most importantly noted by all respondents are the sales of cold drinks through the acquisition of freezers by the residents. Other business opportunities include:
  - Food catering,
  - Food processing such as fruit juice shops,
  - Entertainment centres where football games or movies can be shown,
  - Barbering,
  - Tailoring,
  - Printing and scanning shops.
3. Residents in WP1 communities which have been electrified primarily acquire freezers in their homes for the sole purpose of selling cold drinks to other residents in their communities as well as neighbouring communities who do not have electricity.

### **7.0.2 Outcome domain: Improved Health**

1. CHC staff agree that the most important indicators of a good healthcare system are infrastructure, drug availability, electricity, water and sanitation, highly trained staff, and security. Most of those are not currently provided by CHCs, though they do believe that they provide the best quality care for what they are able to work with.
2. Access to electricity can provide CHCs with light in the evenings. At the moment (unless their site has been electrified) CHC staff use torch lights to treat patients during the evening times. This would allow the staff to attend to patients after dark in a safer manner than they do already, especially for those coming to the clinic at night to give birth or receive treatment after a road accident.

3. Electrification in the clinic and the clinic quarters can incentivise the staff to perform well and remain working at the clinic for a longer period of time. Having light would allow them to feel more comfortable, secure and protected from thieves in the evening time. They could also use the electricity to charge their personal mobile phones, which could be used to call an ambulance if needed.
4. Freezers would allow safe storage of vaccines and drugs, while microscopes would enable treatment of complicated malaria or TB cases.
5. Staff believe that community members 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 malaria, common cold and HIV. CHC staff emphasize the sensitization they do within the communities in order to ensure community members refrain from going to traditional healers and go to the CHC first.

### **7.0.3 Outcome domain: Education**

1. School staff agree that the most important indicators for the provision of quality education are decent infrastructure, availability of water and sanitation, qualified and certified teachers and learning materials. Most of those are not currently met, although they do believe that they are doing the best with what they have available, much like the CHCs.
2. Many school principals commented that with electrification students are now able to go to the schools during evenings to read, study, and do their homework. They mention that this is especially helpful for those families who cannot afford any source of lighting for their children.
3. The general consensus among all staff is that electrification would allow the introduction of different appliances in schools, such as televisions, laptops, photocopy machines, and printers.
4. The school staff have hope that the electricity will allow for a digitalization of the school records rather than having a manual entry where items are easily lost or misplaced.
5. Overall, electrification is believed by all principals and teachers to ensure that the students and staff go to school more often, attract children from other communities to join, and have the potential to begin night classes.
6. The main reasons for student absenteeism are children working in the home or on the farm during school time, traditional events in the community, migration, parents' unfavourable attitudes to education, and parents' inability to pay for fees that are still needed at the school.

### **7.0.4 Gender dynamics**

1. The Ministry of Energy, mini-grid operators and members of the FGDs feel as though electrification may have strong effects on women than men. This is because women carry the majority of domestic unpaid work and benefit strongly from the introduction of electricity-powered appliances such as electric stoves and refrigerators. This could lead women to engage in income-generating activities.
2. Women are typically deemed responsible for taking care of children. Men only step in in case their wife is sick, busy, or visiting family, but this is not as common
3. The majority of respondents mentioned that women do work outside the household, but this is in tangent with their other duties as a wife, such as taking care of the house, children, and husband.

They stated that the women are the first to wake up in the morning and the last to go to sleep in the evening for all the work they need to get done during the day.

4. Respondents from FGDs report that decisions on the purchase of electricity-powered assets are always negotiated and discussed between husband and wife and that none of them can make decisions by themselves. However, unless the woman is making her own money and paying for household items first, she would usually require explicit permission of the husband to buy a certain appliance.

#### **7.0.5 Outcome Domain: CO2 reduction**

1. Firewood is the most common method for cooking, charcoal being perceived as only for the rich and requires a long process to make.
2. Community members state that they will switch to a different manner of cooking (i.e. wood to electricity) if the method was available and was cheaper than what they are using now. They primarily cared about what was the most cost-effective, rather than what might be best for their health or the environment.
3. The most important CO2 reductions would be a result of many gensets being replaced with solar power. Gensets use a large amount of fossil fuel, with more fuel being used to transport it to those communities.
4. Although the initial building of the mini-grids came with high CO2 emissions, the operators are optimistic that if the systems are well-maintained there would be a large reduction in CO2 emissions in the long run.

### **7.1 Results**

This section will discuss the findings for each of the outcome domains of the RREP, as discussed within the WP1 communities during the recent midline data collection. The results will be from the various key informant interviews and all the focus group discussions.

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 percent of the country currently have access to electricity, with only 2 percent of the population in rural communities having access to some form of electricity. These respondents stated that regional variation in access to electricity depends on proximity to major cities. Away from those main cities, the respondents do not expect the rural communities to have any access for various reasons, the largest barrier being the road network. Geographically, they all agreed on the north and eastern regions being the most difficult to access with their roads.

#### **7.1.1 Progress with WP1**

The 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 the change needed for their livelihoods level to increase. Residents of neighbouring communities do travel to RREP communities to utilize the electricity if needed, though it has been mentioned by the operators, Ministry of Energy and members of RREP communities that the neighbouring residents often complain about not being connected themselves. Another issue that was raised by one of the mini-grid operators was that due to the long delay of acquiring the materials, the batteries for the mini-grids are not as strong and cannot hold the intended capacity anymore and backups are needed to have the mini-grid perform to the maximum capacity.

Nonetheless, the installation and connection seem to be perceived as a form of desirable development and as a way of generating local jobs for the entire community.

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. However, during site visits and phone calls with the operators, customers in WP1 regularly complain that they are paying too much, and tariffs are too high. Residents have made comments that they are paying a higher fee than those who are in Freetown, and do not understand why they would be paying more in the rural areas compared to the main city. There has been much confusion around the service fee of having the ability to use the electricity, as well as a daily or monthly tariff. The residents of WP1 sites report that these fees were not communicated outside of the initial connection fee, and they do not think it is fair for them to have to pay such a high price. This was raised as an issue by the Ministry of Energy in addition to the fact that mini-grid operators do not engage with the local authorities to listen to their complaints. 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. Some of the operators have been able to make some mild modifications. One was able to lower the tariff from 900 SLL a day, to 400 SLL a day, while another operator is stratifying their tariff to have 3 different payment types.

“We went to all of the communities, many times, with the town elders and residents discussing the entire payment fee for the electricity. Everyone in the communities understood what our position was and knew the background of how the tariffs were put in place.”

– PowerLeone

All of the operators have mentioned that they are continuously being contacted about setting up new connections inside the community, and residents are consuming more electricity even if there are minor issues with the mini-grid. They did acknowledge that the batteries are quite old and so the capacity to electrify the community is not working as it should be. Each of them has taken this into consideration when they were planning to do WP2 sites for the powerhouses, making sure that the grid will be large enough to meet the needs of the communities. Among the residents 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, or discourage some people from utilising the mini-grids and lead them to go back to gensets.

The collaboration between UNOPS, the Ministry of Energy and the three mini-grid operators were discussed in all interviews. All respondents were happy that UNOPS had the initiative for this project because they would not have been able to do this on their own. The operators agreed that the leadership from UNOPS has been effective and necessary in particular with creating an enabling environment and liaising with the different parties to ensure that the project runs smoothly. 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 cordial and they are being extremely helpful when needed.

### **7.1.2 Outcome Domain: Household Income and Assets**

Agricultural production, non-agricultural activities and household asset ownership were addressed in FGDs about how electrification may impact each domain. One main benefit identified by residents was

that electrification could nudge them into moving towards mechanized and electrified farming, in conjunction with financial support. The mechanized or electrified farming could potentially improve yields and allow the farmers to work more efficiently. If, for instance, residents were to have a rice mill inside their community, they would then be able to spend less time than they would by milling by hand and spend less money through the use diesel generator operated mills.

An additional benefit respondents had mentioned was their need for storage facilities and 'cooling rooms' for their crops as well as meat and fish. The freezers would enable the preservation of food items, ranging from fish and meat to fruit and vegetables. The storage facilities would keep a dry space for rice and other goods while ensuring rats and other rodents would not infest with the assistance of light. As of now, the residents are continuously having to either only prepare for the day at hand or throw away their excess food because they have no manner to preserve it for a future date. The main benefit of cold storage, according to the Ministry of Energy, is that it allows the products to not spoil and keep a longer shelf life.

During the FGDs, issues related to food security were discussed in relation to a subsistence farming household. When asked how food is divided among household members, respondents all responded the same. During times of hardship, the food will always be prioritized for the children under the age of 5 regardless of the gender of the child. The respondents were adamant that this is necessary for the children to develop properly and this was of the most importance, and the parents would forego meals to ensure that the children ate as much as necessary.

Respondents identified a range of business opportunities that electrification enables. Where there is light, residents have been purchasing freezers in order to sell cold drinks and ice to the community members and the neighbouring communities. This was mostly perceived to be beneficial to women, since the majority of women are petty traders, although FGDs mentioned that both genders are equally participating in this newly found business opportunity. With regards to the effects that this project could have in terms of new businesses, all operators, the Ministry of Energy, and FGDs believe that the first electrified venture will be that of cold storage through cold drinks and storing ice 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 open new businesses. This has not yet been seen in the WP1 communities, but residents have been spoken about this as an option as long as they have enough capital. In relation to cattle rearing, respondents mentioned how having freezers would enable storage of vaccines for cattle and other animals to ensure that their livestock does not hold any diseases. Other FGDs respondents suggested that within the community, one person could invest in a refrigerator or freezer and that others would be able to rent fridge space. Lastly, according to respondents processing facilities could be set up, allowing the residents to mill their own rice, dry their products better, and potentially create new markets such as a juice facility.

### **7.1.3 Outcome Domain: Improved Health**

Key Informant Interviews (KIIs) with health staff in CHCs and FGDs shed light on the following topics:

- What do the CHOs perceive as indicators of good clinic quality,
- How CHOs perceived quality of their own facility,
- How CHOs believed their clinic would change after electrification,

- How well the staff is able to treat the most common health problems, and
- 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. As mentioned previously, most of these requirements were not met. Other problems are related to lack of mobility, availability of (working) equipment, cleanliness, lack of accommodation for staff, light for the staff quarters, lack of certified staff members and incentives for volunteer staff, and lack of financial capacity to buy drugs in times of shortages. Although the staff expressed many concerns and problems with the state of the facility, they mentioned they believe they are utilizing the most they can with what they have and are managing until more improvements come along.

The greatest impact that access to electricity can have in the CHCs is the the provision of light. Without electricity, staff need to use phone lights or torch lights that require constant batteries and are not ideal during evening emergencies. Light enables the conduct of routine treatments after dark and allows the CHC to stay open 24 hours a day. Electrification was found to be most impactful for treatment of patients coming in from road accidents or for child deliveries. Communities are quite far away so many residents when traveling a distance would come through late at night when they are more susceptible to get into accidents so the CHOs have to be prepared to have someone knock at their quarters in case an accident arises. 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 or attempt with a phone flashlight. 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:

“Electricity is necessary to have safe deliveries for babies. There was one time where we had no light, we were using a torch light, and when it came to snip the umbilical cord for the baby we cut too close and had to treat the baby to ensure they didn’t die. Thankfully the baby was okay, but if we had light, this would have never happened.”

– CHO in Bombali District

However, many of the CHOs and FGD participants mentioned that they more than often get referred to the district headquarter for many of their needs that cannot be met through the CHC. They say that with the free health care that was provided, many of the communities members do not realize this is only for under 5 children and for mothers, so they go to the clinic and cannot be seen by the staff, and then cannot pay to go to the main district hospital either due to transport.

Electrification provides incentives to staff to stay in the clinic and do well, since staff mentioned having light makes their quarters more comfortable, they feel more secure and protected from thieves. Their main complaint is that the light they are receiving is not constant so they are still prone to injuries late at night when patients come, and worry about their own security in the dark.

“There are only two of us who work here, and patients are coming 24/7 where they knock on our doors if they need to be seen. This would be fine if there was light all the time, but what happens is the light goes off the same time as it does in the community, and we cannot see unless we purchase torch lights. This means we can hurt ourselves on accident very easily. We

as staff should be taken care of first, that way we can properly take care of everyone else in the community.”

– CHO in Moyamba district

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. 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.

When asked about residents continuing seeking the help from traditional healers, the staff mentioned that they are working incredibly hard to sensitize the community on coming to the CHC first. They say that occasionally members will still go to a traditional healer, but then even the healer will tell them they need to go to the clinic for treatment. This is harder for the outreach communities and the members of the community that live very far from the clinic if their situation is severe. These are typically the reasons as to why the residents will still choose to seek a traditional healer rather than make the trek to the clinic.

#### **7.1.4 Outcome Domain: Education**

KIIs with School Principals, head teachers and FGDs addressed indicators of good quality schools, how the school staff perceived quality of their own school and how they believed it could change after electrification, as well as possible reasons for low student and teacher attendance rates. Some of the schools had been electrified when conducting the interviews, while others still had not yet been connected.

Important indicators of good quality schools as perceived by staff were qualified, certified and motivated teachers, availability of learning materials, good infrastructure, and water and sanitation. Other factors mentioned were accessibility of the school to disabled students, 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, the lack of water and sanitation, and the lack of trained and qualified teachers. This remains consistent with the previous Baseline report when speaking with the school staff.

The general responses to having access to electricity for the schools is that this should allow the teachers and students to progress even if their structure itself was not being maintained. The electricity seemed to be the key component for taking the first step into advancing since teachers and students can utilize the light to assist in grading papers and doing homework in the evening time if their days are too busy to accomplish this. 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. While all the operators believe that electrifying the schools is an important factor of the project, they did agree that this is only a step that will help primarily with students to go and study if their own home does not have light for them. A school principal commented on an instance where students were coming late at night:

“We have had electricity in a few areas of the school for some time now. What we are seeing is that students are coming from all over the community when it gets dark out, to use the light to do their homework and study for lessons. This is benefitting the community since some of them do not have the funds to pay for it themselves.”

– KII School Principal

Respondents mentioned they would like to learn how to work with computers and teach this to students as well so they can prepare them for more jobs later on. 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. Electrification was perceived to make the school environment more comfortable for students to attend and for teachers to stay in the schools, because of the availability of light and the potential benefit of growing capacity and infrastructure in their communities. FGD participants confirmed having light in the schools could encourage their children to study there at nighttime and would increase the security where the students feel safe, and lead to fewer break-ins.

When asked about student attendance rates, most respondents said student attendance was high. Reasons mentioned for not attending school were distance to school (particularly during the rainy season due to the distance some of the children walk to get to school), sickness, parents moving to another town, and the occurrence of traditional events in the community. Some respondents also said parents' attitudes were problematic because some of them do not believe in education and do not care to help the students do their homework. This is more common during the farming season when students parents would begin to have their children come help on the farm instead of going to school. Throughout the rest of the year students also work at home sometimes to carry water or food or take care of younger children. Many FGD respondents mentioned that the school fees that students still need to pay are the main deterrent for students staying in 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 large problem, especially to keep them in the rural areas. They reported that the distance to school and availability of accommodation and allowances for teachers were deterrents for them and they would miss school occasionally due to this.

### **7.1.5 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 workload, the FGDs showed an unequal division of work in the home. All FGDs mentioned that the women take the responsibility of caring for the children. The men are said to go to the farm, or work in their businesses during the day and that is all, whereas the women are to do the cooking, all the household chores, and take care of the children:

*"Women do much more than men do. The men in our village wake up in the morning, go to their farms and then come home. The women are the first in the household to wake up, they do all cleaning and cooking for every meal, take care of the children and most have to work as well because the men only give the women money for rice. All the other additions in the meals has to come from the women figuring it out."*

- 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 most 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 daily. 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'.

#### **7.1.6 Outcome Domain: CO2 reduction**

Information around energy consumption and cooking facilities were collected during the FGDs. The respondents mentioned that their primary source of light was through batteries for their torchlights and radios. Most of the respondents reported using firewood for cooking purposes, as charcoal was perceived as being only for rich people and as a time-consuming process to make the charcoal that many do not have the time to do. Charcoal requires the resident to keep maintain the creation process for up to a week, while collecting firewood is less time consuming and an immediate benefit. 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. When probed 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 although they did not see this being a realistic option since they had never seen it before. Most the respondents spoken to mentioned that they would only switch their methods of cooking if all items were available nearby in their communities and they were the same cost, or cheaper.

"If we were to get gas stoves but the refill station was a village over, I would continue to use wood as I would not go travel to refill the gas."

– Town Chief FGD participant

According to the operators, the main reduction in CO2 that will be seen will be when residents are transitioning from generators to the use of solar power. This initial transition they say will take the most time, and will be hard to see impacts, but once they begin to go to solar it will become cheaper and more sustainable. 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.

## **7.2 Recommendations**

Recommendations for RREP stakeholders were developed based on the findings of this report.

### 1. UNOPS:

- When visiting all the communities, have clear communication to neighbouring communities about what is occurring, how the RREP communities were selected, the purpose of the project, and how they are still able to benefit while visiting the communities nearby. the communication with communities with regards to what support they will receive from the project and the key actors so as to better manage expectations (e.g., the tariff may not be reduced).

### 2. Government/Ministry of Energy

- Emphasize the importance of sensitization for going to CHCs in the rural areas, especially during outbreaks such as the COVID-19 outbreak rather than seeking traditional healers.
- Be in communication with the staff at the CHCs and schools to create a cohesive relationship working towards infrastructure improvements.
- Mitigate the loss of qualified staff for CHCs and schools by providing incentives in the rural areas.
- Continue collaboration with the mini-grid operators to work towards renewable energy tax policies

### 3. Mini-grid operators

- Continue communication with the entire population of the community on the tariffs and service fees so the members feel seen and supported throughout the transition process.
- Develop a system for residents where they can ask questions and express concerns and know they are being considered

## 8. Conclusion and Recommendations

The RREP impact evaluation intends to provide an understanding of the effect of electrification on important dimensions of welfare through rigorous data collection and analysis, and recommend policies based on those insights. The combination of quantitative and qualitative findings presented throughout this report are meant to generate insight, necessary to understand how the programme is currently affecting beneficiaries in key areas of interest, as well as on how local stakeholders perceive mini-grid operations, both of which have consequences for programme sustainability.

In addition to the effects of the RREP mini-grids, the Midline survey captures the impacts of Covid-19 on the respondents. The difference-in-differences methodology we use allows us to identify which observed changes are from factors common across all communities, such as Covid-19 (i.e. changes over time), and which changes are related to the ongoing electrification efforts.

We conclude with five recommendations to UNOPS for continuation of work on the RREP and similar future projects. These recommendations are based on intermediary findings: less than two years have passed since the commissioning of the first RREP community mini-grids, and just 7 months ago the final RREP of WP1 community was connected. The Endline survey (planned for early 2022), will present a more holistic analysis of the effects of the RREP mini-grids, and final recommendations moving forward.

While the current report documents some important changes attributable to the electrification process, findings presented in this report also emphasize that a lot of the impact of mini-grid electrification is slow to come.

As a result, the current evaluation might fail to capture or under-report some of the effects of this programme as they will likely take place beyond the closing of the programme. This is something worth considering, in case the commissioner of this impact evaluation was interested in learning about the longer term impacts of electrification to inform similar investments in Sierra Leone or in other countries. The RREP provides a unique opportunity to do so with modest additional investments, allowing us to leverage the activities already implemented and the infrastructure put in place.

### **Recommendation 1: Longer-term impact evaluations**

While the first effect of the transition from more traditional sources of energy to the (cleaner) electricity produced by the mini-grids are already observed as seen in [Section 4.2](#) Tables 7, and 8, the benefits related to increased access to electricity seem to take a longer time to manifest. This is because beneficiaries not only would need to connect to the electric grid, but they would also need to invest in technologies that increase productivity. This could be labour-enhancing technologies, or agricultural technologies that increase farm productivity for instance.

These type of investments are the ones that would be responsible for changes to be observed in farming and business practices, with the potential of transforming a the local economy by e.g. allowing the development of value chains through the transformation or preservation of specific products on site (consider the case of the cold chain, drying or other type of processing of perishable products into less perishable goods with more added value captured by local entrepreneurs) However, households have limited savings to invest in the appliances needed to start these types of economic activities. In addition, limited access to credit markets, poor public infrastructure, and technological familiarity need to be addressed in order to capitalise on the improvements in the energy infrastructure made possible by RREP.

## **Recommendation 2: Increase access to productive electrified assets**

While we observe high rates of connection to mini-grids, self-employed individuals in RREP communities are not more likely to use electricity in their business relative to self-employed individuals in comparison communities. Therefore, it is worth understanding what are the barriers to the adoption of (productive) electrified assets, and design interventions that could help people in RREP communities overcome these barriers. Electricity is an "enabler", and therefore one should not be discouraged or skeptical about the importance of access to electricity for (economic) development. Rather, now that the investment in the infrastructure has been made, it is important to focus on how to best design programmes that help people residing in RREP communities take full advantage of electricity and fully leverage on the investment in the infrastructure. For the benefit of other electrification programmes in Sierra Leone and elsewhere, it is important to rigorously test and document the impact of these programmes.

Low technology adoption rates are a known problem in the literature [1, 2, 7]. The problems have been documented for a broad range of cost effective technologies, products and behaviours which, if adopted, would improve health, education, and welfare indicators [5, 6, 8, 10, 12, 9]. By better understanding which factors hamper the adoption of these technologies, policymakers can plan interventions to overcome these barriers. We recommend that interventions which increase the adoption of productive electrified assets in households and small businesses should be developed and rigorously tested.

## **Recommendation 3: Promote productive use of electricity at CHCs and schools**

Schools and Community Health Clinics have increased access to electricity. Therefore, they now are "enabled" to operate specific devices that might increase the quality of the infrastructure. For instance, CHCs can have fridges and allow the storage of vaccines, and computers can be operated in schools to allow e-learning.

In addition, both CHCs and schools could now operate longer hours. While this may improve the quality of the health and educational infrastructure, it is also important to think about how this can be complemented by other factors necessary for reaping the benefits of electrification. For instance, incentive schemes for workers at CHCs in rural Sierra Leone have shown promising results on utilization and health outcomes [3].

Alternatively, policymakers might consider instituting night shifts at CHCs, now that the electricity makes the lighting at night possible allowing CHCs to operate and serve patients after it gets dark. This would require coordination with relevant government counterpart to fully exploit the potential of electrification programmes. Similarly when it comes to schools, investing in complementary inputs like teaching aids dependent on electricity, improving teacher incentives etc. will be essential to see sustained effects on learning outcomes and attendance rates.

## **Recommendation 4: Provide clarity and education on the mini-grid tariff structure**

Based on focus group discussions, people find the tariff structure rather unclear, and the cost of the unit of electricity too expensive. The qualitative report, in Section 7, provides more detailed analysis of these concerns. It is recommended to engage in an information campaign clarifying the tariff structure. UNOPS and the mini-grid operators should take steps to re-iterate the tariff and service fees with community members and listen to their complaints to see if the tariff can be reduced. While UNOPS and other stakeholders may not be able to change the price per unit of electricity, it might be worthwhile to provide incentives for

the distribution and adoption of energy efficient devices, so that energy efficient devices can become more affordable to beneficiaries with the result of also making electricity units more affordable.

**Recommendation 5: Improve communication with stakeholders**

UNOPS should improve communication with local authorities and beneficiaries residing in communities where mini-grids have been installed. In particular, it could be useful to verify whether local authorities have properly understood relevant messages and pass them along correctly to the local population. As UNOPS hands over the RREP mini-grids to operator companies, we recommend to increase the quantity and detail of communication with key stakeholders in these communities. This will ensure there are no misconceptions regarding the scope and goals of the project.

Surrounding communities also expressed confusion and disappointment because their communities were not selected for the RREP. Communication will ease any potential future difficulties. Therefore, when visiting all the communities, UNOPS should clearly communicate to neighbouring communities how the RREP communities got selected, the purpose of the project, and the value of spillover effects from the nearby electrification projects.

## **9. List of Annexes**

- A) **Terms of Reference**
- B) **WP 1 Field Plan Locations**
- C) **WP 1 Midline Field Plan**
- D) **List of Key Stakeholders**
- E) **Key Personnel**
- F) **Midline Training Plan**
- G) **Enumerator Training Manual**
- H) **Household Questionnaire**
  - I) **CHC Questionnaires**
  - J) **WHO Covid-19 Material**
- K) **Knowledge Management Plan**
- L) **Staffing and Project Management**
- M) **Ethical Approvals**
- N) **Monetizing Outcomes**
- O) **Sampling Methodology**

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# 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.

<b>Primary sector of intervention</b>	Renewable energy, Economic growth, Health, Education, CO2 Reduction
<b>Project Locations</b>	<p><b>Total: 98 villages in Sierra Leone</b> (See Annex-3 for a detailed list of villages)</p> <p><b>WP-1/1+ Villages:</b> 54 Villages (6kW to 36kW) <b>Current status:</b></p> <ul style="list-style-type: none"> <li>- Solar power stations <b>installed</b> in all 54 villages<sup>1</sup>;</li> <li>- Electricity <b>provided</b> to 54 Community Health Centers (CHCs)</li> <li>- Mini-grids <b>installed</b> in communities surrounding CHCs</li> <li>- Electricity <b>not yet provided</b> to the communities<sup>2</sup></li> </ul> <p><b>List of villages:</b></p> <ul style="list-style-type: none"> <li>- <b>Type-0, 4 pilot villages</b> with Stand-alone systems (6kWp) only for the CHCs: Kukuna, Mambolo, Koinadugu 2 and Levuma.</li> <li>- <b>Type-1, 14 villages</b> (16kWp): Gbalamuya, Sendugu, Kathantha Yimboi, Batkanu, Kagbere, Kamaranka, Rokonta, Kaodu, Gbap, Mokelleh, Bomotoke, Mano Gbongeima, Futa Pejeh and Mabang.</li> <li>- <b>Type-2, 22 villages</b> (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</li> <li>- <b>Type-3, 14 villages</b> (36kWp): Kychom, Conakry Dee, Sinunia, Bajodia, Yifin, Kayima, Tombodu, Bumpeh, Sanduru, Gandorhun, Sembahun, Kangahun, Bradford, Gbangbatoke</li> </ul> <p><b>WP-2 Villages:</b> 44 villages (=&gt;36kWp to 50kWp) Hybrid systems: <b>Current status:</b></p> <ul style="list-style-type: none"> <li>- Solar power stations <b>not installed</b>;</li> <li>- Electricity <b>not yet provided to CHCs</b></li> <li>- Mini-grids <b>not yet installed</b> in communities surrounding CHCs</li> <li>- Electricity <b>not yet provided</b> to the communities<sup>3</sup></li> </ul> <p><b>List of villages:</b> 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>

<sup>1</sup> This includes 4 pilot villages with electricity only provided to the CHCs

<sup>2</sup> 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.

<sup>3</sup> 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)
<b>Impact</b>	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.
<b>Outcomes</b>	<b>People in Sierra Leone benefit from access to low carbon electricity.</b> <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.
<b>Outputs</b>	<ol style="list-style-type: none"> <li>1. Electrification of Community Health Centres and extension to mini-grids for the</li> <li>2. communities (WP-1/1+ and WP-2)</li> <li>3. Private sector invests, operates and maintains generation and distribution equipment</li> <li>4. Improved enabling environment to support private sector investment, and commercial sustainability of off-grid electricity provision</li> <li>5. Increased demand for electricity provided, through stimulating private sector development and brokering synergies with complementary projects in the targeted communities</li> </ol>

## 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 CO<sub>2</sub> 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+<sup>4</sup>:

A Mid-Term assessment will only be carried out with WP-1/1+ villages and it's 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

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<sup>4</sup> 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**

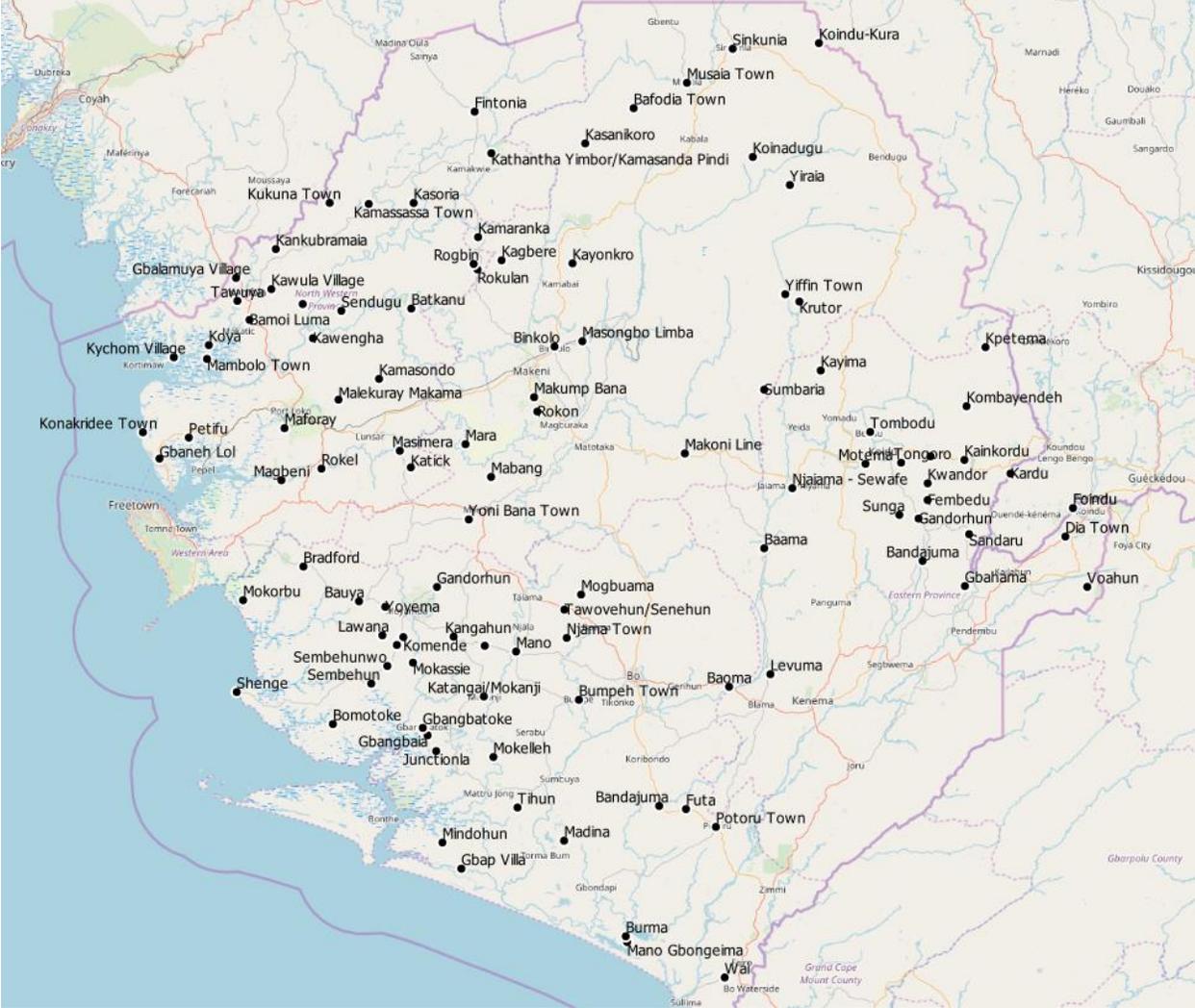
See attached

Annex 1 – Logical Framework

Annex 2 – RREP site Location Map

Annex 3 – List of Villages

# UNOPS WP1 Midline Field Plan



**UNOPS WP1 Midline Field Plan**

<b>Date</b>	<b>Community</b>	<b>Section</b>	<b>Chiefdom</b>	<b>Treat/Control</b>	<b>Team</b>	<b>Hub</b>
<b><i>Kailahun District – 6 Communities</i></b>						
Mar 22 – Mar 25	Bandajuma	Kuivawa	Yawei	Treatment	1	Kailahun
Mar 22 – Mar 25	Dia Town	Kama Toh	Kissi Kama	Treatment	2	Kailahun
Mar 22 – Mar 25	Foindu	Dakaleley	Kissi Kama	Control	3	Kailahun
Mar 22 – Mar 25	Gbahama	Seimaya	Kpeje Bongre	Control	4	Kailahun
Mar 22 – Mar 25	Sandaru	Nimima	Penguia	Treatment	5	Kailahun
Mar 22 – Mar 25	Voahun	Upper Tongi Tingi	Kissi Tongi	Control	6	Kailahun
<b><i>Kenema District – 2 Communities</i></b>						
Mar 22 – Mar 25	Levuma	Karga	Kandu Leppiama	Treatment	7	Kenema
Mar 22 – Mar 25	Baama	Kemoh	Wandor	Control	8	Kenema
<b><i>Bo District – 2 Communities</i></b>						
Mar 22 – Mar 25	Bumpeh Town	Bumpe	Bumpe Ngao	Treatment	9	Bo
Mar 22 – Mar 25	Baoma	Fallay	Boama	Control	10	Bo
<b><i>Pujehun District – 6 Communities</i></b>						
Mar 22 – Mar 25	Bandajuma	Sabba I	Sowa	Treatment	11	Pujehun
Mar 22 – Mar 25	Futa	Pejeh East	Pejeh (Futa Peje)	Treatment	12	Pujehun
Mar 22 – Mar 25	Mano Gbongeima	Kemoh	Mono Sakrim	Treatment	13	Pujehun

### UNOPS WP1 Midline Field Plan

Mar 22 – Mar 25	Burma	Kemo-Bo	Yakemu Kpukumu	Control	14	Pujehun
Mar 22 – Mar 25	Potoru Town	Fallay	Barri	Control	15	Pujehun
Mar 22 – Mar 25	Wai	Moiwebu	Soro Gbema	Control	16	Pujehun
<b><i>Moyamba District – 22 Communities</i></b>						
Mar 22 – Mar 25	Bauya	Gibina/Bauya	Kongbora	Treatment	17	Bo
Mar 26 – Mar 28	Bomotoke	Kambotoke	Timdale	Treatment	3	Bo
Mar 26 – Mar 28	Bradford	Motoni	Ribbi	Treatment	4	Bo
Mar 26 – Mar 28	Gbangbatoke	Gbangbatoke	Lower Banta	Treatment	6	Bo
Mar 26 – Mar 28	Kangahun	Waliwahun	Kaiyamba	Treatment	8	Bo
Mar 26 – Mar 28	Katangai/Mokanji	Mokotawa	Lower Banta	Control	1	Bo
Mar 26 – Mar 28	Komende	Kpange	Kaiyamba	Control	2	Bo
Mar 26 – Mar 28	Korgbortuma	Kpange	Kaiyamba	Control	5	Bo
Mar 26 – Mar 28	Lawana	Mosongla/Lawana	Kongbora	Control	7	Bo
Mar 26 – Mar 28	Mano	Mano Town	Dasse	Treatment	10	Bo
Mar 26 – Mar 28	Mogbassekeh I (Old)	Taninahun Gomoh	Dasse	Control	9	Bo
Mar 26 – Mar 28	Mogbuama	Mogbuama	Kamajei	Control	11	Bo
Mar 26 – Mar 28	Mokassie	Mokassi	Bagruwa	Control	12	Bo

### UNOPS WP1 Midline Field Plan

Mar 26 – Mar 28	Mokelleh	Bei-Kelleh	Upper Banta	Treatment	14	Bo
Mar 26 – Mar 28	Mokorbu	Lower Ribbi	Ribbi	Control	13	Bo
Mar 26 – Mar 28	Njama Town	Njama	Kowa	Treatment	15	Bo
Mar 26 – Mar 28	Sembehun	Sembehun	Bagruwa	Treatment	16	Bo
Mar 26 – Mar 28	Sembehunwo	Sembehun	Bagruwa	Control	17	Bo
Mar 29 – Mar 31	Shenge	Tassor	Kagboro	Treatment	1	Bo
Mar 29 – Mar 31	Tawovehun/Senehun	Tawovehun	Kamajei	Treatment	2	Bo
Mar 29 – Mar 31	Yoyema	Mendegelema	Kaiyamba	Control	3	Bo
Mar 29 – Mar 31	Gandorhun	Gandorhun Central	Fakunya	Control	4	Bo
<b><i>Bonthe District – 6 Communities</i></b>						
Mar 29 – Mar 31	Gbap Villa	Gbap	Nongoba Bullom	Treatment	5	Bonthe
Mar 29 – Mar 31	Madina	Gbondubum	Bum	Treatment	6	Bonthe
Mar 29 – Mar 31	Tihun	Pengor	Sogbeni	Treatment	7	Bonthe
Mar 29 – Mar 31	Gbangbaia	Babum	Imperri	Control	8	Bonthe
Mar 29 – Mar 31	Juntionla	Kahekay	Imperri	Control	9	Bonthe
Mar 29 – Mar 31	Mindohun	Yallan-gbokie	Bendu-Cha	Control	10	Bonthe
<b><i>Port Loko District – 12 Communities</i></b>						

**UNOPS WP1 Midline Field Plan**

Mar 29 – Mar 31	Kamasondo	Kamasundu	Buya Romende	Treatment	15	Port Loko
Mar 29 – Mar 31	Konakridee Town	Mayaya	Kaffu Bullom	Treatment	16	Port Loko
Mar 29 – Mar 31	Malekuray Makama	Malakuray	TMS	Treatment	17	Port Loko
Mar 29 – Mar 31	Masimera	Masimera	Masimera	Treatment	11	Port Loko
Mar 29 – Mar 31	Petifu	Petifu	Lokomasama	Treatment	12	Port Loko
Mar 29 – Mar 31	Sendugu	Sendugu	Sanda Magbolont	Treatment	13	Port Loko
Mar 29 – Mar 31	Gbaneh Lol	Foronkoya	Kaffu Bullom	Control	11	Port Loko
Apr 1 – Apr 3	Katick	Katick	Masimera	Control	12	Port Loko
Apr 1 – Apr 3	Kawengha	Marenka	Bureh Kasseh Makonteh	Control	13	Port Loko
Apr 1 – Apr 3	Maforay	Maforay	Maforki	Control	14	Port Loko
Apr 1 – Apr 3	Magbeni	Magbeni	Koya	Control	15	Port Loko
Apr 1 – Apr 3	Rokel	Rokel	Masimera	Control	16	Port Loko
<b><i>Kambia District – 12 Communities</i></b>						
Apr 1 – Apr 3	Bamoi Bana Village	Barmoi	Masungbala	Treatment	14	Kambia
Apr 1 – Apr 3	Gbalamuya Village	Rogberay	Gbinle Dixing	Treatment	3	Kambia
Apr 1 – Apr 3	Kamassassa Town	Kamassassa	Tonko Limba	Treatment	4	Kambia
Apr 1 – Apr 3	Kukuna Town	Kukuna	Bramaia	Treatment	8	Kambia

### UNOPS WP1 Midline Field Plan

Apr 1 – Apr 3	Kychom Village	Kychom	Samu	Treatment	9	Kambia
Apr 1 – Apr 3	Mambolo Town	Mambolo	Mambolo	Treatment	10	Kambia
Apr 1 – Apr 3	Bamoi Luma	Robat	Magbema	Control	1	Kambia
Apr 1 – Apr 3	Kankubramaia	Kanku-Bramaia	Bramaia	Control	2	Kambia
Apr 1 – Apr 3	Kasoria	Kamassassa	Tonko Limba	Control	5	Kambia
Apr 1 – Apr 3	Kawula Village	Kawula	Masungbala	Control	6	Kambia
Apr 1 – Apr 3	Koya	Koya	Samu	Control	7	Kambia
Apr 1 – Apr 3	Tawuya	Tawuya	Gbinle Dixing	Control	17	Kambia
<b><i>Bombali – 12 Communities</i></b>						
Apr 4 – Apr 8	Batkanu	Batkanu	Libeisaygahun	Treatment	1	Bombali
Apr 4 – Apr 8	Fintonia	Paramount Chief	Tambakha	Treatment	2	Bombali
Apr 4 – Apr 8	Kagbere	Kagberay	Magbaimba Ndorwahun	Treatment	3	Bombali
Apr 4 – Apr 8	Kamaranka	Kamaranka	Gbanti Kamaranka	Treatment	4	Bombali
Apr 4 – Apr 8	Kathantha Yimbor/ Kamasanda Pindi	Kayimbor	Sella Limba	Treatment	5	Bombali
Apr 4 – Apr 8	Rokon	Konta	Bombali Sebora	Treatment	6	Bombali
Apr 4 – Apr 8	Binkolo	Binkolo	Safroko Limba	Control	7	Bombali
Apr 4 – Apr 8	Kayonkro	Kayonkro	Biriwa	Control	8	Bombali
Apr 4 – Apr 8	Makump Bana	Kafala	Bombali Sebora	Control	9	Bombali

### UNOPS WP1 Midline Field Plan

Apr 4 – Apr 8	Masongbo Limba	Mabamba	Safroko Limba	Control	10	Bombali
Apr 4 – Apr 8	Rogbin	Rogbin	Sanda Tendaran	Control	11	Bombali
Apr 4 – Apr 8	Rokulan	Rogbin	Sanda Tendaran	Control	12	Bombali
<b><i>Tonkolili – 4 Communities</i></b>						
Apr 4 – Apr 8	Mabang	Mabang	Kholifa Mabang	Treatment	13	Tonkolili
Apr 4 – Apr 8	Mara	Mara	Malal Mara	Treatment	14	Tonkolili
Apr 4 – Apr 8	Makoni Line	Mathonkara	Kunike Barina	Control	15	Tonkolili
Apr 4 – Apr 8	Yoni Bana Town	Yoni	Yoni	Control	16	Tonkolili
<b><i>Kono – 14 Communities</i></b>						
Apr 4 – Apr 8	Fembedu	Mongo	Gbane	Control	17	Kono
Apr 9 – Apr 11	Gandorhun	Mongo	Gbane	Treatment	7	Kono
Apr 9 – Apr 11	Jagbwema	Fiama	Fiama	Treatment	8	Kono
Apr 9 – Apr 11	Kainkordu	Kokongokuma	Soa	Treatment	9	Kono
Apr 9 – Apr 11	Kardu	Gbane Kour	Gbane Kandor	Treatment	10	Kono
Apr 9 – Apr 11	Kayima	Yawatanda	Sandor	Treatment	11	Kono
Apr 9 – Apr 11	Kombayendeh	Lei	Lei	Treatment	12	Kono
Apr 9 – Apr 11	Kpetema	Komadu	Toli	Control	1	Kono
Apr 9 – Apr 11	Kwandor	Maikandor	Gbane	Control	2	Kono

### UNOPS WP1 Midline Field Plan

Apr 9 – Apr 11	Motema	Bandafafeh	Nimikoro	Control	3	Kono
Apr 9 – Apr 11	Njaiama - Sewafe	Njaifeh	Nimiyama	Control	4	Kono
Apr 9 – Apr 11	Sunga	Kamara	Gbane	Control	5	Kono
Apr 9 – Apr 11	Tombodu	Kongofinja	Kamara	Treatment	17	Kono
Apr 9 – Apr 11	Tongoro	Tankoro	Tankoro	Control	6	Kono
<b><i>Koinadugu District – 10 Communities</i></b>						
Apr 9 – Apr 11	Bafodia Town	Bafodia	Wara Wara Bafodia	Treatment	15	Kabala
Apr 9 – Apr 11	Kasanikoro	Tamiso II	Kasunko	Control	13	Kabala
Apr 9 – Apr 11	Koinadugu	Koinadugu	Sengbe	Treatment	16	Kabala
Apr 9 – Apr 11	Koindu-Kura	Koindu-Kura	Sulima	Control	14	Kabala
Apr 12 – Apr 14	Krutor	Nieni	Nieni	Control	13	Kabala
Apr 12 – Apr 14	Musaia Town	Musaia	Folosaba Dembelia	Treatment	14	Kabala
Apr 12 – Apr 14	Sinkunia	Sinkunia II	Dembelia-Sinkunia	Treatment	15	Kabala
Apr 12 – Apr 14	Sumbaria	Seradu	Nieni	Control	16	Kabala
Apr 12 – Apr 14	Yiffin Town	Nieni	Nieni	Treatment	1	Kabala
Apr 12 – Apr 14	Yiraia	Yiraia	Sengbe	Control	2	Kabala

## **UNOPS WP1 Midline Field Plan**

\*Data collection begins on March 22, 2021 (day 1 is travel day) and is projected to last for 24 days covering 108 RREP communities. All teams will be back in Freetown by April 14<sup>th</sup>. Some will finish early and head back to Freetown by April 11<sup>th</sup>. This is contingent on spending 2 days in each community. If teams have to stay longer, then the timeline may vary by a few days.

\*\*There are 2 Field Coordinators, 5 Field Supervisors, and 68 Enumerators

\*\*\*There are 4 Enumerators in each team

## List of Key Stakeholders

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

## Form E: Format for Resume of Proposed Key Personnel

**RFP reference no:** RFP/2018/5478

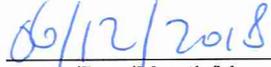
**Name of Offeror:** Wageningen University

<b>Position</b>	Research Coordinator
<b>Name of Personnel</b>	Maarten Jan Voors
<b>Title</b>	Assistant Professor of Development Economics
<b>Years with Firm</b>	At Wageningen University: 9 years
<b>Nationality</b>	Netherlands
<b>Language proficiency</b>	Dutch (native), English (fluent)
<b>Education/Qualifications</b>	PhD: Wageningen University, Development Economics (2011) <i>cum laude</i> MSc: Wageningen University, Development Economics (2006) <i>cum laude</i>
<b>Professional certifications</b>	N/A
<b>Employment Record/ Experience</b>	<p>The Research Coordinator, Maarten Voors has extensive experience conducting impact evaluations. Since 2009 he has successfully completed a set of large scale impact evaluations in Sierra Leone, on land use, forestry, technology adoption and governance. More recently he has initiated impact evaluations in the domains of health and energy. Maarten holds active positions as technical advisor to NGOs to enhance impact evaluation rigour and is the EGAP Trainings Director organizing Master Classes for developing country PIs on causal inference and impact evaluation.</p> <p><b>Professional Position</b></p> <ul style="list-style-type: none"> <li>• 1.0 fte Assistant Professor Development Economics (with tenure), Wageningen University, September 2013 – present <ul style="list-style-type: none"> <li>○ Design, implementation, analysis and write up of multiple impact evaluations in Sierra Leone, Ghana, DRC and China on resource use, access to energy, deforestation, governance, and health</li> <li>○ Supervision of five PhD students</li> <li>○ Teaching Impact Evaluation Methods and Behavioural Economics</li> </ul> </li> <li>• Trainings Director EGAP, August 2016 – present <ul style="list-style-type: none"> <li>○ Masterclass, twice a year, for developing country PIs in Africa and Latin America on Impact Evaluation Methods</li> </ul> </li> </ul> <p><b>Prior Positions</b></p> <ul style="list-style-type: none"> <li>• Visiting Researcher Department of Economics, University of California Berkeley, U.S.A., Jan-June 2016 <ul style="list-style-type: none"> <li>○ Design, implementation, analysis and write up of multiple impact evaluations in Sierra Leone on governance</li> </ul> </li> <li>• 1.0 fte Isaac Newton Trust Post-Doctoral Fellow, Department of Land Economy, University of Cambridge, U.K., November 2011 – September 2013</li> </ul>

	<ul style="list-style-type: none"> <li>○ Design, implementation, analysis and write up of impact evaluations on deforestation</li> <li>○ Teaching Impact Evaluation Methods and Behavioural Economics</li> <li>● fte PhD student Development Economics, Wageningen University, Netherlands, September 2011- August 2016 <ul style="list-style-type: none"> <li>○ Design, implementation, analysis and write up of studies related to conflict, resources and research methods</li> </ul> </li> </ul> <p><b>Selected Publications</b></p> <ul style="list-style-type: none"> <li>● Wilebore, B, M. Voors, E. Bulte, D. Coomes and A. Kontoleon (2018). "Unconditional Transfers and Tropical Forest Conservation. Evidence from a Randomized Control Trial in Sierra Leone," American Journal of Agricultural Economics, forthcoming</li> <li>● Bulte, E. P. Richards and M. Voors (2018) "Institutions and Agrarian Development: A New Approach to West Africa," Palgrave Macmillan Publishers</li> <li>● Voors, M (2018) "Diagnostics and Field Experiments, Wageningen Journal of Life Sciences," 84: 80-84</li> <li>● Voors, M., E. Bulte, A. Kontoleon, J. List and T. Turley. (2017) "Chief for a Day! Participatory Development and Elite Capture in Sierra Leone," Management Science, <a href="https://doi.org/10.1287/mnsc.2017.2866">https://doi.org/10.1287/mnsc.2017.2866</a></li> <li>● Voors, M., P. van der Windt, K. Papaioannou and E. Bulte (2017) "Resources and Governance in Sierra Leone's Civil War, Journal of Development Studies," 53: 278-294</li> <li>● Voors, M.J., E.E.M. Nillesen, P. Verwimp, E.H. Bulte, B.W. Lensink and D.P. van Soest (2012). "Violent Conflict and Behavior: a Field Experiment in Burundi," American Economic Review 102(2): 941-64</li> </ul>
<p><b>References</b></p>	<p>Reference 1: Professor Erwin Bulte, Professor Development Economics. Development Economics Group, Wageningen University, Hollandseweg 1, 6706 KN, Wageningen, the Netherlands, Email: <a href="mailto:erwin.bulte@wur.nl">erwin.bulte@wur.nl</a>, Office Phone: +31 317484879,</p> <p>Reference 2: Professor Andreas Kontoleon, Professor of Environmental Economics and Public Policy, Director of Cambridge Centre for Environment, Energy and Natural Resource Governance, Department of Land Economics, University of Cambridge, Silverstreet, Cambridge, United Kingdom, Email: <a href="mailto:ak219@cam.ac.uk">ak219@cam.ac.uk</a> Office Phone: (01223) 339773</p>

I, the undersigned, certify to the best of my knowledge and belief, this bio-date is accurate.

  
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 Signature of Personnel (individual) or firm representative

  
 \_\_\_\_\_  
 Date (Day/Month/Year)

**Form E: Format for Resume of Proposed Key Personnel**

RFP reference no: RFP/2018/5478

Name of Offeror: Wageningen University

<b>Position</b>	Team Leader
<b>Name of Personnel</b>	Ahmed Mushfiq Mobarak
<b>Title</b>	Professor of Economics
<b>Years with Firm</b>	Collaboration with Wageningen University: 3 years Relevant Professional Experience: 16 years
<b>Nationality</b>	Bangladesh and USA
<b>Language proficiency</b>	Bengali and English (Native), French (basic)
<b>Education/Qualifications</b>	1997 – 2002 Ph.D. Economics, University of Maryland at College Park 1997 – 1999 M.A. Economics, University of Maryland at College Park 1994 – 1997 B.A. Mathematics and Economics, Macalester College, (magna cum laude, with thesis)
<b>Professional certifications</b>	N/A
<b>Employment Record/ Experience</b>	<p>The Team Leader, Ahmed Mushfiq Mobarak, has extensive expertise managing large and complex randomized-controlled-trial (RCT) based program evaluations. He has successfully completed two different field experiments in collaboration with the Malawi Ministry of Agriculture covering 200 villages across 8 districts of Malawi, which led to publications in top-class peer-reviewed economics journals. He has completed several field projects at even more ambitious scales in Asia. In a project funded by the Bill and Melinda Gates Foundation, he investigated the relative effectiveness of various latrine marketing strategies in an RCT that covered 76,000 people, which was published in the journal <i>Science</i>. Beyond academic contributions, Mobarak is committed to leveraging his expertise for policy impact. Mobarak has formed a long-term collaboration with the NGOs Evidence Action and RDRS to help translate the results of his research on seasonal migration into practice. That program has now been scaled up to reach 150,000 households in Bangladesh per year, and Mobarak's research team is replicating and testing the program in Nepal, Indonesia and elsewhere. Mobarak also holds active roles in many policy organizations. He is the lead academic for the International Growth Centre Bangladesh Research Program, a consultant for the World Bank, and an advisor to Evidence Action, the UN High Commissioner for Refugees, WASH for India, and the Overseas Development Institute.</p> <p><b>Professional Position</b>          Professor of Economics, Yale University, New Haven CT, U.S.A, 2015 –          Tenured: School of Management (2015), Dept of Economics, FAS (2017)          Faculty Director and Founder, Yale Research Initiative on Innovation and Scale (YRISE), New Haven, CT, U.S.A., 2018 –</p> <p><b>Prior Positions</b>          Assistant/Associate Professor, School of Management, Yale University, New Haven, CT, U.S.A., 2007-2012/2012–2015          Visiting Assistant Professor, Department of Economics, Yale University, 2006          Assistant Professor of Economics, University of Colorado, Boulder, U.S.A, 2002 – 2007          Consultant, World Bank, Washington D.C., U.S.A., 1998 – 2001</p> <p><b>Selected Publications</b>          A. BenYishay and A. M. Mobarak, "Social Learning and Incentives for Experimentation and Communication," <i>Review of Economic Studies</i> (forthcoming)</p>

	<p>G. Miller and A. M. Mobarak, "Learning about New Technologies through Social Networks: Experimental Evidence on Non-Traditional Stoves in Rural Bangladesh," <i>Marketing Science</i>, 34 (4): 480-499, July-August 2015 (Lead Article).</p> <p>R. Guiteras, J. Levinsohn and A. M. Mobarak, "Encouraging Sanitation Investment in the Developing World: A Cluster-Randomized Controlled Trial," <i>Science</i> 348 (6237): 903-906, May 22, 2015</p> <p>G. Bryan, S. Chowdhury and A. M. Mobarak, "Under-investment in a Profitable Technology: The Case of Seasonal Migration in Bangladesh," <i>Econometrica</i>, 82(5): 1671-1748. September 2014.</p> <p>M. Lipscomb, A. M. Mobarak and T. Barham. "Development Effects of Electrification: Evidence from the Geologic Placement of Hydropower Plants in Brazil," <i>American Economic Journal: Applied Economics</i> 5(2): 200-231, April 2013.</p> <p><b>Selected Research Grants</b></p> <p>International Growth Centre for "Electrifying growth: Electricity access for productive use in Sierra Leone" 2018-2020 (\$115,000)</p> <p>DFID Energy and Economic Growth - Applied Research Programme, 2018-2021 (\$510,000)</p> <p>Bill and Melinda Gates Foundation, Global Development Section: Water, Sanitation and Hygiene Program 2013-2015 (\$414,000) &amp; 2011-2014 (\$4,970,636)</p> <p>World Bank, Gender and Agriculture Program Grant 2009-2010 (\$90,000)</p> <p>National Science Foundation, Human and Social Dynamics Grant SES-0527751, 2005-08 (\$449,000)</p> <p><b>Selected Non-Academic Experience</b></p> <p>Technical Advisory Group, 'Voices of the Poor', Overseas Development Institute, London 2017-</p> <p>Scientific Advisor, Innovations for Poverty Action – Bangladesh Office, New Haven 2015 – Advisory Board for Safe Access to Fuel and Energy (SAFE), UN High Commissioner for Refugees, 2015 –</p> <p>Board of Advisors, Evidence Action 2014 –</p> <p>World Bank, World Development Report 2014, Consultant 2013</p> <p>The Bill and Melinda Gates Foundation, Consultant for Impact Evaluation Training 2011</p> <p>Innovations for Poverty Action, Consultant 2011-</p> <p>Lead, Bangladesh Research Program, International Growth Centre (IGC) at LSE and Oxford 2009 –</p> <p>Consultant, World Bank and IFC 2009 –</p> <p>The World Bank, Africa Impact Evaluation Initiative, Consultant 2009</p> <p>United Nations Development Programme, Human Development Report Team, Consultant 2008-2009</p> <p>United Nations Development Programme (UNDP) – Asia/Pacific, Colombo, Consultant, 2007</p>
<b>References</b>	<p>Reference 1: Adnan Khan, Research and Policy Director, International Growth Centre, London School of Economic and Political Science, 32 Lincoln's Inn Fields, Houghton Street, London, WC2A 2AE, United Kingdom Email: a.q.khan@lse.ac.uk, Office Phone: +44 20 7955 6692</p> <p>Reference 2: Sudipto Mukerjee, Country Director for Bangladesh, UNDP, IDB Bhaban, Shar-E-Bangla Nagar, Agargaon, Dhaka, Bangladesh Email: sudipto.mukerjee@undp.org, Cell: +88 17 3005 6188</p>

I, the undersigned, certify to the best of my knowledge and belief, this bio-data is accurate.

  
 \_\_\_\_\_  
 Signature of Personnel (individual) or firm representative

04/12/2018  
 \_\_\_\_\_  
 Date (Day/Month/Year)

**UNOPS RREP**  
**Work Package – 1**  
**Phase: Midline**  
**Enumerator and Supervisor Training**

<b>Days</b>	<b>Activities</b>	<b>Facilitators</b>
8 March	Check in Introductions and Icebreakers Introduction to the Research team Objectives and details about the project COVID safety measures and precautions Number of surveys in each community Definitions -----Lunch break----- Definitions A test on Definitions Talk about surveys Start with Household survey if time	Madison and Joseph
9 March	HH survey <ul style="list-style-type: none"> <li>• Respondent info</li> <li>• Go over definitions again</li> <li>• Income and Wealth- agricultural sections</li> <li>• Income and wealth- Non-ag sections</li> </ul>	Madison
10 March	HH Survey <ul style="list-style-type: none"> <li>• Ag sections</li> <li>• Non- Ag sections</li> </ul> -----Quiz----- <ul style="list-style-type: none"> <li>• Energy usage</li> </ul>	Madison
11 March	HH Survey <ul style="list-style-type: none"> <li>• Health</li> <li>• Education</li> </ul> Social and Political Attitudes	Madison
12 March	HH Survey <ul style="list-style-type: none"> <li>• Full survey, practice in pairs and groups</li> </ul> Full survey Quiz	Madison and Joseph
13 March	School survey- <ul style="list-style-type: none"> <li>• Translate into Krio and explain</li> <li>• Practice in pairs</li> </ul> -----Test----- Practice in front of class and in pairs	Joseph
14 March	<b>DAY OFF</b>	
11 March	Town Chief and CHC Survey <ul style="list-style-type: none"> <li>• HH Survey practice- Rest of the Group</li> <li>• Introduction to Tablets</li> <li>• SurveyCTO Briefing and Practice</li> </ul>	Joseph
12 March	All surveys practice <ul style="list-style-type: none"> <li>• Field Logistics</li> <li>• Problems and Solutions</li> <li>• Conflict Resolution</li> <li>• Cumulative Tests for all surveys</li> </ul>	Sellu and Sawaneh  Madison and Joseph

**UNOPS RREP**  
**Work Package – 1**  
**Phase: Midline**  
**Enumerator and Supervisor Training**

17 March	PILOT- Songo	
18 March	Problem Solving from Field <ul style="list-style-type: none"><li>• Survey issues</li><li>• Questions</li><li>• Final debriefing</li><li>• Field logistics and team assignments</li><li>• Last minute checks</li></ul>	Madison and Joseph



# TRAINING MANUAL

## MIDLINE EVALUATION RURAL RENEWABLE ENERGY PROJECT

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

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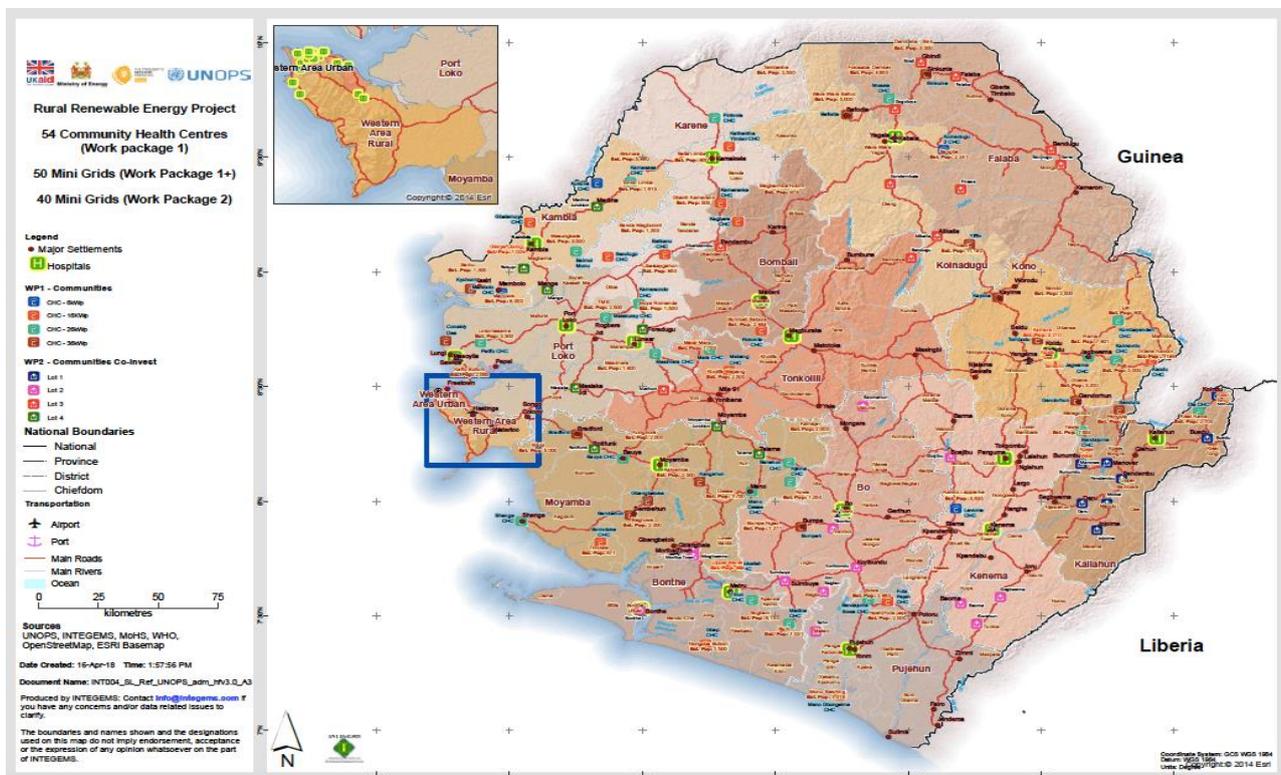
## 1.1 Background

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 6% of the population in rural areas have access to electricity<sup>1</sup>. 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 have been provided with off grid electricity. In the second phase (Work Package 2), 40 mini-grids 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. CO<sub>2</sub>(e) Reductions

The Impact Evaluation began in March 2019 and lasts for two years, subject to extend due to the COVID-19 pandemic. 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 CO<sub>2</sub>e 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**  
Has been completed.
- **Midline**  
This training is geared to prepare enumerators to carry out midline data collection activities. The communities have already been surveyed once before, as well as through a side project, so they understand why we are coming to their community for the 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 midline activities are set to take place from end of March 2021 to middle to end of April 2021.

*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.

- **Endline**  
To take place a year after the midline.

### **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 March 8 and completed by March 18, for a total of 10 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 one training day (March 17<sup>th</sup>), a field visit shall be organized for all the trainees. The whole team, including Research Associates and Field Coordinators, will head to a pilot community to conduct surveys and simulate the entire data collection procedure in a real-life setting.

There will be 78 enumerators in total during the training, of which will be selected (68 enumerators plus 6 supervisors) for the duration of the baseline fieldwork (*subjective to good performance*). The entire training will take place in Freetown at a venue in Aberdeen, 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 29 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 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 SurveyCTO (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) CO<sup>2</sup> 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 SurveyCTO and Tablets**

SurveyCTO is an 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.

SurveyCTO 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. SurveyCTO 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 SurveyCTO app and using these to record the GPS locations. The SurveyCTO 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 SurveyCTO will be pre-loaded. This is what the enumerators will be using.

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

Step 1: Open the SurveyCTO 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 SurveyCTO 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 My first form 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.



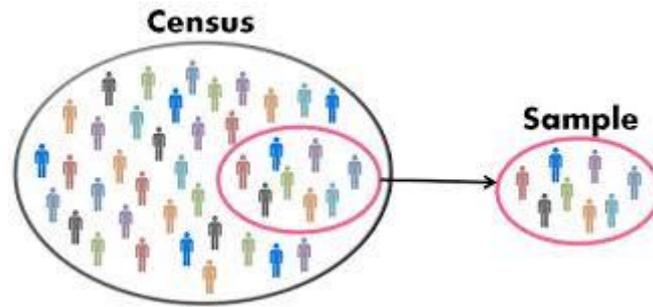
Step 6: Once “Save Form and Exit” is selected, the enumerator is brought back to the main menu. The saved survey will now appear under “Edit Saved Form” and “Send Finalized Form” options in parenthesis (). For example, “Edit Saved Form (3)” means that 3 surveys have been completed and saved in the tablet, 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 and have already conducted a baseline survey so the sample is already selected. These households that have been selected, need to be who we survey once again.

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, or team lead of enumerators, 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 baseline that was previously conducted in 2019. 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 and if there are any concerns, they should be communicated to the research team right away.

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.

# 3 FACTORS TO HELP YOU MAKE SAFER CHOICES

WHEN YOU'RE IN AN AREA OF WIDESPREAD COVID-19 TRANSMISSION

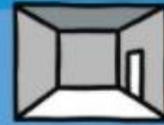
## LOCATION



SAFER

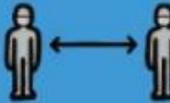


LESS SAFE



Open air spaces safer than enclosed spaces

## PROXIMITY



SAFER



LESS SAFE



Farther away from others safer than close together

## TIME



SAFER



LESS SAFE



Shorter time periods with others are safer

REMEMBER, IT'S ALWAYS SAFER TO:



KNOW YOUR RISK.  
LOWER YOUR RISK.



World Health Organization

# HOW TO WEAR A NON-MEDICAL FABRIC MASK SAFELY

[who.int/epi-win](https://www.who.int/epi-win)

## Do's →



Clean your hands before touching the mask



Inspect the mask for damage or if dirty



Adjust the mask to your face without leaving gaps on the sides



Cover your mouth, nose, and chin



Avoid touching the mask



Clean your hands before removing the mask



Remove the mask by the straps behind the ears or head



Pull the mask away from your face



Store the mask in a clean plastic, resealable bag if it is not dirty or wet and you plan to re-use it



Remove the mask by the straps when taking it out of the bag



Wash the mask in soap or detergent, preferably with hot water, at least once a day



Clean your hands after removing the mask

## Don'ts →



Do not use a mask that looks damaged



Do not wear a loose mask



Do not wear the mask under the nose



Do not remove the mask where there are people within 1 metre



Do not use a mask that is difficult to breathe through



Do not wear a dirty or wet mask



Do not share your mask with others

A fabric mask can protect others around you. To protect yourself and prevent the spread of COVID-19, remember to keep at least 1 metre distance from others, clean your hands frequently and thoroughly, and avoid touching your face and mask.



World Health Organization

## **Information Sheet on COVID-19 (Source: WHO)**

### **Wash your hands frequently**

Regularly and thoroughly clean your hands with an alcohol-based hand rub or wash them with soap and water.

**Why?** Washing your hands with soap and water or using alcohol-based hand rub kills viruses that may be on your hands.

### **Maintain social distancing**

Maintain at least 1 metre (3 feet) distance between yourself and anyone who is coughing or sneezing.

**Why?** When someone coughs or sneezes, they spray small liquid droplets from their nose or mouth which may contain virus. If you are too close, you can breathe in the droplets, including the COVID-19 virus if the person coughing has the disease.

### **Avoid touching eyes, nose and mouth**

**Why?** Hands touch many surfaces and can pick up viruses. Once contaminated, hands can transfer the virus to your eyes, nose or mouth. From there, the virus can enter your body and can make you sick.

### **Practice respiratory hygiene**

Make sure you, and the people around you, follow good respiratory hygiene. This means covering your mouth and nose with your bent elbow or tissue when you cough or sneeze. Then dispose of the used tissue immediately.

**Why?** Droplets spread virus. By following good respiratory hygiene, you protect the people around you from viruses such as cold, flu and COVID-19.

### **If you have fever, cough and difficulty breathing, seek medical care early**

Stay home if you feel unwell. If you have a fever, cough and difficulty breathing, seek medical attention and call in advance. Follow the directions of your local health authority.

**Why?** National and local authorities will have the most up to date information on the situation in your area. Calling in advance will allow your health care provider to quickly direct you to the right health facility. This will also protect you and help prevent spread of viruses and other infections.

### **Stay informed and follow advice given by your healthcare provider**

Stay informed on the latest developments about COVID-19. Follow advice given by your healthcare provider, your national and local public health authority or your employer on how to protect yourself and others from COVID-19.

**Why?** National and local authorities will have the most up to date information on whether COVID-19 is spreading in your area. They are best placed to advise on what people in your area should be doing to protect themselves.

# RREP

## 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.

Note: for some sections you need to speak to the spouse. For households with multiple wives, ask to speak to the head wife / first wife

## 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
	Enumerator Name		
	District		
	Select the chiefdom you are in		
	Select the community you are in		
	Select the household being surveyed		<i>The list will be provided to you. Confirm the name of the head of household and their phone number to check if it's the right household.</i>
	Is the household available for an interview?	Yes No	
	If no, has the household migrated?	Yes No	
	If yes, to which district did they move?	Kailahun Kenema Bo Pujehun Bonthe Moyamba Port Loko Kambia Bombali Tonkolili Koinadugu Karene Falaba Freetown	
	If yes, to which community did they move?	Text	
	When did they move?	Date	
	Is the head of household, or an in-charge, present in the household?	Yes No	
	You previously told us that the head of household was \${hh_name}. Is that correct?	Yes No	
	Has the head of household changed inside this household since we surveyed you for the baseline in 2019?	Yes No	
	You said the head of household has changed, why has the head of this household changed?	The head of household divorced and they left	

		The head of household passed away The head of household migrated The head of household is not working any longer and is not taking any financial responsibility of the household anymore The head of household married; their new spouse is now the head of household	
	If other, specify	Text	
	ENUMERATOR: What is the new head of household's gender?	Female Male	
	What is the new head of households first name?	Text	
	What is the new head of households middle name?	Text	
	What is the new head of households last name?	Text	
	What is the new head of households nickname?	Text	
	<b>INFORMED CONSENT</b>		
<b>II</b>	<b>Respondent Information</b>	<b>Choices</b>	<b>Notes and Comments</b>
	You had told us previously in 2019 that the head of household's main occupation is \${farm_ent}. Is that correct?	Yes No	
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.  In 2019, we asked you for a list of everyone in your household. We will now go through that list.	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>
<b>Head of the Household details</b>			
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  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, <b>EXCLUDING</b> the head of the household.	Note	
	<b>Household Roster Adults</b>		<b>WILL REPEAT FOR NUMBER OF ADULT PEOPLE IN THE HOUSEHOLD</b>
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/daught er 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 <b>boys</b> under-five live in the household?	Integer	
	Household Roster Boys 0-5 y/o	begin_repeat	<i>REPEATS FOR NUMBER OF BOYS IN HOUSEHOLD WHO ARE 0-5 YRS</i>
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 <b>girls</b> 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 <b>boys</b> 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</i>

			<i>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 er 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 <b>girls</b> 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 er	

		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	
<b>III</b>	<b>Health Problems</b>	<b>Choices</b>	<b>Notes and Comments</b>
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 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
		end_group	
<b>Health Problems - Boy 6-18 2</b>			
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 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
16	Does \${name_boy_618_2} 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	
17	Does \${name_boy_618_2} 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	
18	Does \${name_boy_618_2} 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	
19	Does \${name_boy_618_2} 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	
20	Using your usual (customary) language, does \${name_boy_618_2} 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	
	<b>Health Problems - Girl 6-18 1</b>	<b>begin group</b>	
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 No - no difficulty 2 Yes - some difficulty 3 Yes - a lot of difficulty 4 Cannot do at all 98 Refuse to answer	
23	Does $\{name\_girl\_618\_1\}$ 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	
24	Does $\{name\_girl\_618\_1\}$ 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	
25	Does $\{name\_girl\_618\_1\}$ 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	
26	Does $\{name\_girl\_618\_1\}$ 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	
27	Using your usual (customary) language, does $\{name\_girl\_618\_1\}$ 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	
	<b>Health Problems - Girl 6-18 2</b>	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      No - no difficulty 2      Yes - some difficulty 3      Yes - a lot of difficulty 4      Cannot do at all 98      Refuse to answer	
30	Does \${name_girl_618_2} 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	
31	Does \${name_girl_618_2} 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	
32	Does \${name_girl_618_2} 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	
33	Does \${name_girl_618_2} 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	
34	Using your usual (customary) language, does $\{name\_girl\_618\_2\}$ 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	
<b>IV</b>	<b>Income and Wealth</b>	<b>Choices</b>	<b>Notes and Comments</b>
	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 past two years 2020 and 2019. 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		<b><i>WILL REPEAT FOR NUMBER OF PLOTS</i></b>
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</i>

			<i>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 (2020)?	decimal	
22	Thank you for telling me about the UPLAND RICE that was planted in the 2020 season. Now let's talk about the season before this. 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	
23	How many <i>bushels</i> of UPLAND RICE did you sow in 2019?	decimal	
24	What month in 2019 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 2019?	decimal	
26	How many <i>bushels</i> of harvested UPLAND RICE did you sell in 2019?	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>
28	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
29	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 2020 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 (2020)?	decimal	
43	Thank you for telling me about the LOWLAND RICE that was planted in the 2020 season. Now let's talk about the season before this. 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	

44	How many <i>bushels</i> of LOWLAND RICE did you sow in 2019?	decimal	
45	What month in 2019 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 2019?	decimal	
47	How many <i>bushels</i> of harvested LOWLAND RICE did you sell in 2019?	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>
49	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2020 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 2020?	decimal	
64	Thank you for telling me about the MAIZE that was planted in the 2020 season. Now let's talk about the season before this. 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	
65	How many cups of MAIZE seeds did you sow in 2019?	decimal	
66	What month in 2019 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 2019?	decimal	
68	How many <i>cobs</i> of harvested MAIZE did you sell last season (2019)?	decimal	<i>By selling we mean in the market or to any</i>

			<i>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	
70	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
71	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2019?	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		Will show up if Groundnuts are grown on this plot
88	You told me that you farmed GROUNDNUTS on this plot in the past 2 years. Can you tell me what month in 2020 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 2020?	decimal	
90	Thank you for telling me about the GROUNDNUTS that was planted in the 2020 season. Now let's talk about the season before this. 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	
91	How many <i>bags (50kg rice bags)</i> of GROUNDNUT seeds did you sow in 2019?	decimal	
92	What month in 2019 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 (2019)?	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 (2019)?	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	
96	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2020 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 2020?	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 2020 season. Now let's talk about the season before this. 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	
114	How many <i>sticks</i> of CASSAVA did you sow last season (2019)?	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	
117	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
124	Enter the exact amount	Integer	
130	What month in 2019 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 2019?	decimal	
132	How many <i>bags (50kg rice bags)</i> of harvested CASSAVA did you sell in 2019?	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	
134	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
141	Enter the exact amount	Integer	
		end_group	
	<b>Garden eggs</b>	Note	
147	Can you tell me what month in 2020 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 2020?	Integer	
149	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	
150	How many <i>cups</i> of GARDEN EGGS seeds did you sow in 2019?	Integer	
151	What month in 2019 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 2019?	Integer	
153	How many <i>bags (50kg rice bags)</i> of harvested GARDEN EGGS did you sell last season (2019)?	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	
155	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
162	Enter the exact amount	Integer	
	Peppers	Note	
168	Can you tell me what month in 2020 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 2020?	Integer	
170	Can you tell me what month in 2019 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 (2019)?	Integer	
172	What month in 2019 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 (2019)?	Integer	
174	How many <i>bags (50kg rice bags)</i> of harvested PEPPER did you sell last season (2019)?	Integer	<i>By selling we mean in the market or to any</i>

			<i>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	
176	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
183	Enter the exact amount	Integer	
	<b>Onions</b>	<b>Note</b>	
189	Can you tell me what month in 2020 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 2020?	Integer	
191	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	
192	How many bags <i>cups</i> of ONION seeds did you sow last season (2019)?	Integer	

193	What month in 2019 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 (2019)?	Integer	
195	How many <i>bags (50kg rice bags)</i> of harvested ONIONS did you sell last season (2019)?	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	
197	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
204	Enter the exact amount	Integer	
	Okra	Note	
210	Can you tell me what month in 2020 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 2020?	Integer	
212	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	
213	How many <i>cups</i> of OKRA did you sow in 2019?	Integer	
214	What month in 2019 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 (2019)?	Integer	
216	How many <i>bags (50kg rice bags)</i> of harvested OKRA did you sell last season (2019)?	Integer	<i>By selling we mean in the market or to any other person in exchange for money. Self-consumption</i>

			<i>DOES NOT COUNT.</i>
217	How many Leones did you sell {g2_c} bags of harvested OKRA for?	Integer	
218	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2020 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 November 12 December 98 Refuse to answer 99 Don't know	
232	How many 50kg bags of vines of POTATOES did you sow in 2020?	Integer	
233	What month in 2020 did you harvest POTATOES?	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	
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 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 November 12 December 98 Refuse to answer 99 Don't know	
237	How many 50kg bags of vines of POTATOES did you sow in 2019?	Integer	
238	What month in 2019 did you harvest POTATOES?	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	
239	How many <i>bags (50kg rice bags)</i> of POTATOES did you harvested last season (2019)?	Integer	
240	How many <i>bags (50kg rice bags)</i> of harvested POTATOES did you sell last season (2019)?	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	

242	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
249	Enter the exact amount	Integer	
		end_group	
	Cocoa This repeats for 2020 and 2019	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 2019?	Integer	
257	How many <i>kgs</i> of COCOA did you harvest in 2019?	Integer	
258	How many Leones did you sell the harvested COCOA for?	Integer	
259	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2019?	Integer	
274	How many <i>kgs</i> of COFFEE did you harvest in 2019?	Integer	
275	How many leones did you sell the harvested COFFEE for?	Integer	
276	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2019?	Integer	
291	How many <i>kgs</i> of CASHEW did you harvest in 2019?	Integer	
292	How many leones did you sell the harvested CASHEW for?	Integer	
293	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2020?	Integer	
308	How many <i>drums</i> of Oil Palm did you harvest in 2019?	Integer	
309	How many leones did you sell the harvested Oil Palm for?	Integer	
310	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2020?	Integer	
325	How many <i>bags (50kg rice bags)</i> of citrus did you harvest in 2019?	Integer	
326	How many leones did you sell the harvested Citrus for?	Integer	
327	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
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 2020?	Integer	
337	How many <i>bags (50kg rice bags)</i> of Plantains did you harvest in 2019?	Integer	
338	How many leones did you sell the harvested Plantains for?	Integer	
339	Select the range that this amount falls under	0 to 99,999 100,000 to 499,999 500,000 to 999,999 Over 1 million	
346	Enter the exact amount	Integer	

	<b>Non-Agricultural Employment</b>		
	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	
	<b>Non-Ag Income - Head of Household</b>	<b>begin_group</b>	
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 Entertainment Center 7 Barber 8 Charging stations 9 Selling drinks 10 Processing of agricultural goods 11 Petty trading 12 Provision Shop/ Boutique/ Clothing Shop 13 Tailoring 95 Other 98 Refused to answer 99 Don't know	<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>
26	SELECT THE RANGES		
33	Enter the exact amount	integer	
39	Benefit	calculate	<i>This will be done</i>

			<i>automatically by the tablet</i>
	Revenues over the year.	begin_group	<i>If the Benefit calculated is &gt;0</i>
B	Now I want to talk about this person's revenues over the past year.	note	
C	How much did they make in revenue in the month of February?	note	
D	SELECT THE RANGES		
E	How much did they make in revenue in the month of January?	note	
F	SELECT THE RANGES		
G	How much did they make in revenue in the month of December?	note	
H	SELECT THE RANGES		
I	How much did they make in revenue in the month of November?	note	
J	SELECT THE RANGES		
K	Enter the exact amount	integer	
	Running costs over the year.	begin_group	<i>If the Benefit calculated is &lt;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 February?	note	
42	SELECT THE RANGES		
43	How much did they spend in running costs in the month of January?	note	
44	SELECT THE RANGES		
45	How much did they spend in running costs in the month of December?	note	
46	SELECT THE RANGES		
47	How much did they spend in running costs in the month of November?	note	
48	SELECT THE RANGES		
49	Enter the exact amount	integer	
	Employed with a business or an organization		
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 2021</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 <b>cash</b> or a <b>combination of both</b> 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 <b>Febraury</b> , 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 <b>FEBRUARY</b> ?	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 February. 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 themself 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	<b>REPEAT QUESTIONS 222 – 249 FOR JANUARY, DECEMBER, NOVEMBER</b>		
	<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 Entertainment Center 7 Barber 8 Charging stations 9 Selling drinks 10 Processing of agricultural goods 11 Petty trading 12 Provision Shop/ Boutique/ Clothing Shop 13 Tailoring 95 Other 98 Refused to answer 99 Don't know	<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 &lt;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 February?	note	<i>SELECT RANGES</i>
56	How much did they spend in running costs in the month of January?	note	<i>SELECT RANGES</i>
70	How much did they spend in running costs in the month of December?	note	<i>SELECT RANGES</i>
84	How much did they spend in running costs in the month of November?	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 <b>cash</b> or a</i>

			<i>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 FEBRUARY, JANUARY, DECEMBER, NOVEMBER	note	
	<b>Livestock</b>		
	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>
		end_group	
15	You said your household owns $\{\text{animals\_own}\}$ 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 ( $\{\text{animals\_own}\}$ 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	begin_group	
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</i>

			-98 = Refuse to answer
	<b>Land Ownership</b>		
19	I will now ask you questions about your land ownership	note	<i>Enumerator Note: please, remember that for numeric questions:  -99 = Don't know  -98 = Refuse to answer</i>
20	Do you or your household members own any land?	Yes No Refuse to answer Don't know	<i>Any type of land. It can be residential, for agriculture, etc.</i>
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.   If respondent still does not know, write -99.   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	integer	<i>Enumerator Note: Please, write the amount</i>

	that land, what is the fair price? (In Leones)?		<i>in '000. If they say 200.000, write 200.</i>  <i>If respondent does not know, write -99.</i>
	<b>Home Characteristics</b>		
23	I will now ask you questions about the house/structure you and your household live in.	note	
24	How many rooms in total do you have inside your house?	Integer	
25	How many bedrooms are there?	Integer	
	How many rooms are for storage or for cooking? (ONLY for storage and cooking, do not count twice)	Integer	
	How many bathrooms are there?	Integer	
	How many rooms are living rooms, rooms where you spend time in during the day but do not sleep in and do not keep storage in? (such as a parlour)	Integer	
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	<i>Enumerator: see and answer this question based on your observation. If</i>

		4 Roofing tiles 5 Tarpaulin 95 Other	<i>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	<i>Enumerator: Mark as 'shared' if the toilet is being used by people from a</i>

		6 Water side 7 Bush 95 Other	<i>DIFFERENT household</i>
	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>cupss</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</i>

			<i>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>piles of</i> 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>cups</i> of PEPPER did your household consume in the past 7 days?	decimal	
13	How many 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>pounds</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 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 much 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</i>  <i>Please, write the amount in '000. If they say 200.000, write 200.</i>
21	How many <i>pints</i> of Oil did your household consume in the past 7 days?	decimal	
22	How many <i>cups</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	
<b>Food Security</b>			
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"?	0 None of the times 1 One day 2 Two 3 Three days 4 Four 5 Five days 6 6 days 7 Everyday 98 Refuse to answer 99 Don't know	<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>
28	Asked for help from relatives or friends?	0 None of the times 1 One day 2 Two 3 Three days	<i>Enumerator Note: Financially or provision of food</i>

		4	Four	<i>items. If respondent asked for help BUT did not receive help, don't count it</i>
		5	Five days	
		6	6 days	
		7	Everyday	
		98	Refuse to answer	
		99	Don't know	
29	Reduced portions/quantities served per meal for adult males?	0	None of the times	
		1	One day	
		2	Two	
		3	Three days	
		4	Four	
		5	Five days	
		6	6 days	
		7	Everyday	
		98	Refuse to answer	
		99	Don't know	
30	Reduced portions/quantities served per meal for adult females?	0	None of the times	
		1	One day	
		2	Two	
		3	Three days	
		4	Four	
		5	Five days	
		6	6 days	
		7	Everyday	
		98	Refuse to answer	
		99	Don't know	
31	Reduced portions/quantities served per meal for boys under age 10?	0	None of the times	
		1	One day	
		2	Two	
		3	Three days	
		4	Four	
		5	Five days	
		6	6 days	
		7	Everyday	
		98	Refuse to answer	
		99	Don't know	
32	Reduced portions/quantities served per meal for girls under age 10?	0	None of the times	
		1	One day	
		2	Two	
		3	Three days	
		4	Four	
		5	Five days	
		6	6 days	
		7	Everyday	
		98	Refuse to answer	
		99	Don't know	

33	Eaten fewer times per day than normal for this time of year?	0 None of the times 1 One day 2 Two 3 Three days 4 Four 5 Five days 6 6 days 7 Everyday 98 Refuse to answer 99 Don't know	
34	Spent whole day without eating?	0 None of the times 1 One day 2 Two 3 Three days 4 Four 5 Five days 6 6 days 7 Everyday 98 Refuse to answer 99 Don't know	
	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?	select_one yes_no	
3	Dining table and chairs?	select_one yes_no	
4	Bed frame?	select_one yes_no	
5	Mattress?	select_one yes_no	
6	Sewing machine?	select_one yes_no	
7	Charcoal cooking pot	select_one yes_no	
8	Stove (electric)	select_one yes_no	
9	Stove (gas)	select_one yes_no	
10	Stove (kerosene)	select_one yes_no	
11	Refrigerator	select_one yes_no	
12	Freezer	select_one yes_no	
13	Air conditioner	select_one yes_no	
14	Washing machine	select_one yes_no	
15	Iron (electric)	select_one yes_no	
16	Electric fan	select_one yes_no	
17	Iron (charcoal)	select_one yes_no	
18	Car	select_one yes_no	
19	Motorcycle	select_one yes_no	

20	Bicycle	select_one yes_no	
21	Mobile phone	select_one yes_no	
22	Radio	select_one yes_no	
23	Television	select_one yes_no	
24	Stereo system	select_one yes_no	
25	Video/DVD equipment	select_one yes_no	
26	Camera	select_one yes_no	
27	Computer	select_one yes_no	
28	Microwave	select_one yes_no	
		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 dinning table, 2 if two dinning 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	
	<b>Selling Assets</b>		
	Over the past two years (2019/2020) have you or any household member sold any assets?		
30	Sofa set?	integer	<i>This repeats for how many they sold and how many leones they sold for.</i>
31	Dining table and chairs?	integer	
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	
	<b>Purchasing Assets</b>		
	Over the past two years (2019/2020) have you or any household member purchased any assets?		
	Over the past two years (2019/2020) have you or any household member purchased any assets?		

30	Sofa set?	integer	<i>This repeats for how many they purchased and how many leones they sold for.</i>
31	Dining table and chairs?	integer	
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	
	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)	<b><i>DO NOT READ THE OPTIONS</i></b>  <i>Select ALL that apply, but remind the respondent we mean PLANNING to buy, not WANTED to buy</i>

		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	
59	Specify other	text	
	Now, I am going to ask you about you AND your spouse activities during the day. I will divide the 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:	note	
	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 <math>\{c\_day\}</math> 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) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc) 5 Wage labor, non-farm (timber, mining) 6 Traveling 95 Other 98 Refuse to answer 99 Don't know	
3	8AM - 10AM	1 Leisure (talking, socializing, religious activities) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc) 5 Wage labor, non-farm (timber, mining) 6 Traveling 95 Other 98 Refuse to answer 99 Don't know	
4	10AM - 12PM	1 Leisure (talking, socializing, religious activities) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea	

		shop, Okada, selling processed farm product, etc) 5 Wage labor, non- farm (timber, mining) 6 Traveling 95 Other 98 Refuse to answer 99 Don't know	
5	12PM - 2PM	1 Leisure (talking, socializing, religious activities) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc) 5 Wage labor, non- farm (timber, mining) 6 Traveling 95 Other 98 Refuse to answer 99 Don't know	
6	2PM - 4PM	1 Leisure (talking, socializing, religious activities) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc) 5 Wage labor, non- farm (timber, mining) 6 Traveling 95 Other 98 Refuse to answer 99 Don't know	

7	4PM - 6PM	1 Leisure (talking, socializing, religious activities) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc) 5 Wage labor, non-farm (timber, mining) 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 <math>\{c\_day\_s\}</math> 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) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities	

		<p>4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc)</p> <p>5 Wage labor, non-farm (timber, mining)</p> <p>6 Traveling</p> <p>95 Other</p> <p>98 Refuse to answer</p> <p>99 Don't know</p>	
12	8AM - 10AM	<p>1 Leisure (talking, socializing, religious activities)</p> <p>2 HH Chores (fetching water/firewood, cooking, cleaning)</p> <p>3 Farm activities</p> <p>4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc)</p> <p>5 Wage labor, non-farm (timber, mining)</p> <p>6 Traveling</p> <p>95 Other</p> <p>98 Refuse to answer</p> <p>99 Don't know</p>	
13	10AM - 12PM	<p>1 Leisure (talking, socializing, religious activities)</p> <p>2 HH Chores (fetching water/firewood, cooking, cleaning)</p> <p>3 Farm activities</p> <p>4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc)</p> <p>5 Wage labor, non-farm (timber, mining)</p> <p>6 Traveling</p> <p>95 Other</p> <p>98 Refuse to answer</p>	

		99 Don't know	
14	12PM - 2PM	1 Leisure (talking, socializing, religious activities) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc) 5 Wage labor, non-farm (timber, mining) 6 Traveling 95 Other 98 Refuse to answer 99 Don't know	
15	2PM - 4PM	1 Leisure (talking, socializing, religious activities) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter, mason, making soap, tea shop, Okada, selling processed farm product, etc) 5 Wage labor, non-farm (timber, mining) 6 Traveling 95 Other 98 Refuse to answer 99 Don't know	
16	4PM - 6PM	1 Leisure (talking, socializing, religious activities) 2 HH Chores (fetching water/firewood, cooking, cleaning) 3 Farm activities 4 Non-farm business (trading, weaving, carpenter,	

		mason, making soap, tea shop, Okada, selling processed farm product, etc) 5 Wage labor, non-farm (timber, mining) 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 98 Refuse to answer 99 Don't know	
19	Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?	1 Most people can be trusted 2 You need to be 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)	integer	
21	How often have you felt that you were unable to control the important things in your life?	1 All the time 2 Often 3 Sometimes 4 Rarely 5 Never 98 Refused to answer 99 Don't know	
		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 2 Not very worried 3 Somewhat worried 4 Very worried 98 Refuse to answer 99 Don't know	

24	Problems at home and with relatives	1 2 3 4 98 99	Not at all worried Not very worried Somewhat worried Very worried Refuse to answer Don't know	
25	Accidents and disasters	1 2 3 4 98 99	Not at all worried Not very worried Somewhat worried Very worried Refuse to answer Don't know	
26	Not enough money for basic needs (such as food and clothing	1 2 3 4 98 99	Not at all worried Not very worried Somewhat worried Very worried Refuse to answer Don't know	
27	Not being able to educate all children	1 2 3 4 98 99	Not at all worried Not very worried Somewhat worried Very worried Refuse to answer Don't know	
28	Not enough money for other living expense	1 2 3 4 98 99	Not at all worried Not very worried Somewhat worried Very worried Refuse to answer Don't know	
29	Not enough money for medicine and medical treatments	1 2 3 4 98 99	Not at all worried Not very worried Somewhat worried Very worried Refuse to answer Don't know	
30	Difficulty finding work	1 2 3 4 98 99	Not at all worried Not very worried Somewhat worried Very worried Refuse to answer Don't know	
31	Death of a family member	1 2 3 4	Not at all worried Not very worried Somewhat worried Very worried	

		98 Refuse to answer 99 Don't know	
32	Debts owed to other	1 Not at all worried 2 Not very worried 3 Somewhat worried 4 Very worried 98 Refuse to answer 99 Don't know	
	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 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	
35	Education expenses within the household	0 No influence 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	
36	Health expenses within the household	0 No influence 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	
37	Household finances and business decision-making	0 No influence 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	<i>Enumerator Note: If they own a business together. Otherwise, only about household decisions</i>
38	How to use your household's land and property	0 No influence 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	

	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 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	
41	Education expenses within the household	0 No influence 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	
42	Health expenses within the household	0 No influence 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	
43	Household finances and business decision-making	0 No influence 1 Minor influence 2 Major influence 97 Not applicable 98 Refuse to answer 99 Don't know	<i>Enumerator Note: If they own a business together. Otherwise, only about household decisions</i>
44	How to use your household's land and property	0 No influence 1 Minor influence 2 Major influence 97 Not applicable 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	

	<b>Energy Use</b>		
	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	
	There is a mini-grid inside your community. Are you connected to the mini-grid?	Yes, I am connected No, I was connected but I disconnected my meter No I am not connected	
	If yes, what sort of connection is this?	Household Commercial Both household and commercial	
	Did you have to pay to get connected?	Yes No	
	How much did you have to pay?	Select bins	

	What would be the exact amount?	Integer	
	How satisfied are you with the overall operation and upkeep of the mini-grid in your community?	Not satisfied at all Not very satisfied Neither satisfied nor dissatisfied Somewhat satisfied Very satisfied	
	How reliable is the electricity from the mini-grid?	Not reliable at all Not very reliable Somewhat reliable Very reliable	
	You said you used to be connected to the mini-grid and have disconnected your meter. Why did you disconnect your meter?	I could not afford the DAILY service fee The tariff is too high I paid the service fee and top up for the light, but the operator never gave me light Other	
	If other, specify	Text	
	You said you are not connected to the mini-grid. What barriers have you experienced that have caused you to not get connected?	Connection is too expensive I don't know how to get connected I do not want to be connected Other	
	If other, specify	Text	
	You said the connection is too expensive. What amount of SLL would you be able to pay to get connected?	Integer	
	What would be the exact amount?	Integer	

	You said you do not want to be connected to the mini-grid, why do you not want to be connected?	I don't need light I don't want to pay for electricity I can just use a friend/family members connectivity I don't think it is reliable Other	
	If other, specify	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.  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</i>

			<i>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	<b><i>DO NOT READ OUT the options</i></b>

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	<i>DO NOT READ OUT the options</i>

		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	
	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</i>

			<i>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 <b>MAIN</b> 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	<i>Note: by main source I mean source of lighting most used in the house</i>

		9 Generator 10 Candles 11 Phone light 12 Mini-grid electricity 95 Other 98 Refuse to answer 99 Don't know	
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	
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	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</i>	note	

	<p><i>to you different sickness that people sometimes suffer from. After I describe each sickness. Tell me if you have suffered from this illness in the last month (30 days)</i></p>		
	Malaria	begin_group	
1	<p>READ: Sometime s people fall sick and they experience high temperatur e, headache s, vomiting and muscle pain. These symptome s are usually associated with Malaria.</p>	note	<p><i>Enumerat or Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i></p>
2	<p>Have you suffered from this illness or</p>	<p>0. No 1. Yes 98. Refuse to Answer 99. Don't know</p>	

	these symptoms in the past 30 days?		
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	integer	<i>Enumerate or Note: SELECT THE RANGES</i>

	treat this illness?		
9	If you were to suffer from this illness again in the future would you seek treatment?	<ul style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> <li>98. Refuse to Answer</li> <li>99. Don't know</li> </ul>	
10	Where would you seek treatment for this sickness?	<ul style="list-style-type: none"> <li>1. Hospital (District Headquarter Town)</li> <li>2. Community Health Center (CHC) or PHU</li> <li>3. Community Health Post (CHP)</li> <li>4. Pharmacy/ Drug shop</li> <li>5. Private Clinic</li> <li>6. Maternal Care Health Post (MCHP)</li> <li>7. NGO Clinic</li> <li>8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy)</li> <li>95. Other</li> <li>98. Refused to Answer</li> <li>99. Don't konw</li> </ul>	
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?	<ul style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> <li>98. Refuse to Answer</li> <li>99. Don't know</li> </ul>	
12	Where would you seek treatment	<ul style="list-style-type: none"> <li>1. Hospital (District Headquarter Town)</li> <li>2. Community Health Center (CHC) or PHU</li> <li>3. Community Health Post (CHP)</li> <li>4. Pharmacy/ Drug shop</li> <li>5. Private Clinic</li> </ul>	

	for this sickness?	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>Enumerat or 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>Enumerat or 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	

2 2	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 konw	
2 3	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	
2 4	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 konw	
		end_group	
	Dry Eye and/or Cataract	begin_group	

2 5	<p><b>READ:</b> 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"</p>	note	<p><i>Enumerat or Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i></p>
2 6	<p>Have you suffered from this illness or these symptoms in the past 30 days?</p>	<p>0. No 1. Yes 98. Refuse to Answer 99. Don't know</p>	
2 7	<p>For how many days did you suffer this illness?</p>	integer	<p><i>Remember, I am only talking about the last 30 days</i></p>
2 8	<p>Did you seek treatment for this sickness?</p>	<p>0. No 1. Yes 98. Refuse to Answer 99. Don't know</p>	

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>Enumerat or 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	1. Hospital (District Headquarter Town) 2. Community Health Center (CHC) or PHU 3. Community Health Post (CHP) 4. Pharmacy/ Drug shop	

	for this sickness?	<ul style="list-style-type: none"> <li>5. Private Clinic</li> <li>6. Maternal Care Health Post (MCHP)</li> <li>7. NGO Clinic</li> <li>8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy)</li> <li>95. Other</li> <li>98. Refused to Answer</li> <li>99. Don't konw</li> </ul>	
3 5	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?	<ul style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> <li>98. Refuse to Answer</li> <li>99. Don't know</li> </ul>	
3 6	Where would you seek treatment for this sickness?	<ul style="list-style-type: none"> <li>1. Hospital (District Headquarter Town)</li> <li>2. Community Health Center (CHC) or PHU</li> <li>3. Community Health Post (CHP)</li> <li>4. Pharmacy/ Drug shop</li> <li>5. Private Clinic</li> <li>6. Maternal Care Health Post (MCHP)</li> <li>7. NGO Clinic</li> <li>8. Traditional Healer (mori-man, Pehpeh doctor, Malan, Spiritual Healer, Diba/Soweh Mammy)</li> <li>95. Other</li> <li>98. Refused to Answer</li> <li>99. Don't konw</li> </ul>	
		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>Enumerat or 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>Enumerat or Note: If this woman is in the house, ask her to join and answer/p articipate 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	0. No 1. Yes 98. Refused to Answer	

	, did she receive any post-natal care?		
4 2	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	
4 3	How many times did she visit a CHC for pre-natal or post-natal care during her last pregnancy?	integer	<i>Enumerate or: add the pre-natal and the post-natal visits and write down the total amount of visits</i>
4 4	How many of these times were at night times?	integer	<i>After dark – Past 18.00hours (6pm)</i>
4 5	How much did she pay in total for her visit to the CHC for pre-natal or post-natal care during her last	integer	<i>We are also interested on any kind of informal payment.</i>  <i>Enumerate or Note: SELECT THE RANGES</i>

	pregnancy ?		
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	0. No 1. Yes 98. Refuse to Answer 99. Don't know	

	died during pregnancy /delivery in the past 12 months?		
51	What was the cause of death for this woman?	text	
52	<p>Enumerator Note: Do not read out this question - answer based on your observation</p> <p>Who answered most of these questions? Were women of the household contributing to the answers?</p>	<p>1. Male respondent dominated all responses, women not present.</p> <p>2. Male respondent dominated all responses, women present</p> <p>3. Male respondent led answers but active contribution from women</p> <p>4. Female respondent answered all questions</p> <p>5. Female respondent same as main respondent</p>	
		end_group	
	Vaccines		
note	Scientists around the world are working to create vaccine to protect people against the COVID-19		

	virus. A vaccine is at the moment not yet available.		
v 1 7	Do you know what a vaccine is?	0. No 1. Yes	
v 3 1	How are vaccines administered?	1. Orally 2. Injection 3. Both orally and through injection 4. I don't know	
v 1	Should a vaccine against COVID become available in Sierra Leone, would you take it?	0. No 1. Yes	
v 2	If yes, why would you take it?	1. I want to protect myself from having COVID-19 in the future. 2. I want to protect my family/ members of my household against having COVID-19 in the future. 3. I want to protect my community against having COVID-19 in the future. 4. Life won't go back to normal until most people are vaccinated 5. The CHC/government recommends getting vaccines 95. Other	
v 3	If no, why would you not take it?	1. I would be concerned about the side effects from the vaccine/vaccines can be harmful 2. I am not concerned about the risk associated with me/my relatives getting COVID-19. 3. I don't think vaccines are effective. 4. I don't like needles 5. I won't have time to go get	

		<p>vaccinated.</p> <p>6. I don't think COVID exists.</p> <p>7. If there are community or religious objections to the vaccine, then I will not get it</p> <p>8. If the vaccine is being provided by any foreign aid (such as Bill and Melinda Gates Foundation), then I will not get the vaccine</p> <p>9. I don't know what a vaccine is</p> <p>95. Other</p>	
v 9	<p>Would you be willing to pay for a vaccine IF a COVID-19 vaccine were to become available?</p>	<p>0. No</p> <p>1. Yes</p>	
v 1 0	<p>How much would you be willing to pay for the vaccine? Total in leones</p>		Integer
v 1 1	<p>Why would you NOT be willing to pay for a vaccine against COVID?</p>	<p>1. Vaccines should be free</p> <p>2. I am poor and I cannot afford it</p> <p>3. I don't know if it works so I don't want to pay for it</p> <p>4. If the government (or other leaders) are telling me to take it, then I shouldn't have to pay for it</p> <p>95. Other</p>	
v 1 2	<p>If no, would you be willing to take the vaccine if the government /CHC showed evidence on</p>	<p>0. No</p> <p>1. Yes</p>	

	the effectiveness and possible side effects of the vaccine.		
v13	Which of the following people would you trust MOST to help you decide whether you would get a COVID-19 vaccine, if one becomes available?	<ol style="list-style-type: none"> <li>1. Family</li> <li>2. Friends you see and talk to</li> <li>3. Friends you've made online</li> <li>4. A religious leader</li> <li>5. A doctor, nurse or other staff at a community health clinic</li> <li>6. A country medical staff</li> <li>7. A famous person (specify)</li> <li>8. A traditional healer</li> <li>9. Online medical discussion groups</li> <li>95None of these - someone else, specify</li> </ol>	
v14	If no, would you be willing to take the vaccine if prominent people in your community were advocating for everyone to take the vaccine?	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol>	
v15	Do you strongly or somewhat agree, strongly or somewhat disagree or neither agree nor disagree with the following statement? Vaccines are safe.	<ol style="list-style-type: none"> <li>1. Strongly agree</li> <li>2. Somewhat agree</li> <li>3. Neither agree nor disagree</li> <li>4. Somewhat disagree</li> <li>5. Strongly disagree</li> </ol>	
v16	Do you strongly or somewhat agree, strongly or somewhat	<ol style="list-style-type: none"> <li>1. Strongly agree</li> <li>2. Somewhat agree</li> <li>3. Neither agree nor disagree</li> <li>4. Somewhat disagree</li> </ol>	

	disagree or neither agree nor disagree with the following statement? Vaccines are <b>effective</b> .	5. Strongly disagree	
v 1 8	Can you contract a disease even if you are vaccinated for it?	0. No 1. Yes	
v 1 9	Do you think vaccination is effective even after contracting infection or having been in contact with a contagious case?	0. No 1. Yes	
v 2 1	Do you think vaccines strengthen the immune system?	0. No 1. Yes	
v 2 2	Do you believe that there are other (better) ways to prevent vaccine preventable diseases than with a vaccine?	0. No 1. Yes	
v 2 3	Have you been given any immunization in the past (even as a child)?	0. I have never been immunized before 1. Yes	
v 2 4	If yes, where did you take	1. Community Health Clinic 2. Satellite Clinic 3. Hospital	

	your immunization?	<ul style="list-style-type: none"> <li>4. Health personnel coming into my community</li> <li>5. Doctor coming to my house</li> <li>6. Pharmacy</li> <li>7. Faith Based Organization/Mission clinic</li> <li>8. Private Clinic</li> <li>95. Other</li> </ul>	
v32	If other, specify		Text
v25	Have any of your children been taken for any immunization?	<ul style="list-style-type: none"> <li>0. My children have never been immunized before</li> <li>1. Yes</li> </ul>	
v26	If yes, where have your child/children been taken for immunization?	<ul style="list-style-type: none"> <li>1. Community Health Clinic</li> <li>2. Satellite Clinic</li> <li>3. Hospital</li> <li>4. Health personnel coming into my community</li> <li>5. Doctor coming to my house</li> <li>6. Pharmacy</li> <li>7. Faith Based Organization/Mission clinic</li> <li>8. Private Clinic</li> <li>95. Other</li> </ul>	
v33	If other, specify		
v27	On a scale of 1 to 10, how difficult has it been to get your children immunized? (1 is Very Difficult and 10 is Very Easy)		Integer
	Did you have to pay anything for the immunization (other than transport costs)?	<ul style="list-style-type: none"> <li>Yes</li> <li>No</li> </ul>	

<p>Think of ten people that you are close to. How many of these do you think would take a COVID-19 vaccine if one become available?</p>	<p>Integer</p>	
<p>If the people who you are close to would not take a COVID-19 vaccine if one became available. What reasons do you think they might have for not taking it?</p>	<ol style="list-style-type: none"> <li>1. I would be concerned about the side effects from the vaccine/vaccines can be harmful</li> <li>2. I am not concerned about the risk associated with me/my relatives getting COVID-19.</li> <li>3. I don't think vaccines are effective.</li> <li>4. I don't like needles</li> <li>5. I won't have time to go get vaccinated.</li> <li>6. I don't think COVID exists.</li> <li>7. If there are community or religious objections to the vaccine, then I will not get it</li> <li>8. If the vaccine is being provided by any foreign aid (such as Bill and Melinda Gates Foundation), then I will not get the vaccine</li> <li>9. I don't know what a vaccine is</li> <li>95. Other</li> </ol>	
<p>If the people who you are close to would take a COVID-19 vaccine if one becomes available. What reasons do you think they might have for taking it?</p>	<ol style="list-style-type: none"> <li>1. I want to protect myself from having COVID-19 in the future.</li> <li>2. I want to protect my family/ members of my household against having COVID-19 in the future.</li> <li>3. I want to protect my community against having COVID-19 in the future.</li> <li>4. Life won't go back to normal until most people are vaccinated</li> <li>5. The CHC/government recommends getting vaccines</li> <li>95. Other</li> </ol>	
<p>If you knew that some/few people in your community take the vaccine, would you then take the vaccine?</p>	<p>Yes No</p>	

	If you knew that many/all people in your community take the vaccine, would you then take the vaccine?	Yes No	
	We have previously asked if you would pay for a COVID-19 vaccine. Monetary incentives have been used in some countries to encourage citizens to take vaccines in the past. How likely would you be to take a COVID-19 vaccine if you were given cash to take a COVID-19 vaccine?	Very likely Somewhat likely Not very likely Not likely at all	
	How much SLL do you think is a fair incentive to take a COVID-19 vaccine?	Integer	
Polio			
	Now we would like to talk to you about a specific disease, one named Polio. Have you personally heard of the disease Polio?	Yes No	
	How serious do you think that Polio is?	Extremely serious Very serious Somewhat serious Not very serious Not at all serious	
	How do children get Polio?	Polio can be spread from person to person contact Contact with fees from an infected person Contact with bodily fluids such as a cough or a sneeze from an infected person If one has feces on hands, touching mouth can cause you to get Polio I don't know	
	Can Polio be cured?	Yes No I don't know	
	What do you know of that can be done to prevent children from getting Polio?	IPV (inactivated poliovirus vaccine) injection OPV (oral poliovirus vaccine) Have a very sanitary environment Avoid anyone who has polio I don't know	
	What sort of things can parents do to prevent	Take my child to get vaccinated Keep my entire environment extremely sanitary We avoid those who have polio	

	their children from getting Polio?	I don't know	
	Do you think your children are at risk of getting Polio?	Yes No Refuse to answer I don't know	
	Are they vaccinated against Polio?	Yes No	
	Are majority of the children in your community vaccinated against Polio?	Yes No Refuse to answer I don't know	
	If you were offered to get your child vaccinated for Polio, would you accept this offer and vaccinate your child?	Yes No	
	Would this depend on which child it was?	Yes No	
	What are the positives about the oral Polio vaccine?	The drops stimulate the immune system to produce anti-poliovirus antibodies The drops are easier to give my child The drops cover antibodies for poliovirus types 1, 2, and 3 They cost less than the injection There are no positives to taking the drops	
	What are the negatives about the oral Polio vaccine?	My child can't fight infections, so the drops will harm them Long term steroid medicines don't allow the medicine to work well My child has cancer, AIDS, or HIV infection which can worsen with the oral drops There are no negatives to taking the drops I don't know	
	Child Health (<5 years)	begin_group	
53	I will now ask you about the health condition of the under-five that live in this	note	

	<p>household. Under-five refers to the children of an age of 5 or less living in this household.</p> <p>I will ask you questions about: {child_0 5_1} and {child_0 5_2}</p>		
5 4	<p>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.</p> <p>I will ask you questions about: {child_0 5_1}</p>	note	
	Child 1	begin_group	

5 5	<i>Let's move to the first child, <math>\{child\_05\_1\}</math></i>	note	
5 6	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>
5 7	Has $\{child\_05\_1\}$ ever been vaccinated?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
5 8	Has $\{child\_05\_1\}$ received any of these vaccinations?	1. OPV0 2. BCG 3. 1 <sup>st</sup> DPT 4. 1 <sup>st</sup> OPV 5. 2 <sup>nd</sup> DPT 6. 2 <sup>nd</sup> OPV 7. 3 <sup>rd</sup> DPT 8. 3 <sup>rd</sup> 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>Enumerate or Note: Ask the respondent to show you the yellow vaccination card for <math>\{child\_05\_1\}</math>. Copy the information from there into the tablet</i>

59	Where did $\{\text{child}_05_1\}$ get the vaccinations?	<ul style="list-style-type: none"> <li>1. Community health center</li> <li>2. Hospital</li> <li>3. Private clinic</li> <li>4. Mobile unit</li> <li>5. School</li> <li>6. Home</li> <li>95. Other</li> <li>98. Refused to answer</li> <li>99. Don't know</li> </ul>	
60	Why was $\{\text{child}_05_1\}$ not vaccinated?	<ul style="list-style-type: none"> <li>1. Child too young</li> <li>2. Did not know about vaccines</li> <li>3. Health center too far</li> <li>4. Shortage of supply</li> <li>5. Too expensive</li> <li>6. Vaccines are useless</li> <li>95. Other</li> <li>98. Refused to answer</li> <li>99. Don't know</li> </ul>	
61	<i>I am going to describe to you different sickness that people sometimes suffer from. After I describe each sickness. Tell me if <math>\{\text{child}_05_1\}</math> have suffered from this illness in the last month (30 days)</i>	note	
	Malaria	begin_group	
62	READ: Sometime s people fall sick and they experience	note	

	high temperature, headaches, vomiting and muscle pain. These symptoms are usually associated with malaria		
63	Has $\{\text{child}_0\text{5}_1\}$ had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
64	Was $\{\text{child}_0\text{5}_1\}$ treated at the CHC for this condition?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
		end_group	
	Acute Respiratory Infections	begin_group	
65	READ: There are also times when you are sick that you cannot breathe properly, you have runny	note	

	nose, coughing, and sore throat.		
6 6	Has \${child_0 5_1} had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
6 7	Was \${child_0 5_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	
6 8	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	note	

	call this "apolo"		
69	Has $\{\text{child}_05_1\}$ had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
70	Was $\{\text{child}_05_1\}$ 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, <math>\{\text{child}_05_2\}</math></i>	note	
71	Does $\{\text{child}_05_2\}$ 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>

7 2	Has \${child_0 5_2} ever been vaccinated ?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
7 3	Has \${child_0 5_2} received any of these vaccinatio ns?	1. OPV0 2. BCG 3. 1 <sup>st</sup> DPT 4. 1 <sup>st</sup> OPV 5. 2 <sup>nd</sup> DPT 6. 2 <sup>nd</sup> OPV 7. 3 <sup>rd</sup> DPT 8. 3 <sup>rd</sup> 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>Enumerat or Note: Ask the responde nt to show you the yellow vaccinati on card for \${child_0 5_2}. Copy the informati on from there into the tablet</i>
7 4	Where did \${child_0 5_2} get the vaccinatio ns?	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	
7 5	Why was \${child_0 5_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</i>	note	

	<i>different sickness that people sometimes suffer from. After I describe each sickness. Tell me if <math>\{child\_05\_2\}</math> have suffered from this illness in the last month (30 days)</i>		
	Malaria	begin_group	
7 6	READ: Sometime s people fall sick and they experience high temperatur e, headache s, vomiting and muscle pain. These symptoms are usually associated with Malaria	note	
7 7	Has $\{child\_05\_2\}$ had any of these	0. No 1. Yes 98. Refuse to Answer 99. Don't know	

	symptoms or illnesses?		
7 8	Was \${child_0 5_2} treated at the CHC for this condition?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
		end_group	
	Acute Respiratory Infections	begin_group	
7 9	READ: There are also times when you are sick that you cannot breathe properly, you have runny nose, coughing, and sore throat.	note	
8 0	Has \${child_0 5_2} had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
8 1	Was \${child_0 5_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	
8 2	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	
8 3	Has \${child_0 5_2} had any of these symptoms or illnesses?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
8 4	Whas \${child_0 5_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	
8 5	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	
8 6	How many pikins have passed away in this household in the past year?	integer	
	Age of children- Infant mortality	begin_repeat	
8 7	What was the age of this pikin that passed away in the past year?	integer	
8 8	What was the cause of this	text	

	pikin's death?		
		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.	note	

	I will ask you questions about: $\{\text{child\_618\_1}\}$		
	Child 1	begin_group	
4	<i>Let's move to the first child, <math>\{\text{child\_618\_1}\}</math>.</i>	note	<i>Enumerat or Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
5	Is $\{\text{child\_618\_1}\}$ currently enrolled in school?	0. No 1. Yes 98. Refused to Answer	
6	Which school is $\{\text{child\_618\_1}\}$ enrolled in?	text	
7	Is this school in this community?	0. No 1. Yes 98. Refused to Answer	
8	What grade is $\{\text{child\_618\_1}\}$ attending?	1. Nursery/ Pre- primary 2. 1 <sup>st</sup> primary 2. 2 <sup>nd</sup> primary 3. 3 <sup>rd</sup> primary 4. 4 <sup>th</sup> primary 5. 5 <sup>th</sup> primary 6. 6 <sup>th</sup> primary 7. 1 <sup>st</sup> JSS 8. 2 <sup>nd</sup> JSS	

		9. 3 <sup>rd</sup> JSS 10. 1 <sup>st</sup> SSS 11. 2 <sup>nd</sup> SSS 12. 3 <sup>rd</sup> SSS 13. Higher education 95. Other 98. Refused to answer 99. Don't know	
9	Specify other	text	
10	What is the highest grade $\{\text{child\_6 18\_1}\}$ achieved?	1. Nursery/ Pre- primary 2. 1 <sup>st</sup> primary 2. 2 <sup>nd</sup> primary 3. 3 <sup>rd</sup> primary 4. 4 <sup>th</sup> primary 5. 5 <sup>th</sup> primary 6. 6 <sup>th</sup> primary 7. 1 <sup>st</sup> JSS 8. 2 <sup>nd</sup> JSS 9. 3 <sup>rd</sup> JSS 10. 1 <sup>st</sup> SSS 11. 2 <sup>nd</sup> SSS 12. 3 <sup>rd</sup> SSS 13. Higher education 95. Other 98. Refused to answer 99. Don't know	
11	Specify other	text	
12	How much time does $\{\text{child\_6 18\_1}\}$ 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 $\{\text{child\_6 18\_1}\}$	integer	

	miss school?		
1 4	Did \${child_6 18_1} miss school because the teacher was absent?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
1 5	Children often help people in their families or other people with work on their farm. During the past month, did \${child_6 18_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	
1 6	In general, how many hours does \${child_6 18_1} work on the farm during a typical <i>week?</i>	integer	

1 7	<p>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 <math>\{child\_6\}</math> <math>\{18\_1\}</math> help with chores around the house?</p>	integer	
1 8	<p>Sometimes children help with work outside of the farm and household. For example, some school children help take</p>	<p>0. No 1. Yes 98. Refuse to Answer 99. Don't know</p>	

	<p>care of a store or other business. In the past <i>month</i>, has <math>\{\text{child\_618\_1}\}</math> helped out with any non-farm activities, outside of the household ?</p>		
19	<p>In general, how many hours does <math>\{\text{child\_618\_1}\}</math> help out with these activities in a <i>week</i> (7 days)?</p>	integer	
20	<p>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</p>	integer	

	<p>much of anything. In a typical <i>week</i>, how many hours does <math>\{\text{child\_6 18\_1}\}</math> spent playing and hanging out?</p>		
2 1	<p>Children spend much of their day studying at school. Think about when <math>\{\text{child\_6 18\_1}\}</math> comes home from school. In the past <i>month</i>, has <math>\{\text{child\_6 18\_1}\}</math> done any studying at home?</p>	<p>0. No 1. Yes 98. Refuse to Answer 99. Don't know</p>	
2 2	<p>In general, how many hours does <math>\{\text{child\_6 18\_1}\}</math> spend studying at home in a <i>week</i>?</p>	<p>integer</p>	

2 3	When the day is done its time to sleep. On a typical <b>weekday</b> (by that I mean Monday through Friday), how many hours does $\{\text{child\_618\_1}\}$ sleep at night?	integer	
		end group	
	Child 2	begin group	
2 4	<i>Let's move to the second child, <math>\{\text{child\_618\_2}\}</math></i>	note	<i>Enumerat or Note: please, remember that for numeric questions: -99 = Don't know -98 = Refuse to answer</i>
2 5	Is this $\{\text{child\_618\_2}\}$ currently enrolled in school?	0. No 1. Yes 98. Refused to Answer	
2 6	Which school is $\{\text{child\_618\_2}\}$ enrolled in?	text	

27	Is this school in this community?	<ul style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> <li>98. Refused to Answer</li> </ul>	
28	What grade is the $\{\text{child\_618\_2}\}$ attending?	<ul style="list-style-type: none"> <li>1. Nursery/ Pre- primary</li> <li>2. 1<sup>st</sup> primary</li> <li>2. 2<sup>nd</sup> primary</li> <li>3. 3<sup>rd</sup> primary</li> <li>4. 4<sup>th</sup> primary</li> <li>5. 5<sup>th</sup> primary</li> <li>6. 6<sup>th</sup> primary</li> <li>7. 1<sup>st</sup> JSS</li> <li>8. 2<sup>nd</sup> JSS</li> <li>9. 3<sup>rd</sup> JSS</li> <li>10. 1<sup>st</sup> SSS</li> <li>11. 2<sup>nd</sup> SSS</li> <li>12. 3<sup>rd</sup> SSS</li> <li>13. Higher education</li> <li>95. Other</li> <li>98. Refused to answer</li> <li>99. Don't know</li> </ul>	
29	Specify other	text	
30	What is the highest grade $\{\text{child\_618\_2}\}$ achieved?	<ul style="list-style-type: none"> <li>1. Nursery/ Pre- primary</li> <li>2. 1<sup>st</sup> primary</li> <li>2. 2<sup>nd</sup> primary</li> <li>3. 3<sup>rd</sup> primary</li> <li>4. 4<sup>th</sup> primary</li> <li>5. 5<sup>th</sup> primary</li> <li>6. 6<sup>th</sup> primary</li> <li>7. 1<sup>st</sup> JSS</li> <li>8. 2<sup>nd</sup> JSS</li> <li>9. 3<sup>rd</sup> JSS</li> <li>10. 1<sup>st</sup> SSS</li> <li>11. 2<sup>nd</sup> SSS</li> <li>12. 3<sup>rd</sup> SSS</li> <li>13. Higher education</li> <li>95. Other</li> <li>98. Refused to answer</li> <li>99. Don't know</li> </ul>	
31	Specify other	Text	
32	How much time does this $\{\text{child\_618\_2}\}$ do?	<ul style="list-style-type: none"> <li>1. Less than 30 minutes</li> <li>2. 30 – 60 minutes</li> <li>3. 60 – 120 minutes</li> <li>4. More than 120 minutes</li> </ul>	

	18_2} spend going to school (one way)?		
3 3	How many days in the last <b>week</b> (excluding holidays) did this \${child_6 18_2} miss school?	Integer	
3 4	Did \${child_6 18_2} miss school because the teacher was absent?	0. No 1. Yes 98. Refuse to Answer 99. Don't know	
3 5	Children often help people in their families or other people with work on their farm. During the past month, did \${child_6 18_2} spend any time working on a family	0. No 1. Yes 98. Refuse to Answer 99. Don't know	

	member or anyone else's farm?		
3 6	In general, how many hours does $\{\text{child\_618\_2}\}$ work on the farm during a typical <i>week</i> ?	integer	
3 7	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 $\{\text{child\_618\_2}\}$ help with chores around the house?	integer	

38	<p>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 <math>\{\text{child\_618\_2}\}</math> helped out with any non-farm activities, outside of the household?</p>	<p>0. No 1. Yes 98. Refuse to Answer 99. Don't know</p>	
39	<p>In general, how many hours does <math>\{\text{child\_618\_2}\}</math> help out with these activities in a <i>week</i> (7 days)?</p>	integer	
40	<p>We all know that children like to play. By</p>	integer	

	<p>“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 <math>\{\text{child\_618\_2}\}</math> spent playing and hanging out?</p>		
41	<p>Children spend much of their day studying at school. Think about when <math>\{\text{child\_618\_2}\}</math> comes home from school. In the past <i>month</i>, has</p>	<p>0. No 1. Yes 98. Refuse to Answer 99. Don't know</p>	

	<p> <math>\{\text{child}_6 18_2\}</math>  done any studying at home? </p>		
4 2	<p> In general, how many hours does <math>\{\text{child}_6 18_2\}</math> spend studying at home in a <i>week</i>? </p>	integer	
4 3	<p> 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 <math>\{\text{child}_6 18_2\}</math> sleep at night? </p>	integer	
		end_group	
4 4	<p> Enumerator Note: Do not read out this question - answer based on your observation   Who answered </p>	<ol style="list-style-type: none"> <li>1. Male respondent dominated all responses, women not present.</li> <li>2. Male respondent dominated all responses, women present</li> <li>3. Male respondent led answers but active contribution from women</li> <li>4. Female respondent answered all questions</li> <li>5. Female respondent same as main respondent</li> </ol>	

	most of these questions? Were women of the household or mothers of children contributing to the answers?		
		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>Enumerat or 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>Enumerat or Note: By this I mean more than simply hearing the radio. I mean that you could actually</i>

			<i>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>Enumeration or 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</i>	note	

	<i>way you use your phone and use social media.</i>		
5	Do you own a cellphone?	0. No 1. Yes 98. Refused to Answer	<i>Enumerat or note: Its okay if the phone actually belongs to someone else. What's important is that the responde nt 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 <b>credit bundle</b> ,  How much did you spend in the last <b>month</b> on internet credit?	integer	<i>Enumerat or 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?	<ol style="list-style-type: none"> <li>1. Less than 30 min</li> <li>2. Between 30 min and 1 hour</li> <li>3. Between 1 – 2 hours</li> <li>4. 2 – 3 hours</li> <li>5. More than 3 hours</li> </ol>	
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 ?	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol> 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	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol> 98. Refused to Answer	

	internet. Do you have a facebook?		
1 4	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	
1 5	Now I want to ask you a few questions about your interest in politics and politicians	note	
1 6	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	
1 7	We are in Ward $\{ward\}$ . Who is the Local Councilor for Ward $\{ward\}$ ?	1. Correct 0. Incorrect	<i>Enumerat or Note: Select 'Correct' if the responde nt answers this question correctly, even if partially. Select 'Incorrect'</i>

			<p><i>if Incorrect or respondent does not know.</i></p> <p><i>Local Councilor of Ward \${ward} is \${council or}</i></p>
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</p>	<p>0. No  1. Yes, with receipt  2. Yes, has NO receipt  98. Refuse to Answer  99. Don't know</p>	<p><i>Enumeration or Note: Wait for respondent to get receipt. Be sure it is from this year or last year (2018).</i></p>

<p>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>2 You may have heard that the Mayor in Freetown wants transform Freetown by improving sanitation, transportat ion, and other services. To do so, she is asking all</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>	

	<p>property owners to pay a tax.</p> <p>What if the FREETO WN 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>		
		end_group	
2 3	<p>Thank you for your time and collaboration. This is the end of the survey.</p>	note	
2 4	<p>Earlier you said you had a generator. Do you mind showing it</p>	text	<p><i>Enumerat or Note: Write -98 if responde nt refuses to show</i></p>

	to me before I leave?  Enumerator: Write the model and Kwh of the generator		<i>the generator to you</i>
2 5	Household Location	geopoint	
2 6	ENUMERATOR: Please write here any comments/issues you think it needs to be communicated to the RA team from this survey	text	

## RREP

### 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 Sellu Kallon, 076331161 or Osman Sawaneh 078611600. 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](mailto:efoday@health.gov.sl). You can also contact Maarten Voors, contact for Principal Investigators of this study, [maarten.voors@wur.nl](mailto:maarten.voors@wur.nl) and/or Ariful Islam, the Lead Evaluator, [arifuli@unops.org](mailto:arifuli@unops.org) and/or call Sydnella Bob-Williams, the Feedback and Monitoring Officer at + 232 30 955093.

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

Q#	Question	Answer	Comments
S1	<b>PERSONNEL</b>		
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	
<b>S2</b>	<b>EQUIPMENT/DRUGS</b>		
Note	<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>		
1	Do you have any of the following equipment?  <i>Equipment that use electricity</i>	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	<b><i>* Do not select the equipment unless the respondent shows it to you</i></b>

2	[For each selected equipment] Is [EQUIPMENT] working?	0. No 1. Yes 95. Other 98. Refuse to answer 99. Don't know	<b>* Enumerator to test it with electricity</b>
Note	<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>		
3	If you have any drugs available at the moment in the CHC, please note them here	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	<b>* select multiple</b>
4	Which of these drugs are stored in freezer or refrigerator?	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	<b>* Select multiple</b>
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	<b>* Select the ones that apply</b>

		<ul style="list-style-type: none"> <li>9. Pneumococcal</li> <li>10. Rotavirus 1</li> <li>11. Rotavirus 2</li> <li>12. IPTi1</li> <li>13. IPTi2</li> <li>14. IPTi3</li> <li>15. IPV</li> <li>16. Yellow Fever</li> <li>17. MCV 1</li> <li>18. MCV 2</li> <li>95. Other</li> <li>98. Refused to answer</li> <li>99. Don't know</li> </ul>	
7	Which of these are stored in refrigeration?	<ul style="list-style-type: none"> <li>1. OPV0</li> <li>2. BCG</li> <li>3. 1st DPT</li> <li>4. 1st OPV</li> <li>5. 2nd DPT</li> <li>6. 2nd OPV</li> <li>7. 3rd DPT</li> <li>8. 3rd OPV</li> <li>9. Pneumococcal</li> <li>10. Rotavirus 1</li> <li>11. Rotavirus 2</li> <li>12. IPTi1</li> <li>13. IPTi2</li> <li>14. IPTi3</li> <li>15. IPV</li> <li>16. Yellow Fever</li> <li>17. MCV 1</li> <li>18. MCV 2</li> <li>95. Other</li> <li>98. Refused to answer</li> <li>99. Don't know</li> </ul>	
8	Which of these are stored in freezers?	<ul style="list-style-type: none"> <li>1. OPV0</li> <li>2. BCG</li> <li>3. 1st DPT</li> <li>4. 1st OPV</li> <li>5. 2nd DPT</li> <li>6. 2nd OPV</li> <li>7. 3rd DPT</li> <li>8. 3rd OPV</li> <li>9. Pneumococcal</li> <li>10. Rotavirus 1</li> <li>11. Rotavirus 2</li> <li>12. IPTi1</li> <li>13. IPTi2</li> </ul>	

		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	
<b>S3</b>	<b>SERVICES / AVAILABILITY</b>		
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	<i>*Closing hours: Facility must be physically closed with no medical</i>

		99. Don't know	<i>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	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</i>

			<i>facility, how much time do they have to wait till they are attended to?</i>
	<b>CATCHMENT AREAS</b>		
	How many catchment communities do you service?	<i>Integer</i>	
	What is the name of one of the communities in the catchment?	<i>Text</i>	
	What is the chiefdom of this community?	<i>Text</i>	
	What is the section of this community?	<i>Text</i>	
	What is the population of this community?	<i>Integer</i>	
<b>S4</b>	<b>ENERGY AVAILABILITY / USAGE</b>		
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?	<i>Integer</i>	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	
<b>S5</b>	<b>SATISFACTION AND HEALTH FACILITY PERFORMANCE</b>		
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)	<i>*select multiple</i>

		<ul style="list-style-type: none"> <li>5. Lack of community mobilization skills</li> <li>6. Poor clinic management</li> <li>7. Deficient equipment and drugs</li> <li>8. Poor infrastructure/building</li> <li>9. Poor staff quarters</li> <li>10. Difficult to reach</li> <li>11. Lack of electricity</li> <li>12. Lack of clean water</li> <li>13. Illegal practitioners</li> <li>14. Late or no payments of personnel</li> <li>95. Other</li> <li>98. Refuse to answer</li> <li>99. Don't know</li> </ul>	
<b>S6</b>	<b>CONDITION OF BUILDING AND GENERAL OBSERVATIONS</b>		
<i>Note</i>	<i>After you have completed the interview, assess the condition of the building and answer the following questions based on your own observations.</i>		
1	Is the floor swept with no obvious dirt or waste?	<ul style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> <li>95. Other</li> <li>98. Refuse to answer</li> <li>99. Don't know</li> </ul>	<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?	<ul style="list-style-type: none"> <li>1. Mud</li> <li>2. Wood</li> <li>3. Cement or tiles</li> <li>95. Other</li> <li>98. Refuse to answer</li> <li>99. Don't know</li> </ul>	
3	What is the material of the walls?	<ul style="list-style-type: none"> <li>1. Mud brick</li> <li>2. Wood</li> <li>3. Cement</li> <li>95. Other</li> <li>98. Refuse to answer</li> <li>99. Don't know</li> </ul>	

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	

Date	Variable	Question	Choices	Notes
	enum	Select which group of Enumerator you are in		
	district	Select the district you are in		
	chiefdom	Select the chiefdom		
	section	Select the section		
	community	Select the community		
	clinics	Select the chc		
	enum	Select which group of Enumerator you are in		
	district	Select the district you are in		
	note1	<p>The interview with the respondent starts now.</p> <p>Please, make sure the respondent is engaged during the time of the interview and understands the questions properly.</p> <p><i>Remember to use the following legend for "integer" questions:</i>  -98 for "Refuse to answer"  -99 for "Don't know"</p>		Note
	date	Select the day you are conducting this survey		Date
	language	What language are you conducting the interview in?	1. Krio 2. Temne 3. Mende 4. Loko 5. Susu 6. Madingo 7. Fula 8. Kono 9. Kissi 10. Limba	
	inform_consent	READ INFORMED CONSENT		

	consented	Has the respondent consented to participate in the interview?	0. No 1. Yes	
	<b>RESPONDENT INFO</b>			
	resp1	Who is the respondent?	1. CHO (Community Health Officer) 2. Head Nurse 3. Midwife 4. MCHA (Maternal Child Health Aid) 5. SECHN (State Enrolled Community Health Nurse) 95. Other 96. No one else	
	resp1_oth	If other, specify		Text
	f_name	What is the CHO's first name		Text
	m_name	What is the CHO's middle name		Text
	l_name	What is the CHO's last name		Text
	phone	What is the best phone number to contact the CHO at?		Integer
	check	Enumerator, you selected that we are surveying a CHO at \${community}, is this correct?	0. No 1. Yes	
	community_id_check	Please enter the community code this CHC		Integer
	clininc_name	Please enter the name of the CHC		Text
	<b>ALL REGISTERS BY MONTH</b>			
	num_	How many months are we looking at?	.<14 and .>16	This will only allow you to select 15
	<b>PATIENT VISITS 2016/2017</b>			<b>Note: This is the structure for every year that data is collected for</b>
	note_c1	Now I will ask you questions related to		Note

		your records. Please refer to the relevant record while answering these questions. Include all the catchment areas that you service in these counts.		
	month	Enumerator, what month are we looking at? Remember, we have January, February, March, April, May, June, July, August, September, October, November, and December. We need to do all of these for the specific year that it is asking for. This is to help keep you in order. Please select the month that the following registers will follow under.	<ol style="list-style-type: none"> <li>1. January 2016/17</li> <li>2. February 2016/17</li> <li>3. March 2016/17</li> <li>4. April 2016/17</li> <li>5. May 2016/17</li> <li>6. June 2016/17</li> <li>7. July 2016/17</li> <li>8. August 2016/17</li> <li>9. September 2016/17</li> <li>10. October 2016/17</li> <li>11. November 2016/17</li> <li>12. December 2016/17</li> <li>13. December 2019</li> <li>14. January 2021</li> <li>15. February 2021</li> </ol>	
	month1	List what month we are looking at		Text
	a0	Does your facility have : <b>Above 5 Treatment Register?</b>	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol>	
	<b>ABOVE 5 TREATMENT REGISTER</b>			
	a1	Look back in your records for $\{month1\}$ in <b>2016</b> . How many people in total have visited your facility?		Integer
	a2	How many of these are NEW cases (above 18 years)?		Integer
	a3	How many of these new cases are MALE?		Integer
	a4	How many of these are FOLLOW-UP		Integer

		cases (above 18 years)?		
	a5	How many of these follow-up cases are MALE?		Integer
	a6	How many of these are NEW cases (under 18 years)?		Integer
	a7	How many of these new cases are MALE?		Integer
	a8	How many of these are FOLLOW-UP cases (under 18 years)?		Integer
	a9	How many of these follow-up cases are MALE?		Integer
	a10	In $\{month1\}$ of 2016 many patients come in with at least 3 of these symptoms at the same time such as Fever Fatigue Dry coughing Runny nose Nasal and throat congestion Difficulty breathing Sore throat Diarrhea Loss of smell and taste Body aches (muscle or joint pain) Dizziness Headaches Wet cough (mucus production)		Integer
	a11	How many patients came in with malaria, typhoid, or other illnesses in $\{month1\}$ <b>2016</b> ?		Integer
	a12	Now I want you to look at your records from the year 2017. Look back in your		Integer

		records to \${month1} in 2017. How many people in total have visited your facility?		
	a13	How many of these are NEW cases (above 18 years)?		Integer
	a14	How many of these new cases are male?		Integer
	a15	How many of these are FOLLOW-UP cases (above 18 years)?		Integer
	a16	How many of these follow-up cases are male?		Integer
	a17	How many of these are NEW cases (under 18 years)?		Integer
	a18	How many of these new cases are MALE?		Integer
	a19	How many of these are FOLLOW-UP cases (under 18 years)?		Integer
	a20	How many of these follow-up cases are MALE?		Integer
	a21	In \${month1} in 2017 , how many patients come in with at least 3 out of the following symptoms at the same time such as Fever Fatigue Dry coughing Runny nose Nasal and throat congestion Difficulty breathing Sore throat Diarrhea Loss of smell and taste Body aches (muscle or joint pain)		Integer

		Dizziness Headaches Wet cough (mucus production)		
	a22	How many patients came in with malaria, typhoid, or other illnesses in $\{month1\}$ in 2017?		Integer
	b0	Does your facility have an <b>Under 5 treatment register</b> ?	0. No 1. Yes	
	<b>UNDER 5 TREATMENT REGISTER</b>			
	b1	Look back in your records to $\{month1\}$ in 2016. How many children under 5 in total have visited your facility?		Integer
	b2	How many of these are NEW cases?		Integer
	b3	How many of these new cases are MALE?		Integer
	b4	How many of these are FOLLOW-UP cases?		Integer
	b5	How many of these follow-up cases are MALE?		Integer
	b6	In $\{month1\}$ in 2016, how many patients come in with at least 3 of the following symptoms at the same time such as Fever Fatigue Dry coughing Runny nose Nasal and throat congestion Difficulty breathing Sore throat Diarrhea Loss of smell and taste		Integer

		<p>Body aches (muscle or joint pain)</p> <p>Dizziness</p> <p>Headaches</p> <p>Wet cough (mucus production)</p>		
	b7	How many patients came in with malaria, typhoid, or other illnesses in $\{month1\}$ in 2016?		Integer
	b8	Look back in your records to $\{month1\}$ in 2017. How many children under 5 in total have visited your facility?		Integer
	b9	How many of these are NEW cases?		Integer
	b10	How many of these new cases are male?		Integer
	b11	How many of these are FOLLOW-UP cases?		Integer
	b12	How many of these follow-up cases are male?		Integer
	b13	<p>In <math>\{month1\}</math> in 2017, how many patients come in with at least 3 of the following symptoms at the same time such as</p> <p>Fever</p> <p>Fatigue</p> <p>Dry coughing</p> <p>Runny nose</p> <p>Nasal and throat congestion</p> <p>Difficulty breathing</p> <p>Sore throat</p> <p>Diarrhea</p> <p>Loss of smell and taste</p> <p>Body aches (muscle or joint pain)</p> <p>Dizziness</p> <p>Headaches</p>		Integer

		Wet cough (mucus production)		
	b14	How many patients came in with malaria, typhoid, or other illnesses in \${month1} in 2017?		Integer
	<b>UNDER 2 EPI REGISTER</b>			
	note_c2	<i>Now I will ask you about the vaccines that are administered in this CHC and the Under 2 EPI register.</i>		Note
	c1	In \${month1} in 2016, how many vaccinations in total did this CHC administer?		Integer
	c2	In \${month1} in 2016, how many Pentavalent vaccinations did this CHC administer?		Integer
	c3	In \${month1} in 2016, how many BCG vaccinations did this CHC administer?		Integer
	c4	In \${month1} in 2016 how many ROTA vaccinations does this CHC administer?		Integer
	c5	In \${month1} in 2017, how many vaccinations in total did this CHC administer?		Integer
	c6	In \${month1} in 2017, how many Pentavalent vaccinations did this CHC administer?		Integer
	c7	In \${month1} in 2017, how many BCG vaccinations did this CHC administer?		Integer

	c8	In $\{\text{month1}\}$ in 2017, how many ROTA vaccinations does this CHC administer?		Integer
	c9	Does your facility have an <b>Under 2-EPI register</b> ?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
	c10	In $\{\text{month1}\}$ in 2016, how many infants were brought to your facility to get vaccinations?		Integer
	c11	How many of these infants were male?		Integer
	c12	Did your facility conduct any outreach programs in the community for vaccinations in July 2016?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
	c13	How many total infants did you vaccinate during this outreach?		Integer
	c14	How many of these infants were male (outreach program)?		Integer
	c15	Look back in this record in $\{\text{month1}\}$ in 2017, how many infants in total were brought to your facility to get vaccinations?		Integer
	c16	How many of these infants were male?		Integer
	c17	Did your facility conduct any outreach programs in the community for vaccinations in the months of July 2017?	0. No 1. Yes 98. Refuse to answer 99. Don't know	
	c18	How many total infants did you vaccinate during this outreach?		Integer

	c19	How many of these infants were male (outreach program)?		Integer
	<b>FAMILY PLANNING REGISTER</b>			
	d1	Does your facility have a <b>Family Planning register</b> ?	0. No 1. Yes	
	d2	Look back into this record in \${month1} in 2016, how many patients in total did your facility receive for family planning services?		Integer
	d3	How many of these clients in the \${month1} in 2016 were NEW patients?		Integer
	d4	How many of these clients in \${month1} in 2016 were FEMALE clients?		Integer
	d5	What was the age of the youngest FEMALE new client in \${month1} in 2016?		Integer
	d6	What was the age of the oldest FEMALE new client in \${month1} in 2016?		Integer
	d7	What were the three main services availed by these patients in \${month1} in 2016?	1. Combined Oral Contraceptive 2. Progestin only orals 3. Injectibles 4. Copper-T IUDs 5. Implants 6. Condoms 95. Other	
	d8	Now I want you to look at the records from last year. Look back into this record to \${month1} in 2017, how many patients in total did your facility receive		Integer

		for family planning services?		
	d9	How many of these clients in \${month1} in 2017 were NEW patients?		Integer
	d10	How many of these clients in \${month1} in 2017 were FEMALE patients?		Integer
	d11	What was the age of the youngest FEMALE NEW patient in \${month1} in 2017?		Integer
	d12	What was the age of the oldest FEMALE new patient in \${month1} in 2017?		Integer
	d13	What were the three main services availed by these patients in \${month1} in 2017?	<ol style="list-style-type: none"> <li>1. Combined Oral Contraceptive</li> <li>2. Progestin only orals</li> <li>3. Injectibles</li> <li>4. Copper-T IUDs</li> <li>5. Implants</li> <li>6. Condoms</li> <li>95. Other</li> </ol>	
	e0	Does your facility have a <b>Mother and Neonate register</b> ?	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol>	
	<b>MOTHER AND NEONATE REGISTER</b>			
	e1	Look back in this record to \${month1} in 2016, how many mothers gave birth at your facility?		Integer
	e2	Did any mothers die during childbirth at your facility in \${month1} in 2016?	<ol style="list-style-type: none"> <li>0. No</li> <li>2. Yes</li> <li>98. Refuse to answer</li> <li>99. Don't know</li> </ol>	
	e3	How many mothers died during childbirth at your facility in \${month1} in 2016?		Integer
	e4	Did any newborns die during or after delivery at your	<ol style="list-style-type: none"> <li>0. No</li> <li>2. Yes</li> <li>98. Refuse to answer</li> </ol>	

		facility in \${month1} in 2016?	99. Don't know	
	e5	How many newborns died during or after delivery at your facility in \${month1} in 2016?		Integer
	e6	Were there any stillbirths in your facility in \${month1} in 2016?	0. No 2. Yes 98. Refuse to answer 99. Don't know	
	e7	How many babies were stillborn in you facility in \${month1} in 2016?		Integer
	e8	How many pregnant women visited your facility seeking ante- natal care in \${month1} in 2016?		Integer
	e9	How many new mothers visited your facility in \${month1} in 2016 to get vaccinations and marklates for their babies?		Integer
	e10	How many new mothers visited your facility seeking post- natal care for their babies in \${month1} in 2016?		Integer
	e11	Did your facility conduct any outreach programs for maternal care (antenatal and/or postnatal care) in \${month1} in 2016?	0. No 2. Yes 98. Refuse to answer 99. Don't know	
	e12	Look back in this record to \${month1} in 2017, how many mothers gave birth at your facility?		Integer
	e13	Did any mothers die during childbirth at your facility in \${month1} in 2017?	0. No 2. Yes 98. Refuse to answer 99. Don't know	

	e14	How many mothers died during childbirth at your facility in \${month1} in 2017?		Integer
	e15	Did any newborns die during or after delivery at your facility in \${month1} in 2017?	0. No 2. Yes 98. Refuse to answer 99. Don't know	
	e16	How many newborns died during or after delivery at your facility in \${month1} in 2017?		Integer
	e17	Were there any stillbirths in your facility in \${month1} in 2017?	0. No 2. Yes 98. Refuse to answer 99. Don't know	
	e18	How many babies were stillborn in you facility in \${month1} in 2017?		Integer
	e19	How many pregnant women visited your facility seeking ante-natal care in \${month1} in 2017?		Integer
	e20	How many new mothers visited your facility in \${month1} in 2017 to get vaccinations and marklates for their babies?		Integer
	e21	How many new mothers visited your facility seeking post-natal care for their babies in \${month1} in 2017?		Integer
	e22	Did your facility conduct any outreach programs for maternal care (antenatal and/or postnatal care) in \${month1} in 2017?	0. No 2. Yes 98. Refuse to answer 99. Don't know	
	<b>OTHER RECORDS</b>			

	f1	<p> <math>\{month1\}</math> in 2016, have you had any mortalities in your community and communities in your catchment areas? </p>	<p> 0. No  2. Yes  98. Refuse to answer  99. Don't know </p>	
	f2	<p> How many people died in your community and communities in your catchment areas in <math>\{month1\}</math> in 2016? </p>		Integer
	f3	<p> How many of these people who died in <math>\{month1\}</math> in 2016 were FEMALE? </p>		Integer
	f4	<p> In <math>\{month1\}</math> in 2017, have you had any mortalities in your community and communities in your catchment areas? </p>	<p> 0. No  2. Yes  98. Refuse to answer  99. Don't know </p>	
	f5	<p> How many people died in your community and community in your catchment areas in <math>\{month1\}</math> in 2017? </p>		Integer
	f6	<p> How many of these people who died in <math>\{month1\}</math> in 2017 were FEMALE? </p>		Integer
<b>FINAL NOTES</b>				
	double_check	<p> This is VERY important enumerator. Did you do all of the months IN ORDER? This means, did you go January, February, March, April, May, June, July, August, September, October, November and December in this order? </p>	<p> 0. No  1. Yes </p>	
	note_end	<p> This is the end of the survey. Please write anything you would like to share with the </p>		Note

		research team about this survey.		
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# 3 FACTORS TO HELP YOU MAKE SAFER CHOICES

WHEN YOU'RE IN AN AREA OF  
WIDESPREAD COVID-19 TRANSMISSION

## LOCATION



Open air spaces safer than enclosed spaces

## PROXIMITY



Farther away from others safer than close together

## TIME



Shorter time periods with others are safer

REMEMBER, IT'S ALWAYS SAFER TO:



KNOW YOUR RISK.  
LOWER YOUR RISK.



World Health  
Organization

# HOW TO WEAR A NON-MEDICAL FABRIC MASK SAFELY

[who.int/epi-win](https://www.who.int/epi-win)

## Do's →



Clean your hands before touching the mask



Inspect the mask for damage or if dirty



Adjust the mask to your face without leaving gaps on the sides



Cover your mouth, nose, and chin



Avoid touching the mask



Clean your hands before removing the mask



Remove the mask by the straps behind the ears or head



Pull the mask away from your face



Store the mask in a clean plastic, resealable bag if it is not dirty or wet and you plan to re-use it



Remove the mask by the straps when taking it out of the bag



Wash the mask in soap or detergent, preferably with hot water, at least once a day



Clean your hands after removing the mask

## Don'ts →



Do not use a mask that looks damaged



Do not wear a loose mask



Do not wear the mask under the nose



Do not remove the mask where there are people within 1 metre



Do not use a mask that is difficult to breathe through



Do not wear a dirty or wet mask



Do not share your mask with others

A fabric mask can protect others around you. To protect yourself and prevent the spread of COVID-19, remember to keep at least 1 metre distance from others, clean your hands frequently and thoroughly, and avoid touching your face and mask.



World Health Organization

## Annex K: Knowledge Management Plan

A priority of this Impact Evaluation 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 the impact evaluation 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, the impact evaluation team aims to provide evidence to 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 the impact evaluation team value the independent quality assurance and global profile that comes with publishing our findings in peer-reviewed journal articles, also understand that this alone will not be the most effective way to engage with our primary stakeholders in Sierra Leone. The impact Evaluation team will repackage evidence gathered through the impact evaluation project 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

## Annex L: Staffing and Project Management

**Team Leader (Key Personnel)** will oversee the development and finalization of data collection tools and evaluation design, provide guidance to all personnel on research methodology and implementation, including training of enumerators, and analyse and report data to contribute to the evidence base for off-grid rural electrification projects and public-private partnership models in rural renewable energy provision. The **Team Leader** will also participate in discussions organised by UNOPS regarding the impact evaluation and econometric analysis. They will be in Sierra Leone for project inception and periodically throughout fieldwork.

**Research Coordinator (Key Personnel)** will support the development and finalization of data collection tools and evaluation design, coordinate and implement research methodology, analyse all data, and contribute to report writing, development of infographics, and liaising with the UNOPS M&E specialist to ensure the Impact Evaluation team is aware of findings from activities being handled internally by UNOPS (Remote Sensing/Satellite Imagery, etc.) to inform survey design for endline data collection. They will be in Sierra Leone for project inception and periodically throughout fieldwork.

**Co-Principal Investigator** will feed into all research design and the development of methodology and data collection tools. They will bring expertise surrounding local context for the interpretation of data results and report writing, and facilitate building the evidence base for maximum policy impact. The **Co-Principal Investigator** will be based full-time in Sierra Leone, and will liaise with stakeholders (e.g., GoSL, UNOPS, DFID, Inensus), and between Key Personnel and field teams.

**Data Manager** will work part-time for the duration of data collection periods to perform high-frequency data checks at regular intervals to ensure compliance with quality standards in real time, and facilitate the timely resolution of any possible issues. They are also responsible for data cleaning. This role will enable the **Data Analyst** to begin immediate data review and initiation of findings and reporting upon completion of data collection. They will be based in the United States.

**Data Analyst** will analyse all baseline, mid-term, and endline data, and support the report writing process. The **Data Analyst** will be responsible for the development of infographics at each data collection stage (in consultation with the evaluation's senior experts), for UNOPS to disseminate via social media channels. They will work full time during the data analysis and report writing period, and one-third of the report review/finalization period for each phase. They will be based in the United States.

**Research Associate** is based full-time in the field during data collection periods. They liaise between senior staff and field staff to facilitate the flow of information in real time among all personnel. This position is instrumental to ensure compliance of field activities with research design, and to provide technical feedback from field operations. They will assist in initial training of **Field Coordinators** and **Enumerators** and supervise subsequent performance during data collection. They will support report writing and data analysis from Freetown after each phase of data collection.

**Qualitative Researcher** will conduct KIIs and FGDs during data collection periods to supplement quantitative survey data. They will conduct interviews with all levels of government authorities at relevant bodies, concentrating on issues related to household gender dynamics. The **Qualitative Researcher** will contribute to analysis and report writing. They will work part-time, and be based in the field during data collection periods, and in Freetown during analysis and report writing.

**Field Manager** supervises all logistics and operational requirements, and will split their time between Freetown and the field during data collection periods, with additional time built in for preparation and closeout of field operations. Responsibilities include coordinating training and meeting venues, transportation and fueling, distribution of per diems, addressing any human resource requirements, and tracking field expenditures.

**Field Coordinators** supervise teams of **Enumerators**, and are responsible for coordinating with the **Research Associate** to ensure timely data upload to the **Data Manager**, and quality control of collected data. They will also liaise with the **Field Manager** for personnel and logistics requirements. Four (4) **Field Coordinators** will each supervise a team of ten (10) **Enumerators**. They will be based full-time in the field during data collection periods.

**Enumerators** (40 total, composition 30% female) are responsible for all primary data collection. They will use tablets to administer surveys for electronic data collection, after undergoing rigorous training. Ongoing supervision to ensure quality data collection will be provided by the **Field Coordinators** and the **Research Associate**. The **Enumerators** will be based full-time in the field during data collection periods.



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

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13<sup>th</sup> May, 2020

<b>To: Dr Niccolo Meriggi</b> Development Economics Department Wageningen University The Netherlands niccolo.meriggi@igic.org	<b>Principal Investigator</b>
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<b>Laura Langbeen</b> Dreijenplein 6B - 32 6703 HB Wageningen The Netherlands laura.langbeen@gmail.com	<b>Data Analyst</b>

**Study Title: Impact Evaluation of the Rural Renewable Energy Project**

**Version: 07 May 2020**

For further enquiries please contact: [efoday@health.gov.sl](mailto:efoday@health.gov.sl)



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**Office of the Sierra Leone Ethics and Scientific Review Committee**  
**Directorate of Training and Research**  
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**Ministry of Health and Sanitation**

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**Collaborating Institutions:**

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

**Submission Type:** Requests for second amendment and extension for study version 08 May 2019, first approved 14 May, 2019

**Committee Action:** Expedited Review

**Documents Reviewed:**

- Cover letter dated 6<sup>th</sup> May 2020
- Progress Report for Impact Evaluation of RREP dated 10<sup>th</sup> February, 2020
- Study Proposal
- Informed Consent leaflet

**Approval Date:** 13 May, 2020

The Sierra Leone Ethics and Scientific Review Committee (SLESRC) having conducted an expedited review of the above amended 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, **13 May, 2020 – 12 May, 2021.** 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](mailto:efoday@health.gov.sl)



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**Ministry of Health and Sanitation**

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**Review Comments:**

- **Amendments:** Intended changes to the approved amended 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.
- ***Requests for amendments and extension of study period approved***

Professor Hector G. Morgan  
**Chair**



For further enquiries please contact: [efoday@health.gov.sl](mailto:efoday@health.gov.sl)



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

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11<sup>th</sup> February, 2021

**To: Dr Niccolò Meriggi**  
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**Principal Investigator**

**Study Title: Impact Evaluation of the Rural Renewable Energy Project**

**Version:** 18 January, 2021

**Submission Type:** Requests for:

1. Third amendments to protocol version 07 May 2020-  
vide
  - a) School characteristics
  - b) COVID-19 additions
  - c) Number of students
  - d) Number of teachers
  - e) Exams
2. Addition of Vasudha Ramakrishna and Joseph Levine  
as Research Associates for the study

**Documents Reviewed:**

- Cover letter of 18 January 2021
- Amended data collection tool
- CVs of Research Associates

**Review Comment:** Amendments to the study and addition of research  
associates are approved

  
Professor Hector G. Morgan  
Chair

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## Annex N – Monetizing Outcomes

### *Methodology:*

There exist many ways of estimating value for money in poverty reduction interventions. For interventions targeting particular fields or groups of people, one of the most used ways of estimating value for money is the cost per standard deviation increase in certain key indicators. For instance, in programs targeting education learning outcomes, it is common to assess its monetary equivalent value as the cost of one additional standard deviation of test scores (e.g. maths or English). However, in large scale interventions where goals and target outcomes are several and covering different poverty elements (income, education, health, etc), this way of evaluating value for money on educational outcomes will not produce great results compared to more targeted programs, which aim at improve a very particular element of the education system. Furthermore, this method does not assign a monetary equivalent to the gains or losses from an intervention. Instead it just allows comparison of costs between different programs by setting a homogeneous bar (cost of 1 SD increase in a given indicator).

Another way of calculating the value for money, more centred to the field of education, is to assign monetary value to additional schooling years enabled by the implementation of a program. It is well known in the education literature that additional years of education are associated with higher lifetime earnings (Card, 1999). 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. In the absence of work experience, he proposes using potential experience. In virtue of its simplicity and international acceptance, we will use this framework to support our monetarization of education outcomes.

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. Returns to education in Ghana have been estimated by Jones (2001) using 1992-1994 data from workers' wage and years of schooling. The estimated return to education, measured as the increase in annual earnings per extra year of education, is 7.1 points. For the Sub-Saharan Africa, the returns to education were estimated in 7.3 points (Psacharopoulos & Patrinos, 2004). In order to present a more comprehensive evaluation of the monetary value of education gains in RREP communities, we will display the results using three different rates of return: 5%, 7.1% and 10%.

### *Assumptions:*

Converting program indicators into monetary equivalent requires from strong assumptions. These assumptions are not free of critique and the evaluation team is willing to work together with UNOPS M&E to decide which is the best way to set them. Over the next lines, we explain and detail the assumptions that have been considered in this report:

- **Average Annual Earnings:** In order to give a monetary value to returns to education, we need to determine the average annual earning of a typical Sierra Leonian citizen. This is a challenging task, as proven by the baseline report, as most of our sample is rural and their main occupation agriculture. For simplicity and generalization sake, we will assume that education increases the probabilities of employment by an organization or business. The mean salary of an individual employed by an organization in our sample is 860,000 SLL/month. Our first assumption will then be that the *Average Annual Earning of a Sierra Leonian is 10,320,000 SL/year.*

- **Rate of return:** as explained above there is not reliable study that estimates the returns to education in a Sierra Leonian context. The most recent study in a country within the same region is (Jones, 2001), in Ghana. This might or might not be the same case in Sierra Leone. We present the reader with three different choices of returns so that one can experiment with different rate of returns should there be a more appropriate one.
- **Employment sector:** this assumption has been partly explained under the Average Annual Earning assumption. Calculating average annual earnings of farmers is a complicated and unreliable task. Additionally, disaggregating returns to education by employment sector is both complicated and inadequate due to the fact that education is a strong determinant of type of future employment. It is for these reasons that we have decided to use average annual earnings of individuals employed by an organization.
- **Constant return to years of education:** we assume that an extra year of education gives the same returns independently of which year in the education cycle it corresponds to. Hence, one extra year of primary education yield the same benefits than one extra year of secondary education. Once information from school records is collected, results will be presented disaggregated by education level (primary, secondary)
- **Enrolment:** in our report, we differentiate between enrolment and attendance rates. In order to show aggregate monetary equivalents of education outcomes, we consider that a child not enrolled in school is losing a full year of education.
- **Attendance:** full attendance is considered to be 40 weeks per year (or 200 schooling days). We also simplify our results in attendance rate to make calculations easier. For example, we report in the baseline study that 88.1% of the sample does not miss a single day of school. We treat the other 11.9% as missing at least one schooling day. Our results will then be considered as a lower bound estimation since we are treating children missing more than one day a week as missing *only* one day. Differences in annual earnings for individuals missing *more* than one day of school compared to full attenders will be even larger.
- **Private versus social returns:** a note rather than assumption. We are using *private* returns to education in this analysis. This means that we are only taking into account private gains from extra years of schooling. However, better education is also associated with other benefits (social returns) caused by positive externalities of education. One could argue that our estimates of the benefits of education are (again) a lower bound, because it does not include these positive social returns to education (e.g. more educated individuals tend to be more enterprising, therefore could bring more business and economic value to the community)

#### *Results:*

The evaluator cannot make definite inferences about the monetary implications of the program until midline or endline data has been collected. Thus, we limit this analysis to set out the methodology for monetization of education outcomes and give examples of how it would work in practice.

Below we present an example of how this method and assumptions will produce an estimation of the monetary equivalent of different indicators collected in the study. For this example, we use a rate of return of 7.1% and an average salary of 860,000 SLL/month.

Baseline data shows that the average *enrolment rate* of children in study communities is 89%. This means that 11% of children aged 6-18, living in the households participating in the study, are not attending school at all. Under the above assumptions, these children will see their earnings reduced by 732,720 SLL every year of not attending school compared to someone that has attended school.

Using the data collected on *attendance*, the baseline report shows that 88.1% of the children enrolled in school did not miss a single day of school in the past week. Therefore, 11.9% of the children in our sample missed at least one day of school in the past week. Annually, this means 40 days of school

missed (one fifth of the schooling year). These children will see their average annual earning reduced by 146,544 SLL/year.

Once midline and endline data and school records are collected, we will be able to compare enrolment, attendance and test scores for control and treatment samples. Using the same strategy and assumptions described above, we will estimate the monetary equivalent to our education indicators. Based on these differences in the selected indicators, we will calculate monetary equivalents between control and treatment samples. These monetary equivalents will then be considered the monetary gains from electricity attributed to better quality of education.

Indicator	Assumption: Rate of Return	Assumption: Mean Salary	Annual Income Increase
Attendance	5%	10,320,000 SLL/year	
		20,000,000 SLL/year	
		40,000,000 SLL/ year	
	7.1%	10,320,000 SLL/year	
		20,000,000 SLL/year	
		40,000,000 SLL/ year	
	10%	10,320,000 SLL/year	
		20,000,000 SLL/year	
		40,000,000 SLL/ year	
Enrolment	5%	10,320,000 SLL/year	
		20,000,000 SLL/year	
		40,000,000 SLL/ year	
	7.1%	10,320,000 SLL/year	
		20,000,000 SLL/year	
		40,000,000 SLL/ year	
	10%	10,320,000 SLL/year	
		20,000,000 SLL/year	
		40,000,000 SLL/ year	
Test scores	5%	10,320,000 SLL/year	TBD
		20,000,000 SLL/year	TBD
		40,000,000 SLL/ year	TBD
	7.1%	10,320,000 SLL/year	TBD
		20,000,000 SLL/year	TBD
		40,000,000 SLL/ year	TBD
	10%	10,320,000 SLL/year	TBD

		20,000,000 SLL/year	TBD
		40,000,000 SLL/ year	TBD

### References

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

Glewwe, P. (1996). The relevance of standard estimates of rates of return to schooling for educational policy: A critical assessment. *Journal of Development Economics*, 267-290.

Jones, P. (2001). Are educated workers really more productive? *Journal of Development Economics*, 67-79.

Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to Investment in Education: A Further Update. *Education Economics*.

## 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 (i.e. during the baseline survey) except that one was randomly allocated to receive the RREP intervention and one does not. Through follow up, it would then be possible to measure key indicators in both types of villages. If at different rounds of data collection we observe, for instance, that welfare indicators were different in the two types of villages, it would be possible to 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 benefitting from RREP have a Community Health Centre (CHC) and at least one governmental or governmental-assisted school. Therefore, it is important to pay careful attention to the way that “comparison villages” are selected. By carefully selecting comparison villages, *and* assessing changes over time, it is possible to create a credible counterfactual and minimize bias in comparisons.

To make causal claims about the impact of the RREP, the Impact Evaluation Team will rely on a Difference-in-Difference comparison. This accounts for all time invariant differences between intervention and control villages. In addition to improve on accuracy of estimates, the Impact Evaluation Team selects control villages based on a matching algorithm. The matching procedure is executed as follows:

First, possible control locations were restricted to villages that contain a Community Health Centre (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, the Impact Evaluation Team constructed a dataset by merging census data to all villages with a CHC or similar type of Peripheral Health Unit (considered as universe of cases). This dataset contains variables that can potentially explain (i.e. 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 centre
- Percent respondents within one mile of water source

Third, a probit model was estimated. In this probit model 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, it was possible to estimate the degree to which a given variable predicts that a community was assigned to the RREP program. These estimated coefficients were multiplied by the values of each corresponding variable to create a "propensity score" for each community.

Fourth, communities that received the RREP program were matched 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, the effectiveness of the matching procedure was verified by looking at a balance table comparing how similar treatment and control villages across all variables.

See workplan for tentative field plan listing all communities that will be visited for WP1 midline.

b. Sampling of households

The midline is implemented in 108 communities across Sierra Leone.

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

Below we discuss the *sampling protocol* for each.

We expect data collection to take three days per community. A typical field visit consists of these steps:

- Day 1
  - o Arrival to the community and introduction to the Town Chief
  - o Conduct Town Chief Survey<sup>1</sup> on tablets.
- Day 2 and Day 3
  - o Do informed consent household survey, all three enumerators
  - o Do informed consent clinic survey, one enumerator
  - o Do informed consent school survey, one enumerator
  - o Do completion survey, one enumerator

#### **i. Town chief survey**

The town chief survey is the first thing we have to do when arriving to a community. We will meet with the Town Chief and introduce ourselves, the project and the purpose of our visit. The tab will ask us to introduce the number of zones or subdivisions of the community, and will select some at random (if applicable).

#### **ii. Household Survey**

The household survey respondents will be randomly selected by the research team based on the data collected at baseline. Team will have a list with the 30 selected households ready by Day 2. You will receive this list in the morning of Day 2 and will start surveying. You will be able to identify households with the identifying code that you gave them during at baseline and by the head of the household name.

When you start the household survey, you should inform the respondent that in that survey there will be questions about his/her spouse and we should get that person with us.

Ideal respondent priority list:

- Household Head
- Household In-charge
- First spouse

#### **iii. 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.

#### **iv. 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

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<sup>1</sup> Town Chief survey contains information about the number of members of the community and number of areas or subdivisions.

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 center 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.

**v. 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 with all the tasks to be carried on during the visit. It will also ask you to record GPS location of CHC, schools and mini-grids and take a picture of the mini-grid.

### 1.1 Estimation Strategy and Model

Once data have been collected for each of the stages of the project, the consultant will analyse the impact of the project. As noted above, our estimation strategy includes both matching and a Difference in Difference comparison. The central logic of our estimation is that we match households in towns that received RREP to households in towns that did not, and then compare outcomes in matched households change over time.

After collecting endline data, we use a regression model to assess the effects of the RREP intervention. Specifically, we estimate:

$$Y_{ijt} = \mu + \tau T_{jt} + Y_{ijt-1} + \varepsilon_{ijt}$$

Where,  $Y_{ijt}$  is the outcome of household  $i$ , in village  $j$ , at time  $t$ , the endline survey round (defined above in 1.4),  $Y_{ijt-1}$  is the outcome of household  $i$ , in village  $j$ , at baseline,  $\tau T_j$  is a binary indicator if community  $j$  was allocated to receive a mini-grid, is a  $\varepsilon_{ijt}$  = idiosyncratic error term, clustered at the village level  $j$ . The regression includes matching weights.

To evaluate CHC and school level outcomes we estimate,

$$Y_{jt} = \mu + \tau T_{jt} + Y_{jt-1} + \varepsilon_{jt}$$

Where,  $Y_{jt}$  is the outcome per CHC/School in community  $j$ , at time  $t$ , the endline survey round (defined above in 1.4b),  $Y_{jt-1}$  is the outcome at baseline,  $\tau T_j$  is a binary indicator if community  $j$  was allocated to receive a mini-grid, is a  $\varepsilon_{jt}$  = idiosyncratic error term. The regression includes matching weights.

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

## 1.2 Sample Frame and Design

Method of sampling for the *quantitative analysis* is explained in **Section 1.4. a. Identification Strategy**. In particular, the consultant will use the 97 communities that has a mini-grid installed and will select 97 communities without a mini grid to serve as comparison group. Once communities are selected, households within each community will also be selected based on a range of different characteristics agreed upon in advance.

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 household interviewed. Once we come back in the future, we will be able to find 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.

Find the *Power Calculations* in the *shared in previous submission*, where we estimate the ideal sample size needed for this impact evaluation in order to obtain meaningful and interpretable results. In particular, the *Power Calculations* estimate that at least 180 communities are needed to be able to accurately detect effects of the intervention. In this case, we need to select 97 comparison communities, one per treatment community. At a lower unit, we estimate that a sample of at least 15 households per community are needed.

For the *qualitative analysis* that was previously conducted for WP1 baseline, 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. When the midline for WP1 is conducted, roughly the same number of KIIs will be taken. 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.

Key Informant Interviews	
Ministry and Operators	Quantity of KIIs
Head of Renewable Energy and Energy Efficiency	1
Monitoring and Evaluation (M&E) Manager of the Ministry of Energy	1
Winch Energy	1

PowerGen	1
Energyciti (PowerLeone)	1
School Principals	4
Community Health Center	4
Total KIIs	13

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.

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. Similar to the KII quantity for the WP1 midline, roughly the same amount will be conducted as seen for WP1 baseline. 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.

Focus Group Discussions		
Ministry and Operators	Quantity of FGDs	Number of People Involved

Town Chief	1	8
Mammy Queen	1	9
Youth Leader, Business owners, users of Medical Facilities	1	8
Community Elders, Traditional Authorities (Including Pastors or Imams)	1	8
Total FGDs and Respondents	4	33

Date	Variable	Question	Choices	Notes
2019-11-03	enum_name	Enumerator Name		
2019-11-03	district	Select the district you are in		
	dist_check	You selected \${district}, is that correct?	0. No 1. Yes	
2019-11-03	chiefdom	Select the chiefdom you are in		
	chief_check	You selected \${chiefdom}, is that correct?	0. No 1. Yes	
2019-11-03	community	Select the community you are in		
	comm_check	You selected \${community}, is that correct?	0. No 1. Yes	
2019-11-03	schls	Select the school you are at		
2019-11-03	gov	Is this school funded AT ALL by the government?	0. No 1. Yes	
		<b>GENERAL INFO</b>		
2019-11-03	schl_other	What is the name of the GOVERNMENT or GOVERNMENT-ASSISTED school?		
2019-11-03	day	What is the date today?		Date
2019-11-03	resp	Who is the respondent?	1. Principal 2. Head teacher 95. Other	
2019-11-03	resp_other	Specify other:		Text
	f_name	What is the first name of the respondent?		Text
	m_name	What is the middle name of the respondent?		Text
	l_name	What is the last name of the respondent?		Text
	n_name	What is the nickname of the respondent?		Text
	gender	What is the gender of the respondent?	0. Female 1. Male	
	age	What is the age of the respondent?		Integer
	resp_phone	What is the phone number of the respondent?		Integer
	resp_phone_oth	What is an alternate phone number for the respondent?		Integer
2019-11-03	inform_consent	Read informed consent		Note

2019-11-03	consented	Has the respondent consented to participate in the interview?	0. No 1. Yes	
		<b>SCHOOL CHARACTERISTICS</b>		
2019-11-03	note_s11	Thank you for providing informed consent. I am now interested in learning more about the student and teacher composition of this school	Note	
2019-11-03	admin	How many different administrations are in this school?	Integer	
2019-11-03	note_s12	Ok, so there are more than one administrations in this school. From now on, please answer the questions I ask in the context of the administration you work for and get help from the other administrators to understand the workings of the entire school.	Note	
2019-11-03	n_attend	How many children attend this school?	Integer	
2019-11-03	n_teach	How many teachers teach in this school before the government closed schools in March?	Integer	
2019-11-03	grades	Select which grades are taught at this school	1. Pre-primary 2. Primary 3. JSS 4. SSS 95. Other	
2019-11-03	grades_other	Specify what other grades?		Text
2019-11-03	n_class	What is the total number of classrooms in this school?	Integer	
2020-07-15		Did your school provide any alternative methods to teach the children while the government closed schools from March 2020 through end of July 2020?	0. No 1. Yes	
2020-07-15		If yes, what alternative methods did you provide?	1. Radio 2. Television Shows 3. Online materials 4. Private teaching 5. Homestudy materials 6. Home learning 7. Phone calls 95. Other	

2020-07-15		If other, specify		Text
2020-07-15		Did you know of any radio, sms or phone call programs about education going on in in the country?	0. No 1. Yes	
2020-07-15		If yes, what type?	1. Radio 2. Television Shows 3. Online materials 4. Private teaching 5. Homestudy materials 6. Home learning 7. Phone calls 95. Other	
2020-07-15		If other, specify		Text
2020-07-15		Did your school tell the students about it?	0. No 1. Yes	
2020-07-15		Were any of your students following these programs?	0. No 1. Yes	
		How many students?		Integer
2020-09-13		How many of the students were boys?		Integer
		Did any of the teachers monitor these programs?	0. No 1. Yes	
		How did they monitor?		Text
		<b>COVID ADDITIONS</b>		
2020-07-15		Now we are going to ask about how the school is coping with the COVID-19 crisis while the students are coming back for their exams.		Note
2020-07-15		Does your school have a veronica bucket that is filled with clean water?	0. No 1. Yes	
2020-07-15		How many do you have?	Integer	
2020-07-15		Is this accessible for the children at any time?	0. No 1. Yes	
2020-07-15		Are the teachers required to wear face masks?	0. No 1. Yes	
2020-07-15		Do the teachers have face masks?	0. No 1. Yes	
2020-07-15		Do they wear the face masks the whole day?	0. No 1. Yes	
2020-07-15		Are the children required to wear face masks?	0. No 1. Yes	
2020-07-15		Does your school have face masks in case the children need one?	0. No 1. Yes	

2020-07-15		Have you decreased the number of students you allow in one classroom?	0. No 1. Yes	
2020-07-15		How many students normally would be in a classroom?	Integer	
2020-07-15		How many students do you now allow to be in a classroom at one time?	Integer	
		<b>SPILLOVER SCHOOLS</b>		
2019-11-03	comm_name	What is the name of one of the communities that come to this school?	Text	
2019-11-03	chi_name	What is the chiefdom of this community?	Text	
2019-11-03	sec_name	What is the section of this community?	Text	
2019-11-03	num_kids	How many children from this community attend this school?	Text	
		<b>NUMBER OF STUDENTS</b>		
2019-11-03	n_boys	The school records say \${n_attend} number of students attend school here.  Of this, how many are boys?	Integer	<i>Enumerator Note: Put '0' if there are none</i>
2019-11-03	n_girls	How many are girls?	Integer	<i>Enumerator Note: the number of boys plus the number of girls must add up to the total number of students attending the school</i>
2019-11-03	n_disability	How many children have a disability?	Integer	<i>Enumerator Note: Disability can be defined as any condition that restricts everyday activities.  For example: - Impairments in vision, hearing, speech, nervous system, limbs. - People with difficulties understanding, talking and communicating, dressing or washing by themselves.</i>
2019-11-03	n_boy_dis	How many children who have a disability are boys?	Integer	<i>Enumerator Note: The number of boys plus the number of girls must add up to the total number of students who have disabilities</i>
2019-11-03	n_girl_dis	How many children who have a disability are girls?	Integer	<i>Enumerator Note: The number of boys plus the number of girls must add up to the total number of students who have disabilities</i>
2020-07-20		Have you had any students not come back since schools have reopened?	0. No 1. Yes	

2020-07-20		If yes, how many children in total have not come back to school this month?	Integer	
2020-07-20		How many of those are boys?	Integer	
2020-07-20		How many of those are girls?	Integer	
2020-07-20		How many children who did not come back have a disability?	Integer	
2020-07-20		How many of the children who have a disability and did not come back are boys?	Integer	
2020-07-20		How many of the children who have a disability and did not come back are girls?	Integer	
		<b>NUMBER OF TEACHERS</b>		
2019-11-03		The school records say $\{n\_teach\}$ number of teachers teach here since before the government closed schools in March.	Integer	
	n_men	Of this, how many are men?		<i>Enumerator Note: Put '0' if there are none</i>
2019-11-03			Integer	<i>Enumerator Note: the number of men plus the number of women must add up to the total number of teachers in the school</i>
	n_women	How many are women?		
2020-07-20		Did any of the teachers not come back when schools reopened for exams?	0. No 1. Yes	
2020-07-20		If yes, how many teachers in total did not come back?	Integer	
2020-07-20		How many are men?	Integer	
2020-07-20		How many are women?	Integer	
		<b>STAFF</b>		
2019-11-03		I am going to ask you now about the number of teachers in each position. How many...		<i>Remember the total number of teachers must match the number of teachers in the previous question</i>
	note_staff			
2019-11-03	full_time	... full-time staff?	Integer	<i>Teachers with pin-code</i>
2019-11-03	stipend	... full-time staff?	Integer	<i>Teachers who get stipend</i>
2019-11-03	work_part	... part-time staff	Integer	<i>Less than 4 hours a day, but still getting paid</i>
2019-11-03	part_time	... volunteer (part-time) staff?	Integer	<i>Less than 4 hours a day</i>
2019-11-03	volunteer	... volunteer (full-time) staff?	Integer	<i>Over 4 hours a day</i>
		<b>ELECTRICITY USAGE</b>		

2019-11-03		Now I want to know a little more about the energy availability and usage at this school.		Note
2019-11-03		Does the school have access to electricity?	0. No 1. Yes	
2019-11-03		What is the main source of electricity at this school?	1. On grid 2. Mini grid solar/UNOPS mini grid 3. Stand-alone solar 4. Generator 5. Other 98. Refuse to answer 99. Don't know	
2019-11-03		Specify other		
2019-11-03		How much does the school spend for electricity per day (source: National Grid)?	Integer	
2019-11-03		How much does the school spend for electricity per day (source: UNOPS Mini-grid)?	Integer	
2019-11-03		How much does the school spend for electricity per day (source: Generator)?	Integer	
2019-11-03		How much does the school spend for electricity per day (source: Stand-Alone Solar Panel)?	Integer	
2019-11-03		How many hours of electricity per day did the school have on an average in the past week (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	
2019-11-03		How many hours of electricity per day did the school have on an average in the past week (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	
2019-11-03		How many hours of electricity per day did the school have on an average in the past week (source: Generator)?	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	
2019-11-03		How many hours of electricity per day did the school have on an average in the past week (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	
2019-11-03		How many days in the past month have there been power cuts in the school?	Integer	<i>Enumerator Note: only from National grid or UNOPS mini-grid</i>
2019-11-03	elec_cuts_long	For how long (in hours)?	Decimal	<i>Enumerator Note: If more than one power cut, refer to the longest one. Answer in hours</i>
2019-11-03	elec_bins1	How much does the school spend for electricity per day (source: National Grid)?	1. 0 to 99,000 2. 100,000 to 499,999 3. 500,000 to 999,999 4. Over 1 million	
2019-11-03	elec_bins2	What was the exact amount?		Integer
2019-11-03	elec_bins3	What was the exact amount?		Integer
2019-11-03	elec_bins4	What was the exact amount?		Integer
2019-11-03	elec_bins5	What was the exact amount?		Integer
		<b>REPEAT FOR WHICHEVER LIGHT SOURCE THE SCHOOL USES.</b>		
2019-11-03	elec_pay	How is the school paying for the electricity connection and/or maintenance?	1. Subsidy from 'Free Education Policy' 2. Community contributions	<i>Enumerator Note: Payments for maintenance and operational costs, not setting new sources up. Keep in mind this is only for the light and not for any school fees.</i>

			3. For free from government or other NGO entities 4. School activities 95. Other 98. Refused to answer 99. Don't know	
2019-11-03	elec_pay_other	Specify other:		
2019-11-03	elec_today	Do you have electricity today?	0. No 1. Yes	<i>Enumerator Note: select "Yes" even if the have had electricity only for a short period of time</i>
2019-11-03	elec_yest	Did you have electricity yesterday?	0. No 1. Yes	<i>Enumerator Note: select "Yes" even if the have had electricity only for a short period of time</i>
2019-11-03	elec_hours_yest	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 6. 15+ 98. Refused to answer 99. Don't know	
2019-11-03	elec_issues	What type of issues do you face with electricity supply?	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	
2019-11-03	elec_issues_other	Specify other		Text
2019-11-03	elec_areas	In which areas of the school do you have electricity? (offices, classrooms, quarters, etc)	1. Principal's office 2. Staff rooms 3. Classrooms 4. Storage room 5. School quarters 6. Canteen	

			<p>7. Laboratory</p> <p>95. Other</p> <p>98. Refuse to answer</p> <p>99. Don't know</p>	
2019-11-03	area_appliance	What appliances does your school have?	<p>1. Light</p> <p>2. Freezer/Refrigerator</p> <p>3. Fan</p> <p>4. Projector</p> <p>5. A/C</p> <p>6. Water cooler/dispenser</p> <p>7. TV</p> <p>8. DVD player</p> <p>9. Laptop</p> <p>10. Computer (desktop)</p> <p>11. Tablets</p> <p>12. Internet connection**</p> <p>95. Other (Other)</p>	
2019-11-03	area_appliance_other	Specify other		Text
2019-11-03	appliance_works	What appliances are working in your school?	<p>1. Light</p> <p>2. Freezer/Refrigerator</p> <p>3. Fan</p> <p>4. Projector</p> <p>5. A/C</p> <p>6. Water cooler/dispenser</p> <p>7. TV</p> <p>8. DVD player</p> <p>9. Laptop</p> <p>10. Computer (desktop)</p> <p>11. Tablets</p> <p>12. Internet connection**</p> <p>95. Other (Other)</p>	
2019-11-03	appliance_buy	What appliances would you like to buy if you had electricity?	<p>1. Light</p> <p>2. Freezer/Refrigerator</p> <p>3. Fan</p> <p>4. Projector</p> <p>5. A/C</p>	<i>DO NOT READ THE RESPONSES</i>

			6. Water cooler/dispenser 7. TV 8. DVD player 9. Laptop 10. Computer (desktop) 11. Tablets 12. Internet connection** 95. Other (Other)	
2019-11-03	appliance_buy_other	Other appliance:		Text
2019-11-03		Thanks for your time and patience. This is the end of the survey. We appreciate your collaboration.		Note
		<b>SCHOOL TIME</b>		
2019-11-03	note_4	Thanks for telling me about the energy sources in the school. I will now ask questions related to the school schedule and shifts.		Note
2019-11-03	n_shifts_prim	How many shifts does the school have for primary?		Integer
2019-11-03	n_shifts_jss	How many shifts does the school have for Junior Secondary?		Integer
2019-11-03	n_shifts_sss	How many shifts does the school have for Senior Secondary?		Integer
		<b>SHIFTS PRIMARY</b>		
2019-11-03	open_time_prim	What time does shift $\${cur\_shift\_prim}$ start for primary?		Time
2019-11-03	end_time_prim	What time does shift $\${cur\_shift\_prim}$ end for primary?		Time
		<b>SHIFTS JSS</b>		
2019-11-03	open_time_jss	What time does shift $\${cur\_shift\_jss}$ start for JSS?		Time
2019-11-03	end_time_jss	What time does shift $\${cur\_shift\_jss}$ end for JSS?		Time
		<b>SHIFTS SSS</b>		
2019-11-03	open_time_sss	What time does shift $\${cur\_shift\_sss}$ start for SSS?		Time
2019-11-03	end_time_sss	What time does shift $\${cur\_shift\_sss}$ end SSS?		Time

		<b>OTHER SHIFT QUESTIONS</b>		
2019-11-03	night_shift	Do you have any shifts at night? (after 18:00 or 6 pm)	0. No 1. Yes	
2019-11-03	why_no_night	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 98. Refuse to answer 99. Don't know	
2019-11-03	why_no_night_other	Other reason:		Text
2019-11-03	night_type	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	
2019-11-03	night_type_other	Specify other		Text
2019-11-03	night_teach	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	
2019-11-03	night_comp	Are the teachers compensated extra for the night shifts?	0. No 1. Yes	
2019-11-03	gen_rev	Does the school do anything to generate revenue?	0. No 1. Yes	
2019-11-03	rev_type	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, sports and arts clubs 95. Other 98. Refuse to answer 99. Don't know	

2019-11-03	rev_type_other	Other activity:		Text
2019-11-03	revs_	From the activities, how much total SLL did the school make?	1. 0 to 99,000 2. 100,000 to 499,999 3. 500,000 to 999,999 4. Over 1 million	
2019-11-03	revs_1	What was the exact amount?		Integer
2019-11-03	revs_2	What was the exact amount?		Integer
2019-11-03	revs_3	What was the exact amount?		Integer
2019-11-03	revs_4	What was the exact amount?		Integer
2019-11-03	closed	How many days did the school remain closed due to "lack of lighting" (on a weekly basis) in the past month?		Integer
2019-11-03	adult_learn	Are adult learning sessions offered at this school?	0. No 1. Yes	
2019-11-03	adult_when	When?	1. Morning time (6am – 12pm) 2. Afternoon time (12pm – 5pm) 3. Evening time (5pm to 8pm) 4. Night time (8pm or later) 95. Other	
2019-11-03	adult_when_other	Other time:		Text
		<b>STUDENT PERFORMANCE</b>		
2019-11-03		Student Performance. Here I will ask you to show and tell us about the school records of the students in this school.		Note
		<b>PRIMARY</b>		
2020-07-20	n_prim_exam2	What is the total number of students that appeared for the public NPSE exams this past year? (school year 2019/2020)	Integer	<i>Enumerator 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 schools</i>
2020-07-20	n_prim_pass2	How many students passed the NPSE exams this past	Integer	<i>Enumerator Note: Get total number from official records</i>

		year? (school year 2019/2020)		
2020-07-20	n_prim_w_pass2	How many students who passed the NPSE exams are female?	Integer	<i>Enumerator Note: Get number from official records</i>
2020-07-20	n_prim_m_pass2	How many students who passed the NPSE exams are male?	Integer	<i>Enumerator Note: Get number from official records</i>
		<b>JSS</b>		
2020-07-20	n_jss_exam2	What is the total number of students that appeared for the public BECE exams this past year? (in 2019/2020)	Integer	<i>Enumerator 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>
2020-07-20	n_jss_pass2	How many students passed the BECE exams this past year? (school year 2019/2020)	Integer	<i>Enumerator Note: Get total number from official records</i>
2020-07-20	n_jss_w_pass2	How many students who passed the BECE exams are female?	Integer	<i>Enumerator Note: Get number from official records</i>
2020-07-20	n_jss_m_pass2	How many students who passed the BECE exams are male?	Integer	<i>Enumerator Note: Get number from official records</i>
		<b>SSS</b>		
2020-07-20	n_sss_exam2	What was the total number of students that appeared for the public WASSCE exams this past year? (in 2019/2020)	Integer	<i>Enumerator 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>
2020-07-20	n_sss_pass2	How many students passed the WASSCE exam this past year? (school year 2019/2020)	Integer	<i>Enumerator Note: Get total number from official records</i>
2020-07-20	n_sss_w_pass2	How many students who passed the WASSCE exams are female?	Integer	<i>Enumerator Note: Get number from official records</i>
2020-07-20	n_sss_m_pass2	How many students who passed the WASSCE exams are male?	Integer	<i>Enumerator Note: Get number from official records</i>