

SAMPLING STRATEGY FOR THE MTF SURVEY IN BURUNDI

SAMPLE SIZE

The MTF survey in Burundi is a multistage survey designed to have a 50:50 ratio between urban and rural areas (first stage) and a 50:50 ratio of (grid) electrified and nonelectrified households (second stage). The sample size was determined using the formula and assumptions listed in table 1.

TABLE 1 • Formula and assumptions in calculating the sample size

$n = \frac{z^2 r(1-r)fk}{e^2} = \frac{z^2 r(1-r)[1 + \rho(m-1)]k}{e^2}$ where:		
Symbol	Value	Description
z	1.96	Z-statistics corresponds to the level of confidence desired. The commonly used level of confidence is 95 percent, for which z is 1.96
r	0.5	Estimate indicator of interest to be measured by the survey (50 percent is most conservative for calculating n)
f	4.85	Sample design effect. It represents how much larger the squared standard error of a two-stage sample is compared with the standard error of a simple random sample of the same size. The sample design effect has been included in the sample size calculation formula and is defined as $f = 1 + \rho(m-1)$.
ρ	0.35	Intraclass correlation coefficient. It is a number that measures the tendency of households within the same primary sampling unit (PSU) to behave alike with regard to the variable of interest.
m	12	The average number of households selected per PSU
k	1.1	Factor accounting for nonresponse (assume 10 percent)
e	5%	The margin of error (5 percent is standard)
n	2,052	Sample size in terms of the number of households to be selected
	342	Number of PSUs required (171 rural and 171 urban)

At a national level, the formula yields a sample size of 2,052 households. However, to meet the urban-rural parity (50-50), we treated the two categories as separate analytical domains and doubled the sample size, bringing the total to 4,104 households. The total number of primary sampling units (PSUs) to be covered was 342.

SAMPLING FRAME

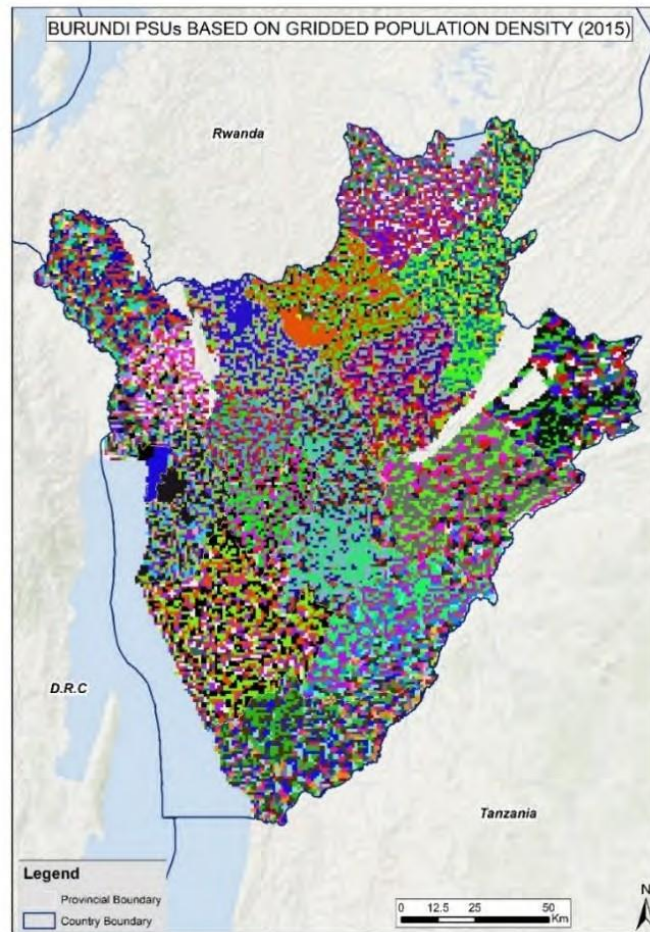
During the inception phase, the initial plan was to utilize the national census sampling frame from l'Institut National de la Statistique du Burundi (ISTEEBU). However, the absence of a recent census (the last one being from 2008) necessitated a more creative approach. To overcome this limitation, a spatial algorithm developed by EED Advisory, the National Autonomous University of Mexico (UNAM), and the Stockholm Environment Institute was used as a sampling frame. This innovative solution allowed us to construct a national sampling frame with PSUs averaging 241 households. While this adaptive methodology enabled us to proceed with the study, it is important to acknowledge the variability in household numbers across these PSUs (table 2).

TABLE 2 • Distribution of households in selected primary sampling units (PSUs)

Number of households	Number of PSUs
Less than 199	149
200–399	177
400–599	9
600–799	6
800–999	3
Above 1,000	1

The process of generating PSUs for Burundi involved the integration of raster and vector data derived from multiple sources. The raster data, sourced from the Socioeconomic Data and Applications Center, utilized the World Gridded Population Density Version 4.11 (CIESIN 2018) (map 1). This comprehensive data set offers a detailed representation of global population distribution. The initial step in this process entailed downloading the aforementioned raster data set, which subsequently served as the basis for subsequent spatial analysis.

MAP 1 • Map showing Burundi primary sampling units based on gridded population density (GPWv4), 2015



PROJECTIONS OF POPULATION

According to the official population projections for Burundi in 2021, the country's population was estimated to be 12,551,213 (World Development Indicators). By assuming an average household size of 4.85, we calculated the number of households to be 2,587,879 (table 3). Population projections derived from the survey data yielded a nationwide total of 2,523,748 households, a difference of 64,131 households compared to the official estimates.

TABLE 3 • Population in Burundi, by source

Source	Population			No of households			Urbanization (%)
	Total	Urban	Rural	Total	Urban	Rural	
World Development Indicators (2015)	10,727,148	1,295,625	9,431,523	2,211,783	267,139	1,944,644	12.1
Sampling Frame 2015 estimate from SEDAC	9,708,726	697,201	9,011,525	2,001,799	143,753	1,858,046	7.2
World Development Indicators (2021)	12,551,213	1,764,450	10,786,763	2,587,879	363,804	2,224,075	14.1
MTF survey (2021)	12,240,178	924,298	11,315,879	2,523,748	190,577	2,333,171	7.6

Notes: MTF = Multi-Tier Framework; SEDAC = Socioeconomic Data and Applications Center.

Once the raster data were acquired, they were imported into ArcMap, a geographic information system (GIS) software. To narrow the focus to Burundi, the global raster data was clipped or delineated to match the country's administrative boundaries. The vector data, representing the provinces and “*collines*” of Burundi, was also downloaded and added into ArcMap (OCHA 2017). Adjustments were made to ensure that the projection of both raster and vector data aligned seamlessly. Additionally, new columns, such as ID_cty (numerical codes for provinces) and ID_admin (numerical codes for the lowest administrative units), were added to the vector data set for processing in R using the spatial algorithm.

After preprocessing in ArcMap, the raster and vector data sets were exported for further processing in R software. R is employed to implement an algorithm designed to generate PSUs. These PSUs are delineated based on the administrative unit boundary (such as *colline* or *commune*) used in the administration vector data, with an average number of households of 241 per unit. However, to account for areas with high population density, such as cities and urban regions, additional steps were taken. In these areas, the raster data for areas with high population density were clipped and resampled (changing the resolution of the raster data set) by “downsampling”¹ to ensure that the generated units aligned more accurately with the projected population size, maintaining the representativeness of the sampling process.

Generally, Burundi PSUs' generation involved raster and vector data acquisition, preprocessing in ArcMap or QGIS to align and enhance the data sets, and further algorithmic processing in R to generate PSUs. The inclusion of population density information from the raster data and the adjustment of vector data based on administrative boundaries contribute to a more accurate and representative sampling approach for Burundi. However, this process can lead to data inaccuracies, particularly in densely populated areas where resampling may cause the loss of pixel values. This issue is particularly pronounced in urban areas with high population density, where pixels with both high and low values coexist. When adjusting high-value pixels, low-value pixels are often downsampled, leading to data loss. Additionally, the resampling process operates on cumulative pixels within the area of interest, resulting in most PSUs having the target values while a few are negatively impacted.

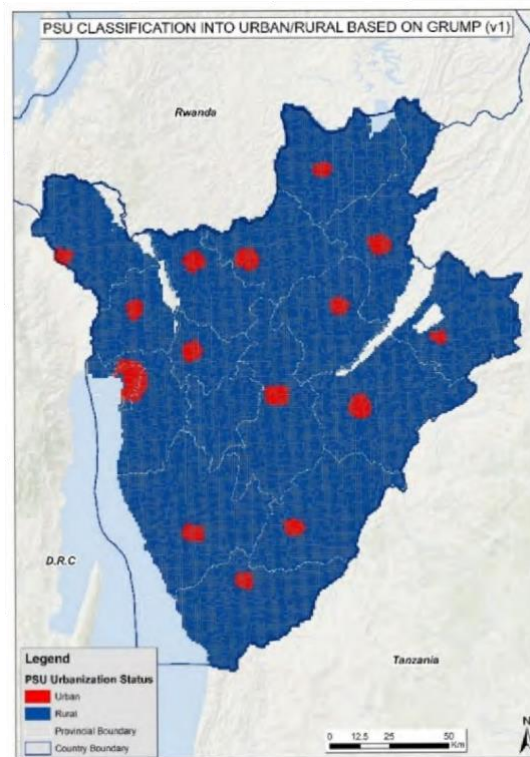
¹ Downsampling in this context refers to the process of adjusting the pixel resolution of the raster data. For instance, the default population density resolution is 1,000 by 1,000 meters (m). Downsampling will involve changing the resolution, especially in areas with high population density, to 400 m by 400 m or any other dimension based on mathematical calculation of the pixel with the highest value in the selected area.

TWO-STAGE STRATIFICATION

Urban-rural stratification

Once the PSUs were generated at the national scale, we classified them as either urban or rural using the Global Rural-Urban Mapping Project (GRUMP) data (map 2). This data set identifies urban areas based on factors such as population density, population count, and urban settlement patterns. PSUs located within these identified urban areas were categorized as urban, while the remaining PSUs were categorized as rural. To estimate the population of urban and rural areas, we counted the number of PSUs in each category and multiplied them by the average population size of a PSU. However, because the GRUMP data for Burundi is outdated, these estimates may not accurately reflect the current urban and rural populations in the country. Map 2 shows how the PSUs were stratified into urban and rural areas based on the 2015 GRUMP data. From each of these strata, we randomly selected 171 enumeration areas (EAs) at the national level. Using GRUMP data, we estimated the urban and rural populations as 697,201 and 9,011,525, respectively. This yields a 7.5 percent urbanization rate, lower than the official 2015 estimate of 12 percent.²

MAP 2 • Urban-rural stratification of primary sampling units using the GRUMP v1 data set



Stratification based on electrification status

The second stage of stratification sought to achieve a 50:50 ratio between electrified and nonelectrified households. Due to low electrification rates, we needed to oversample electrified households within the 342 EAs. However, some EAs lacked national grid coverage and were ineligible for oversampling. We categorized EAs into electrified and nonelectrified using the following three steps.

² World Development Indicators.

Step 1: Isolation of electrified *collines* using ABER data

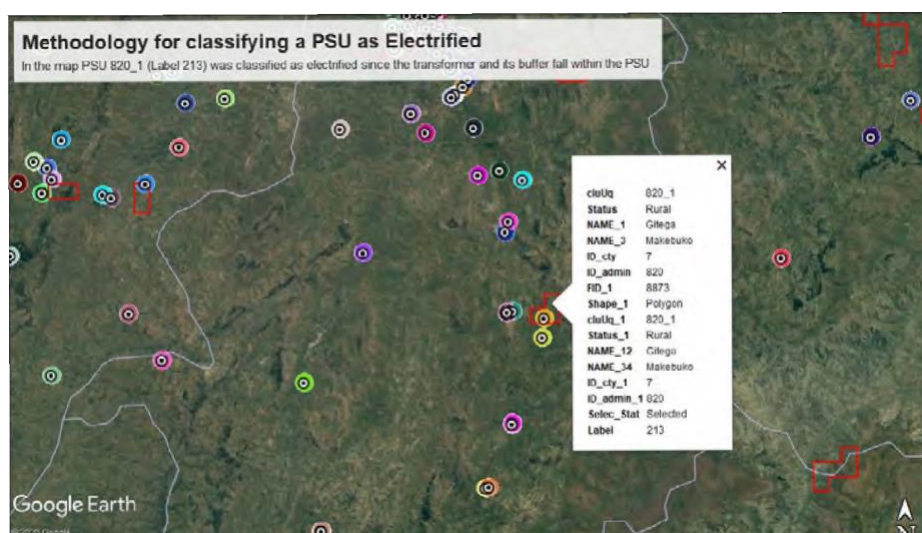
The rural electrification agency Agence Burundaise de l'Électrification Rurale (ABER) provided Excel-based data listing 16 *collines* equipped with transformers across four provinces: Ruyigi, Rumonge, Muramvya, and Karusi. These data were used to determine which rural PSUs within these four provinces were electrified. The electrified *collines* were isolated and selected on the ESRI ArcGIS platform. Subsequently, the *collines* were mapped onto the Google Earth platform, alongside the selected EAs in the four provinces, to determine whether the EAs and the electrified *collines* intersected. All EAs identified as intersecting with the electrified *collines* were classified as electrified. Based on the ABER data set, only one EA (in the Colline of Gasenyi in Ruyigi Province) was categorized as electrified. However, upon further verification by ABER and REGIDESO staff, it was determined that this EA was, in fact, nonelectrified.

Step 2: Overlaying REGIDESO transformer data with the 342 EAs

Next, REGIDESO's Excel-based transformer inventory was used to classify remaining EAs. These data, including transformer power ratings and geo-coordinates, were converted to shapefile format for processing on ArcGIS and Google Earth platforms.

- A 600-meter buffer was created around the transformers on the ESRI ArcGIS platform
- The transformers and their buffers were mapped out on Google Earth alongside the 342 EAs to isolate EAs that were either intersected by transformer buffers or had transformer(s) falling directly within them, as illustrated in figure 1.
- All 342 EAs were then analyzed using the abovementioned method and classified as electrified, nonelectrified, or needing further verification. EAs requiring additional verification were close to transformer buffers and were difficult to classify as nonelectrified correctly.
- An Excel list of all the EAs with associated data on their electrification status—the province, *colline*, commune name, and global positioning system (GPS) coordinates—was generated for further verification by REGIDESO and ABER staff.

FIGURE 1 • Primary sampling unit (PSU) classification process on Google Earth



Step 3: Additional verification by the REGIDESO team

The finalized list was sent to ABER and REGIDESO for verification using *colline* names. Collines, the second-smallest administrative unit (Hijmans 2015), were used as a reference point.³ Given that an EA can encompass multiple *sous-collines*, *collines* were employed to facilitate a more straightforward classification of the EAs by the REGIDESO and ABER teams.

By utilizing the coordinates coupled with the *colline* data for each EA, the teams were able to verify 63 EAs that necessitated additional verification (37) or were incorrectly classified (26). The resulting classification yielded 175 electrified EAs and 167 nonelectrified EAs. This represents a relatively high number of electrified EAs in Burundi, where, given the low electrification rate of 11 percent, one would anticipate a lower number of electrified EAs. The elevated number of electrified EAs can be attributed to the high number of urban EAs (129/171) randomly selected from Bujumbura Mairie Province, which is characterized by a high level of electrification.

HOUSEHOLD LISTING

Initially, the classification between electrified and nonelectrified EAs was conducted utilizing night light satellite imagery (VIIRS DNB)⁴ obtained from the National Oceanic and Atmospheric Administration,⁵ resulting in the identification of 65 electrified EAs and 277 nonelectrified EAs. Subsequently, a more rigorous process (as outlined in the previous section) was implemented to reclassify the EAs, yielding a revised ratio of 174 electrified EAs (representing an additional 109 electrified EAs compared to the initial 65 EAs) versus 168 nonelectrified EAs.

This large difference between the two methods can be explained by the limitations of satellite imagery, especially in regions with low-quality electricity services and small EAs. Satellite images have a relatively low resolution and can be affected by factors like cloud cover, moonlight, and missing data. Additionally, satellite images may not be able to detect interior lighting, which can lead to an underestimation of electrification, especially in areas with intermittent power supply. In the case of Bujumbura Mairie, where many EAs are quite small, the low resolution of satellite images may not be able to accurately capture the presence of electricity. Ultimately, using actual ground-based data on transformers, combined with information from utility workers, provided a more accurate estimate of electrification in the region.

Owing to budgetary limitations, the household listing was not conducted in all 174 electrified EAs, but was limited to 65 EAs. Notably, the listing did not extend to the 109 electrified urban EAs situated within Bujumbura Mairie. The three criteria employed to select the 65 EAs included in the household listing are delineated below:

1. All rural EAs classified as electrified (25 EAs);
2. All urban EAs classified as electrified and falling outside Bujumbura Mairie province (20 EAs); and
3. Urban EAs in Bujumbura Mairie falling within a 2.5 kilometer radius of the province border (20 EAs).

³ The lowest administrative unit is the *sous-colline*. ISTEERU uses *sous-collines* as PSUs.

⁴ Visible Infrared Imaging Radiometer Suite—Day Night Band.

⁵ <https://www.noaa.gov/>.

The listing exercise identified the following three data points:

1. The head of the household (name, gender);⁶
2. Electrification status of the household (connected to the grid or not); and
3. GPS coordinates of the household.

Approximately 23,000 households were listed. Of the 65 EAs, 12 had no electrification (10 in rural areas and 2 in urban areas), and 6 had low electrification rates, that is, less than 1 percent (5 in rural areas and 1 in an urban area) (table 4)

TABLE 4 • Listing results (electricity access)

No.	Province	Locality	EA	Total HH	Nonelectrified HH	Nonelectrified (%)	Electrified HH	Electrified (%)	Oversampling done
1.	Kayanza	Rural	1213_2	203	165	81.3	38	18.7	Yes
2.	Kirundo	Rural	1375_3	254	254	100.0	0	0.0	No
3.	Bujumbura Rural	Rural	166_4	487	446	91.6	41	8.4	Yes
4.	Bujumbura Rural	Rural	174_3	81	81	100.0	0	0.0	No
5.	Ngozi	Rural	2165_1	403	402	99.8	1	0.2	No
6.	Ngozi	Rural	2206_2	1,094	1,048	95.8	46	4.2	Yes
7.	Rutana	Rural	2435_2	207	186	89.9	21	10.1	Yes
8.	Bujumbura Rural	Rural	250_2	87	87	100.0	0	0.0	No
9.	Bubanza	Rural	27_14	452	196	43.4	256	56.6	Yes
10.	Bururi	Rural	320_2	203	203	100.0	0	0.0	No
11.	Bururi	Rural	326_1	356	356	100.0	0	0.0	No
12.	Bururi	Rural	360_5	46	46	100.0	0	0.0	No
13.	Rumonge	Rural	368_2	121	121	100.0	0	0.0	No
14.	Rumonge	Rural	372_2	149	134	89.9	15	10.1	Yes
15.	Rumonge	Rural	373_1	730	584	80.0	146	20.0	Yes
16.	Rumonge	Rural	374_8	20	20	100.0	0	0.0	No
17.	Bururi	Rural	388_2	229	227	99.1	2	0.9	No
18.	Bururi	Rural	390_3	53	47	88.7	6	11.3	No
19.	Bururi	Rural	401_4	168	167	99.4	1	0.6	No
20.	Bubanza	Rural	41_1	502	498	99.2	4	0.8	No
21.	Bururi	Rural	429_4	112	112	100.0	0	0.0	No
22.	Cibitoke	Rural	525_1	290	290	100.0	0	0.0	No
23.	Cibitoke	Rural	586_3	411	251	61.1	160	38.9	Yes
24.	Cibitoke	Rural	615_5	623	420	67.4	203	32.6	Yes
25.	Gitega	Rural	820_1	242	205	84.7	37	15.3	Yes

⁶ In order to manage budgetary constraints and time limitations, the name and gender were recorded only for respondents who were present during the process. The household listing code (555) had an “unavailable” option for respondent names.

No.	Province	Locality	EA	Total HH	Nonelectrified HH	Nonelectrified (%)	Electrified HH	Electrified (%)	Oversampling done
26.	Bujumbura Rural	Urban	119_4	722	452	62.6	270	37.4	Yes
27.	Kirundo	Urban	1370_2	307	178	58.0	129	42.0	Yes
28.	Kirundo	Urban	1383_3	270	259	95.9	11	4.1	No
29.	Bujumbura Rural	Urban	141_1	394	233	59.1	161	40.9	Yes
30.	Muyinga	Urban	1831_1	530	297	56.0	233	44.0	Yes
31.	Muyinga	urban	1842_4	261	261	100.0	0	0.0	No
32.	Muyinga	Urban	1845_3	333	6	1.8	327	98.2	Yes
33.	Muyinga	Urban	1853_1	303	279	92.1	24	7.9	Yes
34.	Ngozi	Urban	2194_1	679	678	99.9	1	0.1	No
35.	Ngozi	Urban	2209_1	779	741	95.1	38	4.9	Yes
36.	Rutana	Urban	2430_1	386	226	58.5	160	41.5	Yes
37.	Rutana	Urban	2451_3	170	144	84.7	26	15.3	Yes
38.	Ruyigi	Urban	2608_2	285	254	89.1	31	10.9	Yes
39.	Ruyigi	Urban	2626_2	588	430	73.1	158	26.9	Yes
40.	Bururi	Urban	288_3	35	9	25.7	26	74.3	Yes
41.	Cankuzo	Urban	439_1	706	421	59.6	285	40.4	Yes
42.	Cibitoke	Urban	622_6	238	195	81.9	43	18.1	Yes
43.	Gitega	Urban	765_7	263	1	0.4	262	99.6	No
44.	Gitega	Urban	780_2	344	285	82.8	59	17.2	Yes
45.	Bujumbura Mairie	Urban	88_10	268	0	0.0	268	100.0	No
46.	Bujumbura Mairie	Urban	86_43	234	47	20.1	187	79.9	Yes
47.	Bujumbura Mairie	Urban	86_46	231	77	33.3	154	66.7	Yes
48.	Bujumbura Mairie	Urban	86_47	90	0	0.0	90	100.0	No
49.	Bujumbura Mairie	Urban	88_2	911	100	11.0	811	89.0	Yes
50.	Bujumbura Mairie	Urban	88_45	348	116	33.3	232	66.7	Yes
51.	Bujumbura Mairie	Urban	88_8	943	144	15.3	799	84.7	Yes
52.	Bujumbura Mairie	Urban	89_29	419	59	14.1	360	85.9	Yes
53.	Bujumbura Mairie	Urban	89_47	316	151	47.8	165	52.2	Yes
54.	Bujumbura Mairie	Urban	89_54	550	241	43.8	309	56.2	Yes
55.	Bujumbura Mairie	Urban	89_56	205	19	9.3	186	90.7	Yes
56.	Bujumbura Mairie	Urban	89_62	436	37	8.5	399	91.5	Yes

No.	Province	Locality	EA	Total HH	Nonelectrified HH	Nonelectrified (%)	Electrified HH	Electrified (%)	Oversampling done
57.	Bujumbura Mairie	urban	89_65	63	63	100.0	0	0.0	No
58.	Bujumbura Mairie	Urban	89_69	149	78	52.3	71	47.7	Yes
59.	Bujumbura Mairie	Urban	90_23	432	3	0.7	429	99.3	No
60.	Bujumbura Mairie	Urban	91_15	434	420	96.8	14	3.2	Yes
61.	Bujumbura Mairie	Urban	91_17	94	6	6.4	88	93.6	Yes
62.	Bujumbura Mairie	Urban	91_20	337	108	32.0	229	68.0	Yes
63.	Bujumbura Mairie	Urban	91_24	905	96	10.6	809	89.4	Yes
64.	Bujumbura Mairie	Urban	91_5	650	34	5.2	616	94.8	Yes
65.	Bujumbura Mairie	Urban	91_8	54	2	3.7	52	96.3	No

Notes: EA = enumeration area; HH = household.

Households were selected from the EAs as follows:

- In the 17 EAs where the electrification rate was less than 1 percent, 9–11 households were randomly selected.
- In the four EAs where the electrification rate exceeded 99 percent, 16 households were randomly selected.
- In the two EAs where the absolute number of electrified households was less than 12 (while the electrification rate was above 1 percent) and in the one EA where the number of nonelectrified households was less than 4 (while the electrification rate was less than 99 percent), 9–11 households were randomly selected.
- In the remaining 41 EAs, households were stratified into electrified and nonelectrified categories, and 12 electrified households and 4 nonelectrified households (a total of 16 households) were selected from each EA.
- In 168 nonelectrified unlisted EAs, 10–13 households were randomly selected.⁷
- In 109 electrified unlisted EAs, 10 or 11 households were randomly selected.

These households were preloaded onto tablets and overlaid with EA boundaries on SW-Maps, an open-source Android-based mapping application that enables data visualization and real-time navigation.

For the 277 nonlisted EAs, household selection was based on publicly available high-resolution (30M or 1 arc-second) population distribution maps of Burundi, similar to those developed by the Center for International Earth Science Information Network in collaboration with Connectivity Lab at Facebook and

⁷ In one EA (EA 56_1), eight households were selected inadvertently.

Digital Globe. This raster data set of settlements, derived from a land use/land cover classification using Landsat satellite imagery, represents each building or structure on the earth's surface. By converting this data set to point data, a nearly exhaustive household listing was generated for each EA, from which the target households were randomly selected. The final sample sizes are presented in table 5.

SAMPLING WEIGHTS

The survey was designed to achieve representative samples independently in rural and urban areas, as well as nationally. This design resulted in oversampling in urban areas and electrified EAs. To rectify this oversampling, sample weights were applied. These weights were calculated for both stages of the sample frame, and the overall weight was determined by multiplying the weights from each stage.

The first stage weight was defined for rural and urban areas as follows:

$$WW_{i(\#, \%)} = \frac{1}{PP_{i(\#, \%)}}$$

Where $PP_{i(\#, \%)}$ is the probability of selecting EAs in rural or urban regions.

This is defined as the ratio of the number of EAs selected to the total $PSUs$ in the region

$$PP_{i(\#, \%)} = \frac{SS_{i(\#, \%)}}{NN_{i(\#, \%)}} \text{ iipp } WW_{i(\#, \%)} = \frac{NN_{i(\#, \%)}}{SS_{i(\#, \%)}}$$

The second stage was defined twice:

First, for the household selection within the oversampled EAs, it was defined as follows:

$$WW_{+, j(\%, \%)} = \frac{1}{PP_{+, j(\%, \%)}}$$

Where $PP_{+, j(\%, \%)}$ is the probability of selecting electrified or unelectrified HHs in $EA j$, defined

as the ratio of electrified or unelectrified HHs selected $SS_{+, j(\%, \%)}$ to total HHs $NN_{+, j(\%, \%)}$.

$$PP_{+, j(\%, \%)} = \frac{SS_{+, j(\%, \%)}}{NN_{+, j(\%, \%)}} \text{ iipp } WW_{+, j(\%, \%)} = \frac{NN_{+, j(\%, \%)}}{SS_{+, j(\%, \%)}}$$

Second, for the household selection within the rest of the EAs , it was defined as follows:

$$WW_{+, j} = \frac{1}{PP_{+, j}}$$

Where $PP_{+, j}$ is the probability of selecting a HH in $EA j$ defined as

$$pp_{+,} = \frac{SS_{-,}}{NN_{-,}} \quad iipp_{ww+,} = \frac{NN_{-,}}{SS_{-,}}$$

And the total weight was the product of both:

$$ww_{! \times +} = ww_{!(\#, \%)} \times ww_{+,\%)} = \frac{NN_{* \% , (\#, \%)} }{nn_{* \% , (\#, \%)} } \times \frac{NN_{-,\%)} }{nn_{-,\%)} }$$

Given that the use of raster and vector data leads to inaccuracies in estimating the actual population of the PSUs (as variations in population density within a pixel are not accounted for) (see section above on the sampling frame), the PSUs have varying population sizes (resulting in wide variation in the number of households in each PSU). Therefore, calculating the first-stage weights by using the number of EAs and PSUs (as it is generally done) yields inaccurate results. To avoid this, the first-stage weights have been calculated using the number of households in each EA (instead of the number of EAs and PSUs).

For an EAj falling under the rural or urban stratum, the weights $New_wI(j)$ were calculated as follows:

$$NNNNww_wwI_{(j)} = \frac{NN_{--(\#, \%)} }{nn_{--(j)}}$$

where $NN_{--(\#, \%)}$ is the number of households in the rural or urban stratum at the national level;

and $nn_{--(j)}$ is the number of households in EAj

The second-stage weights are not affected, as the calculations are done using the number of households. The final weights are the product of the new first-stage weights and the second-stage weights.

TABLE 5 • Listing results (after sample weights applied)

	Rural						Urban						Grand Total	
	Electrified		Unelectrified		Total		Electrified		Unelectrified		Total			
Province	EA	HH	EA	HH	EA	HH	EA	HH	EA	HH	EA	HH	EA	HH
Bubanza	2	26	5	54	7	80	0	0	1	12	1	12	8	92
Bujumbura Marie	0	0	0	0	0	0	130	1,501	0	0	130	1,501	130	1,501
Bujumbura Rural	3	34	8	95	11	129	2	32	6	72	8	104	19	233
Bururi	7	70	6	73	13	143	1	16	0	0	1	16	14	159
Cankuzo	0	0	8	98	8	98	1	16	0	0	1	16	9	114
Cibitoke	3	42	10	120	13	162	1	16	3	36	4	52	17	214
Gitega	1	16	12	144	13	160	2	32	0	0	2	32	15	192
Karuzi	0	0	12	144	12	144	0	0	1	12	1	12	13	156
Kayanza	1	16	9	108	10	124	0	0	0	0	0	0	10	124
Kirundo	1	11	10	120	11	131	2	27	1	12	3	39	14	170
Makamba	0	0	4	48	4	48	0	0	1	12	1	12	5	60
Muramvya	0	0	4	47	4	47	0	0	5	60	5	60	9	107
Muyinga	0	0	8	96	8	96	4	58	2	24	6	82	14	178
Mwaro	0	0	8	96	8	96	0	0	0	0	0	0	8	96
Ngozi	2	26	13	155	15	181	2	26	0	0	2	26	17	207
Rumonge	4	50	10	120	14	170	0	0	0	0	0	0	14	170
Rutana	1	16	10	120	11	136	2	32	2	24	4	56	15	192
Ruyigi	0	0	9	107	9	107	2	32	0	0	2	32	11	139
Nationwide	25	307	146	1,745	171	2,052	149	1,788	22	264	171	2,052	342	4,104

Notes: EA = enumeration area; HH = household.