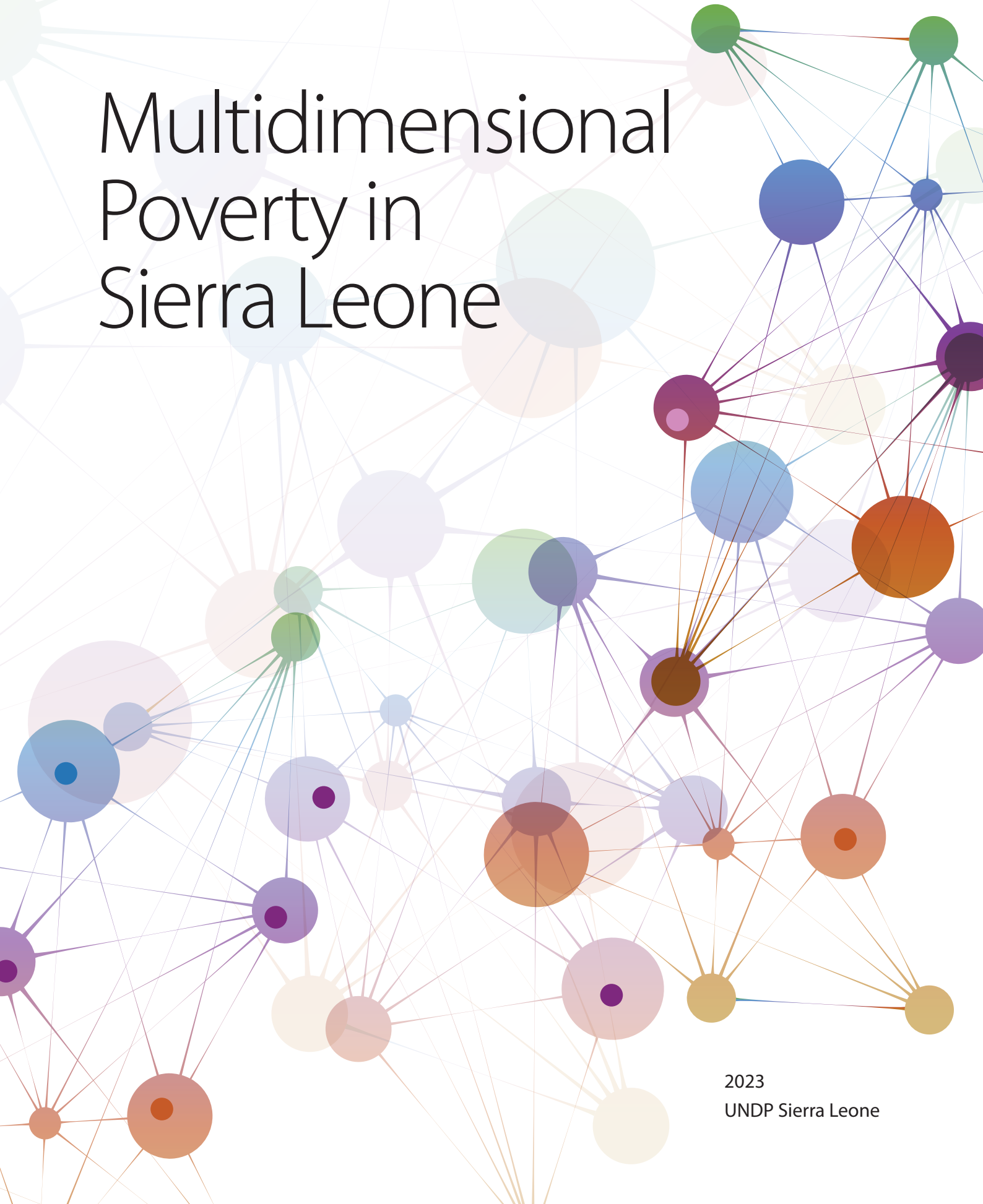
Multidimensional Poverty in Sierra Leone



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The data used to compute indices in the report is mainly from the Demographic and Health Survey (DHS) of Sierra Leone of 2019, implemented by Statistics Sierra Leone.

The report was edited by Larson Moth. Production and publication were managed by Janet Dabire.

Foreword

This report presents the second official National Multidimensional Poverty Index (MPI) for Sierra Leone and computes changes over time between 2017 and 2019, following the first Sierra Leone MPI Report produced in 2019. The report was produced in collaboration with Statistics Sierra Leone, with technical guidance and support from UNDP and the Oxford Poverty Human Development Initiative (OPHI). Midway into the implementation of the 2030 Agenda and commencing the preparation of Sierra Leone's new Medium-Term National Development Plan (MTNDP), 2024-2028, the need for data to assess progress towards meeting the Sustainable Development Goals (SDGs) cannot be overemphasised.

Therefore, this *Sierra Leone Multidimensional Poverty Index 2023* underscores the government's commitment to promoting evidence-based decision-making in the national development planning processes. By giving a thorough picture of household welfare and the various deprivations experienced at the district level, the index also aims to complement the traditional income/expenditure poverty estimates. The process also gave the staff of Statistics Sierra Leone and the Ministry of Planning and Economic Development practical capacity and skills training in multidimensional index estimation and analysis.

The first national MPI estimates were produced in 2019 using the 2017 Multiple Indicator Cluster Survey data that provided critical baseline information in the formulation of the current Sierra Leone Medium-Term National Development Plan (MTNDP), 2019–2023, which is strongly aligned with the United Nations 2030 Agenda for Sustainable Development and African Union Agenda 2063. The Sierra Leone National MPI, which is based on the Global MPI concept, was created to depict the country's specific context and development priorities. It also illustrates the linkages between the various deprivations experienced by poor people.

For this 2023 MPI estimation, we used the 2019 Sierra Leone Demographic and Health Survey (DHS) dataset, which presents a sample coverage of households at the district level across the country. The estimation method employed is based on the Alkire-Foster method of multidimensional poverty measurement, which uses the household as the unit of analysis to estimate the proportion of the population that is deemed poor and deprived. Like the 2019 MPI report, the estimation is arranged around 14 indicators, all clustered into five critical dimensions—education, health, housing, living standards, and energy. This report also presents the trends in multidimensional poverty in Sierra Leone, comparing the results of the 2023 MPI to the 2019 index.

The results show that the percentage of people in Sierra Leone who are multidimensionally poor decreased from 64.8 percent in 2017 to 58 percent in 2019. The intensity of poverty, which measures the average share of weighted deprivations that each poor person experiences, is estimated at 55.5 percent in 2019, decreasing from 58.9 percent in 2017. The national MPI is 0.322 (a slight decrease from 0.343 in 2017), implying that, on average, multidimensionally poor people in Sierra Leone face 32.2 percent of all possible deprivation that could be experienced if all individuals were multi-dimensionally poor and deprived in all indicators. Among the 16 districts, the three poorest are Pujehun in the southern region, with an intensity of multidimensional poverty measure of 59.8 percent; Karene and Falaba districts in the

north, with a score of 58.3 percent and 57.2 percent, respectively. This is similar to the results of the 2017 MPI, with the Pujehun district remaining the poorest district in the country and the Western Urban Area as the least poor region. Generally, multidimensional poverty in Sierra Leone dropped between 2017 and 2019, although this reduction was not statistically significant at the 10 percent confidence level.

The result further revealed striking differences in the levels of multidimensional poverty among households based on the educational level of their family heads. The results show that households headed by individuals with no education are 80 percent poorer compared to those whose heads have a minimum of completed primary education. We also found the level of multidimensional poverty to be higher among households with a large family size (at least three people living there).

These findings, therefore, provide insightful information at national and district levels, with wide-ranging policy implications for the implementation of the SDGs and the National Development Plan. The policy recommendations also call for the inclusive participation of the private sector in the design and implementation of interventions to eliminate multiple deprivations and inequality among the people.

On this note, we hope this report provides a platform for continuous policy dialogues to inform programme and policy formulations that address multidimensional poverty across all sectors and facets of our economy.

I wish to thank the Oxford Poverty Human Development Initiative, especially Ms. Monica Pinilla-Roncancio, who led the estimation and analysis; Statistics Sierra Leone for providing general technical guidance; and the UNDP for providing technical input and logistical support.

Ms. Kenyeh Barlay

Hon. Minister of Planning and
Economic Development

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Photo: UNDP Sierra Leone/Geoffrey Buta

Executive Summary

The Sustainable Development Goals (SDGs) call for a multidimensional measure of poverty to complement the monetary poverty analysis and present a more comprehensive picture of poverty. Specifically, SDG 1.2 aims to *"reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions".*

This report presents the updated results of the national Multidimensional Poverty Index (MPI) of Sierra Leone for 2019, and an analysis of changes over time from 2017 to 2019. The report uses the national MPI of Sierra Leone developed by Statistics Sierra Leone, with support of the United Nations Development Programme (UNDP) and Oxford Poverty and Human Development Initiative (OPHI) in 2018.

Multidimensional Poverty

The national MPI of Sierra Leone is based on the Alkire-Foster method of multidimensional poverty measurement. It includes five dimensions and 14 indicators that capture deprivations of individuals and households. The indicators are computed at the household level, assuming that all household members share equally achievements and deprivations. Statistical tests were performed to validate the measure's robustness and significance of the findings at the national level and for governorates. This report uses the Demographic and Health Survey (DHS) of Sierra Leone of 2019. The DHS is representative at the national level, for rural and urban areas, for the four regions of the country and 16 districts.

This report also presents the trends over time, comparing the results of 2019 with the ones of 2017, and analyzes if there have been significant changes in multidimensional poverty between 2017 and 2019.

Results

Results based on data for 2019 indicate that the percentage of people living in multidimensional poverty in Sierra Leone was 58 percent. That is, almost six in every ten people in the country is multidimensionally poor. The intensity of poverty, which reflects the share of weighted deprivations that each poor person experiences on average, is 55.5 percent. Thus, on average, a poor person experienced deprivations in 55.5 percent of the weighted indicators, which is equivalent to being deprived in almost three dimensions of poverty. The national MPI, which is the product of the incidence (percentage of people living in multidimensional poverty) and the intensity (average proportion of weighted indicators in which poor people are deprived) of multidimensional poverty, was 0.322. Thus, multidimensionally poor people in Sierra Leone face, on average, 32.2 percent of all possible deprivation that could be experienced if all individuals were multidimensionally poor and deprived in all indicators.

Almost six out of ten people are multidimensionally poor and live in a household without access to electricity (55.5 percent). A similar result is found regarding the possession of a bank account, where 55.2 percent of the population is poor and lives in a household where nobody has an account at the bank, 54.4 percent is poor and doesn't have access to an improved sanitation facility, and 53.1 percent is poor and lives in a household where at least one person doesn't have access to internet. Improving any of these deprivations which concern around 4.4 million people, on average, and more than 90 percent of the poor population, would help reduce multidimensional poverty in Sierra Leone.

58.5% 4.7m

people live in Rural Areas

3.8m are multidimentional poor **8 of 10** people **79.8%**

41.5% 3.3m

people live in Urban Areas

911k are multidimentional poor **3 of 10** people **27.3%**

Moreover, 58.5 percent of Sierra Leone's population, which is around 4.7 million people, lives in rural areas, while 41.5 percent of the country's population, or 3.3 million people, lives in an urban environment. Among the population living in rural areas, 3.8 million are multidimensionally poor, which is equivalent to about eight out of ten people (79.8 percent). This situation stands in stark contrast to the incidence of poverty in urban areas, which affects around three in ten people (27.3 percent) -or 911 thousand people. Considering the distribution of the population by area of residence, rural areas are home of 80.5 percent of the total population living in multidimensional poverty in Sierra Leone, whereas urban areas represent 19.5 percent.

Levels of multidimensional poverty are significantly lower in the western region, where the capital Freetown is located, than in the other regions of the country: 21.7 percent of the population in this region is multidimensionally poor, experiencing almost half of the weighted deprivations (48.0 percent) and with an MPI of 0.204. By contrast, the three other regions of the country are the poorest, but it is not possible to identify a clear ranking of which is poorer, since the confidence intervals of the MPI, the incidence and the intensity of multidimensional poverty of each of the regions overlap between each other. Therefore, on average, 67.3 percent of the population living in the eastern, northern or southern regions is multidimensionally poor, representing 92.2 percent of the poor population in Sierra Leone (4.3 million people).

Districts that are part of the western region -western urban area and western rural area- are significantly less poor than the other districts of the country. The incidence of multidimensional poverty in western urban area is 12.6 percent and in western rural area 37.0 percent; the intensity of multidimensional poverty is 46.7 percent in western urban area and 48.8 percent in western rural area, meaning that multidimensionally poor people in both districts experience, on average, almost half of the weighted deprivations. The value of the MPI is 0.059 in western urban area and 0.180 in western rural area. These figures contrast those of the poorest districts in the country, Pujehun (southern region), Karene and Falaba (northern region).

Children aged 0-14 are the poorest group in the country. Among them, 63.6 percent are multidimensionally poor, which represents almost half of the poor population in Sierra Leone, roughly 2.3 million people. More specifically, while six out of ten people are multidimensionally poor in Sierra Leone, three of them are children.

Striking differences in the levels of multidimensional poverty exist between male and female-headed households. People living in the former are poorer than those who live in a female-headed household. Precisely, 60.4 percent of individuals living in male-headed households are poor, compared to 51.4 percent among female-headed households. In addition, people living in households where the head of the household has no education are poorer than those who live in a household where the head of the household has at least completed primary education: about 80 percent of the poor population (3.7 million Sierra Leoneans) live in the former type of household, representing five in every six poor people in the country. Multidimensional poverty is also higher among households with largest size (at least three people living there).

Changes over time

Although multidimensional poverty dropped between 2017 and 2019, this reduction was not significant. The MPI decreased from 0.343 to 0.322, and the incidence (H) fell from 60.7 percent to 58.0 percent, but neither was statistically significant at 10 percent confidence level. Between 2017 and 2019, 12 of the 14 indicators presented an absolute change in the censored headcount ratios. Therefore, the percentage of people who are deprived in each indicator and at the same time are multidimensionally poor reduced between both years. However, this reduction was only statistically significant in six of the twelve indicators, being the largest in school attendance (five percentage points), followed by internet access (4.3 percentage points) and overcrowding (4.2 percentage points). Two indicators presented a positive absolute change (increase) of the censored headcount ratios: cooking fuel and access to a clean source of water, but only cooking fuel represented a statistically significant increase.

Amongst the four regions, only one shows statistically significant reductions in the MPI over the period under study. The western region shows the fastest absolute reduction in the MPI between 2017 and 2019 (0.059 points of the index), followed by the northern and southern region (almost 0.03 points). However, the reductions in these last two regions were not significant. A very small increase in MPI was seen in the eastern region, though this increase was not statistically significant. This means that poverty did not statistically change in the northern, southern, or in the eastern regions of Sierra Leone between 2017 and 2019.

Conclusion and Recommendations

More than half of the population in Sierra Leone in 2019 were multidimensionally poor. Their intensity of poverty was higher than 55 percent, therefore multidimensionally poor individuals experienced, on average, deprivations in almost three dimensions of poverty. At the national level, poor people continued presenting higher levels of deprivation in the access to electricity, the type of cooking fuel, the access to a bank account, the type of sanitation facility and the access to internet. Children 0-14 years of age, people living in male-headed households, people living in households where the head of the household has no level of education, and people living in large-sized households, are the poorest groups. Between 2017 and 2019, multidimensional poverty in Sierra Leone did not fall, with the exception of the western region of the country, which presented a statistically significant reduction in the incidence of multidimensional poverty during this period.

Chapter 1

Photo: UNDP Sierra Leone/Geoffrey Buta

Introduction

This report presents the results of the National Multidimensional Poverty Index (MPI) for Sierra Leone. Since the end of the civil war in 2002, the measurement of poverty in Sierra Leone has become a priority. The Sierra Leone Integrated Household Survey (SLIHS) is one of the most important tools to inform national policies on poverty reduction. This survey is complemented by the Multiple Indicator Cluster Survey (MICS) and the Demographic and Health Survey (DHS), which are collected every five years and provide more detailed information on important development indicators. All these surveys are implemented by Statistics Sierra Leone (Stat SL), the country National Statistics Office.

Traditionally, poverty in Sierra Leone has been measured using the income/expenditure approach, which is the main tool to analyse the levels and distribution of poverty in the country. However, given the importance of other dimensions in the understanding of poverty, non-monetary measures have become an important tool for poverty analysis. In 2017, Stat SL published a thematic report on poverty and durables using the National Household and Population Census 2015, which included the results of a pilot National MPI for Sierra Leone based on the structure of the Global MPI.[1/2] In 2018, Stat SL presented the National MPI of SL, which responds to national priorities and needs, and aims to measure poverty in all its dimensions, thus complementing the income/expenditure measure of poverty in the country.

The National MPI of Sierra Leone uses the Alkire-Foster (AF) method[3] and has five dimensions and 14 indicators. Results for 2017 revealed that the incidence of multidimensional poverty was 64.8 percent – that is, almost two thirds of the population in the country was identified as MPI poor. The intensity of poverty was 58.9 percent, meaning that, on average, poor people experience almost 60 percent of the weighted deprivations. In turn, the MPI, which is the product of the incidence and the intensity of poverty, was 0.375.

This report presents the second update of the national MPI for Sierra Leone using data from 2019, and analyzes the changes over time on multidimensional poverty between 2017 and 2019. The results of the report provide useful information for policy makers to design and implement policies at the national, regional and district level to reduce multidimensional poverty based on their levels of deprivation and the intensity of the poverty.

[1] For more information visit https://www.statistics.sl/

[2] For more information on the Global MPI visit https://ophi.org.uk/multidimensional-poverty-index/global-mpi-2018/

[3] Alkire, S. and J. Foster (2011). "Counting and Multi-dimensional Poverty Measurement". *Journal of Public Economics.*

Chapter 2

Photo: UNDP Sierra Leone/Geoffrey Buta

Methodology

The Alkire-Foster method

The national MPI of Sierra Leone is constructed using the Alkire-Foster method. This method, developed by Alkire and Foster (2011)[4] to measure multidimensional poverty, uses a counting approach to identify poor people and specifically considers the deprivations they face simultaneously. Not only does this method identify who is poor, but it also breaks new ground by incorporating the extent or intensity of the multidimensional poverty condition.

The method can be summarized in the following steps:

1. Create a deprivation profile.

The first step is to create a deprivation profile for each individual or households. For each of the indicators considered in the MPI structure, the individual's achievement is compared to the deprivation cutoff or the deprivation threshold. This allows us first to identify whether the individual or household is deprived or not deprived in each indicator.

2. Applying weights to each of the deprivations

The next step is to apply weights (which when added together are equal to one, or 100 percent) to each of the deprivations, which will be summed so that each individual is given a deprivation score indicating the percentage of weighted deprivations she or he experiences.

3. Identifying the poor

Once the deprivation score for each individual or household is created, an individual or household will then be identified as multidimensionally poor if her or his deprivation score is greater than or equal to the established multidimensional poverty line - which may be, for example, 20 percent, 33 percent, 40 percent or other.

4. Aggregating the information

After identifying each person as poor or non-poor, the information is aggregated into two informative statistics:

a. *The incidence of multidimensional poverty (H),* which is the proportion of individuals identified as multidimensionally poor, also called the 'multidimensional poverty rate'. This is the percentage of individuals in the total population whose deprivation score is greater than or equal to the defined poverty line;

b. *The intensity of multidimensional poverty (A*), which refers to the average proportion of weighted indicators in which poor people are deprived, i.e., the average deprivation score for all poor individuals;

c. *The Multidimensional Poverty Index (MPI)* is then calculated as the product of these two components [MPI = H x A]. The MPI can be seen as the percentage of deprivation that the multidimensionally poor experience in relation to the possible deprivations that society would experience if all people were deprived in all indicators simultaneously.

Data

The updated results of the national MPI of Sierra Leone are compiled using the data from the Demographic Health Survey (DHS) for 2019. The DHS 2019 was implemented by Statistics Sierra Leone and collected from 15 May to 31 August 2019. The main objective of the survey was to provide up-to-date estimates of basic demographic and health indicators. The survey collected information on fertility, use of family planning methods, nutritional status of women and children, maternal and child health among other topics.

[4] Alkire, S. and J. Foster (2011). "Counting and Multi-dimensional Poverty Measurement". *Journal of Public Economics.*

The sampling frame used was the Population and Housing Census of Sierra Leone (2015). The sample was a stratified sample selected in two stages. In total, 31 sampling strata were created. Samples were selected independently in every stratum via a two-stage selection process. The DHS for Sierra Leone included all women aged 15 to 49 in the sampled households. The men's questionnaire was conducted in one-half of the sampled households, and all men aged 15-59 in these households were included. In this subsample, one eligible woman in each household was randomly selected to be asked additional questions about domestic violence. Similarly, biomarker information was collected only in those households selected for the men's questionnaire. In total, 13,399 households were successfully interviewed, which corresponds to a 99 percent response rate. In the interviewed households, 16,099 women aged 15-49 were identified for individual interviews; interviews were completed with 15,574 women, yielding a response rate of 97 percent. In the subsample of households selected for the male questionnaire, 7,429 men aged 15-59 were identified, and 7,197 were successfully interviewed, yielding a response rate of 97 percent.

Summary structure of the measure

a. Unit of identification and analysis

In the Sierra Leone context, the household was considered the unit of identification for the national MPI, and the individual was chosen as the unit of analysis. This means that the information in terms of the deprivations of each household member is aggregated and combined within each household. Thus, all household members are considered equally deprived or non-deprived in each indicator and identified as equally poor or non-poor.

b. Choice of dimensions and indicators

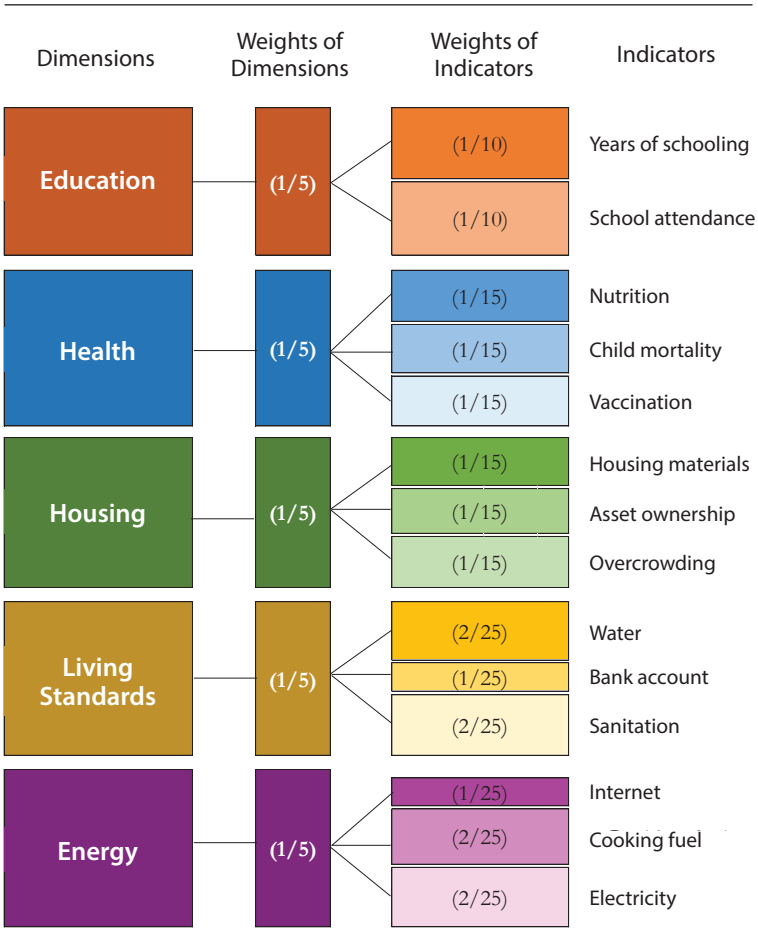
The choice of the dimensions and indicators of the national MPI of Sierra Leone was made following a participatory and inclusive approach considering the priorities and challenges in improving the living conditions of households. The dimensions and indicators were chosen in line with the country's forward-looking development vision, national and sectoral strategies, and commitments defined through international agendas.

Meetings were held with members of the Government, Statistics Sierra Leone, and the United Nations Development Program to discuss and validate the choice of dimensions and indicators for the national MPI. At the end of the various meetings, 14 indicators grouped in five dimensions were retained for the structure of the national MPI (Figure 1 and Table 1 for details).

c. Deprivation cutoffs

Deprivation thresholds were decided in a normative way. National laws as well as the development objectives set in national, sectoral and international policy documents have mainly based the choice of the deprivation threshold for each indicator. Table 1 summarizes the list of all indicators with their respective deprivation thresholds.

Figure 1. Structure of the National MPI of Sierra Leone



Note: the size of the boxes is proportional to the corresponding weights.

Table 1. Dimension, indicators, deprivation cutoffs and weights of the National MPI of Sierra Leone

Dimension	Indicator	SDG and Target	Deprivation cut-off: A household and all its members are deprived if the household (household's) …	Weights	
Education	Years of schooling	4.1.1	No household member older than school age has completed at least six years of schooling.	1/10	10 %
	School attendance	4.1.1	At least one school-aged (6 to 14 years) child is not attending school.	1/10	10 %
Health	Nutrition	2.1.1	At least one child under five is underweight or stunted.	1/15	6.7 %
	Child mortality	3.2.1	At least one child under five has died in the household in the five years prior to the survey.**	1/15	6.7 %
	Vaccination	3.b.1	At least one child under three has not received full vaccination according to his/her age.***	1/15	6.7 %
Housing	Housing materials	11.1.1	The house has earth/sand or dung floor, and it has walls or a roof made of natural or low-quality materials.*	1/15	6.7 %
	Asset ownership	11.1.1	It does not own more than one of these assets: radio, TV, telephone, bicycle, motorcycle, computer, animal cart, or refrigerator; it does not own a car or a truck.	1/15	6.7 %
	Overcrowding	11.1.1	The number of persons per sleeping room is three or more.	1/15	6.7 %
Living Standards	Water	6.1.1	The main source of drinking water is an unprotected well, unprotected spring, tanker-truck, cart with small tank, water kiosk, or other, or it is a protected source of water but it takes more than 30 minutes (round trip) to collect it. (Households using bottled water are only considered to be using an improved source of water when they use water from an improved source for cooking and personal hygiene.).	2/25	8 %
	Bank account	8.10.2	No member has a bank account.	1/25	4 %
	Sanitation	6.2.1	There is no toilet facility or the main toilet facility is flush to open drain/unknown location, pit latrine, pit latrine without slab, open pit, bucket, hanging toilet, hanging latrine, or other, or it is improved but shared with other households.	2/25	8 %
Energy	Internet	17.8	At least one person in the household doesn't use internet.****	1/25	4 %
	Cooking fuel	7.1.2	The household uses coal, charcoal, wood, crop residue, processed biomass, or other and it does not cook outside. *****	2/25	8 %
	Electricity	7.1.1	There is no electricity in the household.	2/25	8 %

** It is considered deprived if the roof is non-existent or made of the following: thatch/palm leaf, sod, rustic mat, palm/bamboo, cardboard, or other materials. It is considered deprived if the walls are non-existent or made of the following: cane/palm/trunks, dirt, bamboo with mud, stone with mud, uncovered adobe, cardboard, or other materials.*

*** Only mother's information is considered – Deaths reported by men are no longer used because it significantly increases the number of children who are dead. The reason is because when the information comes from a man, it considers 'all reported child mortality regardless of age and time'. Whereas the information from women considers (i) the age of the child (below 5 years); and (ii) the year preceding survey (5 years before). When a man's report is included, all deaths are counted, regardless of age and time.*

**** The original definition of the indicator considered children under the age of 5. However, only information for children under the age of three is available on DHS 2019. So, the indicator is adapted to only consider this age cohort.*

***** The original definition captures whether there is no connection to the internet in the household. However, the information on DHS 2019 is only available at the individual level, so the indicator is adapted to fit the available information.*

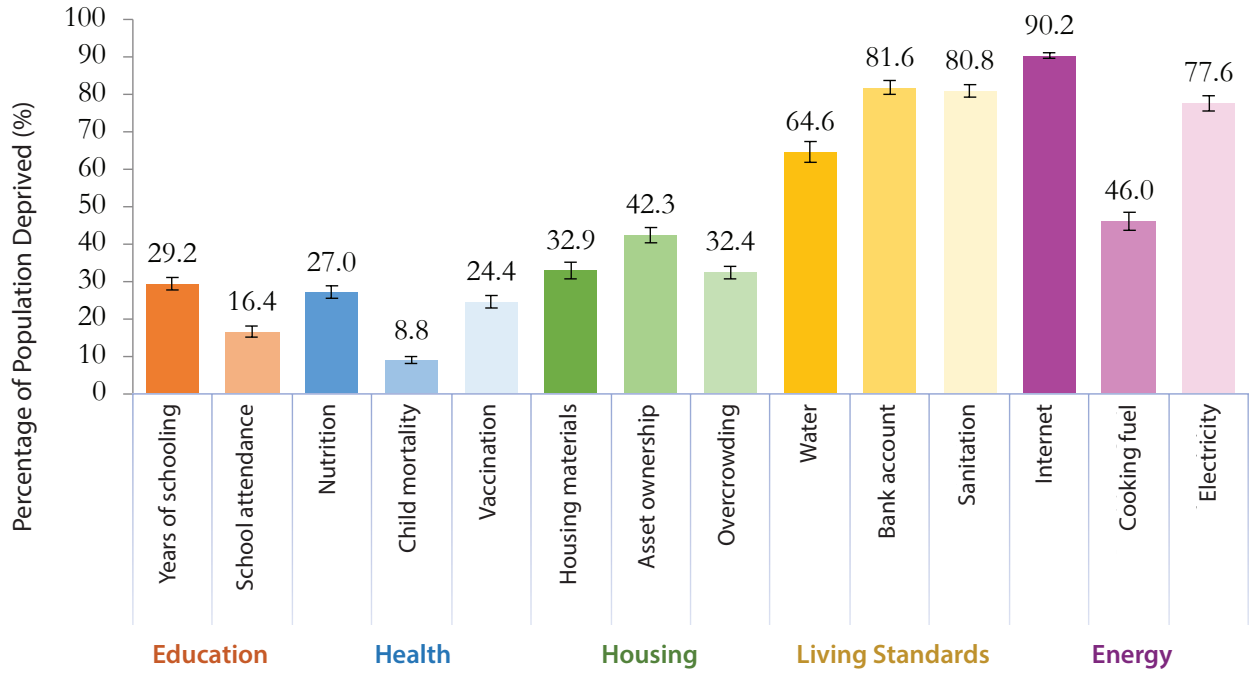
******The original definition captures whether the household has as the main cookstove a liquid fuel stove, a manufactured solid fuel stove, a traditional solid fuel stove, or a three-stone stove/open fire/other type of stove, and the energy used is coal, charcoal, wood, crop residue, processed biomass, or other and it does not cook outside, or the stove does not have a chimney. However, on DHS 2019, only the information about the type of cooking fuel and whether the household has an additional room for cooking is available. So, the indicator is adapted accordingly.*

Uncensored Headcount Ratios at the National level[5]

The uncensored headcount ratios measure the percentage of population who is deprived in each indicator. This analysis (Figure 2) shows that about nine out of ten people (90.2 percent) live in a household where at least one person does not use internet. Within the living standards dimension, about eight of ten people live in a household where no member has a bank account (81.6 percent) and about the same percentage of people (80.0 percent) live in a household where there is no toilet facility, or the main toilet facility is not improved, or it is improved but shared with other households. High levels of deprivation are also found in the indicator of electricity, showing that 77.6 percent of the population in Sierra Leone live in a household where there is no electricity; and in the indicator of water, where 64.6 percent of the population drink water from an unprotected source or it is a protected source, but it takes more than thirty minutes (round trip) to collect it.

In turn, the lowest incidence of deprivation are found in the indicator of nutrition, vaccination, school attendance and child mortality. More precisely, almost a third of the population in the country (27.0 percent) live in a household where any child under the age of five is either underweight or stunted, one in every four persons (24.4 percent) live in a household where any child under three has not received full vaccination according to his/her age, 16.4 percent live in a household where at least one school-aged (six to fourteen years) child is not attending school, and 8.8 percent of the population in Sierra Leone live in a household where any child under the age of five has died in the last five years.

Figure 2. Uncensored headcount ratios for each indicator



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

[5] These uncensored headcount ratios do not depend on the poverty cutoff.

27% child under 5 underweight or stunted,

24.4% child under 3 not fully vaccinated

16.4% children 6 to 14 not attending school

d. Weights

The national MPI of Sierra Leone examines the nature and extent of each individual's deprivation simultaneously for the 14 indicators grouped into five dimensions, hence allowing for the identification of poor people and the aspects of their poverty. For this purpose, through the different exchanges that took place throughout the process of building the national MPI, it was agreed that equal weights should be given to each of the dimensions considered. Since there are five dimensions of poverty, each one receives a weight of 1/5=0.20 or 20 percent. The indicators of the dimensions of education, health and housing are all given the same relative weight, equal to the weight of the dimension and divided by the number of indicators that are groups in that dimension. However, the weight of 'bank account' and 'internet access' is half of the weight of other indicators included in the dimensions of living standards and energy, respectively. The main reason for this normative decision is that having access to internet at home and having a bank account are important indicators for tracking Sierra Leone's progress towards reducing multidimensional poverty. Nonetheless, providing basic services such as an improved source of drinking water, improved sanitation facilities, access to electricity and the type of fuel that households use for cooking, are a major priority for the country, and therefore their relative importance is higher.[6]

e. Poverty cutoff

The second cutoff that the Alkire-Foster method uses is a poverty cutoff (k), which is a threshold that identifies whether a person is multidimensionally poor or non-poor according to the weighted share of deprivations that she or he experiences. The value of the poverty cutoff reflects the minimum level of deprivation or the minimum deprivation score that an individual must experience to be considered multidimensionally poor. The setting of this poverty cutoff should reflect the country's priorities and policy objectives.

Within the context of Sierra Leone, it has been agreed to set a poverty cutoff of k=40 percent, corresponding to being deprived in two dimensions or more. Given the five dimensions chosen for the national MPI, each person suffering at least 40 percent of the weighted deprivations, equivalent to being deprived in at least two dimensions, is considered multidimensionally poor. In other words, a person who is deprived in a set of indicators whose weights add up to 40 percent or more is identified as multidimensionally poor.[7]

[6] Other weighting structures were calculated and compared to analyse the robustness (stability of the results) of the results. Results from the DHS 2019 about the stability of the results when the weighting of the dimensions and, hence, the indicators, is modified, are presented in the Appendix.

[7] Analyzes of the robustness of the results for different poverty lines were carried out and made it possible to retain this cutoff for the analysis of multidimensional poverty in Sierra Leone. Results from the DHS 2019 about the stability of the results when the poverty cutoff is modified, are presented in the Appendix.

Chapter 3

Photo: UNDP Sierra Leone/Janet Dabire

Results

This chapter presents the national results of the national MPI of Sierra Leone using data from the DHS 2019. First, the national MPI is presented –the incidence and intensity of multidimensional poverty. It then shows how poor the people are, according to each indicator, and who is poorest among different population subgroups. In the appendix, the robustness of the analysis is presented, showing that the national MPI provides robust information for policy, even if the weights and the poverty cutoffs are changed.

National Results

Table 2 presents the main figures for the national MPI for 2019, including the multidimensional poverty rate among Sierra Leone's population, H, also known as the incidence of poverty (or the proportion of the population identified as multidimensionally poor); and the intensity of poverty (or the average proportion of weighted indicators in which poor people are deprived), A.

The incidence of multidimensional poverty in 2019 in Sierra Leone is 58 percent, which means that about six out of ten people (4.7 million) are multidimensionally poor.[8] The intensity of poverty, which reflects the share of weighted deprivations that each poor person experiences on average, is 55.5 percent. This indicates that each poor person in Sierra Leone is, on average, deprived in 55.5 percent of the weighted indicators. The MPI, calculated by multiplying the percentage of the population that is multidimensionally poor (the incidence of multidimensional poverty, H) by the share of weighted deprivations that poor people face on average (the intensity of multidimensional poverty, A), is 0.322, which shows that poor people experience almost a third of all possible deprivations.[9] The MPI is the official statistic because it is the most sensitive to change, but for non-technical users, the incidence of multidimensional poverty (H) can be more intuitive. This is why this report always provides an analysis of both.

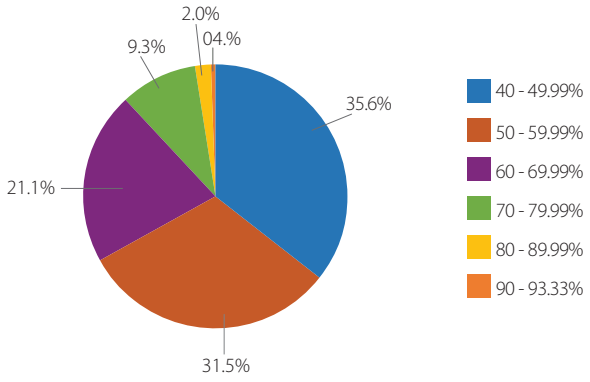
Figure 3 shows the percentage of poor people who are deprived in each band of the deprivation score. It gives an idea of how the proportion of weighted deprivations faced by the poor population is distributed. The minimum number is 40 percent, because it corresponds to the poverty cutoff. That is, multidimensionally poor people are deprived in at least 40 percent of the weighted indicators. The highest number is 93.3 percent, which means that the poorest person in Sierra Leone confronts 93.3 percent of the weighted deprivations. Thus, no poor person in Sierra Leone is deprived of all indicators. The figure reveals that 67.1 percent of all poor people in the country are deprived of between 40 percent and 60 percent of the weighted indicators. This

Table 2. Multidimensional Poverty Index, Incidence, and Intensity of Sierra Leone

Poverty Cutoff (k)	Index	Value	Confidence Interval (95%)	
k value = 40% (deprived in two or more dimensions)	MPI	0.322	0.309	0.335
	Incidence (H, %)	58.0	55.8	60.2
	Intensity (A, %)	55.5	55.0	56.1

Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Figure 3. Intensity bands of multidimensionally poor individuals



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

[8] Since all estimates are based on sample-based survey data, each estimate has a margin of error. Thus, the 95 percent confidence interval is also presented in the tables. In the case of the incidence, one can state with 95 percent confidence that the true poverty rate for the whole national population is between 55.8 percent and 60.2 percent.

[9] With a confidence level of 95 percent, the actual value of the MPI is between 0.309 and 0.335.

suggests that most of the poor are very close to the multidimensional poverty cutoff. On the other hand, 2.4 percent of the poor population experience the highest poverty intensities, as they are deprived in at least 80 percent or more of the weighted indicators, which is equivalent to being deprived in four dimensions or more.

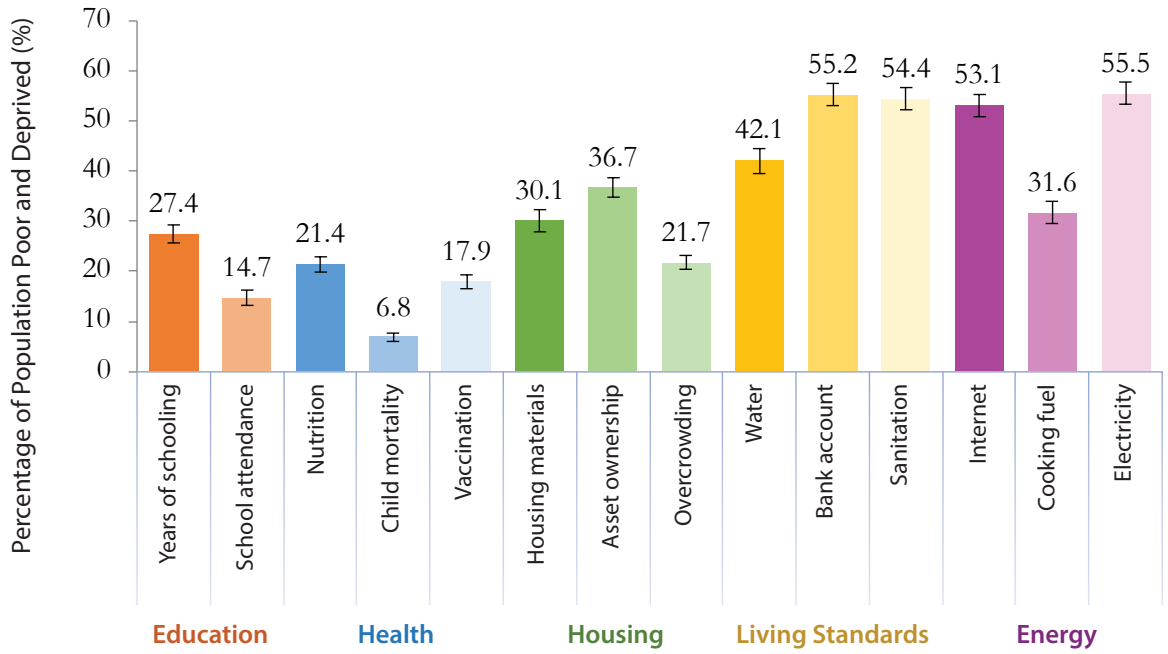
Multidimensional poverty in Sierra Leone has been described by the national MPI by identifying how many people are poor on average (incidence) and how poor they are (intensity). Now interest turns to analyzing how poor they are. In other words, what deprivations do they experience? This information is useful for designing public policies that reduce them most effectively.

Censored Headcount Ratios[10] at the National level

The percentage of the population that is multidimensionally poor and deprived in each of the indicators is presented. These are called the censored headcount ratios. The analysis of the censored headcount ratios shows the indicators in which poor people face the highest levels of deprivation. A reduction in any deprivation of any poor person (i.e., any censored headcount ratio) will reduce the MPI and improve the lives of poor people in Sierra Leone.

Figure 4 shows that about six out of ten people are multidimensionally poor and live in a household without access to electricity (55.5 percent). A similar result is found regarding the possession of a bank account, where 55.2 percent of the population is poor and lives in a household where nobody has an account at the bank, 54.4 percent is poor and does not have access to an improved sanitation facility, and 53.1 percent are poor and live in a household where at least one person does not have access to the internet. Improving any of these deprivations which concern around 4.4 million people, on average, and more than 90 percent of the poor population, would help reduce multidimensional poverty in Sierra Leone.

Figure 4. Censored headcount ratios



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

[10] Percentage of people who are deprived in each indicator and at the same time are multidimensionally poor.

The percentage population who is poor and deprived in other indicators such as those in years of schooling (27.4 percent), school attendance (14.7 percent), housing materials (30.1 percent) and asset ownership (36.7 percent), is much lower than the previous ones, but they should not be overlooked as between 86 percent and 94 percent of those who experience them are multidimensionally poor, and together they contribute to about one third of the national MPI. The indicator in which poor people face the lowest level of deprivation is child mortality, with 6.8 percent of the population being poor and deprived because they live in a household where at least a child under five has died in the past five years.

These results highlight the composition of multidimensional poverty in Sierra Leone and help to identify public policy priorities in order to allocate resources more effectively to the highest deprivations faced by people living in poverty in the country.

Disaggregation by rural and urban areas

In order to learn how to use the composition of the national MPI to set budgetary and policy priorities, this section analyzes how deprivation patterns vary by different subgroups of population, by identifying who the poorest groups are and how poor they are. The disaggregated results enable to reveal disparities and pockets of high poverty, so that very poor places and groups can be targeted with appropriate interventions.

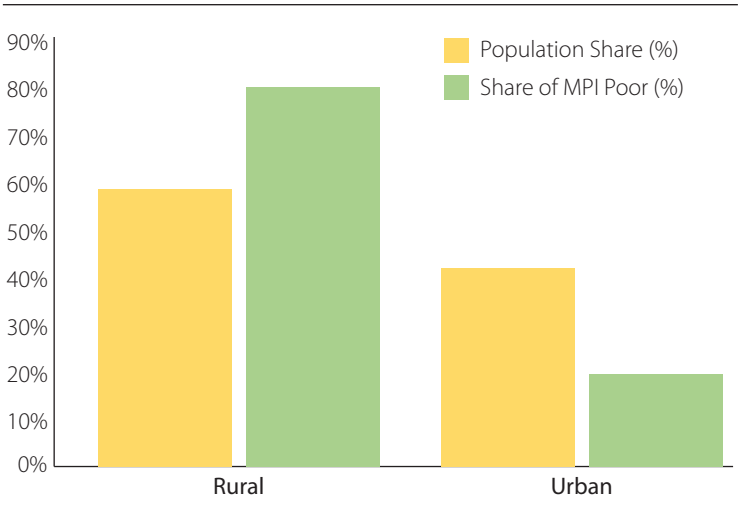
Table 3. Incidence, intensity and MPI by rural and urban areas

Area	Population Share (%)	MPI			Incidence (H, %)			Intensity (A, %)		
		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)	
Rural	58.5	0.455	0.439	0.471	**79.8**	77.3	82.2	57.1	56.5	57.6
Urban	41.5	0.135	0.119	0.150	**27.3**	24.3	30.3	49.3	48.4	50.1
National	100.0	0.322	0.309	0.335	**58.0**	55.8	60.2	55.5	55.0	56.1

Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Table 3 shows that about 58.5 percent of Sierra Leone's population, which is around 4.7 million people, live in rural areas, while 41.5 percent of the country's population, or 3.3 million people, lives in an urban environment. Among the population living in rural areas, 3.8 million are multidimensionally poor, which is equivalent to about eight out of ten people (79.8 percent). This situation stands in stark contrast to the incidence of poverty in urban areas, which affects around three in ten people (27.3 percent) -or 911 thousand people. Considering the distribution of the population by area of residence (Figure 5), rural areas are home of 80.5 percent of the total population living in multidimensional poverty in Sierra Leone, whereas urban areas represent 19.5 percent.

Figure 5. Distribution of the population and MPI poor by urban and rural areas



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

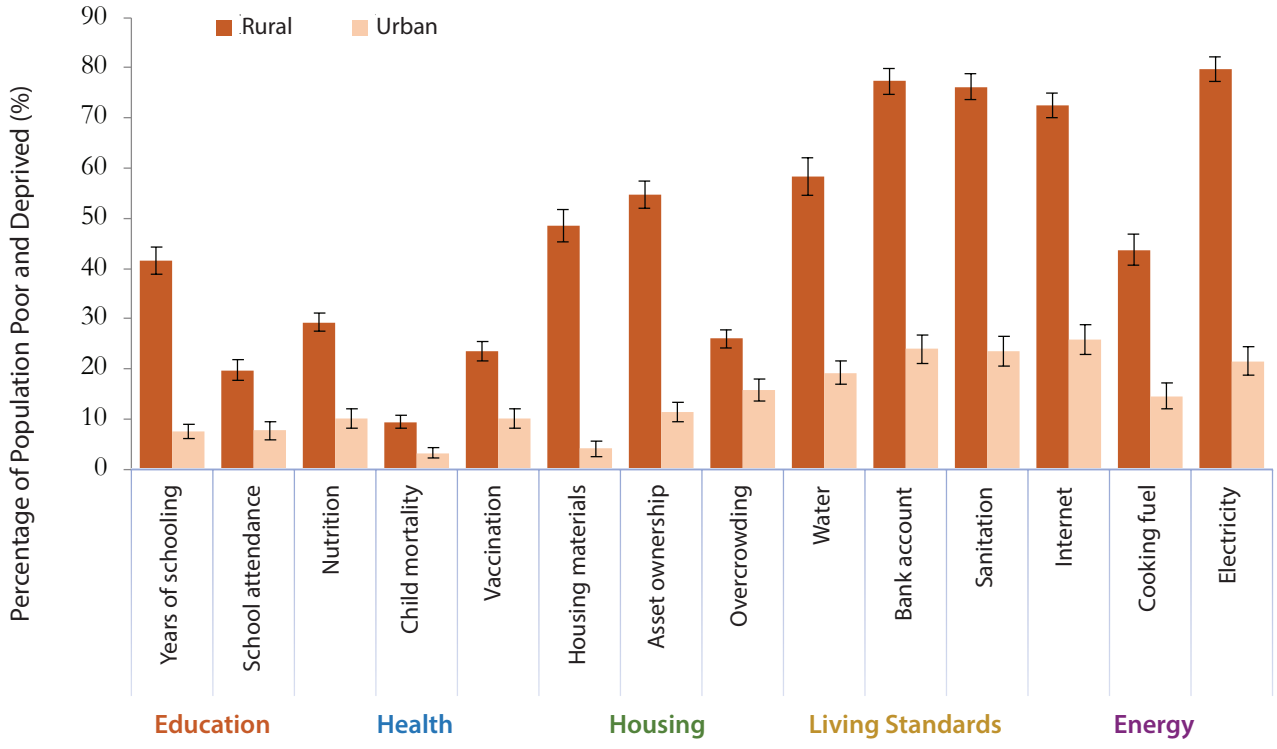
The intensity of poverty in rural areas indicates that each poor person is on average deprived in 57.1 percent of the weighted indicators, which is very close to the intensity of poverty in the whole country and significantly higher than the intensity of poverty in urban areas. Disparities between areas are also found when analyzing the national Multidimensional Poverty Index. Indeed, the MPI in rural areas (0.455) is 3.4 times higher than that in urban areas (0.135).

All these results identify rural areas as pockets of poverty that require priority attention from public authorities within the country.

Composition of poverty by area of residence and by indicator

Figure 6 shows the censored headcount ratios by area of residence, that is, the percentage population in each area that is MPI poor and deprived in each of the indicators. First, one can observe significant disparities between rural and urban areas. Indeed, the share of the population in rural areas that is poor and deprived is each of the indicators is significantly higher than that in urban areas, and this is true for the fourteen indicators that measure multidimensional poverty in Sierra Leone. The biggest differences can be observed for the indicators of electricity, sanitation, and bank account, followed by internet access, housing materials and asset ownership. For instance, 79.6 percent of the population who lives in rural areas is poor and does not have access to electricity, whereas in urban areas it is 21.5 percent of the population. Even within the indicators that have the lowest censored headcount ratios at the national level, such as school attendance, nutrition, child mortality and vaccination, one can observe significant differences. The largest one concerns the indicator of nutrition: one in ten people in urban areas is MPI poor and live in a household where at least one child is underweight or stunted, whereas it is three in ten people in rural areas.

Figure 6. Censored headcount ratios by urban and rural areas



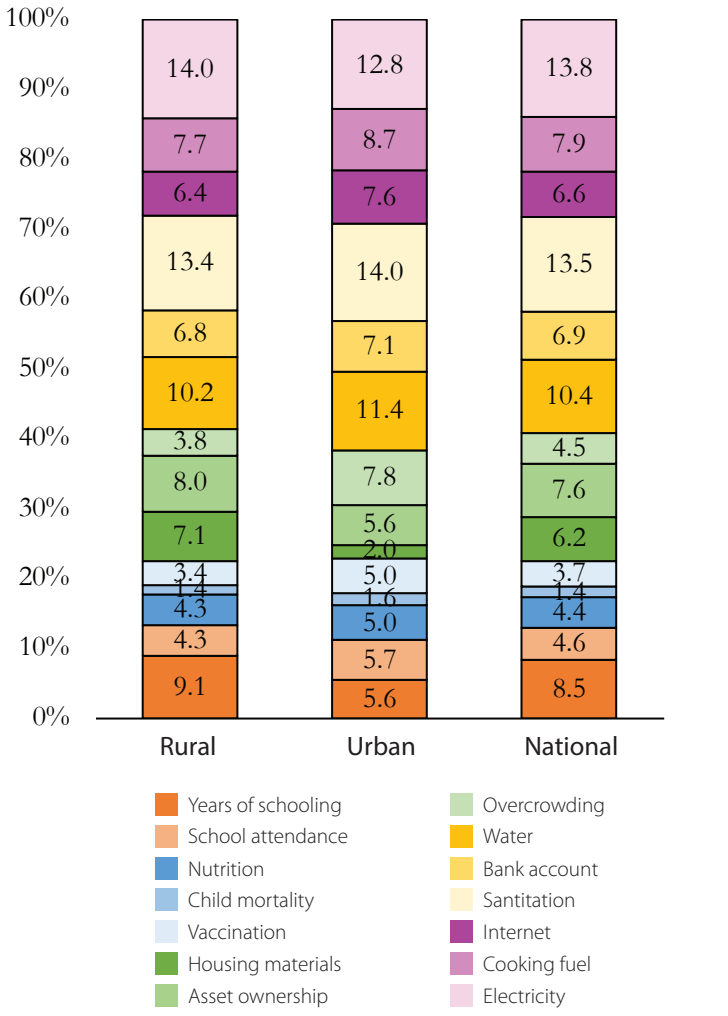
Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Second, one can observe that the indicators in which poor people living in rural areas face the highest levels of deprivation are electricity, bank accounts, sanitation, and internet access. Indeed, around 75 percent of the population living in rural areas is multidimensionally poor and deprived in each of these indicators, which is equivalent to around 3.6 million people. These are also the indicators in which poor people living in urban areas face the highest levels of deprivation. However, in contrast, only 23.7 percent of the population living in urban areas are MPI-poor and deprived in these indicators, on average (800,000 people). On the other hand, the indicators in which poor people living in rural areas face the lowest levels of deprivation are child mortality, school attendance, vaccination and overcrowding, where on average around 19.7 percent of the population living in these areas is MPI poor and deprived (almost one million people). In urban areas, it is the indicators of years of schooling, school attendance, child mortality and housing materials, those in which poor people face the lowest levels of deprivation: 5.6 percent of people in urban areas are MPI poor and deprived in each of these indicators, on average (188,000 people).

To continue analyzing the composition of poverty by area of residence, Figure 7 shows the contribution (in percentage) of each of the indicators to the MPI of each area of residence. This contribution is the result of the product between the censored headcount ratios previously described multiplied by the weight of each of the indicators, as a percentage of the MPI of each area of residence.

One can observe that in rural areas, the housing and education dimensions contribute more to the MPI than in urban areas, whereas the dimension of health contributes more to urban poverty that to rural. More precisely, living in a household where at least one person aged 15 or older has not completed at least six years of schooling, accounts for 9.1 percent of the national MPI in rural areas, whereas it only represents 5.6 percent of the MPI in urban areas. Living in a house where the floor is made of earth, sand or dung, and the walls or the roof are made of natural or low-quality materials, represents 7.1 percent of the MPI in rural areas, whereas only 2.0 percent in urban areas. However, living in an overcrowded house contributes more to urban poverty than to rural. On the other side, in urban areas, not having at least one child under three years old in the household with full vaccination for her/his age, contributes more to the MPI (around 5.0 percent) than in rural areas (3.4 percent). Not having access to internet or cook with coal, charcoal, wood, crop residue, processed biomass, or other and not cooking outside the house, contribute also more to poverty in urban areas than in rural areas. Nevertheless, in both urban and rural areas, the deprivations in water, bank account, sanitation, and electricity contribute most to poverty and very similarly, accounting for almost the half of the respective MPI of each area.

Figure 7. Percentage contribution of each indicator to the national MPI by rural and urban areas



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Disaggregation by region

This section analyzes the levels of poverty and its composition for each of the four regions -eastern, northern, southern and western- of the country.[11] Table 4 and Figure 8 reveal that the levels of multidimensional poverty are significantly lower in the western region, where the capital Freetown is located, than in the other regions of the country: 21.7 percent of the population in this region is multidimensionally poor, experiencing almost half of the weighted deprivations (48.0 percent) and with an MPI of 0.204. By contrast, the three other regions of the country are the poorest, but it is not possible to identify a clear ranking of which is poorer, since the confidence intervals of the MPI, the incidence and the intensity of multidimensional poverty of each of the regions overlap between each other (Figure 8). Therefore, on average, 67.3 percent of the population living in the eastern, northern or southern region is multidimensionally poor, representing 92.2 percent of the poor population in Sierra Leone (4.3 million people).

Table 4. Incidence, intensity and MPI by region [12]

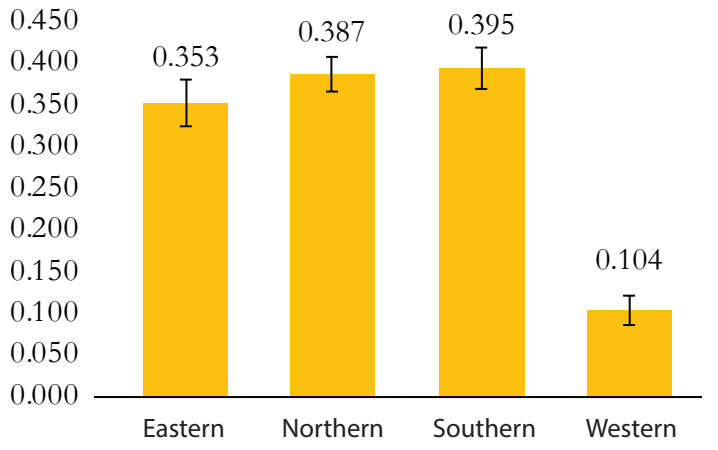
Region	Population Share (%)	MPI			Incidence (H, %)			Intensity (A, %)		
		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)	
Eastern	22.5	0.353	0.325	0.381	**63.7**	59.0	68.3	55.4	54.4	56.4
Northern	36.1	0.387	0.366	0.409	**68.8**	65.5	72.2	56.2	55.4	57.1
Southern	20.6	0.395	0.370	0.419	**69.5**	65.7	73.3	56.8	55.7	57.8
Western	20.8	0.104	0.086	0.122	**21.7**	18.0	25.4	48.0	46.8	49.2

Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

To set policy priorities and design high-impact policies in Sierra Leone, Figures 9 and 10 show the censored headcount ratios of each of the indicators and the percentage contributions of each of the weighted indicators to the MPI of each region.

The censored headcount ratios of each region measure the percentage population that is multidimensionally poor and deprived in each of the indicators. One can observe three main results. The first one is that the censored headcount ratios are always larger in the southern, northern and eastern regions, compared to the those in the western region. The largest disparities can be noticed, for instance, in the indicators of years of schooling or in the one related to housing materials, and in the bank

Figure 8. Multidimensional Poverty Index by region[13]



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

[11] The authors have joined the north western region into the northern region, for comparability of the geographic subnational decomposition by these four regions from 2017.

[12] Table A6 in the Appendix presents the results for the five administrative regions, which includes the north western region created in 2017.

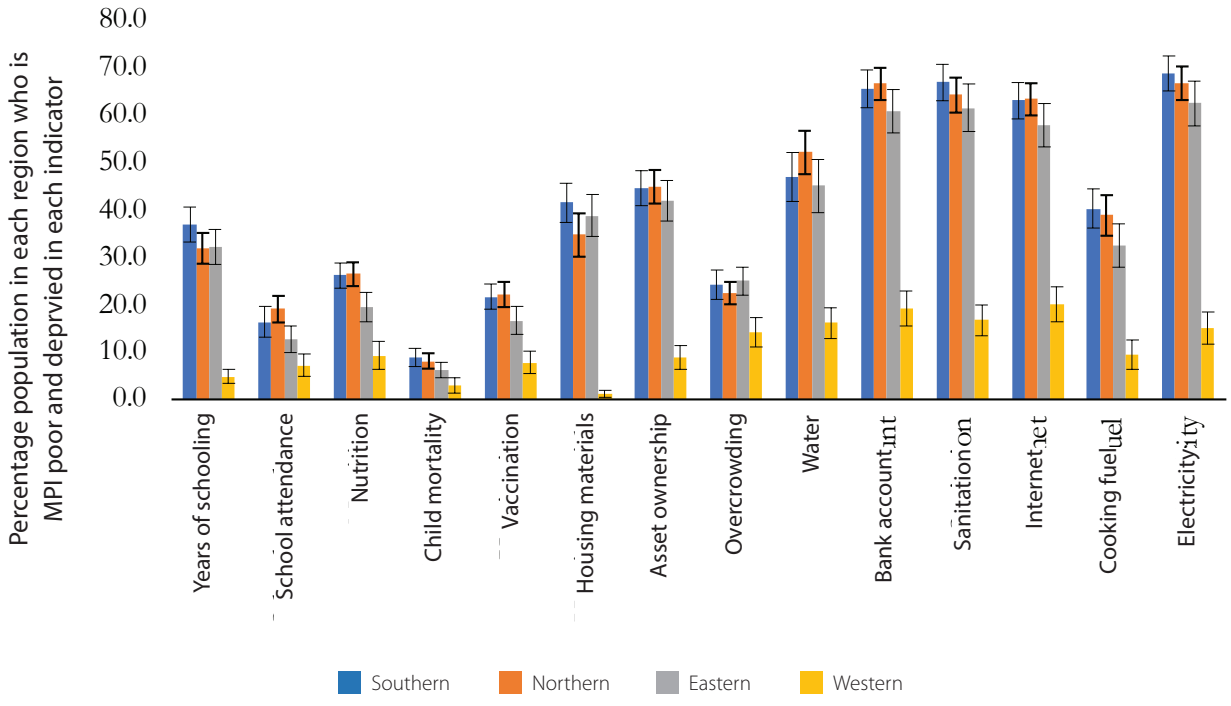
[13] Figure A2 in the Appendix presents the results for the five administrative regions, which includes the North western region created in 2017.

account, sanitation, internet and electricity. A significantly larger share of the population in each of the poorest regions of the country is MPI poor and deprived in each of these indicators, compared to a relatively small proportion of population in the least poor region, the western one. This is particularly more accentuated in the housing materials indicator, for instance. Indeed, only 1.2 percent of the population in the western region is poor and live in a house where the roof, the floor or the walls are made of natural or low-quality materials, whereas the percentage goes up to 34.8 percent, 38.9 percent and 41.6 percent in the northern, eastern and southern regions, respectively.

The second result is that the censored headcount ratios are very similar across the poorest regions of the country, with only statistically significant differences across them with regards to the school attendance and the nutrition indicators. Indeed, the proportion of the population who is MPI poor and lives in a household where at least one child in school age is not attending school, is significantly larger in the northern region, with respect to that in the eastern region. Likewise, the share of the population who is MPI poor and lives in a household where at least one child is underweight or stunted, is significantly larger in the southern and northern regions than in the eastern region.

Finally, the indicators in which poor people face highest levels of deprivation in all regions are bank account, sanitation, and internet. However, in the three poorest regions, the largest censored headcount ratio is found in the indicator of electricity, showing that the share of the population who is multidimensionally poor and doesn't have access to electricity is between 62.6 percent in the eastern region and up to 68.8 percent in the southern region. Nonetheless, in the western region, it is the indicators of internet and water the ones in which poor people face the highest levels of deprivation (20.2 percent and 19.2 percent, respectively).

Figure 9. Censored headcount ratios by region[14]



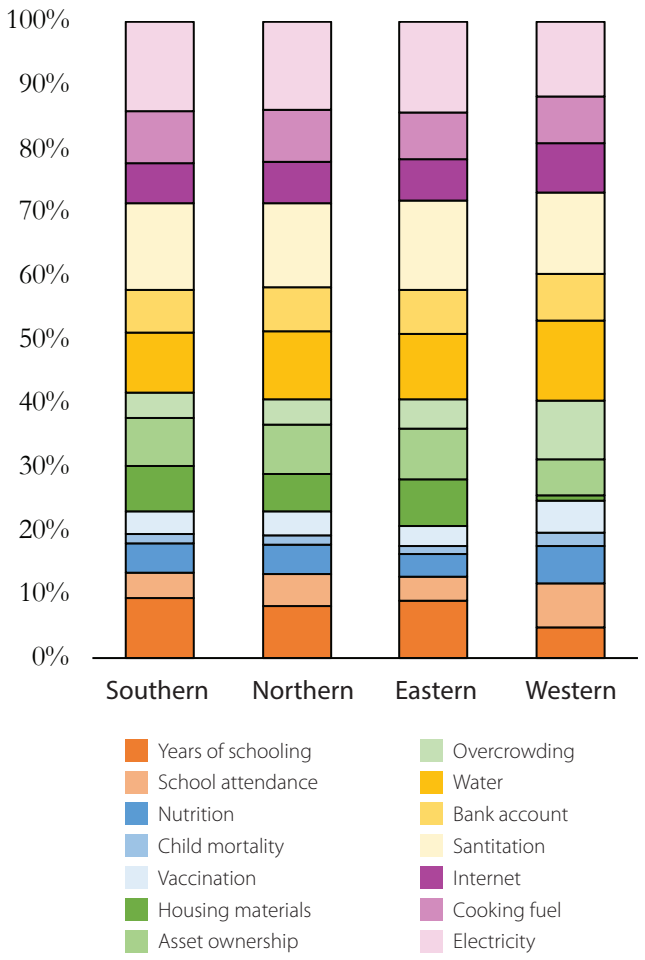
Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

[14] Figure A2 in the Appendix presents the results for the five administrative regions, which includes the north western region created in 2017.

Figure 10 shows the percentage contributions of each of the indicators to the MPI of each region, which captures the censored headcount ratios explained above multiplied by the weight of each indicator, as a share of the MPI of each region. The regions are again ordered by the MPI value, with the southern region in the left having the highest value, and the western region in the right with the lowest one.

According to Figure 10, the deprivations in school attendance, nutrition, child mortality, vaccination, overcrowding, access to safe drinking water, to a bank account and to an internet connection, contribute more to the MPI of the western region than to the MPI of the other regions in the country. The opposite is found for the deprivations in years of schooling, housing materials, and asset ownership, which contribute similarly and at least the double to the MPI in the southern, northern, and eastern regions, compared to their contribution to poverty in the western parts of the country. Additionally, in the poorest regions, using coal, charcoal, wood, crop residue, processed biomass, or other fuel to cook and cooking inside the house, or not having access to electricity, or to a toilet facility or having one but not improved, contribute more to poverty, than in the least poor region.

Figure 10. Percentage contribution of each indicator to the MPI by region[15]



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Disaggregation by district

To understand with more detail the geographic distribution of the level and composition of poverty in Sierra Leone and the pockets of poverty, this section analyzes a disaggregation of multidimensional poverty by the sixteen districts of the country. Table 5 and Figure 11 show that the districts that are part of the western region -western urban area and western rural area- are significantly less poor than the other districts of the country. The incidence of multidimensional poverty in western urban area is 12.6 percent and in western rural area 37.0 percent; the intensity of multidimensional poverty is 46.7 percent in western urban area and 48.8 percent in western rural area, meaning that multidimensionally poor people in both districts experience, on average, almost half of the weighted deprivations. The value of the MPI, which is the multiplication of the incidence and the intensity of multidimensional poverty, is 0.059 in the western urban area and 0.180 in the western rural area. These figures contrast to those of the poorest districts in the country, Pujehun (southern region), Karene and Falaba (northern region). Indeed, in these three poorest districts, around eight out of ten people on average, are multidimensionally poor. The intensity of multidimensional poverty is 59.8 percent in Pujehun, 58.3 percent in Karene, 57.2 percent in Falaba, underlining that multidimensionally poor people in these districts experience, on average, deprivations in almost 60 percent of the weighted indicators (equivalent to deprivations in three out of five dimensions of poverty). The value of the MPI in Pujehun is 0.500, in Karene it is 0.473 and in Falaba 0.448.

[15] Figure A3 in the Appendix presents the results for the five administrative regions, which includes the North western region created in 2017.

Apart from the two districts in the western region mentioned above, Pujehun, Karene and Falaba are also significantly poorer than the least poor districts of Kenema and Kono (eastern region), Kambia and Bombali (northern region) and Bo (southern region). The incidence of multidimensional poverty in these districts ranges from 55.8 percent in Bombali to 64.9 percent in Kambia. In Kenema, 61.0 percent of the population is multidimensionally poor and experience, on average, 57.0 percent of the weighted deprivations, which is the highest intensity of multidimensional poverty among these least poor districts and is very close to the intensity of poverty in Falaba, one of the poorest districts (as described above). This makes Kenema the poorest district among the least poor, with an MPI value of 0.348.

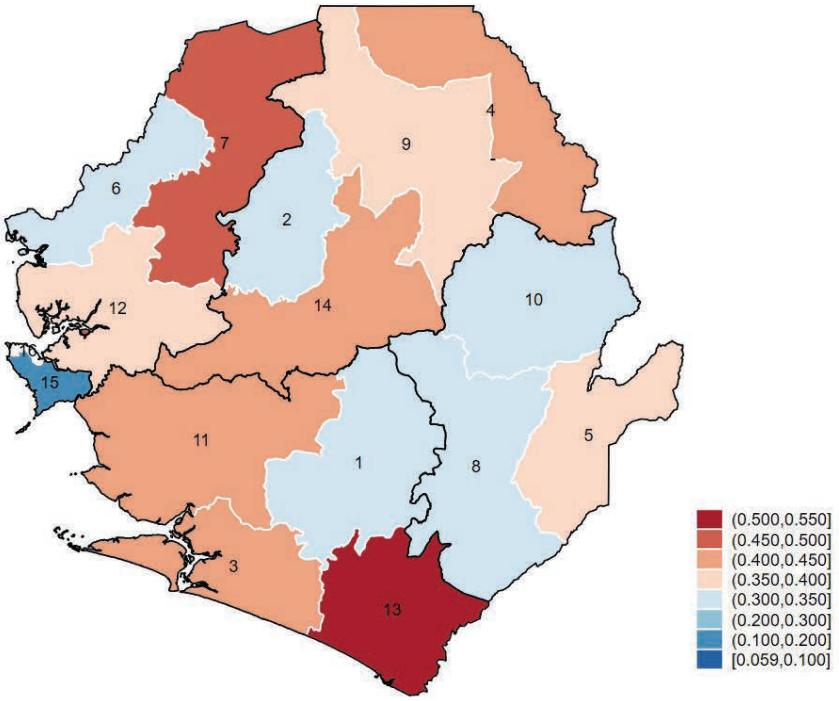
Table 5. Incidence, intensity and MPI by District

Region	District	Population Share (%)	MPI			Incidence (H, %)			Intensity (A, %)		
			Value	Confidence Interval (95%)		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)	
Western	Western Area Urban	13.1	0.059	0.041	0.077	**12.6**	8.9	16.4	46.7	44.8	48.6
	Western Area Rural	7.7	0.180	0.150	0.211	**37.0**	30.8	43.2	48.8	47.2	50.4
Eastern	Kono	6.6	0.330	0.288	0.371	**61.3**	54.1	68.6	53.7	52.5	55.0
	Kenema	10.6	0.348	0.296	0.400	**61.0**	52.6	69.4	57.0	55.2	58.9
	Kailahun	5.4	0.392	0.350	0.434	**71.8**	64.7	78.9	54.6	53.1	56.1
Northern	Bombali	7.2	0.314	0.244	0.383	**55.8**	43.8	67.9	56.1	54.1	58.2
	Kambia	5.1	0.346	0.288	0.403	**64.9**	55.8	74.1	53.2	50.8	55.7
	Koinadugu	2.6	0.392	0.328	0.457	**70.6**	60.3	80.8	55.6	52.2	58.9
	Port Loko	7.2	0.395	0.349	0.442	**71.0**	63.9	78.1	55.7	54.1	57.2
	Tonkolili	8.4	0.418	0.366	0.469	**72.7**	65.1	80.3	57.5	55.2	59.7
	Falaba	2.6	0.448	0.409	0.486	**78.3**	71.7	84.9	57.2	55.3	59.1
	Karene	3.0	0.473	0.426	0.520	**81.2**	73.4	88.9	58.3	56.9	59.7
Southern	Bo	8.9	0.328	0.289	0.367	**59.7**	53.5	65.8	55.0	53.0	57.0
	Bonthe	3.3	0.406	0.358	0.454	**71.4**	64.2	78.5	56.9	54.7	59.1
	Moyamba	4.9	0.433	0.373	0.492	**76.0**	66.3	85.6	56.9	55.3	58.6
	Pujehun	3.5	0.500	0.452	0.548	**83.6**	77.4	89.8	59.8	57.4	62.3

Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Figure 11. Multidimensional Poverty Index by districts

ID	District	MPI
1	Bo	0.328
2	Bombali	0.314
3	Bonthe	0.406
4	Falaba	0.448
5	Kailahun	0.392
6	Kambia	0.346
7	Karene	0.473
8	Kenema	0.348
9	Koinadugu	0.392
10	Kono	0.330
11	Moyamba	0.433
12	Port Loko	0.395
13	Pujehun	0.500
14	Tonkolili	0.418
15	Western Area Rural	0.180
16	Western Area Urban	0.059



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

When designing the budget allocation of resources for poverty reduction by geographic areas, it is also important to analyze the distribution of the population and the poor population across the different districts of the country. As such, 8.9 percent of the Sierra Leonean population lives in Bo and 10.6 percent in Kenema (two of the least poor districts in Sierra Leone), shares of population that are significantly higher than those who live in the poorest districts of Falaba (2.6 percent), Karene (3.0 percent) and Pujehun (3.5 percent). Consequently, the number of poor people who live in Kenema or Bo, is at least double that of the number of poor people living in either Pujehun, Karene or Falaba. Adding up the numbers, Kenema and Bo are home to almost 1 million poor people in Sierra Leone, which represents one in every five poor people in the country (20.2 percent). By contrast, almost 600,000 poor people live in the three poorest districts of Pujehun, Karene and Falaba, which represents around 13 percent of the multidimensionally poor people in Sierra Leone. Figure 12 and Figure 13 respectively, show the censored headcount ratios of each of the indicators by district, and the percentage contributions of each of the weighted indicators to the national MPI of each district. In Figure 12, districts are ordered by their respective MPI value presented in Table 5, from the least poor in the western urban area (left), to the poorest in Pujehun (right). The censored headcount ratios of each district measure the percentage population that is multidimensionally poor and deprived in each of the indicators. One can observe that there exist significant disparities across districts and for specific indicators. For instance, almost a third of the population (27.6 percent) in one of the least poor districts of Sierra Leone, Bombali (northern region), is multidimensionally poor and deprived in the indicator of years of schooling, whereas in the poorest district, Pujehun (southern region), is almost the double (50.3 percent of its population). These figures contrast significantly with those of the western urban area, the least poor district of the country, where only 3.0 percent of the population who live there is MPI poor and lives in a household where no member older than school age has completed at least six years of schooling.

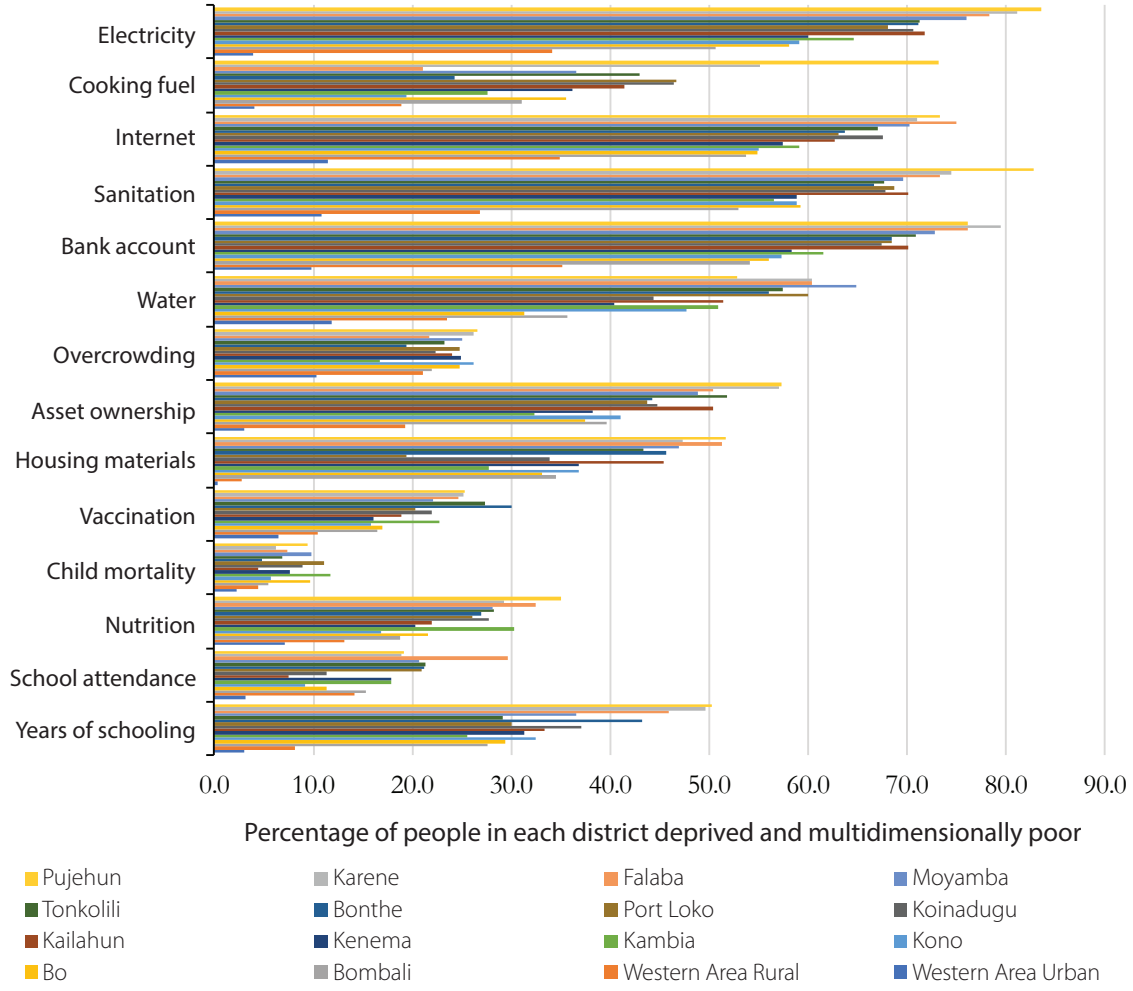
Other indicators such as cooking fuel, show significant disparities across the three poorest districts of the country, Falaba (northern region), Karene (northern region) and Pujehun (southern region). Indeed, one in every five

persons in Falaba (21.1 percent) is MPI poor and uses coal, charcoal, wood, crop residue, processed biomass, or other fuel to cook and does not cook outside, whereas it concerns more than half of the population (55.1 percent) in Karene and almost three in every four persons (73.2 percent) in Pujehun.

On the other hand, the indicators of overcrowding or child mortality show less disparities across districts in terms of the levels of deprivations faced by poor people. For instance, the proportion of the population who is multidimensionally poor and deprived in child mortality is very similar in Bo (southern region) (9.6 percent), one of the least poor districts, and in Pujehun (southern region) (9.4 percent), the poorest district.

Analyzing the percentage contributions of each of the indicators to the MPI of each district, captures the censored headcount ratios explained above multiplied by the weight of each indicator, as a share of the MPI of each district. According to Figure 13, deprivations in access to water, nutrition, vaccination and overcrowding, contribute more to the national MPI of the western Area Urban, (the least poor district in the country), than to the national MPI of any other district. On the other hand, deprivations in years of schooling and cooking fuel, contribute more significantly to the national MPI of Pujehun and Karene (two of the poorest districts). Deprivations in sanitation and electricity are the two factors that contribute the most to poverty in all districts of Sierra Leone, including the western rural area and except for the western urban area, in which the contribution of the deprivation to electricity access is relatively minor.

Figure 12. Censored Headcount Ratios by District

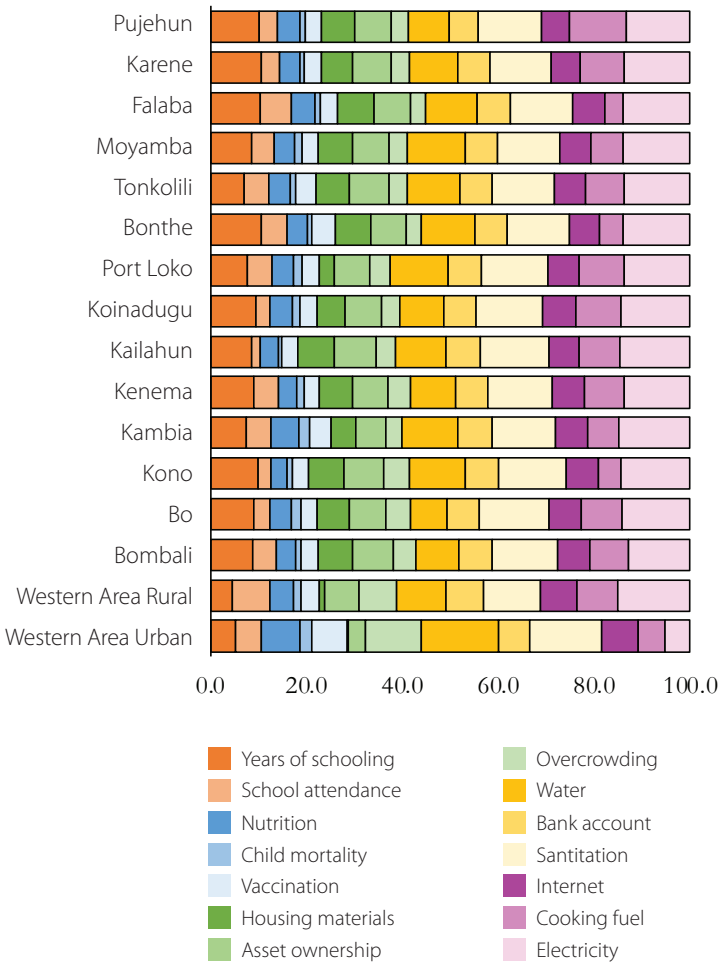


Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

How to shape the budget and public policy between districts

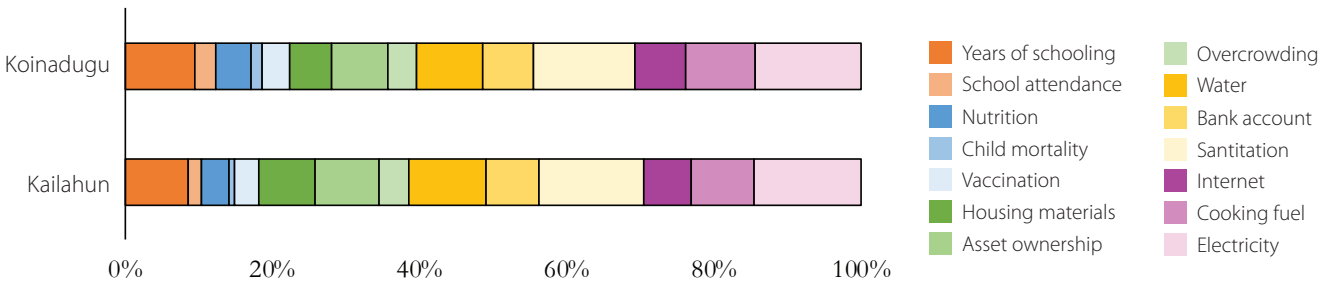
In order to use the percentage contributions to guide policy, let us take the example of Koinadugu and Kailahun in Figure 14, which are two districts that have the same national MPI value (0.392). One might think that the policies for reducing poverty would be the same. However, deprivations in the health, education and energy dimensions contribute more to multidimensional poverty in Koinadugu than in Kailahun, while deprivations in the housing and living standards dimensions contribute more to multidimensional poverty in Kailahun than in Koinadugu. In particular, deprivations in school attendance, nutrition, cooking fuel and internet, contribute more to the national MPI in Koinadugu than to the national MPI in Kailahun; while deprivations in housing materials, asset ownership, and access to a safe source of drinking water, contribute more to the national MPI in Kailahun than to the national MPI in Koinadugu. In policy terms, this means that a 'one-size-fits-all' approach is not cost-effective, as the different composition of poverty in each district requires different policy and budgetary responses.

Figure 13. *Percentage contribution of each indicator to the district MPI*



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Figure 14. *Composition of poverty at Koinadugu and Kailahun*



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Disaggregation by age group

Table 6 shows that children aged 0-14, who represent almost half of the population in Sierra Leone (44.5 percent – the largest share of population), are the poorest group in the country. Among them, 63.6 percent are multidimensionally poor, which represents almost half of the poor population in Sierra Leone, roughly 2.3 million people within the 4.7 who are multidimensionally poor. More specifically, while six out of ten people are multidimensionally poor in Sierra Leone, three of them are children. This result is significantly higher than that of young adults 15–35-year-old (49.4 percent are poor), and of people aged 36-64 years old (58.4 percent are poor). The elderly population (65 years old or older), despite representing only 4.4 percent of Sierra Leona's population, is the second poorest group in the country: 60.5 percent of them are multidimensionally poor, although, in contrast, it only concerns 212,000 people.

Table 6. Incidence, intensity and MPI by age group

Age Group	Population Share (%)	MPI			Incidence (H, %)			Intensity (A, %)		
		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)	
0-14	44.5	0.359	0.345	0.373	63.6	61.4	65.8	56.5	55.9	57.0
15-35	31.1	0.268	0.254	0.282	49.4	46.9	51.8	54.3	53.8	54.9
36-64	20.1	0.323	0.309	0.337	58.4	56.1	60.7	55.2	54.7	55.8
65+	4.4	0.326	0.308	0.345	60.5	57.3	63.8	53.9	53.0	54.8

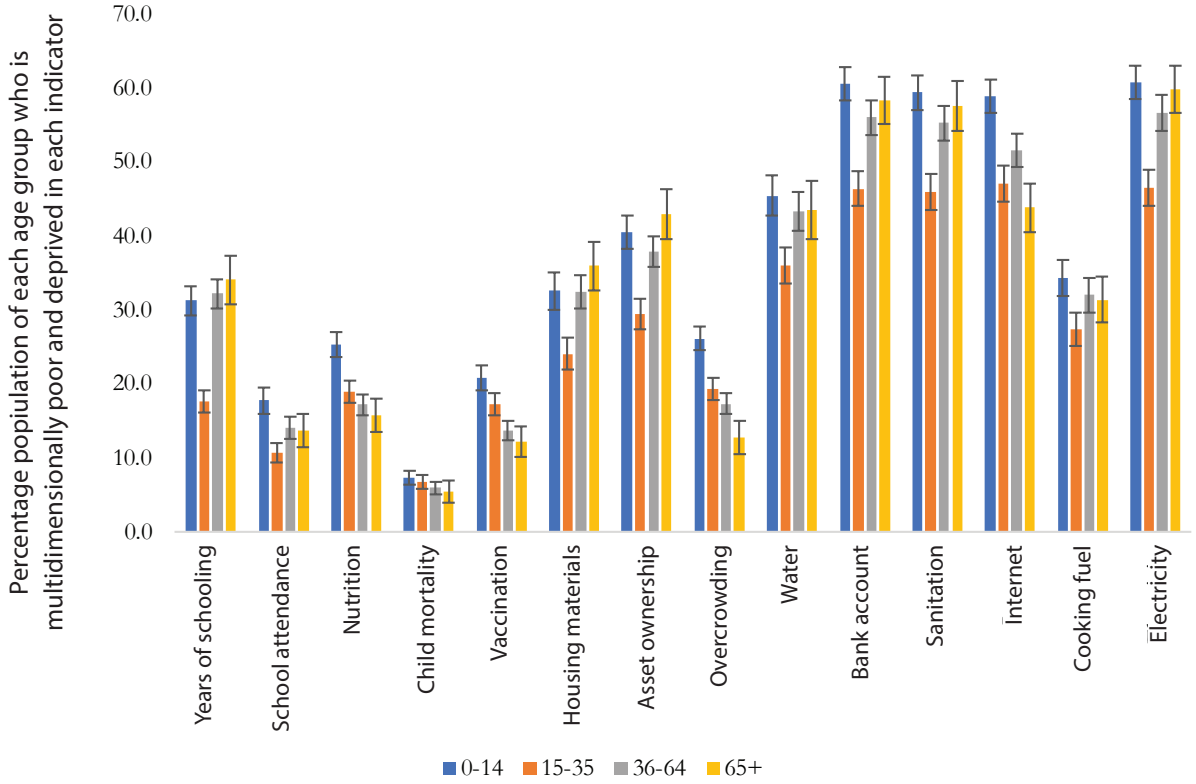
Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Furthermore, poor children suffer more weighted deprivations on average (56.5 percent) than the other groups of population, who confront an average intensity of poverty of around 54.5 percent. The national MPI of children aged 0-14 years old is 0.359, which is significantly higher than that of the other three age groups. These results underline the fact that children are a priority group to be considered in poverty reduction policy strategies in Sierra Leone; and the elderly should not be overlooked since, despite being the smallest population group, six in every ten of them, are multidimensionally poor.

The analysis of the composition of poverty by age group provides valuable insights for policy action, as it identifies the indicators in which multidimensionally poor people of each age group experiences the highest levels of deprivation, as well as the deprivations that contribute most to poverty in each age group. This information allows better targeting of interventions to reduce the deprivations faced my multidimensional poor people in Sierra Leone and, hence, to reduce multidimensional poverty in the country.

Figure 15 presents the censored headcount ratios of each age group. That is the proportion of the population of each age group who is multidimensionally poor and deprived in each of the indicators. First, the indicators in which the four age groups experience the highest levels of deprivation are bank accounts, sanitation, internet, and electricity. The indicator in which the four age groups experience the lowest level of deprivation is child mortality and school attendance. Second, children 0-14 years of age, adults 36-64 and the elderly 65 or more, experience significantly higher deprivations than the young adults 15-35 years of age (the least poor group), in the indicators of years of schooling, housing materials, asset ownership, water, bank account, sanitation and electricity. Finally, the deprivations that are particularly experienced by children 0-14 year of age (the poorest group) are school attendance, nutrition, vaccination and overcrowding. Indeed, the proportion of child population who is MPI poor and deprived in these indicators is significantly higher than that of the other age groups.

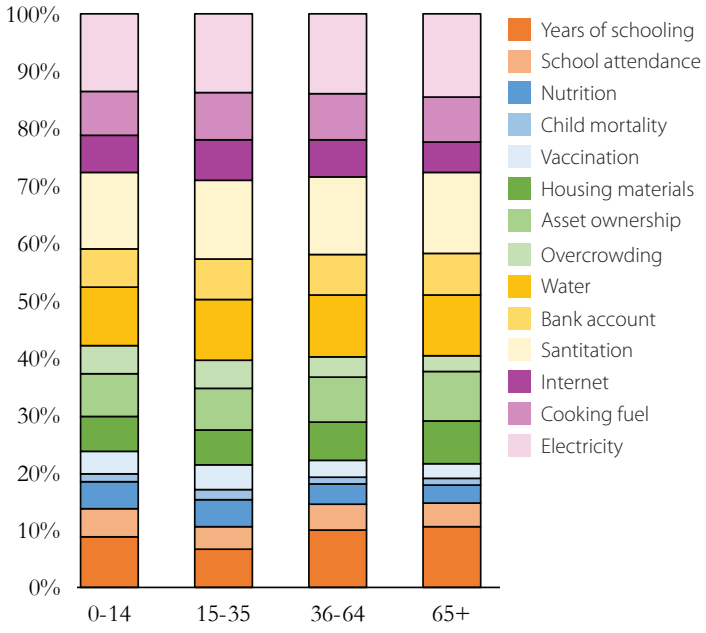
Figure 15. Censored Headcount Ratios by age group



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Figure 16 shows the percentage contributions of deprivations in each indicator to the national MPI of Sierra Leone of each age group, which is the multiplication of the censored headcount ratio of each indicator and its weight, as a share of the MPI of each age group. Highlighting the deprivations in electricity, sanitation facilities, and access to a safe source of drinking water contributes more than one-third to the national MPI of each age group. This is followed by living in a household where no member has attained at least six years of schooling; using coal, charcoal, wood, crop residue, processed biomass, or other fuel to cook and cooking inside the house; and having less than two small assets and not owning a car or a truck; which together contribute an average of 35 percent to poverty of each age group. Despite internet access and bank account being two indicators in which the proportion of population who is MPI poor and deprived is also significantly high for all the age groups (as described above), their contributions to poverty are smaller due to their lower weight.

Figure 16. Percentage contribution of each indicator to the MPI by age group



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

The indicators that contribute more to poverty among children 0-14 years of age than to any other age group are school attendance, nutrition, and overcrowding, although nutrition contributes also as much to the MPI of 15-35 years old group. On the other hand, years of schooling, asset ownership and housing materials contribute particularly more to poverty among the elderly.

Disaggregation by sex and educational level of the head of the household

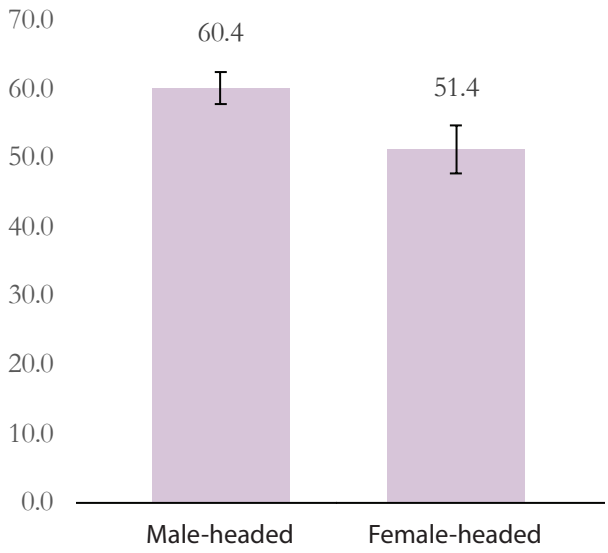
The following analyzes whether there exist disparities in terms of multidimensional poverty and its composition according to the sex and the educational level of the head of the household.

Household Headship

By disaggregating the national MPI of Sierra Leone by the sex of the head of household to explore gender inequalities, one finds a significantly higher incidence of multidimensional poverty among individuals living in male-headed households compared to female-headed households. Figure 17 shows that 60.4 percent of individuals living in male-headed households are poor, compared to 51.4 percent among female-headed households. The poverty intensity among poor people living in male-headed households is 55.9 percent, which is statistically higher than the intensity of poverty among individuals living in female-headed households (54.3 percent). The value of the MPI for individuals living in a male-headed household is 0.337, which is statistically higher than the respective value in female-headed households (0.279).

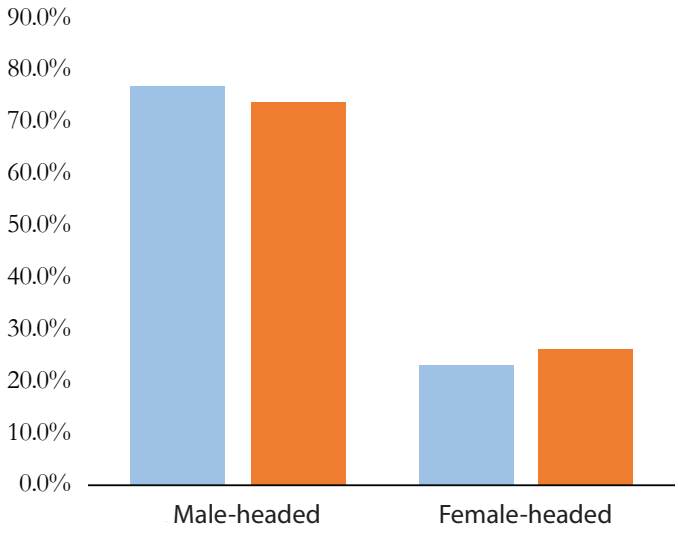
Regarding policy responses, it is essential to also consider the number of poor people. Thus, considering the demographic distribution of the population living in each type of household -where 73.8 percent live in a male-headed household and 26.2 percent live in a female-headed household-, the vast majority of the multidimensionally poor (76.8 percent, or almost 3.6 million) live in the former, while 23.2 percent (1 million poor) live in the latter (Figure 18). More specifically, while six out of ten people are multidimensionally poor in Sierra Leone, almost five of them live in a male-headed household, and one of them in a female-headed household.

Figure 17. Incidence of multidimensional poverty by household headship



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Figure 18. Distribution of the population and MPI poor by household headship



Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Level of education of the head of the household

The study also looks at the level of education of the head of the household. Table 7 reveals that individuals living in a household where the head of the household has no education represent 63.2 percent of the population of Sierra Leone, and they are the poorest population group: 72.1 percent of them are multidimensionally poor. More precisely, about 80 percent of the poor population (3.7 million Sierra Leoneans) live in this type of household. That is, while six out of ten people are multidimensionally poor in Sierra Leone, almost five of them live in a household where the head of the household has no education.

The MPI of individuals living in a household where the head of the household has no education is 0.411, and they face an intensity of multidimensional poverty in almost 60 percent of the weighted indicators on average, which corresponds to being deprived in three dimensions of poverty. All these results are significantly higher than those of individuals living in households where the head of the household has completed primary or secondary school or has attained higher education. More precisely, people living in households where the head of the household has attained (although maybe not completed) higher education,[16] the MPI of Sierra Leone is 0.008, with a poverty incidence of 1.9 percent, which concerns four thousand poor people in the country. The intensity of poverty of individuals living in a household where the head of the household has completed primary school (50.8 percent), is significantly higher than that of the individuals living in a household where the head of the household has attained higher education (43.1 percent).

Table 7. Incidence, intensity and MPI by education level of the head of the household

Level of education of the household head	Population Share (%)	MPI			Incidence (H, %)			Intensity (A, %)		
		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)	
No education	63.2	0.411	0.396	0.425	**72.1**	69.9	74.4	56.9	56.4	57.5
Completed primary	21.2	0.208	0.186	0.229	**40.9**	36.7	45.1	50.8	49.8	51.7
Completed secondary	13.2	0.145	0.119	0.171	**29.1**	24.2	34.1	49.9	48.2	51.6
Higher education	2.3	0.008	0.000	0.017	**1.9**	-0.3	4.1	43.1	39.1	47.0

Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

[16] She or he has completed at least 12 years of schooling.

Disaggregation by household size

Finally, the study conducted an analysis of multidimensional poverty according to the size of the household and considered four types of households: one person, a couple, three to five persons and six or more. Table 8 shows that the last type of household is overrepresented among the Sierra Leonean population. Indeed, 61.2 percent of the population in the country lives in a household with at least six people or more, 34.7 percent lives in a household with three to five people, 2.9 percent lives in couple, and 1.2 percent lives alone. Table 8 shows that multidimensional poverty is higher among households with largest size (at least three people living there): almost six in every ten persons living in a household with either three to five persons or six or more, is multidimensionally poor (57.9 percent and 59.2 percent, respectively). The intensity of poverty is also highest among these two groups and the MPI is equal to 0.318 for people living in households with three to five persons, and equal to 0.332 for people living in households with six people or more.

Table 8. Incidence, intensity and MPI by household size

Household size	Population Share (%)	MPI			Incidence (H, %)			Intensity (A, %)		
		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)	
1 person	1.2	0.155	0.130	0.179	**31.8**	26.7	36.8	48.6	47.4	49.8
2 persons	2.9	0.228	0.205	0.252	**44.9**	40.4	49.5	50.8	49.7	52.0
3-5 persons	34.7	0.318	0.302	0.335	**57.9**	54.9	60.8	55.0	54.3	55.6
6+ persons	61.2	0.332	0.316	0.349	**59.2**	56.5	61.9	56.1	55.3	56.8

Source: Author's calculation based on data from the Demographic and Health Survey (DHS, 2019).

Households of six or more people represent the largest part of the poor population in Sierra Leone. Indeed, almost three million poor people in Sierra Leone live in a household where at least six people living in it. This is almost the double of the number of poor people who live in a household with three to five people living in it (1.6 million), and together these two types of households are home to 97.1 percent of the multidimensionally poor population in Sierra Leone.

Chapter 4

Photo: UNDP Sierra Leone/*Mohamed Kanu*

Changes Over Time Analysis

A key question to understanding multidimensional poverty in Sierra Leone is 'how has it changed over time?' To answer this question, this report computes a comparable measure of poverty using data from MICS 2017 and DHS 2019. This section covers the following:

- Comparable Measure,
- Changes in Multidimensional Poverty 2017 and 2019,
- Changes in Multidimensional Poverty by Region.

Comparable Measure

This section explains the measure and data used to compare multidimensional poverty across time. In this chapter, a MPI and its sub-indices using the data from the MICS 2017 and DHS 2019 is computed and presented.

To compare poverty across time, it is necessary to have a poverty measure that can be harmonized across the different datasets used. This measure is based on the structure of the national MPI that was analysed earlier in the report, and it is slightly modified due to data limitations in the earlier datasets and the need for strict comparability across time. The comparable measure maintains the same 5 dimensions (education, health, housing, living standards and energy) and the 14 indicators. However, some indicators were modified given data restrictions, those are:

1. Child mortality: Only information reported by women regarding the death of any child younger than five in the last 5 years was used
2. Vaccination: This indicator was only computed for households with children three years or younger, given that DHS 2019 only ask questions on vaccination for this group
3. Internet access: The original definition captures whether there is no connection to the internet in the household. However, the information on DHS 2019 is only available at the individual level, so the indicator is adapted to fit the available information and deprivation is identified if at least one person in the household doesn't use the internet
4. Cooking fuel: The original definition captures whether the household has as the main cookstove a liquid fuel stove, a manufactured solid fuel stove, a traditional solid fuel stove, or a three-stone stove/open fire/other type of stove, and the energy used is coal, charcoal, wood, crop residue, processed biomass, or other and it does not cook outside or the stove does not have a chimney. However, on DHS 2019, only the information about the type of cooking fuel and whether the household has an additional room for cooking is available. So, the indicator is adapted accordingly, identifying a deprivation if the household uses coal, charcoal, wood, crop residue, processed biomass, or others and it does not cook outside.

Indicators regarding the dimensions of education, housing, and living standards did not present any changes between surveys, therefore the same definition was used, and no changes were implemented in the definitions.

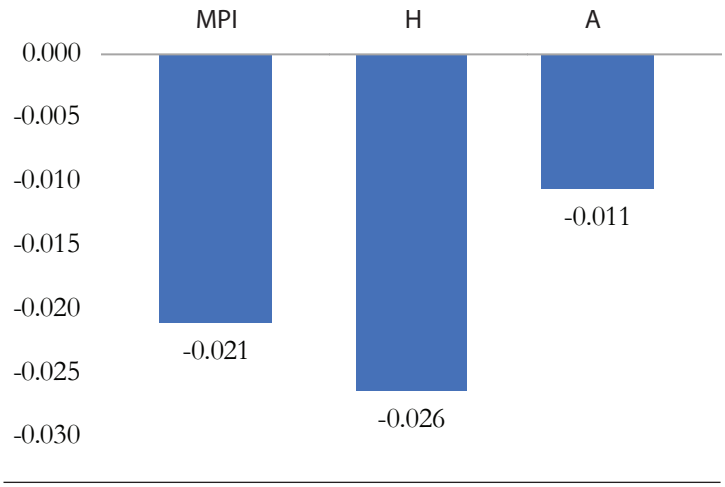
Changes in Multidimensional Poverty 2017-2019

This section examines the evolution of multidimensional poverty in Sierra Leone looking at data from the years 2017 and 2019. It calculates the national MPI and its sub-indices (H and A) for the two periods using MICS and DHS datasets, and it is disaggregated by regions. The MPI allows presenting changes over time rigorously for indicators having strictly comparable definitions and inferring trends over time in terms of poverty alleviation. This section focuses on regional and dimensional changes over time.

Figures 19 and 20 give an overview of how the incidence, the intensity, and the MPI have changed over the two points in time. Although multidimensional poverty dropped between 2017 and 2019, this reduction was not statistically significant. The MPI decreased from 0.343 to 0.322, and the incidence (H) fell from 60.7 percent to 58.0 percent, but neither was statistically significant at ten percent confidence level.

It is interesting to analyse the extent to which these results in the MPI, the incidence, and the intensity depend on the poverty cut-off. Figures 21 and 22 show the value of the incidence and the MPI for all possible values of the poverty cut-off and for the two waves under study. As can be seen, when comparing 2017 and 2019, the curves for the incidence of multidimensional poverty are not overlapping across the whole distribution, with the curves for 2019 always falling below the ones for 2017. However, the confidence intervals of the MPI and the incidence of multidimensional poverty always overlap, therefore the differences are not statistically significant in any point of the distribution.

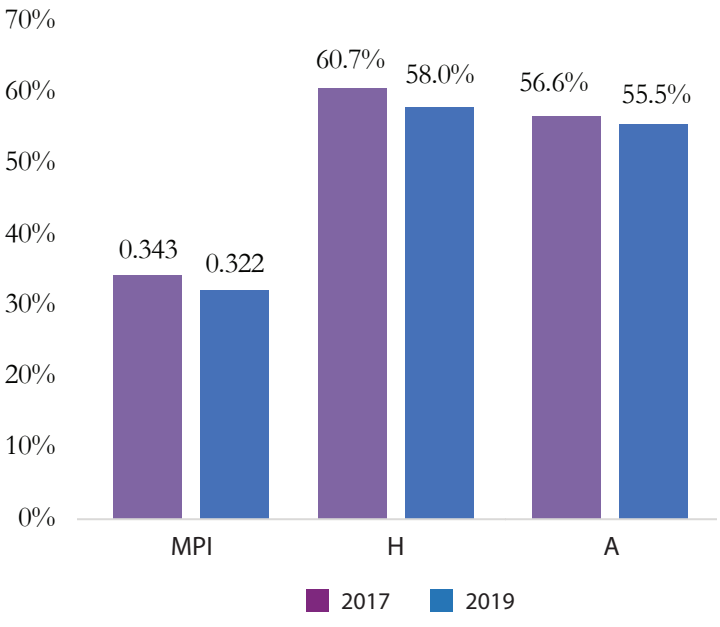
Figure 19. Absolute Changes in Incidence, Intensity and MPI in Sierra Leone, 2017 and 2019



Source: Authors' calculations based on data from MICS and DHS, various waves.

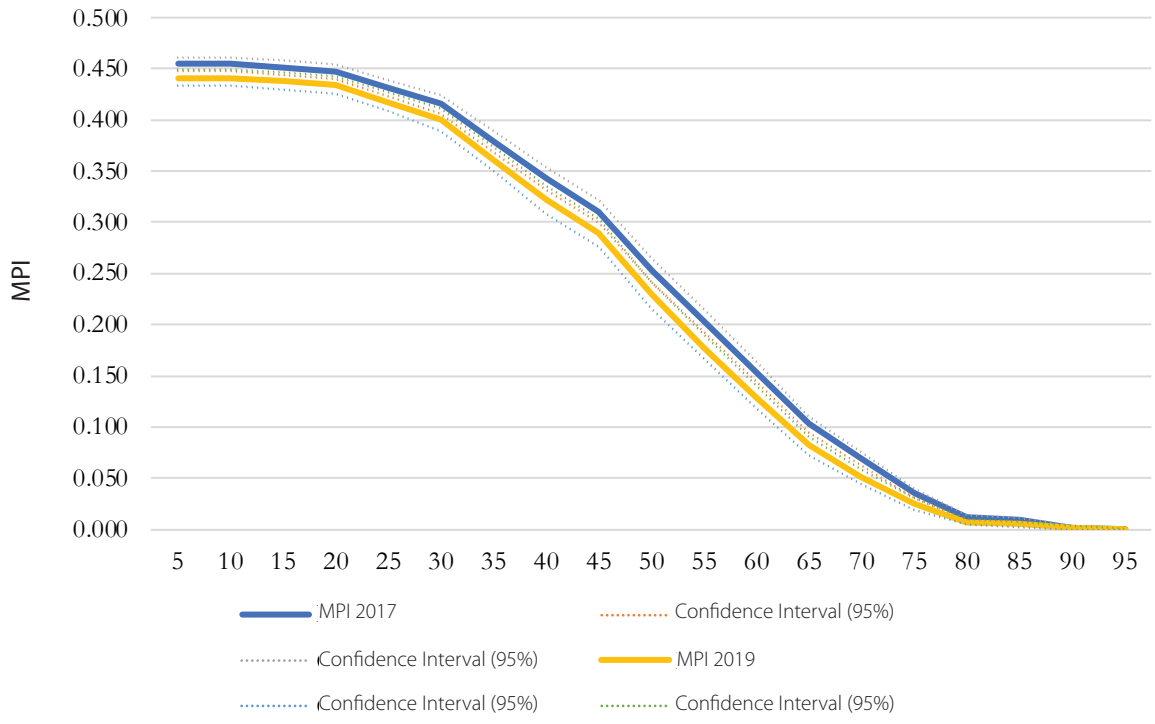
*Note: *** 1 percent level of significance; ** 5 percent level of significance, * 10 percent level of significance, two-tailed test.*

Figure 20. Incidence and Intensity of Multidimensional Poverty in Sierra Leone, 2017-2019



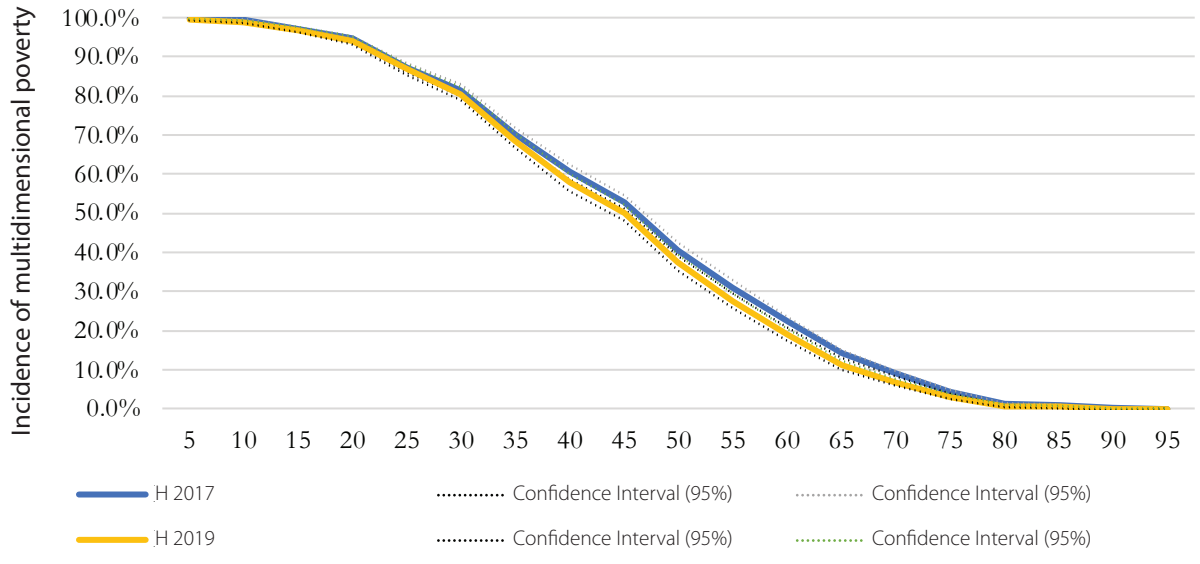
Source: Authors' calculations based on data from MICS and DHS, various waves.

Figure 21. Multidimensional Poverty Index for Different Values of the Poverty Cut-off, 2017, 2019



Source: Authors' calculations based on data from MICS and DHS, various waves.

Figure 22. Incidence of Multidimensional Poverty for Different Values of the Poverty Cut-off, 2017, 2019

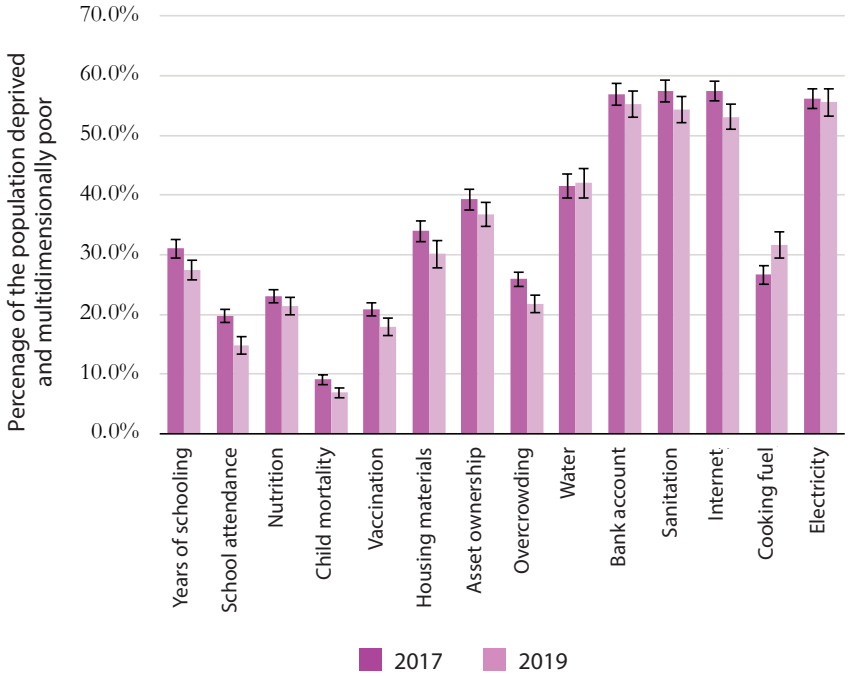


Source: Authors' calculations based on data from MICS and DHS, various waves.

Despite the incidence, the intensity and the MPI have not significantly decreased over time, it is useful to analyse whether there are any statistically significant changes in the indicators and dimensions that characterise poverty in Sierra Leone. Figure 23 provides a more refined view of what drove the reduction in multidimensional poverty over time. Censored headcount ratios – measuring the percentage of people who are MPI poor and deprived in a given indicator – are depicted for the two points in time. One can observe significant differences between 2017 and 2019, in the indicators of years of schooling, school attendance, child mortality, vaccination, overcrowding, internet access and cooking fuel.

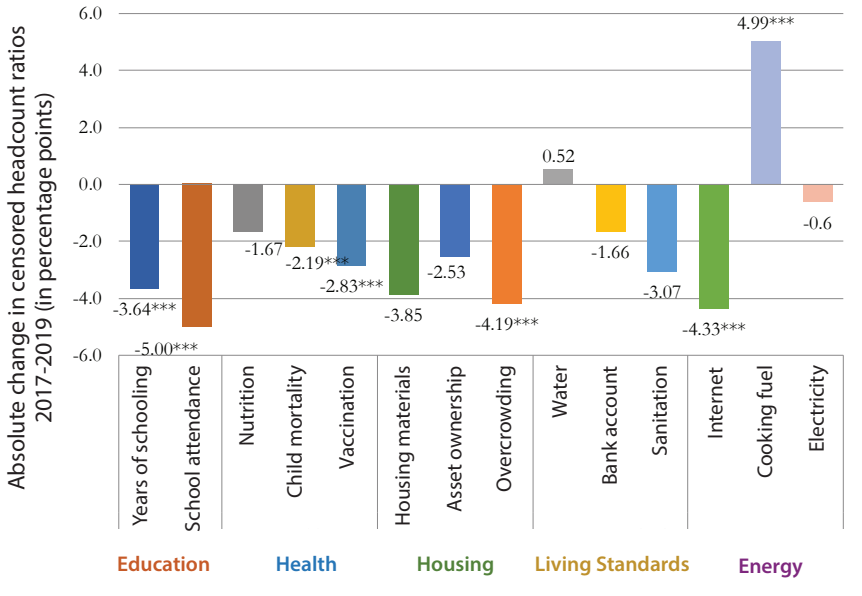
Figure 24 depicts the absolute change in the censored headcount ratios between 2017 and 2019, in percentage points (pp). Between 2017 and 2019, 12 of the 14 indicators presented an absolute change in the censored headcount ratios, therefore, the percentage of people who are deprived in each indicator and at the same time are multidimensionally poor reduced between both years. However, this reduction was only statistically significant in six of the 12 indicators, with the largest reduction in school attendance (5 pp), followed by internet access (4.3 pp) and overcrowding (4.2 pp). Two indicators presented a positive absolute change of the censored headcount ratios: cooking fuel and access to a clean source of water, but only cooking fuel represented a significant increase.

Figure 23. Censored Headcount Ratios, 2017-2019



Source: Authors' calculations based on data from MICS and DHS, various waves.

Figure 24. Absolute Change in Censored Headcount Ratios between 2017-2019

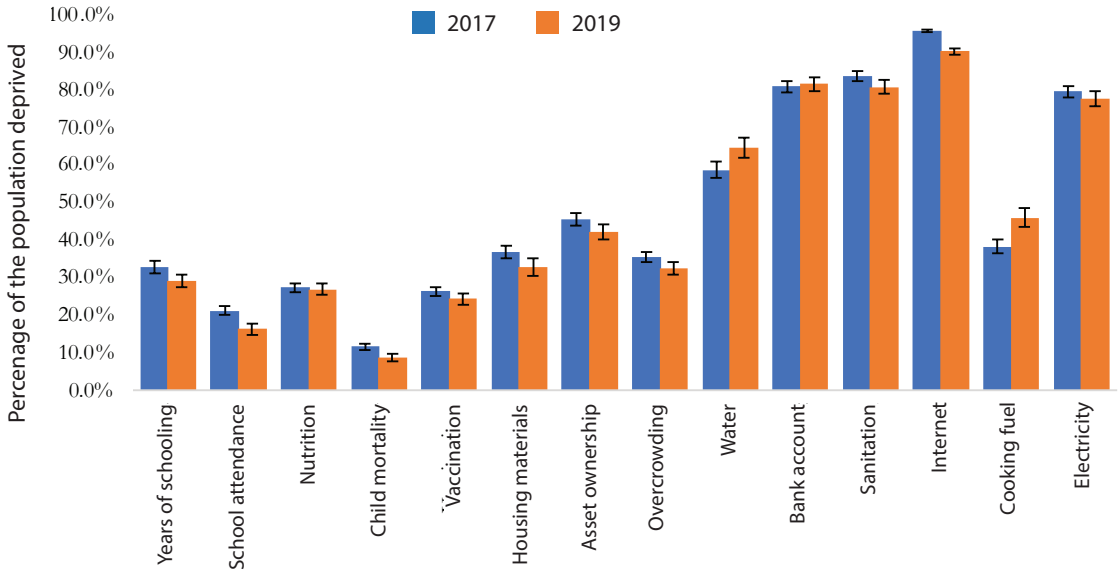


Source: Authors' calculations based on data from MICS and DHS, various waves.

*Note: *** 1% level of significance; ** 5% level of significance, * 10% level of significance, two-tailed test.*

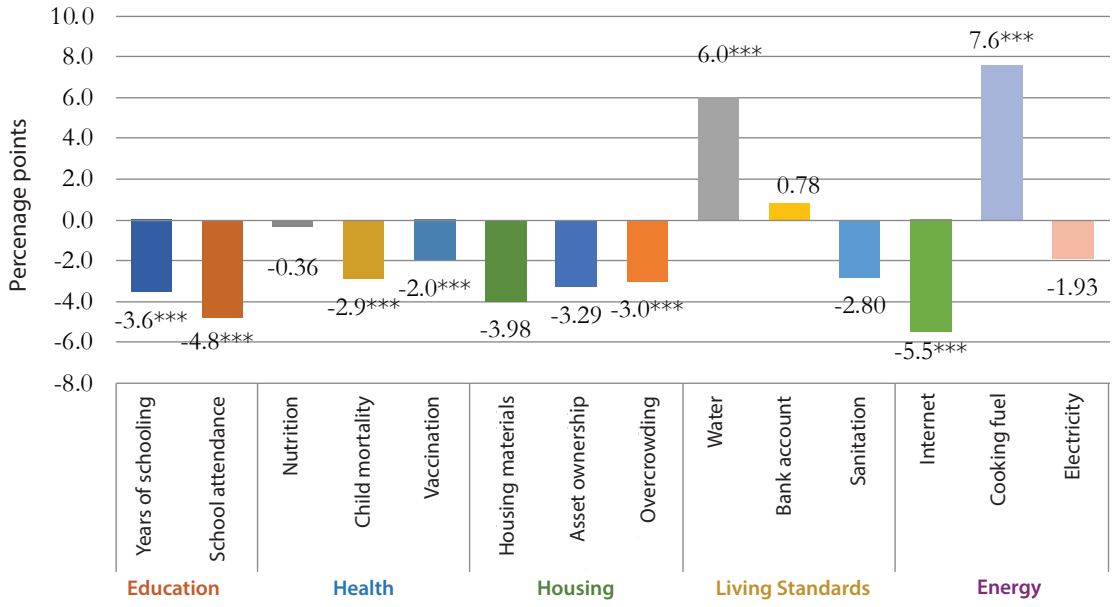
It is useful to analyse population-wide trends in the MPI indicators alongside the trends in deprivations of the poor. Figure 25 presents the proportion of people deprived in each of the 14 indicators used in the MPI, or the uncensored headcount ratios. This figure reveals that there was a statistically significant reduction in the percentage of people who were deprived in all indicators except in nutrition, access to a clean source of water, bank account and cooking fuel. Figure 26 displays the absolute change in the uncensored headcount ratios between 2017 and 2019. Internet access and school attendance show the largest absolute improvements with a reduction in the percentage of people deprived in each indicator (of 5.5 pp and 4.8 pp, respectively), followed by housing materials (3.98 pp) and years of schooling (3.6 pp). On the other hand, deprivations in access to a clean source of water and cooking fuel increased between 2017 and 2019, with an absolute change of 6.0 pp and 7.6 pp, respectively.

Figure 25. Uncensored Headcount Ratios, 2017 and 2019



Source: Authors' calculations based on data from MICS, various waves.

Figure 26. Absolute Change in Uncensored Headcount Ratios between 2017-2019



Source: Authors' calculations based on data from MICS and DHS, various waves.

*Note: *** 1 percent level of significance; ** 5 percent level of significance, * 10 percent level of significance, two-tailed test.*

Changes in Multidimensional Poverty by Region

Table 9 presents the incidence, the intensity and the MPI of the four regions in 2017 and 2019. Amongst the four regions, only one – the western region – shows statistically significant reductions in the MPI over the period under study. Figure 27 shows regional trends in absolute changes over time of multidimensional poverty. As can be seen, the western region shows the fastest absolute reduction in the MPI between 2017 and 2019 (0.059 points of the index), followed by the northern and southern region (almost 0.03 points). However, the changes in these last two regions were not statistically significant. A very small increase in MPI was seen in the eastern region, though this increase was not statistically significant. This means that poverty did not statistically change in the northern, southern and eastern regions between 2017 and 2019.

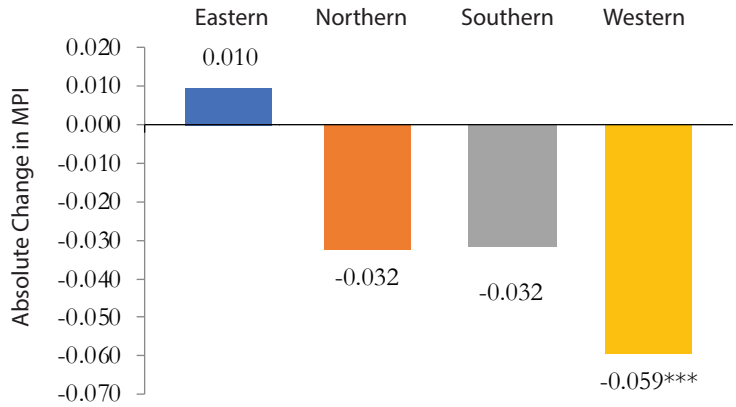
To investigate if the reduction of multidimensional poverty across regions is pro-poor or is leaving the poorest regions behind, Figure 28 plots the absolute change in MPI on the vertical axis against the initial level of multidimensional poverty (i.e., the level of the MPI in 2017). Considering that the region experiencing the most substantial reduction in multidimensional poverty in 2017 was initially the one with the lowest level of such poverty, it appears that the reduction in multidimensional poverty was not directed towards alleviating the conditions of the poorest. In fact, the regions that gained the most from this reduction were not the most economically disadvantaged areas in the country. Conversely, the regions that exhibited the highest levels of poverty in 2017 did not make significant strides in reducing poverty during this period.

Table 9. Incidence, Intensity and MPI across regions in 2017 and 2019

	MPI		Incidence (%)		Intensity (%)	
	2017	2019	2017	2019	2017	2019
Eastern	0.343	0.353	61.6	63.7	55.7	55.4
Northern	0.420	0.387	72.0	68.8	58.3	56.2
Southern	0.426	0.395	72.8	69.5	58.5	56.8
Western	0.163	0.104	33.1	21.7	49.3	48.0

Source: Authors' calculations based on data from MICS and DHS, various waves.

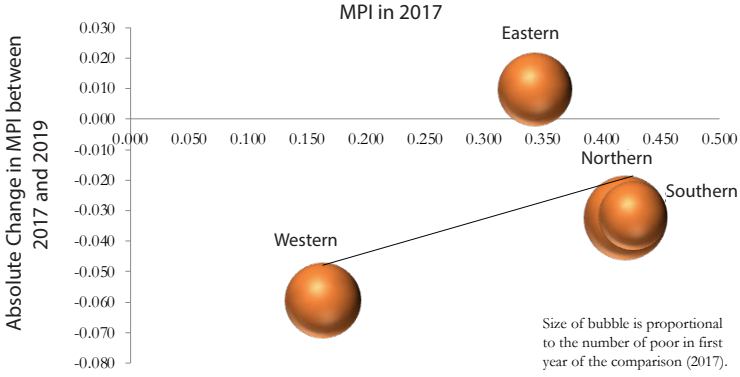
Figure 27. Absolute Change in Subnational Regions' MPI between 2017 and 2019



Source: Authors' calculations based on data from MICS and DHS, various waves.

*Note: *** 1 percent level of significance; ** 5 percent level of significance, * 10 percent level of significance, two-tailed test.*

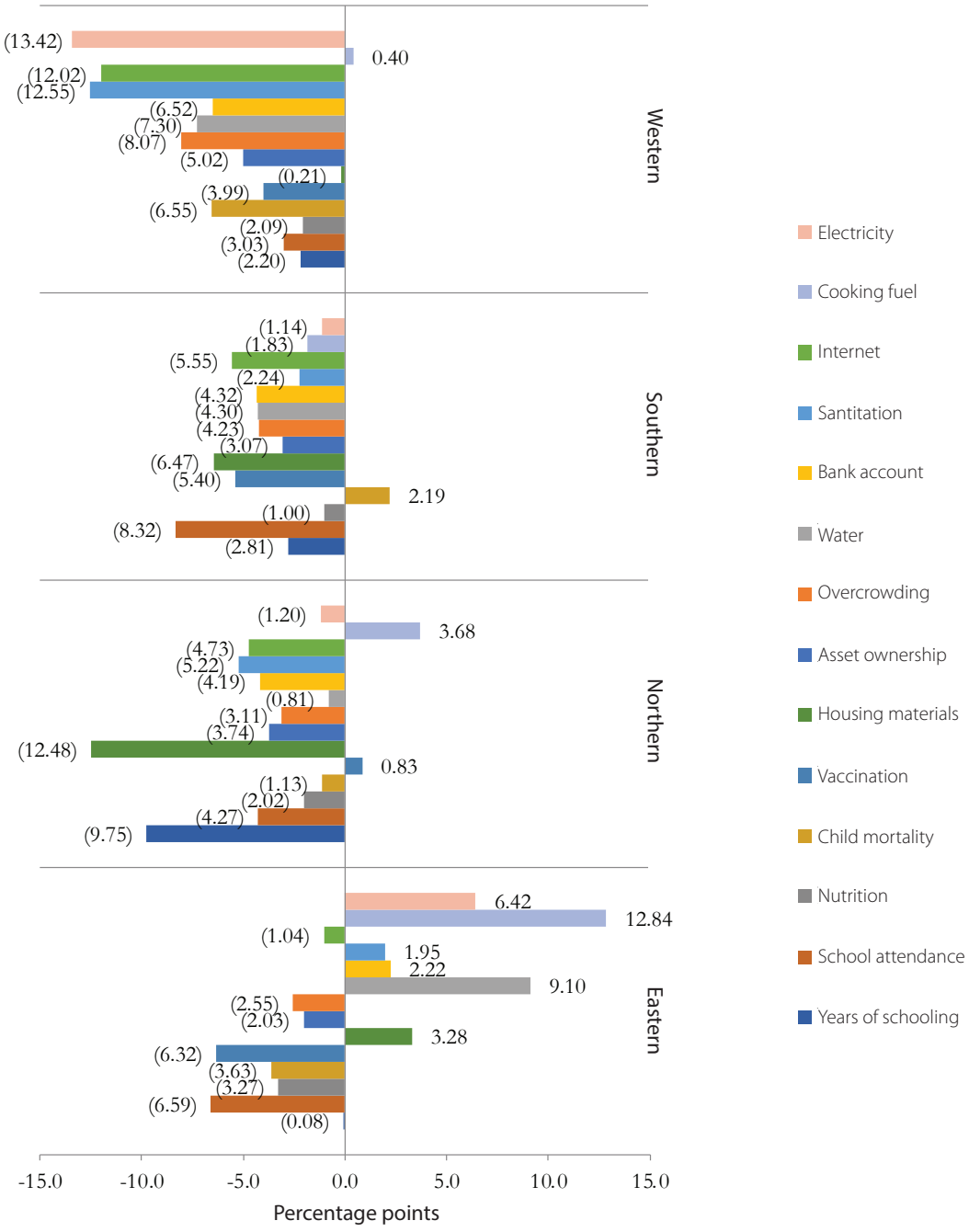
Figure 28. Poverty Reduction in Regions between 2017 and 2019



Source: Authors' calculations based on MICS and DHS, various waves.

Figure 29 highlights the changes in censored headcount ratios between 2017 and 2019 for each region. While there are clear improvements across most of the indicators in most regions, there are some exceptions. Notably, deprivations in cooking fuel and access to a clean source of water in the eastern region are the highest among the four regions. In the western region the indicator with the largest reduction was electricity (13.4 pp), followed by internet access (12.6 pp) and overcrowding (8.1 pp). In the southern region the indicator with the largest reduction was school attendance (8.3 pp) and in the northern region, housing materials was the indicator with the largest reduction (12.5 pp).

Figure 29. Absolute Change in Censored Headcount Ratios by Region between 2017 and 2019



Source: Authors' calculations based on MICS and DHS, various waves.

Chapter 5

Photo: UNDP Sierra Leone/Janet Dabire

Conclusions and Recommendations

This report has provided a comprehensive overview of multidimensional poverty in Sierra Leone for 2019 and its trends between 2017 and 2019, using the national MPI of Sierra Leone. Overall, 58 percent of people (4.7 million) is poor in 2019 by the national MPI, but levels vary across the country. Poverty is highest in rural areas, where almost 80 percent of the population is poor, compared to only one third of the population that is poor in urban areas. Multidimensional poverty is highest in the northern, southern and eastern regions, concentrating 92.2 percent of the poor population of Sierra Leone. The districts of Pujehun (southern region), Karene and Falaba (northern region), are the poorest of the country, and the capital of Freetown is the least poor.

Children aged 0-14 are the poorest group in the country. Among them, 63.6 percent are multidimensionally poor, which represents almost half of the poor population in Sierra Leone, roughly 2.3 million people. More specifically, while six out of ten people are multidimensionally poor in Sierra Leone, three of them are children, and they experience particularly high deprivations in school attendance, nutrition, vaccination and overcrowding.

Striking differences in the levels of multidimensional poverty exist between male and female-headed households. People living in the former are poorer than those who live in a female-headed household. Precisely, 60.4 percent of individuals living in male-headed households are poor, compared to 51.4 percent among female-headed households. In addition, people living in households where the head of the household has no education are poorer than those who live in a household where the head of the household has at least completed primary education: about 80 percent of the poor population (3.7 million Sierra Leoneans) live in the former type of household, representing five in every six poor people in the country. Multidimensional poverty is also higher among households with largest size (at least 3 people living there).

Policy priorities vary across regions and groups. In general, deprivations tend to be low in child mortality, school attendance and vaccination; and high in electricity, sanitation, bank account and internet, where more than 90 percent of the poor population is deprived. Improving these deprivations would help to reduce multidimensional poverty in Sierra Leone.

The analysis of the trends over time reveal that efforts still need to be made in order to reduce multidimensional poverty in Sierra Leone. Indeed, between 2017 and 2019, neither the incidence, nor the intensity or the MPI have significantly decrease at the national level. However, a reduction in poverty numbers is found in the western region of the country, which was the least poor region in 2017 and, thus, remains also the least poor in 2019. This underlines the urgency to strengthen poverty reduction strategies in the other three regions of Sierra Leone, the northern, southern and eastern regions, which are home of nine in every ten poor persons in the country.

The analysis of the trends in the deprivation levels of each indicator of the national MPI shows that particular efforts would need to be placed in improving the nutritional health of children under the age of five, in ensuring that the dwellings are made of finished materials, in reinforcing the capacity of the households to cope with unexpected situations through the increase in the number of assets that they own, in enabling that each household has access to a safe source of drinking water and an improved sanitation facility, in supporting the financial inclusion of the households by facilitating the access to at least one bank account, and in transitioning towards the use of non-solid fuels for cooking or at least direct efforts towards engaging the households to cook outside their homes in order for people to avoid suffering from possible respiratory health problems.

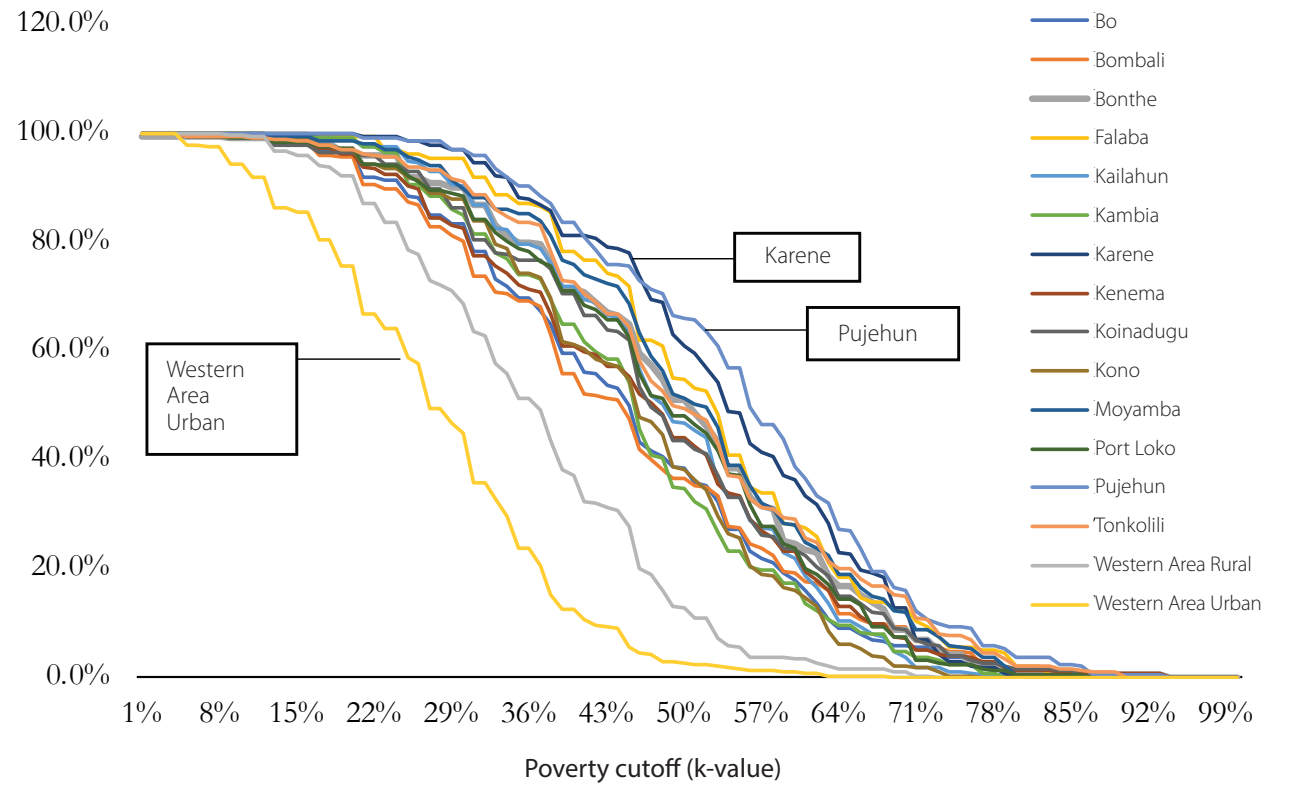
As such, these results of the national MPI of Sierra Leone and its associated platform provide key information for policy actors and users on strategic actions that could be designed in order to reduce multidimensional poverty in the country. They also showcase the importance of synergic actions across sectors of priority areas to direct joint efforts towards reducing the simultaneous deprivations that poor people experience in Sierra Leone.

Appendix

Robustness analysis

The robustness analysis measures the sensitivity of the results to the choice of the different parameters of the national MPI structure. This section presents robustness tests for the choice of the poverty cutoff and for different structures that have been considered and that have assigned different weights to each of the dimensions, and therefore to the indicators. This analysis confirms that the results of the national MPI of Sierra Leone described in the previous sections are stable with respect to parametric changes in its structure, even when the poverty cutoff is modified with respect to the one considered (k=40 percent) and when the dimensions, and therefore the indicators, have a higher or lower weight. The results show that the national MPI of Sierra Leone provides roughly the same information for policy, even if the weights and poverty cutoffs are changed.

Figure A1. District poverty rates (H) for different values of the poverty cutoff k



Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

Figure A1 presents the incidence of multidimensional poverty (H) by district for different values of the poverty cutoff. It highlights four findings. Firstly, there is a contrast in the incidence of multidimensional poverty between the western Urban Area where the capital Freetown is located, as well as the western Rural Area, and the rest of the country, regardless of the poverty cutoff. Secondly, the order of ranking between the districts is relatively stable for all possible poverty cutoffs. Additionally, the district of Pujehun is the poorest in the country for all the poverty cutoffs, except for the interval between 41 percent and 46 percent for which Karene becomes the poorest one. Finally, some lines cross each other between specific intervals of values of the poverty cutoff. For instance,

Moyamba is poorer than Tonkolili for most of the poverty cutoff values, except for the values between 29 percent and 33 percent and then from 59 percent onwards where the ranking reverses and Tonkolili becomes poorer than Moyamba. The same happens with Kambia and Bombali, where the former is poorer than the later, until the value of k=49 percent where Bombali becomes poorer than Kambia.

Despite these slight crossing of rankings between some of the districts and for specific intervals of the poverty cutoff, it is observed that overall, the ranking of districts according to the incidence of multidimensional poverty is not very sensitive to variations in the poverty cutoff. This shows that the policy priorities for each district will be practically the same, whatever the chosen threshold.

Nevertheless, since the national MPI of Sierra Leone is based on a sample of the Sierra Leonean population, it is subject to sampling error. In order to draw conclusions, it is therefore important to take standard errors into account when assessing the robustness of the ranking of districts according to their MPI. To do so, one first compares the national MPI values for each pair of districts under the chosen poverty line of 40 percent with equal weights for the five dimensions, taking into account the standard errors of the MPI. One can then assess whether it is possible to establish, for example, that i) district A is poorer than district B, ii) district B is poorer than district A, or whether iii) one cannot statistically determine which is poorer. This order of districts is considered the baseline ordering. Then robustness tests are done to changes in the poverty line at 25 percent, 35 percent, 45 percent and 55 percent, as well as the weighting structure of the dimensions as follows.[17]

Estimating the national MPI by district for the alternative poverty lines k=25 percent, k=35 percent, k=45 percent, and k=55 percent, under the selected weighting structure, involves considering pairwise comparisons to be robust if the order of the districts established at baseline is preserved. It's noteworthy that over half (57.5 percent) of the 120 possible pairwise comparisons of national MPI levels between the 16 districts show significant differences in the baseline ordering. Moreover, of these, 85.5 percent are also significantly different under the alternative poverty cutoffs and maintain the same ordering of which district is poorer than the other according to their MPI. The yellow column of table A3 presents these results. This shows that the district orderings by the national MPI are largely stable with respect to changes in the poverty cutoff.

Examining district ordering in the dimension-weighting scheme involves conducting pairwise comparison tests to assess the relationship between rankings in the reference structure (with k=40 percent and a 20 percent weight for each dimension) and rankings in five alternative structures. In these alternative structures, each dimension is individually assigned a 40 percent weight, while the other four dimensions each receive a weight of 15 percent. Then, a comparison of the ordering of the districts according to the national MPI between the reference structure and all the alternative structures jointly, as well as with each of them separately brings the results presented in the grey columns of table A3, which show that almost 73 percent of the pairwise comparisons that are significantly different in the structure of the national MPI are also significantly different, with the same districts being poorer, when the weighting scheme of the dimensions changes to any of the alternative hereabove mentioned. When a comparison of the district ordering between the reference structure and each of the alternative separately, one finds that 85.5 percent of the pairwise comparisons that are significantly different in the baseline structure are also significantly different, with the same districts being poorer, when it is the Living Standards dimension that has a weight of 40 percent. This percentage increases to 88.4 percent when it is the dimension of housing that is weighted 40 percent, and to 91.3 percent and 92.8 percent when it is the Health and the Education dimension, respectively, that are weighted 40 percent. The percentage reaches 95.7 percent when it is the Energy dimension that has a 40 percent weighting in turn. These results show that the orderings of the national MPI at the district level are stable and maintained most of the time when the weights scheme of the dimensions is changed.

The pairwise ordering analysis above is the most authoritative analysis and the one that is used to assess the robustness of the national MPI. However, because some readers will be more familiar with rank correlations, these analyses are shown below, keeping in mind that rank correlations are less precise because they do not consider sampling errors.

[17] The values of the alternative poverty cut-offs are chosen in a way that allows to identify the variations in the ranking of the districts and thus to analyse whether these variations are statistically significant and what is their frequency.

Table A1 presents the Spearman and Kendall Tau-b rank correlation coefficients for the rankings of the districts using the selected poverty cut-off, k=40 percent, and the ranking for alternative poverty cut-offs of 25 percent, 35 percent, 45 percent, and 55 percent. The Spearman coefficient is higher than 0.96 for alternative poverty lines between k=25 percent and k=55 percent. Similar results are found when using the Kendall Tau-b correlation coefficient, which is above 0.86 for an alternative poverty cutoff value of k=55 percent, rising to 0.95 for k=25 percent, and to and 0.98 for k=35 percent and k=55 percent.[18] This means that the ranking comparisons of the districts according to their national MPI using a poverty cut-off of 40 percent is preserved to a large extent (at least 86 percent of the time) when one considers alternative poverty lines between 25 percent and 55 percent.

Table A1. Correlation among districts ranks for different poverty cutoffs

		k = 40 percent
k = 25 percent	Spearman	0.988
	Kendall Tau-b	0.950
k =35 percent	Spearman	0.997
	Kendall Tau-b	0.983
k = 45 percent	Spearman	0.997
	Kendall Tau-b	0.983
k = 55 percent	Spearman	0.965
	Kendall Tau-b	0.867

Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

Table A2. Correlation among districts ranks for different weight structures

		Rank Correlation coefficients	national MPI Weights 1	national MPI Weights 2	national MPI Weights 3	national MPI Weights 4	national MPI Weights 5
E = Education			20% E	40% E	15% E	15% E	15% E
H = Health			20% H	15% H	40% H	15% H	15% H
HS = Housing			20% HS	15% HS	15% HS	40% HS	15% HS
LS = Living Standards			20% LS	15% LS	15% LS	15% LS	40% LS
EN = Energy			20% EN	15% EN	15% EN	15% EN	15% EN
national MPI Weights 2	40% E 15% H 15% HS 15% LS	Spearman	0.968				
	15% EN	Kendall Tau-b	0.883				
national MPI Weights 3	15% E 15% H 40% HS 15% LS	Spearman	0.985	0.979			
	15% EN	Kendall Tau-b	0.933	0.917			
national MPI Weights 4	15% E 15% H 40% HS 15% LS	Spearman	0.959	0.947	0.950		
	15% EN	Kendall Tau-b	0.867	0.817	0.833		
national MPI Weights 5	15% E 15% H 15% HS 40% LS	Spearman	0.971	0.921	0.924	0.944	
	15% EN	Kendall Tau-b	0.900	0.817	0.833	0.867	
national MPI Weights 6	15% E 15% H 15% HS 15% LS	Spearman	0.965	0.924	0.968	0.959	0.915
	40% EN	Kendall Tau-b	0.883	0.800	0.883	0.850	0.783

Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

[18] The Kendall Tau-b rank correlation coefficient is always lower than Spearman as it accounts for tied ranks.

Table A3. Summary of the results from the robustness analysis of the national MPI of Sierra Leone

ROBUSTNESS ANALYSIS	**Robustness to alternative values of the poverty cut-off (k)**	**Robustness to different weighting schemes of the dimensions**					
Information obtained from the robustness tests	Poverty cut-off of the national MPI (k = 40%) with k=25%, k=35%, k=45% and k=55%	Weighting of the national MPI with all alternatives at the	Weighting of the national MPI with A1*	Weighting of the national MPI with A2**	Weighting of the national MPI with A3***	Weighting of the national MPI with A4****	Weighting of the national MPI with A5*****
A: Possible pairwise comparisons between 16 districts	120	120	120	120	120	120	120
B: Number of pairwise comparisons that are significantly different at the baseline (National MPI) (95% confidence interval)	69	69	69	69	69	69	69
C: The number of pairwise comparisons in B + number of pairwise comparisons that are not significantly different but whose ordering of which is poorer is the same as in the baseline (National MPI) (95% confidence interval)	92	63	101	104	99	99	98
D: The number of pairwise comparisons in B that are significantly different in the alternatives and maintain the same ordering of which is poorer (National MPI) (95% confidence interval)	59	50	64	63	61	59	66
ROBUSTNESS RATIOS							
Ratio of statistically significant pairwise comparisons: statistically significant pairwise comparisons among all possible comparisons (B/A)	85.5%	72.5%	92.8%	91.3%	88.4%	85.5%	95.7%

*A1 corresponds to the alternative structure 1 for the national MPI, which gives a weight of 40% to the Education dimension and a weight of 15% to the Health, Housing and Living Standards and Energy dimensions.
**A2 corresponds to the alternative structure 2 for the national MPI, which gives a weight of 40% to the Health dimension and a weight of 15% to the Education, Housing, Living Standards and Energy dimensions.
***A3 corresponds to the alternative structure 3 for the national MPI, which gives a weight of 40% to the Housing dimension and a weight of 15% to the Education, Health, Living Standards and Energy dimensions.
****A4 corresponds to the alternative structure 4 for the national MPI, which gives a weight of 40% to the Living Standards dimension and a weight of 15% to the Education, Health, Housing and Energy dimensions.
*****A5 corresponds to the alternative structure 5 for the national MPI, which gives a weight of 40% to the Energy dimension and a weight of 15% to the Education, Health, Housing and Living Standards dimensions.

Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

Redundancy analysis

A final question is whether each indicator adds new information about poverty. It might be the case, for example, that years of schooling and school attendance have the same uncensored headcount ratio and identify the same people as deprived. If this were the case, then in the interests one might be able to drop one indicator with no loss of insight. Table A4 provides the outcome of a redundancy test. The entries show the percentage of the people who could be deprived in both indicators, who are deprived. For example, consider nutrition and years of schooling (see figure 2). Just over 30 percent of the population are deprived in each indicator. So, it could be expected that they are the exact same people. If they were, then the box with the underscored values would be 1.000. In fact, it is 0.327. That means that only 32.7 percent of the people who could be deprived in both nutrition and years of schooling, are actually deprived in both. Looking across all the indicators, the highest redundancy, between bank account and years of schooling or asset ownership, finds 98.1 percent of the population who could be deprived in both, actually are deprived in both indicators. By this table, it is assessed that each indicator is adding new information to the national MPI. The same analysis is performed for the percentage population who is poor and deprived in each indicator (censored headcount ratios), and the conclusions are roughly the same.

Table A4. Redundancy test on uncensored headcount ratios (R0 measure)

	Years of schooling	School attendance	Nutrition	Child mortality	Vaccination	Housing materials	Asset ownership	Overcrowding	Water	Bank account	Sanitation	Internet	Cooking fuel	Electricity
Years of schooling	1.000													
School attendance	0.431	1.000												
Nutrition	0.327	0.325	1.000											
Child mortality	0.301	0.199	0.300	1.000										
Vaccination	0.253	0.289	0.467	0.168	1.000									
Housing materials	0.567	0.450	0.401	0.370	0.342	1.000								
Asset ownership	0.702	0.516	0.483	0.470	0.406	0.688	1.000							
Overcrowding	0.290	0.351	0.392	0.342	0.406	0.304	0.423	1.000						
Water	0.686	0.712	0.672	0.685	0.671	0.673	0.671	0.654	1.000					
Bank account	0.981	0.905	0.881	0.838	0.837	0.973	0.981	0.825	0.810	1.000				
Sanitation	0.923	0.837	0.838	0.846	0.808	0.956	0.913	0.820	0.802	0.870	1.000			
Internet	0.848	0.916	0.972	1.000	1.000	0.894	0.877	0.952	0.901	0.901	0.899	1.000		
Cooking fuel	0.465	0.505	0.462	0.496	0.462	0.465	0.468	0.425	0.630	0.816	0.796	0.915	1.000	
Electricity	0.956	0.891	0.843	0.827	0.792	0.995	0.979	0.723	0.756	0.914	0.869	0.901	0.806	1.000
Uncensored head-count ratio	0.292	0.164	0.270	0.088	0.244	0.329	0.423	0.324	0.646	0.816	0.808	0.902	0.460	0.776

Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

Table A5. Redundancy test on uncensored headcount ratios (R0 measure)

	Years of schooling	School attendance	Nutrition	Child mortality	Vaccination	Housing materials	Asset ownership	Overcrowding	Water	Bank account	Sanitation	Internet	Cooking fuel	Electricity
Years of schooling	1.000													
School attendance	0.479	1.000												
Nutrition	0.411	0.347	1.000											
Child mortality	0.387	0.251	0.356	1.000										
Vaccination	0.339	0.301	0.550	0.174	1.000									
Housing materials	0.602	0.500	0.498	0.464	0.453	1.000								
Asset ownership	0.738	0.572	0.597	0.593	0.541	0.727	1.000							
Overcrowding	0.381	0.358	0.418	0.386	0.438	0.448	0.590	1.000						
Water	0.708	0.750	0.709	0.737	0.717	0.708	0.714	0.708	1.000					
Bank account	0.989	0.947	0.941	0.907	0.919	0.981	0.987	0.922	0.946	1.000				
Sanitation	0.946	0.895	0.918	0.935	0.916	0.965	0.944	0.915	0.931	0.952	1.000			
Internet	0.865	0.918	0.976	1.000	1.000	0.896	0.884	0.954	0.909	0.949	0.934	1.000		
Cooking fuel	0.485	0.528	0.518	0.526	0.517	0.493	0.582	0.507	0.687	0.938	0.932	0.923	1.000	
Electricity	0.980	0.950	0.938	0.938	0.920	0.999	0.991	0.907	0.947	0.968	0.958	0.954	0.958	1.000
Uncensored head-count ratio	0.274	0.147	0.214	0.068	0.179	0.301	0.367	0.217	0.421	0.552	0.544	0.531	0.316	0.555

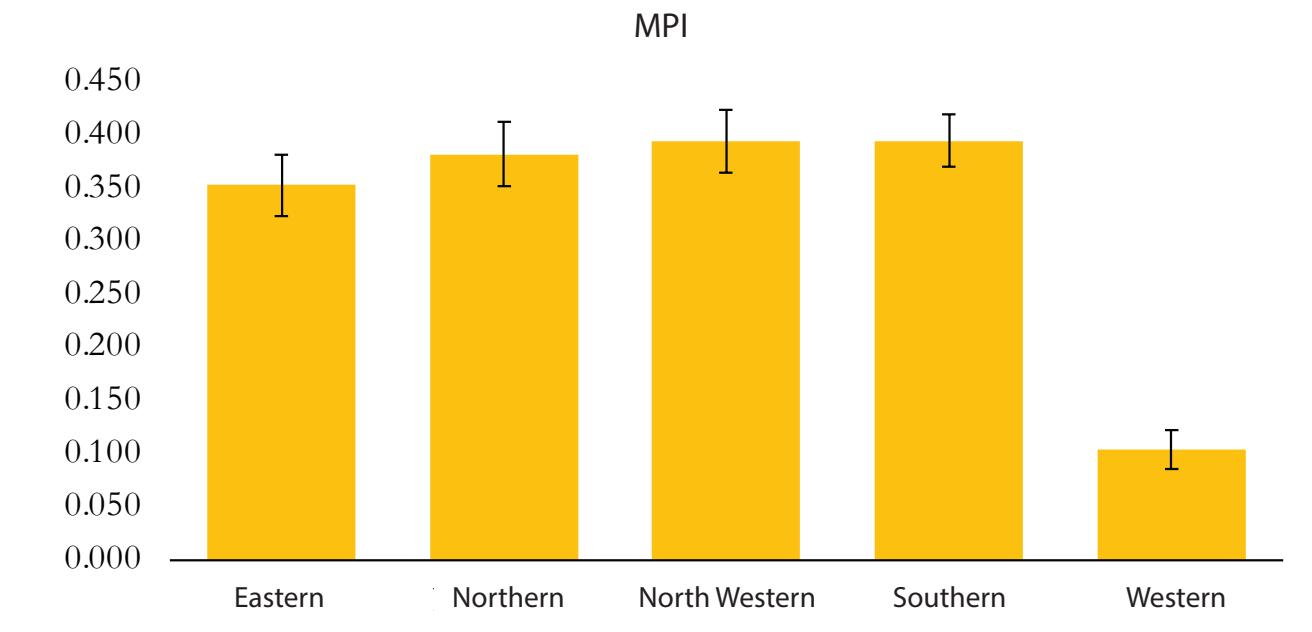
Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

Table A6. Incidence, intensity and MPI by region – 5 regions

Region	Population Share (%)	MPI			Incidence (H, %)			Intensity (A, %)		
		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)		Value	Confidence Interval (95%)	
Eastern	22.5	0.353	0.325	0.381	**63.7**	59.0	68.3	55.4	54.4	56.4
Northern	20.8	0.382	0.352	0.412	**67.2**	62.4	72.0	56.8	55.6	58.0
North- western	15.4	0.394	0.365	0.424	**71.0**	66.4	75.6	55.5	54.5	56.6
Southern	20.6	0.395	0.370	0.419	**69.5**	65.7	73.3	56.8	55.7	57.8
Western	20.8	0.104	0.086	0.122	**21.7**	18.0	25.4	48.0	46.8	49.2

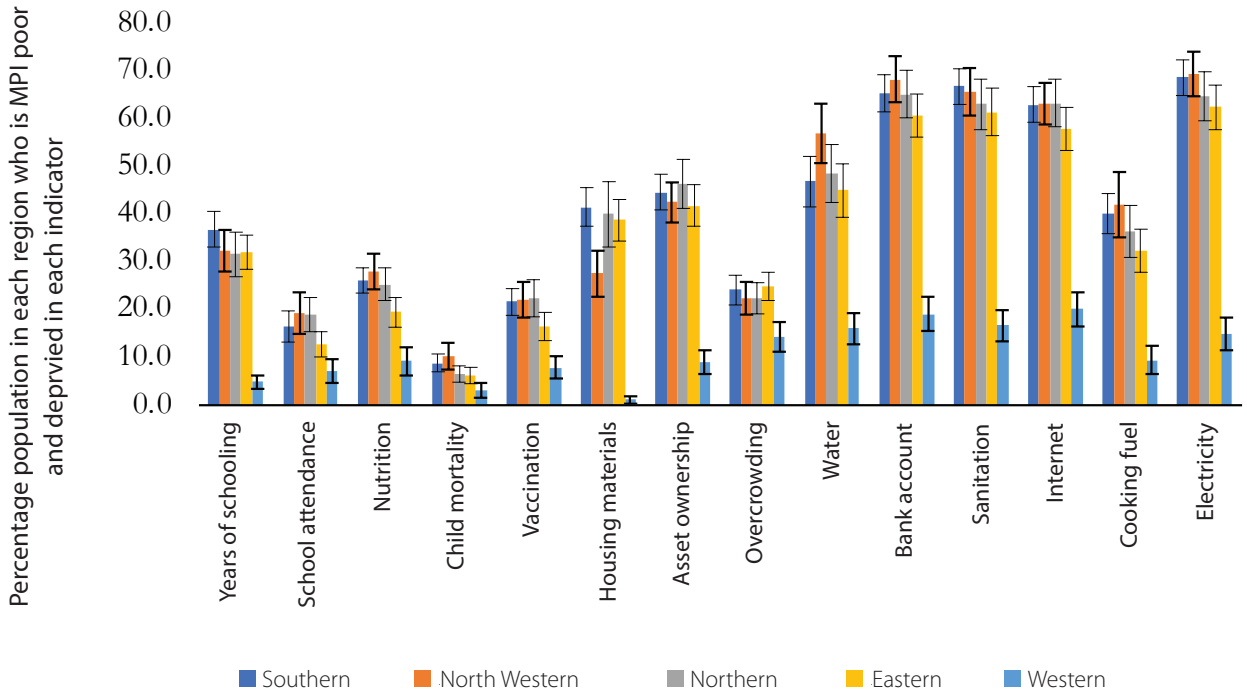
Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

Figure A2. Multidimensional Poverty Index by region – 5 regions



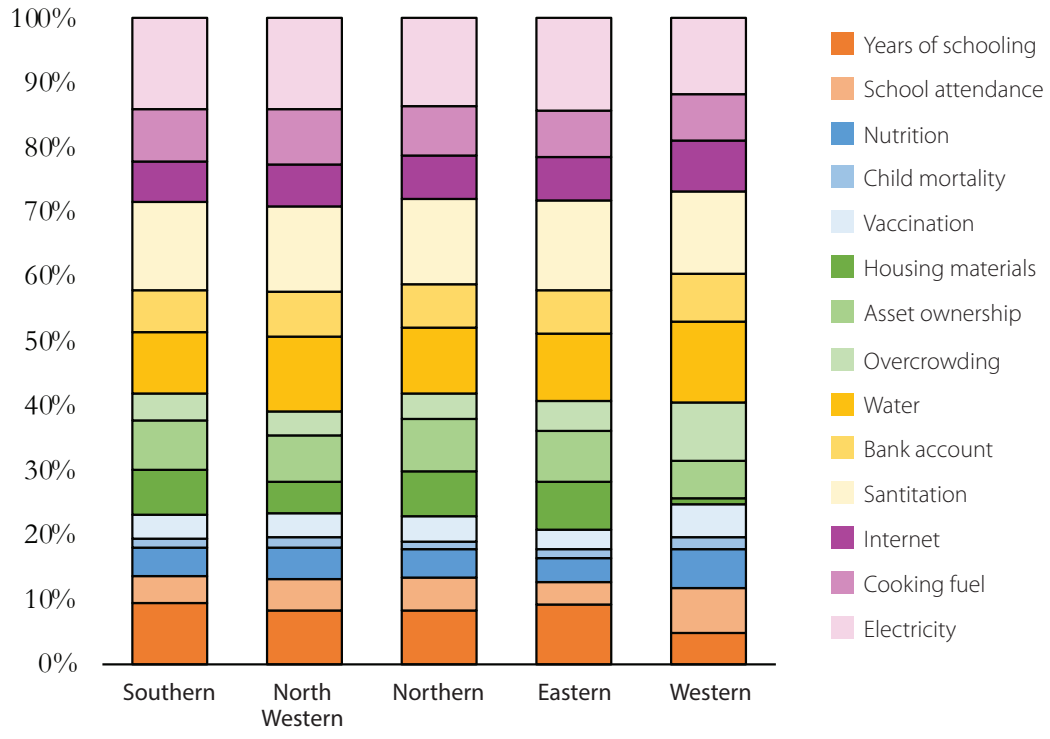
Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

Figure A3. *Censored headcount ratios by region – five regions*



Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).

Figure A4. *Percentage contribution of each indicator to the MPI by region – 5 regions*



Source: Authors' calculations based on data from the Demographic and Health Survey (DHS, 2019).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