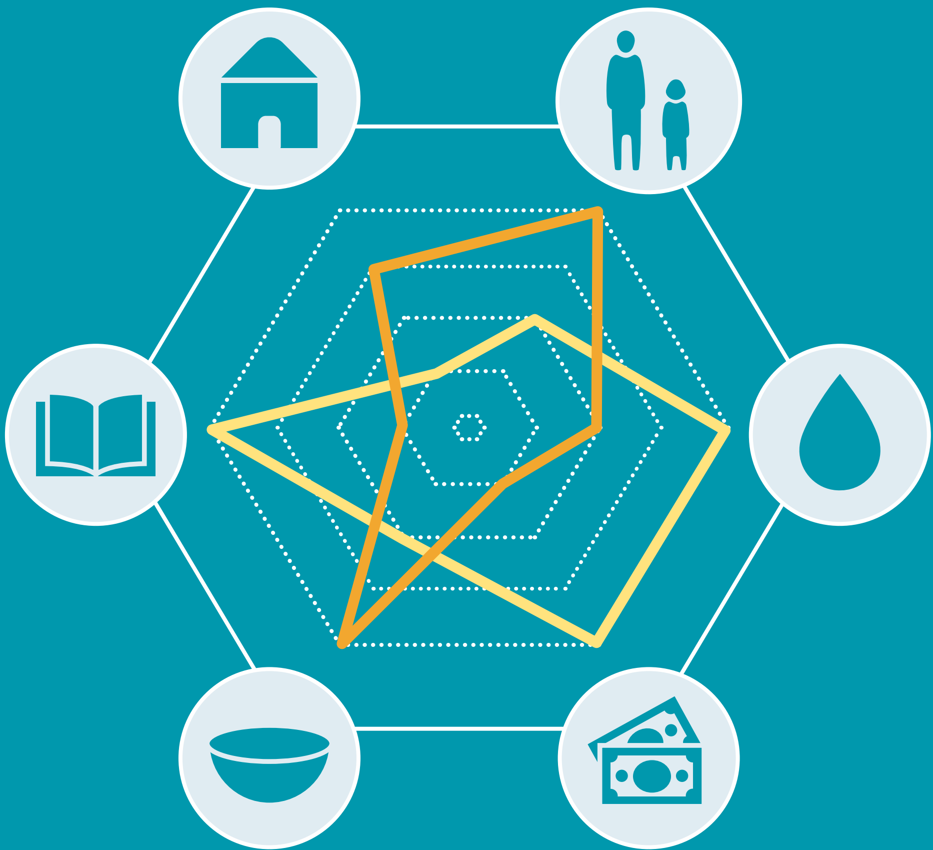
Food and Agriculture Organization of the United Nations

FAO STATISTICAL DEVELOPMENT SERIES 19

ISSN 10143378



# MEASURING RURAL POVERTY WITH A MULTIDIMENSIONAL APPROACH

## The Rural Multidimensional Poverty Index

OPHI
Oxford Poverty & Human Development Initiative

FAO STATISTICAL
DEVELOPMENT SERIES 19

# MEASURING RURAL POVERTY WITH A MULTIDIMENSIONAL APPROACH

## The Rural Multidimensional Poverty Index

Food and Agriculture Organization of the United Nations
Rome, 2022

Required citation:

FAO and OPHI. 2022. *Measuring rural poverty with a multidimensional approach: The Rural Multidimensional Poverty Index*. FAO Statistical Development Series, No. 19. Rome, FAO. https://doi.org/10.4060/cb8269en



ISBN 978-92-5-135618-0

ISSN 1014-3378 (print)
ISSN 2664-746X (online)

# CONTENTS

## TABLES



## FIGURES



## APPENDIX TABLES

## APPENDIX FIGURES

## FOREWORD

The Food and Agriculture Organization of the United Nations (FAO) and the Oxford Poverty and Human Development Initiative (OPHI) are pleased to release this joint report, which presents the conceptual development and empirical validation of a multidimensional poverty index specific to rural areas: the Rural Multidimensional Poverty Index, or R-MPI.

Ending poverty and hunger are central goals of the 2030 Agenda for Sustainable Development, as well as of most national development agendas. Existing evidence indicates that rural areas are home to most of the poor worldwide, and agriculture is central to the livelihoods and food security of these population groups.

As a partner in ending hunger and poverty, FAO works with countries to develop and implement evidence-based policies, strategies and programmes in the areas of its mandate – namely food, agriculture and the sustainable management of natural resources – that promote inclusive growth and sustainable livelihoods, thereby fighting rural poverty. Designing more comprehensive and dedicated approaches to target the poor in rural areas, requires, as a first step, identification of who the poor are, where they live and what specific constraints prevent them from escaping poverty.

In recent times, multidimensional poverty measures have become widely accepted as tools to overcome the limitations of unidimensional metrics, such as monetary poverty measures. They bring into view the joint distribution of direct deprivations that a person or household experiences. As such, the Third United Nations Decade for the Eradication of Poverty (2018–2027) uses both global monetary and multidimensional poverty indices to track trends. Sustainable Development Goal Indicator 1.2.2 reports countries' national multidimensional poverty metrics.

In this context, FAO and OPHI joined forces to harness the strength of FAO's expertise and knowledge of rural contexts and the experience of OPHI in measuring poverty, with the aim of improving the conceptualization of poverty in rural areas, while proposing, discussing and testing the R-MPI, a new multidimensional measure. This effort was driven by the contributions of a number of experts who participated in a consultation held in Oxford in 2019, and some of whom have followed the progress through to the results presented in this report.

Relying on a multidimensional approach, the work included in this report fills an important gap in the measurement of poverty. While a range of poverty measures exist and are commonly used at the aggregate level, harmonized information on rural poverty, which could inform a sound and homogeneous measurement, is less readily available. What is more, the challenges faced by rural communities are different from those applying in other contexts. Rural areas around the world are highly diverse due to the distinct characteristics of their natural environment and the historical reasons that have shaped their physical and human landscapes. Most of the rural poor are family farmers, subsistence producers and/or agricultural workers. They include fisherfolk, pastoralists, forest-dependent people and households with no natural-resource-based assets and limited access to productive means, and many also experience social exclusion and physical remoteness.

The starting point of the R-MPI was the Global Multidimensional Poverty Index (Global MPI), first designed in 2010 by the United Nations Development Programme (UNDP) and OPHI, which encompasses the three dimensions of education, health and living standards. Based on a thorough literature review, expert consultation, a data inventory and several trial measures, the R-MPI was designed as a modification of the Global MPI, based on five dimensions: food security and nutrition, education, living standards, livelihoods and exposure to risks. The R-MPI includes innovative indicators on the adequacy of agricultural assets ownership, rural social protection and risk exposure, and makes use of innovations in the field of multidimensional poverty measurement – by combining household survey with geospatial data.

In order to empirically test the index, the R-MPI was calculated using data from four household surveys conducted in Ethiopia, Malawi, the Niger and Nigeria. Additionally, a field test was implemented in Malawi to assess the adequacy and relevance of the R-MPI as a proposed measure of rural multidimensional poverty. The results demonstrated the effectiveness of the approach in conveying detailed rural poverty profiles in the four countries.

While still hampered by data limitations, the empirical implementation of the R-MPI presented in this report sheds light on important missing elements in current surveys. These can be turned into opportunities to collect such information in further rounds through the data collection exercises promoted by the 50×2030 Initiative to Close the Agricultural Data Gap, in which, FAO, the International Fund For Agricultural Development (IFAD) and the World Bank are engaged.

The R-MPI provides a new tool for the fight to end poverty in all its dimensions in rural areas by documenting successful steps towards that goal. We look forward to the R-MPI being updated regularly and applied more widely around the world to evaluate rural policies and monitor progress.

**Máximo Torero Cullen**
FAO Chief Economist

**José Rosero Moncayo**
Director, FAO Statistics Division

**Sabina Alkire**
Director, OPHI

## ACKNOWLEDGEMENTS

This report was prepared by the Social Statistics team of the Statistics Division of the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the FAO Agrifood Economics Division and the Oxford Poverty and Human Development Initiative (OPHI). The work was led by Piero Conforti under the guidance of José Rosero Moncayo, Sabina Alkire and Máximo Torero Cullen in collaboration with Frank Vollmer, Ana Paula de la O Campos and Adriana Conconi. Carlos Esteban Cabrera, Nidhi Chaudhary, Marcel Mucha and Stella Wambugu made substantive contributions to Part 2 and Appendix C with support from Leopoldo Tornarolli. Yonca Gurbuzer and Lorenzo Moncada provided technical support. The field test in Malawi was undertaken by a team at the Center for Social Research at the University of Malawi at Zomba, led by Maxton Grant Tsoka, with key contributions from Aliko Msukwa, Macdonald Chitekwe, Mtisunge Matope and Patrick Msukwa. The FAO-OPHI team is indebted to the Economic and Policy Analysis of Climate Change team, particularly Nicholas Sitko and Giuseppe Maggio, and the Food Security and Nutrition team at FAO for their support and data inputs. Key insights, comments and suggestions were received from the experts gathered in Oxford, United Kingdom of Great Britain and Northern Ireland, on 13 and 14 May 2019 for a consultation on developing a conceptual framework for measuring rural poverty with a multidimensional approach, including Arild Angelsen, Roberto Angulo, Imelda Magdalene Atai, Carlo Azzarri, Chris Béné, Ben Davis, Cheryl Doss, Alessandra Garbero, Dean Mitchell Jolliffe, Maria Ana Lugo, Xavier Mancero, James Muwonge, Sara Savastano, Marije Schaafsma, Judith Schleicher and Kate Schreckenberg. Detailed comments from Christian Oldiges, Bureau of Policy and Programme Support, United Nations Development Programme are gratefully acknowledged.

# INTRODUCTION

Ending poverty and hunger are central goals of countries worldwide. United Nations member countries have committed to eradicating extreme poverty and hunger by 2030. As a partner in this objective, the Food and Agriculture Organization of the United Nations (FAO) is helping countries to develop and implement evidence-based policies, strategies and programmes in the areas of its mandate – namely food, agriculture and the sustainable management of natural resources – that promote inclusive growth and sustainable livelihoods, thereby fighting rural poverty. The Reduce Rural Poverty programme, one of FAO's strategic programmes, is aimed at reducing rural poverty by supporting countries in designing more comprehensive and dedicated approaches targeting the poor and extreme poor, for which it is necessary to identify who the extreme poor are, where they live and which specific constraints prevent them from escaping poverty.

Existing evidence indicates that, worldwide, most of the poor live in rural areas and that agriculture and natural resource management are central to the livelihoods and food security of this population. Many of the rural poor are family farmers, subsistence producers and/or agricultural workers. They include fisherfolk, pastoralists, forest-dependent people and households with no natural resource-based assets and limited access to productive means, many of whom also experience social exclusion and physical remoteness.

While a range of poverty measures exist and are commonly used at the aggregate level, harmonized information on rural poverty is less readily available, which could inform a sound and homogeneous measurement. Among the many hurdles that need to be addressed in order to improve and harmonize the measurement of rural poverty, three main ones are examined in the present report. First, the definition of "rural area" is laden with conceptual and measurement complications as a result of the specificity of what is considered a rural space and the associated livelihoods. Definitions tend to be diverse across countries, and certainly more diverse compared to urban contexts. In fact, the official (administrative) definition of rural areas is strictly not comparable across countries. Second, the diversity of rural livelihoods and lifestyles is rarely taken into account in the measurement of poverty. In fact, common measurement frameworks are often assessed with an urban view of what constitutes the notion of "well-being". Third, much of the data required to undertake a specific measurement of rural poverty have not been available in many countries. Poverty measures need to be computed at the household or individual level, and data gathered through costly surveys are not necessarily comparable across countries and are infrequent in many.

To contribute to addressing this gap and to propose a harmonized international measurement framework for rural areas, FAO has started a partnership with the Oxford Poverty and Human Development Initiative (OPHI) at the University of Oxford. The two institutions have undertaken a joint programme of work aimed at improving the conceptualization of poverty in rural areas, while proposing, discussing and testing a multidimensional measure.

This report presents the results of this collaboration as undertaken so far and is divided into three parts. The first part proposes a framework for measuring multidimensional poverty in rural areas and describes the motivation for the rural multidimensional poverty index (R-MPI) proposal – which departs from the established global multidimensional poverty index (global MPI), first designed in 2010 as an international measure of acute poverty covering over 100 developing countries (Alkire and Santos, 2014) – by adding modifications in the dimensions and embedded indicators. Specifically, the work undertaken in recent years on the measurement of multidimensional poverty, together with the motivation for developing a multidimensional measure of rural poverty, is considered in Sections 1.1 and 1.2. In Section 1.3 the specificities of rural poverty, as they arise from the empirical literature on the topic, are addressed. In Section 1.4 the logic and the structure of the R-MPI are proposed and areas for further discussion are offered. In Section 1.4 the main differences between the global MPI and the R-MPI are discussed.

The second part of this report presents an empirical test of the proposed R-MPI using data from four household surveys conducted in Ethiopia, Malawi, the Niger and Nigeria, which are harmonized within the Rural Livelihoods Information System (RuLIS).[1] Specifically, data issues are discussed in Section 2.1, while the main results for the four countries are described in Section 2.2. Results dwell on a number of statistics and tests on the different indicators and dimensions included in the R-MPI, showing their absolute and relative importance. Sections 2.3 and 2.4 are devoted to testing the redundancy of the additional indicators included in the R-MPI and the robustness of results to the parameters of the calculation, especially the overall poverty cut-off of 33.3 percent. The third part provides details of the methodology and results of a field test implemented in Malawi to assess the adequacy and relevance of the R-MPI as a proposed measure of rural multidimensional poverty. A summary along with some concluding remarks are presented in the last section.

This report integrates the conclusions of an expert consultation held on 13 and 14 May 2019 at the University of Oxford, during which the proposed R-MPI was discussed in detail. While these results were consolidated, steps were taken to implement a field test of the proposed R-MPI, starting in rural Malawi. A set of qualitative and quantitative tests were prepared with a view to verifying the relevance, solidity and appropriateness of the proposed index. That programme of work was, however, suspended with the outbreak of the coronavirus disease (COVID-19) pandemic in 2020. The report is intended for academics and practitioners alike who wish to use a tailored multidimensional poverty index for rural areas in their work.

[1] The Rural Livelihoods Information System (RuLIS) is a joint initiative of FAO, the World Bank and the International Fund for Agricultural Development that disseminates comparable data and indicators on income livelihoods and rural development at the subnational level using microdata from household surveys. RuLIS currently comprises a set of harmonized data from 38 countries (and increasing). The data cover aspects of agricultural livelihoods including crop and livestock production, off-farm and non-farm income activities, households' composition and demographics, agricultural inputs and technology use, access to social protection, time use, shocks and migration (www.fao.org/in-action/rural-livelihoods-dataset-rulis).

# PART 1

# A MULTIDIMENSIONAL FRAMEWORK FOR MEASURING RURAL POVERTY

## 1.1 MOTIVATION FOR A MULTIDIMENSIONAL MEASURE OF RURAL POVERTY

A multidimensional measurement of rural poverty provides a suitable and flexible framework for addressing some of the limitations of rural poverty measurement, thus facilitating clear policy actions at national and subnational levels to tackle rural poverty. The motivation for a multidimensional measurement of poverty can be attributed to ethical and normative reasons, with the aim mainly being "to improve the fit between the measure and the phenomenon it is supposed to approximate" (Alkire *et al.,* 2015). With the advent of the Sustainable Development Goals (SDGs), development itself and poverty more specifically are recognized as multidimensional phenomena (Alkire, 2018), as manifested in the SDG principle of *leaving no one behind* and SDG target 1.2 to reduce, by 2030, "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". Any future endeavor to measure the phenomenon of poverty is thus inherently connected with such a multifaceted concept of welfare (Alkire *et al.,* 2015; OPHI, 2018).

The consensus on poverty being multidimensional has led to the development of several methodologies to capture simultaneous deprivations, of which the Alkire-Foster method (Alkire and Foster, 2011) is the most widely used. This method is applied, for example, by OPHI and the Human Development Report Office of the United Nations Development Programme (UNDP) to compute the global MPI – an internationally comparable measure of acute multidimensional poverty computed for over 100 developing countries and updated at least yearly since 2010. The World Bank, following the recommendations of the Atkinson Commission report *Monitoring Global Poverty* (World Bank, 2017), also uses this methodology for its own multidimensional poverty measures, launched in October 2018 (World Bank, 2018). Angulo *et al.* (2018) adopt the method as well in a forthcoming measure of rural poverty in Latin America. In addition, several countries have created national MPIs as official permanent poverty statistics, adapting the method to their own context and national priorities, with the objective of guiding and monitoring national policies on poverty reduction.[2]

As demonstrated in Alkire *et al.* (2015), a mismatch in the identification of monetary vis-à-vis non-monetary deprivations has long been demonstrated in the poverty literature (see Ruggeri Laderchi, 1997; Stewart, Harriss-White and Saith, 2007), along with the differences in trends in reductions in

[2] Another normative argument in favour of a multidimensional measure of rural poverty is found in numerous participatory rural appraisals and participatory learning for action evaluations, described as "a family of approaches, methods and behaviors that enable people to express and analyze the realities of their lives and conditions, to plan themselves what actions to take, and to monitor and evaluate the results (Chambers and Blackburn, 1996)" (cited in de Campos Guimarães, 2009).

monetary and non-monetary deprivations. Motivated by Bourguignon *et al.* (2010), Alkire *et al.* (2015) found little association between reductions in monetary poverty and progress in four non-income Millennium Development Goals. This has led to the conclusion that "income poverty reduction does not ensure reducing deprivations in non-income indicators" and that "income poverty trends do not proxy trends in the reduction of non-income deprivations" (Alkire *et al.*, 2015). Such findings were confirmed at the global scale in the 2018 global MPI report, an updated index aligned with the SDGs that showed that "about two-thirds of all MPI poor people live in middle-income countries" (OPHI, 2018) and that "the scale and detail of multidimensional poverty profiles suggest that income and consumption figures need to be complemented with multidimensional measurement for a more in-depth picture" (OPHI, 2018).

Differences in the identification of monetary versus non-monetary poor become especially visible in rural areas. As identified by the World Bank (2018), with a broadening of the definition of poverty beyond monetary terms towards the inclusion of additional aspects of deprivation (such as adult educational attainment and access to adequate sanitation and electricity), the "composition of the poor changes" and tilts more towards rural areas, with the strongest percentage point differences found in East Asia and the Pacific and in Latin America and the Caribbean. In other parts of the world, however, most notably in the Middle East and North Africa and South Asia, "poverty becomes more urban … suggesting that urban residents in these regions, although not monetarily poor, experience deprivations in some of these additional aspects of life" (World Bank, 2018).

Although differences between monetary and non-monetary poverty are apparent, a clear conclusion is that rural poverty is more pronounced, no matter the approach in measurement. The World Bank found that approximately 81.3 percent of the monetary poor live in rural areas (Castañeda *et al.*, 2018; World Bank, 2018). Similarly, of the 1.3 billion MPI poor people across 105 countries analysed in the 2018 update of the global MPI, 85 percent live in rural areas (OPHI, 2018). Strikingly, 30 of the 39 countries with a rural population share below 50 percent have a rural poverty headcount greater than 50 percent. The incidence (the percentage of people who are poor) and the intensity (the average share of weighted indicators in which poor people are deprived) of poverty were also found to be consistently higher in rural areas in all world regions. Particularly in sub-Saharan Africa, the intensities are substantially higher in rural areas, where they differ by approximately nine percentage points.[3]

Multidimensional rural poverty shows a different set of deprivations from multidimensional urban poverty. The living standards indicators contribute more to the MPI in rural areas throughout all world regions, except for electricity in Europe and Central Asia, and cooking fuel in sub-Saharan Africa, where the contributions to the overall MPI in urban areas are marginally greater than those in rural areas. However, once the contributions have been weighted by the respective urban and rural populations in poverty, the weighted contributions in all indicators are greater in rural areas than in urban areas. Only in Latin America and the Caribbean, a region with a substantially lower rural population share, nutrition and child mortality contribute more to the MPI in urban areas than in rural areas (OPHI, 2018).[4]

---

[3] Severe multidimensional poverty (households deprived in 50 percent or more of the weighted deprivations in the global MPI) was found to be consistently higher in rural areas than in urban areas for 100 out of the 105 countries studied. Only nine countries, housing 2.8 percent of the combined population, have a rural share of MPI poverty that is less than 50 percent (meaning that less than half of that country's poor people live in rural areas) (OPHI, 2018).

[4] Similarly, using the World Bank's new multidimensional poverty measurement, Robles Aguilar and Sumner (2019) found that rural poverty tends to be characterized by overlapping deprivations in education and access to decent infrastructure (water, sanitation, electricity and housing), while in urban areas, child mortality and malnutrition are more frequently observed.

The most striking synthesis accounts of the overlapping deprivations faced by rural populations across the world gathered via participatory approaches remain the seminal "voices of the poor" studies, that determined poverty as a multidimensional phenomenon yet with distinct challenges for rural and urban populations (Narayan *et al.,* 2000). While both rural and urban populations name food insecurity and a lack of access to basic services as key deprivations, the rural poor suffer more strongly from isolation and a lack of transportation, and the absence of schools and health clinics, while the urban poor suffer from their anonymity in big cities and their exclusion from social activities and access to land to cover subsistence needs.

While it is important to make rural-urban comparisons using the same measurement for consistency, how much overestimation bias is introduced when measuring rural poverty with the same yardstick that is used for measuring urban poverty? And how much does that yardstick reflect an urban bias concept of well-being? Rural poverty, as will be argued later, is characterized by a set of intertwined challenges that makes it distinct from urban poverty and may require a separate specific measure. Rural people derive their incomes differently; they may live in remote and sparsely populated areas, such as forests and savannahs, and depend on agricultural income and on the management of natural resources (such as direct and indirect forests or fishery incomes). Rural people may be exposed to covariate shocks differently, such as crop or livestock losses due to natural disasters, poor rainfall or specific crop or animal diseases, and they suffer from exclusion to social services due to their remoteness and political exclusion (de la O Campos *et al.*, 2018). Rural livelihoods are intrinsically based on specific agro-climatic conditions. Thus, the nature of rural livelihoods and the constraints that the rural poor face may require a better conceptualization of what constitutes rural and what constitutes the rural poor's well-being, which in turn could better guide countries on the specific policies needed to support them. A multidimensional framework of poverty measurement provides more flexibility than an income-based measure for including livelihoods and risk-exposure indicators that can help to capture rural poverty specificities.

Despite the acknowledgement that poverty in rural areas is more pronounced than in urban areas, no comparable measure that is tailored specifically to the characteristics of rural areas has ever been created. The global MPI report, for instance, highlights that, while the global MPI brings into focus ongoing real deprivations experienced in rural areas, it is not a complete measure. It names crucial indicators for rural populations (such as rural productive assets) that were omitted in the conceptualization of the global MPI, mostly due to the lack of consistent data. It recommends, however, the potential inclusion of these crucial indicators where strong conceptual reasons exist and where data availability permits this to be done (OPHI, 2018). While some countries have included specific indicators in their national MPIs to better understand rural-urban disparities, this practice has been limited in both coverage and depth (for example, Bhutan, Chile and Pakistan have included some indicators in their national MPIs that are specifically relevant in rural areas, such as land and livestock endowments and access and/or distance to roads). The last ten years have also witnessed an intensified research agenda on the extreme rural poor that has produced a rich body of new evidence on their characteristics. This heightens the normative argument for a rural MPI that takes account of this additional knowledge and, as described above, provides a better "fit between the measure and the phenomenon it is supposed to approximate" (Alkire *et al.*, 2015).

## 1.2 REVIEW OF EXISTING PROMINENT MEASURES OF MULTIDIMENSIONAL POVERTY

Any study on poverty must be completed in two stages: identification and aggregation (Sen, 1976). In a one-dimensional analysis, identifying the poor is relatively straightforward once the poverty line has been determined. In this context, the stage of aggregation receives more attention because the selected index should satisfy certain rules or axioms.

However, by extending the analysis to a multidimensional context, the identification stage is more complex (Santos and Ura, 2008). Given a set of dimensions and indicators, each with an associated cut-off, it is possible to identify whether a person or a household is facing hardships in each indicator, which is then followed by the selection of a multidimensional poverty line that helps to identify the poor.

Alkire and Foster (2011) propose a counting identification approach, according to which an individual or household is identified as poor if it shows deprivations in at least *k* indicators, where *k* ranges between 1 and the total number of indicators considered in the analysis.[5] They use a dual cut-off methodology where it is first necessary to determine for each household/person whether she or he is deprived or not in each indicator according to the selected deprivation cut-off per indicator. In the second step, a value for *k* is selected and those deprived in *k* or more than *k* indicators are identified as multidimensionally poor. This method produces the MPI and its two components – the headcount of multidimensional poverty (or incidence) and the average proportion of deprivations faced by the poor, or the average intensity of poverty. The MPI is simply the product of the incidence and the intensity, and it represents the *adjusted headcount ratio*.[6]

There exists a long history of assessing the deprivation of individuals by considering multiple attributes of well-being at the same time. Since the 1980s many countries in Latin America have been computing a measure of unsatisfied basic needs to complement monetary poverty figures. This approach counts the number of deprivations in several indicators, including school enrolment among children, the schooling of the household head, overcrowding, housing conditions, sanitation, running water and the economic capacity of household members. In turn, in the European Union, the Europe 2020 poverty and social exclusion headline indicator combines income poverty (the at-risk-of-poverty rate), household quasi-joblessness and severe material deprivation (Atkinson *et al.*, 2002).

In 2010, OPHI and the Human Development Report Office of UNDP launched the global MPI – the first internationally comparable measure of acute multidimensional poverty, based on the Alkire-Foster method. The G-MPI has ten indicators grouped into three dimensions: education (school attendance and years of schooling), health (nutrition and child mortality) and living standards (electricity, sanitation, drinking water, housing, cooking fuel and assets). Each dimension is equally weighted and each indicator in a given dimension is also equally weighted. People deprived in at least one third of the weighted indicators are considered multidimensionally poor. The global MPI

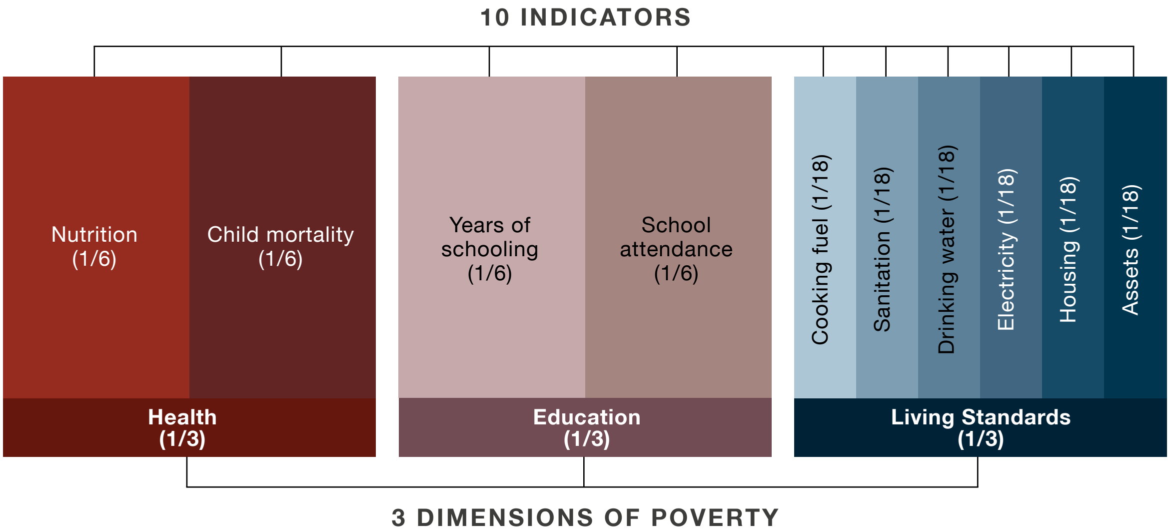
[5] One extreme identification option would be to consider as poor any individual or household deprived in at least one of the indicators included in the analysis, the so-called union approach. In this case, it is expected that the proportion of poor will increase as a larger number of indicators is considered. That is, the poverty rate is sensitive to the number of attributes considered. The union approach has been used extensively in the literature (Tsui, 2002; Bourguignon and Chakravarty, 2003). The method of measuring poverty by unsatisfied basic needs, widely used in Latin America, is another example of applications of the union approach. The other extreme alternative is the intersection approach, according to which an individual or a household is identified as poor if it is deprived in all attributes simultaneously. Naturally, in this case the headcount of poverty is reduced as the number of dimensions increases, since it is less likely that an individual or household presents shortcomings in all of the selected indicators at the same time.

[6] For a detailed description of the Alkire-Foster method (2011) used to measure multidimensional poverty, please refer to Appendix A.

has been updated at least annually since 2010 and has been included in every Human Development Report since. In addition, OPHI publishes figures disaggregated by urban and rural area, subnational region, age group, ethnicity and so on, as well as a detailed analysis of changes over time.

The MPI illuminates the overlapping disadvantages poor people experience. Because of its order of aggregation – first across indicators for each person and then across the population – the MPI captures interconnections between different deprivations for the same person. In this way, the MPI builds upon the counting traditions widely used in Latin America and Europe. Dashboards and standard composite indices do not capture the joint distribution of deprivations because they first aggregate information about one deprivation across all units.

**Figure 1: Structure of the Global MPI**




*Source:* OPHI (2018).

Results of the 2018 global MPI, which was revised that year in order to better align the measurement of acute multidimensional poverty with the SDGs, show that 23 percent of the global population (1.3 billion people) are multidimensionally poor, of which 83 percent live in sub-Saharan Africa and South Asia and 85 percent live in rural areas (across 105 countries, or 77 percent of the global population).

In turn, in October 2018, the World Bank presented its own multidimensional poverty measure, also using the Alkire-Foster method (World Bank, 2018).[7] It includes six indicators grouped into three dimensions (monetary poverty, measured as the daily consumption or equivalent income below USD 1.90, education and access to basic infrastructure). This measure uses comparable data across 119 countries for circa 2013, home to nearly 45 percent of the world's population. This index uses

[7] The World Bank's measures of multidimensional poverty rely on information from the harmonized household surveys in the Global Monitoring Database – the World Bank's repository of multitopic income and expenditure household surveys. Surveys used in the multidimensional analysis must have an income or expenditure module, as well as indicators on education and access to basic infrastructure. The surveys must have been conducted between 2010 and 2016 (World Bank, 2018).

a nested weighting structure and identifies people as poor if they are deprived in the equivalent to at least one of the three dimensions. Using this structure, results indicate that 18 percent of the population is multidimensionally poor and one-third of the poor are deprived in all three dimensions.

The World Bank also presented an exercise expanding its multidimensional measure to include health and security from crime and natural disasters. However, this expansion is available for only six countries (Ecuador, Indonesia, Iraq, Mexico, Uganda and United Republic of Tanzania) covering the years 2009–2013 (World Bank, 2018). When considering the five dimensions, the poverty line is set at 20 percent, which implies that people still need to be deprived in the equivalent to at least one dimension to be considered multidimensionally poor. In all six cases, the proportion of poor people when using five dimensions is higher than when the three-dimensions measure is used. Results also indicate that the drivers of poverty changed in some countries. For instance, in Ecuador and Iraq, the contribution of security to overall poverty is relatively large and, since many of the individuals suffering from threats of crime reside in urban centres, the share of the poor who reside in urban areas rises.

While the coverage of 45 percent of the main World Bank measure has been criticized as too low for claiming to be a global measure of multidimensional poverty, particularly given the low coverage of countries in sub-Saharan Africa and South Asia (Robles Aguilar and Sumner, 2019), the finding that the second exploratory measure may "re-urbanize" poverty in Ecuador and Iraq is worth highlighting (World Bank, 2018).

In addition to global scale exercises, the Alkire-Foster method has also been used by many developing countries, which have created their own national MPIs, each tailored to their national context and policy priorities. Mexico was the first country to launch a multidimensional measure of poverty. The design of that measure began in 2000 and culminated with its launch in December 2009. Several other countries have since released their own national MPIs, including Afghanistan, Armenia, Bhutan, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Honduras, Malaysia, Mozambique, Nepal, Nigeria, Pakistan, Panama, the Philippines, Rwanda, Sierra Leone and Viet Nam, while many more are currently developing their national measures. The two tables in Appendix B present a simplified grouping of the list of dimensions and indicators included in some of the existing national MPIs,[8] the global MPI and two regional measures. As shown in the tables, indicators such as school attendance, housing, water and sanitation are nearly universal. Others pertaining to childhood and youth conditions, the environment or social networks are included where relevant. It should be noted that the specific definition of the dimensions and indicators is, naturally, not exactly the same for every country.

## 1.3 RURALITY AND THE SPECIFICITIES OF RURAL POVERTY

As mentioned in the previous section, the intensified research agenda on rural livelihoods and the characteristics of rural and urban poverty has created additional knowledge (including new data sources) that can be used to improve the measurement of rural poverty. Another strand of research has sought to define "rurality", but there are limitations in identifying a universal definition due to the diversity of rural areas. This work has identified two key issues that, ideally, could be addressed through a new measurement of rural poverty and through potential solutions to some of them. One issue involves the definition of "rural area" and whether a multidimensional rural poverty measurement should include an indicator of "remoteness" (or alternatively, the index to be disaggregated by a

8 For an overview of national MPIs, see https://mppn.org/multidimensional-poverty/who-uses/.

measure of remoteness). The second (and related) issue is how to better account for the diversity of rural livelihoods and their contribution to the well-being of rural populations.

First, there is no universal definition of "rural": rural and urban areas are defined at the national level with a variety of criteria, which are mostly driven by population density and the distance from densely populated areas, but often stem from traditional classifications and administrative purposes. For this reason, rural areas can be extremely diverse across countries, presenting variable degrees of the characteristics that identify rurality, such as population size and density, remoteness or the importance of the agricultural sector to employment.[9] To date there is no internationally agreed and homogeneous definition of rural areas, nor has there been any definite attempt to capture and classify the diversity of rural areas at the global level; therefore, most assessments rely on what countries classify as rural and urban areas (UNSD, 1990; United Nations, 2007).

Second, rural areas, however defined, are extremely diverse: they can present considerable differences in terms of agro-ecological characteristics, levels of institutional organization, economic activities and connectivity (de Janvry and Sadoulet, 2007; FAO, 2017a; Pizzoli and Gong, 2007). The diversity of farming systems is a case in point (Dixon *et al.*, 2001).[10] Most poverty assessments, especially monetary ones, fail to recognize and address the diversity of rural areas that define different levels of well-being. Moreover, the extent to which infrastructure is available to rural dwellers – physical and institutional – makes a substantive difference in the way rural populations live and connect to markets.

In addition, as countries go through the processes of structural transformation, the characteristics that make an area "rural" tend to change and evolve over time. Urbanization is a prominent phenomenon in many countries and regions, and most of the world's population live in small towns and cities (FAO, 2017a). From a cultural perspective, and considering technological advancements, "rural areas" defined as such a few decades ago may very well have acquired the characteristics of an urban or peri-urban settlement today, changes that are rarely reflected in national definitions of "rural". This further complicates the measurement of rural poverty; as the size and density of a population, the supply of goods and services, and the degree of connectivity are constantly changing over time, it will depend on whether the assessment of rural poverty at two points in time considers (or does not consider) the exact same location, and whether a reduction (or an increase) in poverty in rural areas is due to the reduction of poverty of the rural population itself, or influenced by a change of status of some localities to urban status. Currently, poverty measurements, monetary or multidimensional, tend to make use of nationally defined static definitions of rural areas, which may be producing a systematic overestimation of rural poverty.

In relation to the previous point, migration movements from rural to urban areas as part of the structural transformation process could also underestimate relative poverty between rural and urban areas if the numbers of the rural inhabitants are significantly reduced over time, also giving the impression (wrongly) that rural development has been successful in poverty reduction (see de Janvry and Sadoulet, 2000).

---

9 https://unstats.un.org/UNSD/Demographic/sconcerns/densurb/densurbmethods.htm

10 "Global farming systems are extremely diverse but can be broadly categorised into irrigated farming systems, wetland rice-based farming systems, rainfed farming systems in humid areas, rainfed farming systems in steep and highland areas, rainfed farming systems in dry or cold low potential areas, dualistic (mixed large commercial and small holders) farming systems, coastal artisanal fishing systems and urban-based farming systems, typically horticultural" (Dixon *et al*., 2001, cited in Vollmer and Alkire, 2018).

Lastly, rural and urban areas are normally treated as dichotomous for administrative reasons and classified as such in surveys. However, the population is in fact distributed along a continuum of increasingly rural (or urban) contexts, which is normally neglected when discussing the location of poverty and its dynamics. Yet, it is along such a continuum that rural transformation takes place, with intermediate settlements, such as small and midsized cities in rural areas, playing a key role (FAO, 2017a, 2018). In addition, rural households often migrate temporarily, or sometimes permanently, to urban areas to access employment opportunities (de Haan, 1999), often improving their well-being (see de Brauw, Mueller and Woldehanna, 2018 on internal migration in Ethiopia).

How could some of these limitations be addressed? In the case of monetary poverty measures, prices, incomes and supplies of goods and services need to be adjusted by the degree of rurality of an area (Ravallion, Shaohua and Prem, 2007). Most countries have rural poverty lines, which tend to be lower compared to urban ones, in consideration of the lower cost of living and lower costs of basic goods such as food staples (World Bank, 2008; IFAD, 2016). However, the required information (such as prices) is not always captured effectively in survey data or in the adjustments made to take the specificity into account. For example, food prices could be lower or higher in rural areas than in urban areas, depending on what is produced in (specific) rural areas and households' consumption of the food they produce; however, this is not always the case, and urban consumers may benefit from lower food prices. Also, lower population density and remoteness can make certain goods and services more expensive and less economically viable in rural areas than in urban areas. This is the case regarding transportation, health and education.

In the case of multidimensional poverty measures, it seems more amenable to include additional dimensions or indicators that allow a better characterization of rural poverty in terms of livelihoods and the different pathways out of poverty, as well as exposure to shocks and other detrimental environmental conditions.

For rural populations, moving out of poverty, particularly monetary poverty, can encompass different pathways, including not only on-farm improvements (such as increasing agricultural incomes), but also off-farm employment opportunities with higher wages or migration, either to other rural areas or to urban areas (de Janvry and Sadoulet, 2001; de la O Campos *et al.*, 2018). Another important pathway is decreasing food prices (Tomich *et al.*, 2019), including by making access to nutritious food more affordable.

The livelihoods of rural households are often characterized by a high reliance on agriculture (Castañeda *et al.*, 2018),[11] which includes natural resource management income-generating activities. The agricultural activities of the majority of rural households tend to be primarily subsistence oriented, as a number of structural constraints limit their agricultural productivity, particularly in countries in the early process of structural transformation (Webb and Block, 2012).[12] Access to land (not only to agriculture, but also to forests) and water (including for fishing), equipment and credit is essential for agricultural activities. Therefore, in order to capture the different rural livelihoods under a multidimensional poverty framework, key productive assets for each agricultural system must first be identified. This is crucial, as the diversity of the agricultural sector of developing countries is foreseen to grow, with small farms for which agricultural income is a small and decreasing share of household income vis-à-vis the consolidation to medium and large farms (Hazell, 2020). This diversity also speaks to the demographic situation of some rural areas where the age of farmers

---

[11] Agriculture includes crops and livestock (pastoralism), but also fisheries, aquaculture and forestry.

[12] For example, Angelsen *et al*. (2014) found that "subsistence forest income is more aligned with lower quintiles".

is 50 years and above, and where youth migrate into towns and cities seeking to engage in other sectors. The diversity of the agricultural sector is also conditioned by the geographic location of these activities, from highly productive areas to marginal areas (Dixon *et al.*, 2001; de la O Campos *et al*., 2018; Hazell, 2020).

In addition to agriculture, rural households also depend on off-farm activities to different degrees. In some countries and territories, the landless (and/or resource-less) tend to be the poorest groups in rural areas (by all accounts of measurement), usually engaged in wage employment in agriculture and other sectors with low salaries and poor working conditions and without benefits and social protection. Therefore, in addition to secure access to key productive assets, other characteristics in relation to rural employment and livelihood diversification (Ellis, 2000) are highly relevant for a tailored measure of rural poverty. The off-farm sector, including that related to food and agriculture, is a promising engine of growth for rural areas. Changes in dietary patterns as incomes rise – the decline of starchy staples and the increased consumption of dairy products, meat and seafood, edible oils, and fruits and vegetables – are already transforming the sector, including in the economically poorest regions, potentially offering a pathway out of poverty (FAO, 2017a; Tomich *et al.*, 2019).

The dependence on agriculture for their livelihoods also makes rural populations more dependent on the availability of and access to natural resources and it exposes them to specific risks. Beyond economic shocks, which are potentially disruptive for all households, rural households are more vulnerable to the warming of the climate system, which is predicted to increase variability in climate and weather (Thornton *et al.*, 2014). Climate related shocks such as droughts, flooding and severe storms disproportionately affect rural livelihoods (World Bank, 2016). In addition, agricultural production is affected by climate extremes in several ways, including the greater sensitivity of crop yields to extreme day temperatures, elevated ozone levels, and the spread and competition of invasive weeds and pests (Thornton *et al.*, 2014), thereby reducing farmers' incomes. The ability of rural households to mitigate and adapt to shocks could be more limited, and different in nature, in rural areas: certain markets, such as credit, insurance and financial markets can be more segmented and less complete in rural areas compared to urban areas. This can affect the way in which households behave in response to risks. The presence of conflicts in rural areas can also increase or change the nature of risks.

Access to social protection is relevant for supporting rural households' capacity to respond to risks and adapt to new situations. Certain provisions, such as social assistance and social insurance, are often not available for rural households, a phenomenon that some authors have attributed to a potential "urban bias" in policymaking and the reduced voice of dispersed and remote communities (Jones and Corbridge, 2010). Furthermore, social protection may be different in rural areas compared to that in urban areas and it may function to a great extent through informal networks, such as extended families and community support systems (Oduro, 2010).

Lastly, in highlighting the specificities of rural households and their implication for the measurement of poverty, it is important to address the challenge posed by the distribution of territories along a continuum between urban and rural areas, as mentioned earlier. This issue is pertinent not only in general when considering both rural and urban poverty together, but also in the measurement of poverty *within* rural areas. One possible solution in addressing this issue is the identification of a continuous variable – or a set of such variables – that can be used to associate territories to a "degree" of rurality (or urbanization). A suitable variable to this end could be population density. The possibility of using this variable as a scaling factor in the measurement of poverty, and the related policy decisions in rural areas, could be explored.

The proposal for the R-MPI, which is illustrated in the next section, is built around the idea of using the multidimensional approach to address some specificities of rural poverty, with a view to improving the possibility to formulate policies that respond to the needs of each territory. While the proposal does not address all of the described unique characteristics of rural poverty, it goes in the direction of capturing key specificities of rural poverty and factoring them into the analysis of poverty and the related policy design.

## 1.4 THE R-MPI: A MULTIDIMENSIONAL APPROACH FOR MEASURING RURAL POVERTY

Starting from OPHI's work on multidimensional poverty measurement and analysis, and FAO's strategic programme Reduce Rural Poverty (SP3), the R-MPI measure proposed in this report complements existing measures of multidimensional poverty in general and expands the understanding of rural poverty in particular. The proposed measure is built to be specific to different rural settings, thus allowing comparisons among different rural livelihood groups, such as rural and agricultural workers, forest communities, fisher populations and the landless. The present report discusses the issue of the definition of rurality, which affects the quantification of rural poverty in cross-country analyses given the heterogeneity of the definition of rural areas adopted at the national level, and the recommendation for an international definition based on population density.

The main objectives of creating a new index specific to rural areas are: first, to enhance the understanding of FAO and its partners of rural poverty at the global level from a multidimensional perspective; second, to better quantify and measure the interlinkages of rural poverty for academic purposes; and third, to serve as a tool to guide multisectoral strategies for rural poverty reduction at national and territorial levels.[13] If informed with enough granular data, the R-MPI would also constitute a tool to guide, design and monitor the outcomes of FAO's projects, and it could be used as a starting point of a discussion with countries, if requested, on adapting their national MPIs to rural areas.

The proposed R-MPI has the ambition to measure rural poverty effectively, while avoiding putting more urban standards of well-being as the goal of poverty reduction efforts. Rather, by highlighting what is relevant in rural contexts, the R-MPI will help to value, promote and support rural livelihoods and the specific well-being of people living in these areas.

The index has the ambition, at this stage, to identify a workable trade-off between comparability and the ability of the measure to capture the specificities of each rural context. In practical terms, this means that the proposed measure, as illustrated and applied in this report, will offer examples and suggestions about the data source to be employed and a list of suggested indicators to describe these dimensions.

The proposed R-MPI builds on the existing global MPI measure by modifying some of its features and adding dimensions and indicators that can better capture rural features, especially in terms of the specificities of livelihoods in rural areas, and the peculiarity of the exposure to potential shocks and the associated risk management. The approach taken here is to justify the inclusion of additional dimensions and indicators on normative and empirical grounds. This means choosing a set of deprivations that are essential to all population subgroups, to what can be perceived as barriers to an "acceptable standard of living" in rural contexts.

[13] The regional office of FAO for Latin America and the Caribbean has also started an initiative to support some countries in the region to integrate into their existing national MPI indicators that look at rural features (Angulo *et al*., 2018).

While this approach can justify the choice and inclusion of dimensions, the selection of specific data and indicators may take care of context-specific deprivations stemming from the particularity of each area. In the R-MPI, the selection of data sources and specific indicators, while being inevitably influenced by the availability of data, will be tested and verified on some firm principles and on statistical grounds. This follows the approach taken, for instance, by Guio *et al.* (2016), who assessed the suitability, validity and reliability of indicators to be included in the material deprivation indicator of the European Union through a set of statistical tests, such as factor analyses, classical test theory and item response theory. Similarly, the inclusion of indicators in the 2018 update of the global MPI is based on the assessment of five key principles that will also guide the selection process of the R-MPI: data coverage, the extent to which indicators are compelling, comparable and robust, and the extent to which they can be disaggregated and communicated effectively (Alkire and Jahan, 2018).

Based on the characteristics of rural poverty described in the previous section, the results from the expert consultation held at the University of Oxford in May 2019 and a thorough data inventory of 29 surveys included in RuLIS as of 2018, the proposed R-MPI adds to the global MPI two dimensions, namely rural livelihoods and resources and risk, for conceptual reasons, and it substitutes the health dimension with a food security and nutrition dimension, mostly for reasons of data availability. The nested weighting is consequently adjusted:[14] all dimensions are assigned the same weight, and specific indicators are weighted homogeneously, except for the indicators in the risk dimension (as further described below), depending upon their number within each dimension. This corresponds to assigning equal importance to all dimensions, and within each dimension, equal importance to each indicator. Due to the different number of indicators in each dimension, comparability at the dimension level (not the indicator level) is established.[15] The R-MPI maintained the cross-dimensional cut-off line of 33.3 percent to increase comparability to the global MPI results. In the three-dimensional global MPI, this corresponds to one dimension; in the R-MPI, bearing in mind that the index uses five dimensions, the deprivation corresponds to more than one dimension, which was considered more suitable given that the number of dimensions increased from three to five. Details on dimensions, indicators, deprivation thresholds and weights of the proposed R-MPI are presented in Table 1.

14 The weighting could be subject to changes depending on the available information in each country.

15 R-MPI weighting is not directly comparable to the weighting of the global MPI. The objective of achieving an equal weighting across indicators to match the global MPI would have biased the indicator selection, which was the primary objective of the R-MPI.

**Table 1. Dimensions, indicators and weights proposed for the R-MPI**

| Dimension | Indicator | Deprived if: | Weight in percentage |
|---|---|---|---|
| **Food security and nutrition** | Food insecurity | The household's probability of being severely food insecure exceeds 50 percent.[1] | 10 |
| | Child malnutrition | At least one child (aged 6–60 months) of the household is underweight and/or stunted.[2] | 10 |
| **Education** | Years of schooling | No household member of schooling age has completed 6 years of schooling.[3] | 10 |
| | School attendance | At least one household member of schooling age (age at which he or she would complete class 8) does not attend school. | 10 |
| **Living standards** | Cooking fuel | The household uses unclean fuels for cooking.[4] | 3.3 |
| | Improved sanitation | The household's sanitation facility is not improved (according to SDG guidelines).[5] | 3.3 |
| | Drinking water | The household does not have access to safe drinking water, or safe drinking water is at least a 30–minute walk (round trip) from home.[6] | 3.3 |
| | Electricity | The household has no electricity/solar energy. | 3.3 |
| | Housing | The household has inadequate housing: either the floor, roof or walls are made of rudimentary or natural, inadequate materials.[7] | 3.3 |
| | Assets | The household does not own more than one of the following assets: television, radio, telephone/mobile phone, refrigerator, bicycle, motorbike, computer or oxcart, and does not own a vehicle. | 3.3 |
| **Rural livelihoods and resources** | Agricultural assets adequacy | The household's share of income from agriculture (excluding agricultural wages) is equal to or above 30% and the amount of either land or livestock owned or operated falls in the bottom 40% of the cumulative distribution of operated land size (ha)/livestock ownership (TLU[8]). | 4 |
| | Low pay rate | At least one household member is a low–paid employee in either (a) agriculture, (b) mining, quarrying, manufacturing or construction, (c) services, or (d) any other unspecified sector.[9] | 4 |
| | Social protection | No member of the household has enrolled in any pension, insurance or other social programme. | 4 |
| | Child labour | At least one household member under the age of 11 years is employed.[10] | 4 |
| | Extension services | No one in the household has access to any extension service. | 4 |
| **Risk** | Credit denial | If the household was turned down in all its attempts to seek credit, or the household did not borrow because it did not seek credit due to non–adequate reasons, such as (a) believing the credit would be refused, (b) the credit was too expensive, (c) inadequate collateral, or (d) did not know any lenders. | 5 |
| | Risk exposure and coping strategies | The household suffered from covariate shocks or suffered from a shock but had no access to formalized coping strategies such as support from the government or a non–governmental organization.[11] | 7.5 |
| | Risk of climate shocks | The household's probability of experiencing drought, floods or temperatures above 35 degrees Celsius in the critical period of maize production is greater than the respective median probability.[12] | 7.5 |

[1] Severe levels of food insecurity imply a high probability of reduced food intake and can therefore lead to more severe forms of undernutrition, including hunger. The probability of being severely food insecure is based on FAO's food insecurity experience scale.

[2] Underweight: weight for age < –2 standard deviation (SD) of the World Health Organization (WHO) Child Growth Standards median. Stunting: height for age < –2 SD of the WHO Child Growth Standards median.

3 The age cut-off is country specific and based on the official school entrance age to primary school and on the year (previous versus current) for which information on school attendance is available. The age thresholds are the following: 13 years in Ethiopia, 12 years in Malawi, 14 years in the Niger and 12 years in Nigeria.

4 The list of unclean cooking fuels is country specific. Ethiopia, Malawi and Nigeria: collected firewood, charcoal, crop residue, sawdust, animal waste and other undefined fuel. The Niger: collected firewood, coal and other undefined fuel.

5 A household is considered to have access to improved sanitation if it has some type of flush toilet or latrine, or ventilated improved pit or composting toilet.

6 The following water sources are considered as safe drinking water: piped water, public tap, borehole or pump, protected well, and protected spring or rainwater.

7 Natural inadequate materials are soil/sand, dirt, dung (floor); dirt, stones with mud, wood/straw, grass, stabilized earth, semi-solid and other undefined materials (walls); hides/skins, grass, plastic sheeting, wood, dirt/soil, straw (roof).

8 Tropical livestock unit.

9 Low-paid employees in a given sector are defined by the International Labour Organization (ILO) as receiving a wage that is less than two-thirds (66 percent) of the median annual wage of all employees working in that sector.

10 The age threshold is country specific, depending on data availability. Malawi, the Niger and Nigeria: 5–11 years; Ethiopia: 7–11 years. As the survey data employed in the implementation (sections 6–13) do not provide information on the type of work and work conditions, children aged 12 years and above cannot be classified as being (not) engaged in child labour based on the ILO Minimum Age Convention, 1973 (No. 138).

11 The following are considered as covariate shocks: droughts, floods, unusually high levels of crop pests, unusually high levels of livestock disease, irregular rains, unusually high costs for agricultural inputs, unusually low prices for agricultural outputs, unusually high prices for food outputs. Non-adequate/non-formal coping strategies can include selling household assets (such as agricultural land or durables), changing eating patterns, and working more or being obliged to work.

12 Probabilities are calculated based on the standardized precipitation index (SPI-n) taking into account the different lengths of the agricultural rainy seasons. Hence, the use of the SPI is country specific: Ethiopia: SPI-5; Malawi: SPI-6; Nigeria: SPI-7; the Niger: SPI-4.

*Source:* authors'own elaboration, 2021.

The proposed structure of the R-MPI implies some deviations from the G-MPI, which are described below, by dimension.

## Food security and nutrition

One major variance of the proposed R-MPI from the global MPI is to replace or adjust the health dimension with a food security and nutrition dimension, both for reasons of data availability and for conceptual reasons. Anthropometric data on nutrition were available only for children in RuLIS. Hence, the nutrition indicator of the global MPI (which assessed any person under 70 years of age for whom there is nutritional information) is replaced by a child malnutrition indicator in the R-MPI. Second, child mortality was replaced by a food insecurity indicator, both because data on child mortality were not available in RuLIS and because conceptually it was considered crucial to capture food insecurity in a rural poverty index, frequently named as one of the main characteristics of rural hardship. An appropriate approach to capture information on access to food – which is the main dimension in which a household can be food-insecure – is the food insecurity experience scale (FIES). FIES is extensively used by FAO in the global assessment of food insecurity and it informs SDG indicator 2.1.2 on the prevalence of moderate or severe food insecurity based on the FIES, which is one of the two food security indicators of the SDG monitoring framework. Through eight questions pointing to factual conditions, the FIES allows the classifying of households (and potentially individuals) in terms of their ability to access adequate food (FAO *et al.*, 2018).

## Education

This dimension is included in the R-MPI with the same indicators used in the global MPI, as there seems to be no a priori reason to believe that education should be specific to rural areas.

## Living standards

Some indicators in relation to living standards were revised and adapted to living conditions in rural areas. In relatively isolated communities, the characterization of basic services such as housing may refer to different minimum standards when compared to urban areas – for instance, the traditional homes of indigenous people may need to be considered in certain areas as a different standard. In particular, for housing, the human right to adequate housing (article 25 of the Universal Declaration of Human Rights) encompasses a number of elements that concur to define adequacy. To describe habitability, reference is made to the notion of "adequate housing", which is expected to "… provide for elements such as adequate space, protection from cold, damp, heat, rain, wind or other threats to health, structural hazards, and disease vectors" (OHCHR and UN-Habitat, 2009).[16] "Housing is not adequate if its occupants do not have safe drinking water, adequate energy for cooking, heating and lighting, sanitation and washing facilities, means of food storage or refuse disposal" (OHCHR and UN-Habitat, 2009). Therefore, "habitability" and the "availability of services, materials, facilities and infrastructure" may both contribute to the description of this dimension.

To describe "habitability", the R-MPI uses the same definition of "inadequate materials" (when the floor is of natural materials and/or the roof and/or the walls are of natural or rudimentary materials), though it considers households as non-deprived if their houses are made out of burnt bricks. This diversion seems adequate in rural areas where burnt bricks are often seen as signs of improved housing.

Deprivation concepts in terms of safe drinking water, sanitation and the availability of certain assets were unchanged in the proposed R-MPI from those used in the global MPI.

Concerning cooking fuels, it was decided to consider all those households that purchase firewood as non-deprived, as opposed to those that just fetch firewood.

Regarding the electricity indicator, the R-MPI considers households as non-deprived if they have an independent solar plant or generator in the absence of an electricity grid.

These changes were made because of conceptual reasons (following a literature review or recommendations made during the expert consultation) and/or were due to different data availability in RuLIS, compared to the data available in the Demographic and Health Surveys and Multiple Indicator Cluster Surveys that are predominantly used in the computation of the global MPI.

### Rural livelihoods and resources

The inclusion of this dimension stems from the need to identify deprivation conditions that refer to the ability to produce real income in rural areas, and the specificity of the economic activities. One important issue concerns the opportunity to include productive assets and livelihood means in the R-MPI and/or to include income/consumption directly in the dimension. On the latter question, despite several doubts expressed by participants in the expert consultation, there was consensus that the R-MPI would not include a measure of income or consumption because: (a) consumption should not be included if the focus is on assets and structural poverty; (b) monetary income may add volatility to the measure; (c) the nature of the exercise undertaken with the R-MPI – consistent with the approach of the Alkire-Foster measure – considers multidimensional poverty measures as an alternative to monetary measures; and (d) consistent with Sen's capability approach, poverty is considered in terms of outcomes (such as being well nourished) rather than means (such as consumption).

[16] The human right to adequate housing encompasses seven elements: legal security of tenure; affordability; habitability; availability of services, materials, facilities and infrastructure; accessibility; location; and cultural adequacy (OHCHR and UN-Habitat, 2009).

Therefore, the consensus was that productive assets would be included in the R-MPI, in an attempt to reduce noise in the data and to have an appropriate design. The major consensus was that: (a) assets are important because they are the basis of the capacity to produce and, in turn, they act as safety nets in the case of shocks; (b) structural poverty is largely reflected by assets, which predict some 50 percent of income according to some studies; (c) incomes in rural households are volatile, hence the need to focus on assets as a more stable way out of poverty; (d) assets in rural areas are specific and different from urban ones, particularly in terms of access to critical natural resources, information and infrastructure, including information and communications technologies.

The inclusion of livelihood indicators that can effectively point to deprivation conditions is not straightforward. However, this is a challenge that multidimensional measures of poverty have in common with monetary approaches, asset-based measurements[17] and other alternative measures. As previously outlined, rural livelihoods and the natural resources they rely upon are extremely diverse, and the ownership of productive assets is specific to areas, agricultural practices, the ecosystem and even to the household-specific livelihood strategy. Thus, there is a potential risk to misinterpret a lack of certain productive asset ownership as a sign of deprivation, when in fact it was merely a livelihood choice to *not* own certain productive assets when they were considered irrelevant. For example, a lack of livestock ownership may solely indicate a livelihood choice for coastal communities and fisherfolk, and a lack of land ownership may simply indicate that the household has off-farm wage employment, and so forth.

Determining access to productive assets remains problematic – in most surveys this is done through use or ownership, which are imperfect vehicles of information. In addition, the security of tenure or secured access to resources (such as land, fisheries, grazing areas, forests and freshwater for domestic use or irrigation), either privately or communally (which is often the case in rural communities), would need to be addressed. Determining a minimum standard for each productive asset is an additional challenge. Finding a threshold to classify a household as deprived or not is complicated (such as a minimum size of land ownership) and this was identified as one key reason not to include crucial productive assets such as land and livestock in the revised assets indicator of the global MPI in 2018 (Vollmer and Alkire, 2018). Despite the challenges, the ownership of productive assets is frequently found to be a determinant of routes out of poverty (de la O Campos *et al.*, 2018; Tomich *et al.*, 2019), and the importance of their inclusion in the R-MPI should therefore be stressed. Rural households that apply a livelihood strategy based on specialization (particularly agricultural specialization, which continues to be considered one key pathway out of poverty for rural populations by FAO (FAO, 2017b)) will be captured by measuring productive asset ownership, if a suitable indicator specification can be found.

How can this best be implemented? Suggestions were offered during the expert consultation, for instance by considering a comparison with the median number of assets in a community (with a distance from the median as a possible cut-off) rather than the number of assets owned. While this is a valuable idea, concerns were expressed that that approach might prevent the possibility to compare results across surveys collected in different time periods, as those might change due to the change in the median. Specific cut-offs that do not change across surveys may thus be preferable. To capture access to relevant productive assets, the R-MPI approaches a middle way between the two proposals and makes use of the rich data information on rural livelihoods available in RuLIS (though some concessions due to data grouping need to be made).

[17] The measurement of assets deprivation as a proxy for welfare became popular in the late 1990s and early 2000s with the seminal work of Filmer and Pritchett (1999, 2001). Asset ownership indices have since been used widely as alternatives to monetary poverty measurements (see Vollmer and Alkire, 2018).

The new indicator considers key factors used in primary production activities to determine deprivations. *The assumption is that, if a household derives a substantive share of its income from a given activity, then the endowment of key assets used in that activity must be adequate*. Therefore, the proposed solution is to assess, for any household with a given share of income derived from primary activities, the ownership (or, in principle, secure access or tenure) of at least one major productive asset from a basket of assets that are important for that activity (for example, agricultural land for agricultural activities; livestock for pastoralism; a fishing vessel, fishing net and related equipment such as harpoons, and access to an aquaculture pond for fisherfolk; and access to forested areas for forest-dependent people).

Implementing an indicator of this form in the R-MPI requires the establishment of thresholds that can turn the notions of “substantive” income and the “adequacy” of assets into concrete entities. Thresholds are somewhat arbitrary, even if well-articulated and based on transparent normative grounds, and they bear the limitation of cutting the sample into parts. For this assessment of the R-MPI, it was chosen to consider that a household is deprived if its share of income from on-farm agricultural activities (such as crop production, livestock-keeping, fisheries and forestry activities) is equal to or above 30 percent while its endowment of land or livestock falls in the bottom 40 percent of the cumulative distribution of the assets owned across the rural population. Put differently, this criterion is applied to land and livestock for only those households that derive 30 percent or more of their income from agriculture. Those households that derive less than 30 percent are automatically considered non-deprived in this indicator, which aims to proxy specialization in primary activities, as these households seem to pursue another livelihood strategy primarily (such as off-farm wage labour). In other words, households with less than 30 percent are considered non-deprived in specialization simply because they are assumed to engage less in it compared to others in the sample.

Future robustness checks are planned to understand better if results remain robust to changes to these cut-offs. Due to the coding of on-farm agricultural activities in RuLIS, the indicator also captures income from fisheries and forestry and assesses mainly land and livestock ownership. For now, this has been an empirical concession, because in the four countries where the R-MPI is applied, data on fishing activities and ownership of boats were available for only two countries (Malawi and Nigeria) and the ownership or operation of boats (owned or hired) was not widespread (less than 0.5 percent in Nigeria and 1.2 percent in Malawi; see Table 2). The ownership of crucial productive assets for forestry, such as the ownership of a chainsaw to produce charcoal, is not available in RuLIS. As the R-MPI is applied in more countries, the exact coding will be adopted to the available data, to measure deprivations in primary activities through the ownership of key productive assets by activity.

Table 2 shows summary statistics of agricultural asset holding across the four countries analysed. Over 70 percent of livestock-keeping households are in the bottom 40 percent of the cumulative distribution with respect to livestock holding. Similarly, the majority of households have their landholding in the bottom 40 percent of the cumulative distribution. With the exception of the Niger, over 40 percent of farm households have an on-farm agricultural income, accounting for more than 30 percent of total income annually. In both Malawi and Nigeria, less than 2 percent of households operated or owned a boat for fishing activities.

**Table 2. Agricultural assets adequacy**

| Country | Farm households with on–farm income >=30% of total annual income (%) | Share of households whose total operated land (ha) falls in the bottom 40% of cumulative distribution (%) | Share of households whose total livestock holding falls in the bottom 40% of cumulative distribution (%) | Households that operate a boat (%) |
|---|---|---|---|---|
| **Ethiopia** | 53.2 | 78.1 | 73.7 | – |
| **Malawi** | 48.7 | 68.6 | 87.7 | 1.2 |
| **Niger** | 26.7 | 74.9 | 83.3 | – |
| **Nigeria** | 44.1 | 80.0 | 92.6 | 0.5 |

*Source:* Authors' computations, 2021.

The analysis and treatment of productive assets in the proposed R-MPI suffer from several more limitations, particularly if the R-MPI were to proxy the entire rural livelihoods and resources dimension. First, specialization is only one pathway out of poverty for rural households. Access to assets could also include livelihood diversification, which is considered another pathway out of poverty by FAO (FAO, 2017; see also Ellis, 2000). The literature distinguishes between progress-pulled livelihood diversification, a pathway out of poverty, "where diversification is a deliberate strategy adopted by pro-active households with greater opportunities" (Martin and Lorenzen, 2016, pp. 231 and 232), where, for instance, rural households combine agricultural activities "with other forms of higher return non-agricultural activities (self-employment, service provision, wage labour and transfers, including migration) (FAO, 2017b) and distress-pushed diversification, "where diversification is seen as a strategy of spreading risk to reduce vulnerability to unpredictable crises such as floods, droughts, and illness as well as the seasonal fluctuations of natural resources … leading to more stable but lower household income" (Martin and Lorenzen, 2016, pp. 231 and 232). However, diversification is not uniquely related to stability, as progressive diversification "at the household level may not necessarily reduce efficiency, as it still allows for individuals to specialize and develop skills within a household" (Ellis, 2000, cited in Martin and Lorenzen, 2016, p. 232). Given the data limitations and the complexity of the matter in judging from the data if households apply a progress-pulled livelihood diversification if they do have several income streams (Gautham and Andersen, 2016; Davis, Di Giuseppe and Zezza, 2017; Barrett, Reardon and Webb, 2001), the current version of the R-MPI, in consensus with the expert consultation, does not tackle the matter of diversification in this dimension and is limited to assessing the access to some fundamental assets based on the main livelihood of the household.

Second, the available data often neglect the fact that several assets in rural areas can take the form of communal goods (to which households retain user's rights) that can be as stable and secure as ownership or that may serve as a substitute for ownership. At this stage, most of the data consider access in terms of ownership or secure tenure, particularly for land, which may display considerable limitations.[18]

Additional indicators of the rural livelihoods and resources dimension are aimed at measuring the extent of decent employment and the availability of social protection at the household level (both aimed at measuring more formal forms of employment that complement the (often more subsistence-based) livelihood activities captured by the first indicator). The availability of social protection and

[18] See Slavchevska *et al*. (2016) for a discussion on land ownership data as collected in surveys and their limitations as an indicator of access to and tenure of land.

decent working conditions are essential elements of well-being and should also be present in rural livelihoods. Labour markets and several aspects of the organization of work in rural areas tend to be more informal than in urban areas. This calls for specific indicators to be considered with a view to capturing the extent to which work is "decent" as per the decent work framework of the International Labour Organization (ILO), and effective social protection is available through either formal or informal means, especially for the more vulnerable population groups. Among those included in the ILO decent work framework, the indicators that are more widely available in the surveys employed in this exercise are the indicators on low pay rate and the employment of child labour in households.[19] Concerning social protection, the current version of the index focuses on a general perspective and it considers the household as non-deprived if at least one member is enrolled in any form of pension, insurance or other social insurance programme (see Table 1).

Pay rates can be assessed only with reference to paid labour, and this can be the exception rather than the norm in rural areas. However, the low pay rate indicator complements the agricultural assets adequacy indicator well, to proxy rural livelihoods comprehensively from both a subsistence *and* a formal employment perspective. Where the measurement of labour is not entirely detailed in surveys in terms of the hours spent, child labour can be difficult to identify, especially within certain age ranges, where children may support farming activities without being impaired in their growth and education opportunities – as the ILO concept of child labour entails. However, the expert consultation found consensus that absolute "bads", such as forced or child labour, should be included in an R-MPI if the available data permitted inclusion in the index, as these phenomena are highly frequent in the agricultural sector and in rural areas.

In terms of social protection, the main limitation is the difficulty of taking into account social networks, such as family networks, residence in a community, membership of an ethnic group of professional groups, or simple friendships. Even if totally informal, some of these can ensure effective support beyond insurance or pension schemes (Oduro, 2010).

Lastly, the R-MPI includes in its rural livelihoods and resources dimension an indicator of the use of technical assistance, in the form of extension and other services. Technical assistance provides direct support to agricultural livelihoods, thus constituting an important mechanism for reducing poverty. In addition, agricultural research for development was proven to be an effective tool to combat poverty (Pray, Masters and Ayoub, 2017), and even more effective if combined with irrigation, water holding capacity and/or infrastructure capacity (Rosegrant *et al.*, 2017). If adequately managed and delivered, technical assistance can ensure that the benefits of technologies and information reach the rural poor. Both agricultural research for development and assistance have to be adapted to different typologies of agricultural systems, particularly accounting for the great diversity of small-scale farming systems and for marginal farmers, who have very different resources and access to markets (Hazell, 2020).

The R-MPI indicator considers a household as deprived if no one in the household had access to any extension service, such as receiving advice on crop-growing techniques. One limitation of the current approach to include technical assistance in the R-MPI is that an accurate indicator would need to include both agricultural and non-agricultural technical assistance and training to better account for the diversity of rural livelihoods. Access to these services can be as important for rural livelihoods as access to social protection. While the latter can address households' immediate

[19] For further information on the indicators of the ILO decent work framework, see www.ilo.org/wcmsp5/groups/public/---dgreports/---integration/documents/publication/wcms_229374.pdf.

needs, rural advisory services and training enable households to adopt technologies in order to improve practices, to access information, and sometimes to access markets to sell their products and services. In the context of a changing climate, people with livelihoods linked to natural resources need to be supported by governments through more effective rural advisory services. At the same time, information on non-agricultural technical assistance is often limited in the available surveys employed to compute the R-MPI.

### Risk

As mentioned, the R-MPI adds to the three dimensions of the global MPI a risk dimension, based on the notion that risks in rural areas take specific forms that make them different from those of urban areas. In fact, rural dwellers are exposed to specific risks and they are differently affected, sometimes to a larger extent, by environmental and weather-related shocks compared to urban dwellers, particularly as they depend more on natural resources and good weather conditions for their livelihoods. At the same time, this dimension should also include indicators of shocks and risks, beyond those just described, which tend to be covariate, such as the ability to cope with unexpected events in the household (such as the death of the household head, a so-called idiosyncratic shock) and unforeseeable variability in prices and costs.

Indeed, together with risks per se, what is also relevant is the coping strategy that households can enact in response to shocks. Better off households will be better equipped to respond to shocks than poorer households, which may have to resort to selling assets or to processed-pushed diversification. Thus, an analysis of coping strategies allows for an understanding of whether a household risks falling into a poverty trap due to specific risks (Angelsen *et al.,* eds., 2011), or, more generally, whether a household is capable of enacting sustainable coping strategies. Although coping strategies are an essential element of this picture, the challenge is being able to describe their sustainability with one or a few simple indicators. Attempts to measure resilience, which is a related concept, normally rely on a large pool of indicators.[20]

The current proposed version of the R-MPI includes three main indicators in the risk dimension. One of them is an indicator on the household's ability to successfully access credit. The second indicator captures the household's ability to cope when exposed to covariate risks, and the third indicator is on exposure to covariate risks, and specifically climate risks.

Concerning climate risks, *the assumption is that a household located in an area with a high probability of drought, floods or high temperatures is to be considered per se deprived, as it is exposed to health risks and in its ability to earn a living from activities such as growing crops and/or raising livestock.* To implement the indicator, the R-MPI uses territorial data to assess the probability of each household to experience drought or floods – drought or floods in Ethiopia, the Niger and Nigeria; and drought, floods or temperature above 35 degrees Celsius in the critical period of maize production in Malawi – vis-à-vis the respective median probability in each country. Probabilities are computed on the basis of the standardized precipitation index (SPI) by taking into account the different lengths of the agricultural rainy seasons. The assessment of the SPI is country specific, as it depends upon the distribution of the events and temperature patterns, with probabilities computed on historical temperature and precipitation data combined with the location of the household. Again, the R-MPI takes advantage of the rich data source of RuLIS and the ability to link it to available geospatial data.

---

20 See, for instance, the resilience index measurement and analysis at www.fao.org/3/a-i5665e.pdf or the INFORM risk index at www.inform-index.org/.

This is the first such application in a comparable poverty index, and the possibility to adjust existing household surveys with geospatial data to better capture deprivations related to the environment and natural resources was highly recommended in 2019 by UNDP and OPHI in their advice on the construction of national MPIs, where data permit (UNDP and OPHI, 2019, pp. 88 and 89).

Concerning covariate risks, the R-MPI includes another indicator (risk exposure and coping strategies), which assesses the ability of the household to be considered for support from the government or non-governmental organizations and institutions. This is a household level indicator (where the household suffered from covariate shocks or suffered from a shock but had no access to formalized coping strategies such as support from the government or non-governmental organizations) to complement the geospatial indicator with the assumption that support from the government or non-governmental organizations was an *adequate* coping strategy, compared to non-adequate/non-formal coping strategies where households, for example, sell household assets (such as agricultural land and durables), change eating patterns, and work more or are obliged to work.

Concerning the ability to cope with shocks, there exists one additional indicator that is aimed at providing an understanding of whether the household was constrained in its ability to access credit. Specifically, the indicator captures households whose credit request was denied, together with cases in which the household did not ask for credit on the assumption that it would be denied. This indicator assigns a deprivation status to households who cannot access the means to cope with risks (also including idiosyncratic risks). It thus complements the other two indicators that assess covariate shocks and the coping strategies for these. However, the way the question is posed in the questionnaires implies an assumption on the part of the respondent, who is called upon to judge whether she or he might be denied credit, regardless of whether a request was made. For this reason, the indicator was assigned a slightly lower weight than the other two, within the dimension.

The main limitations of the current approach are in the ability to capture, through available data, the informal mechanisms that ensure protection to the households and in fact enhance their ability to cope with shocks. One certainly important item in this domain can be remittances, which are often used as sources of finance and external support in rural areas. However, using their absence as an indicator of deprivation would entail several risks of misassigning a deprivation status to households that do not access or use such mechanisms.

### Dealing with rurality and intra-household differences

For this exercise, the R-MPI was created for rural areas as defined at the national level, without referring to the “degree of rurality” both within and outside what is administratively defined as a “rural’ territorial entity. At a later stage, the possibility will be explored to include in the measurement a gradient that can represent the degree of rurality. Population density appears as a good candidate for this purpose. The literature on the definition of rural areas – and the efforts to build harmonized definitions for enhanced comparability – shows that population density is still the most important characterizing variable, supplemented by information on access to certain basic services (Conchedda, Khan and Offutt, 2018). Population density, which can be measured along a continuum within (and potentially outside) rural areas, may be employed to shape the assessment of relative deprivation for certain indicators in the R-MPI. For instance, the distance from certain services or certain housing conditions could change depending on the extent of population density. In principle, and with sufficient data, the R-MPI could be disaggregated by areas showing different degrees of “rurality” – as defined by convenient variables, such as population density and size – in view of observing differences in the degree of households’ deprivation along the different dimensions.

A final word is dedicated to intra-household differences to best capture the gender dimension in rural areas. It is worth noting that the R-MPI, as it is conceived, can be disaggregated for a number of variables of interest by, among others, gender. What is not possible at this stage is to analyse intra-household differences due to the way the index is designed. Deprivations apply at the individual level, but data are available at a significant scale, so far, at the household level. This implies that deprivations and the poverty status will be reported to be the same for all household members, thus disallowing the assessment of intra-household differences. As new data become available, the option to compute indicators specifically to capture intra-household differences will be explored. Disaggregation by the sex of the household head, or an analysis of household composition (comparing, for example, poverty statuses of households with only female members to those with only male members) is, however, a possibility and this could be explored. An immediate first option could therefore be to compare results by the sex of the household head (something that was beyond the scope of this report). However, the notion of household head has been questioned by recent survey-based evidence (Palacio-Lopez, Christiaensen and Kilic, 2017), indicating that it can be used to designate quite different functions depending on the country and the context. Hence, it may not be enough or efficient to rely solely on whether the head of the household is reported to be a male or a female. As an alternative strategy, it is possible to classify households in three groups: those including only female adults, those including only male adults, and those with both male and female adults. The drawback, in this case, is that in most surveys the first two groups are likely to be much less represented than the third. Future research will investigate the gender dimension further and how best to capture and analyse it in rural areas, taking into consideration the strength and limitations of the current design of the R-MPI.

# PART 2

# IMPLEMENTING THE R-MPI IN FOUR COUNTRIES: ETHIOPIA, MALAWI, THE NIGER AND NIGERIA

## 2.1 DATA DESCRIPTION AND LIMITATIONS

The first empirical application of the proposed R-MPI presented in this report relies on four nationally representative household surveys, implemented in Ethiopia, Malawi, the Niger and Nigeria between 2014 and 2017. The countries were selected based on a data inventory that showed that most indicators were present to compute the R-MPI. The households located in rural areas were also predominant in the sample of these surveys, which made them ideal candidates to implement the R-MPI. Table 3 shows the surveys used and the household sample size by rural/urban area.

**Table 3. National representative surveys**

| Country | Survey name | Year | Sample size | |
|---|---|---|---|---|
| | | | Rural | Urban |
| **Ethiopia** | Ethiopia Socioeconomic Survey (wave 3)[a] | 2015/16 | 3 272<br>(66.1%) | 1 682<br>(33.9%) |
| **Malawi** | Integrated Household Survey[b] | 2016/17 | 10 175<br>(81.7%) | 2 272<br>(18.3%) |
| **Niger** | National Survey on Household Living Conditions and Agriculture[c] | 2014 | 2 319<br>(64.1%) | 1 298<br>(35.9%) |
| **Nigeria** | General Household Survey[d] | 2015/16 | 3 132<br>(67.9%) | 1 480<br>(32.1%) |

[a] Central Statistical Agency of Ethiopia, National Bank of Ethiopia and World Bank, 2017.
[b] Malawi, National Statistics Office, 2017.
[c] The Niger, National Institute of Statistics, 2016.
[d] Nigerian National Bureau of Statistics and World Bank, 2016.

*Source:* Authors' computations, 2021.

These surveys are part of the Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) project implemented by the LSMS team of the World Bank. Therefore, the questionnaires exhibit a large degree of comparability that enables the comparison of the results for similar indicators.[21]

[21] The datasets were downloaded from the Microdata Library of the World Bank, cleaned and processed using the methodology of the RuLIS project. As the project continues, more countries will be computed across different world regions.

However, one of the main limitations of the analysis comes from the difference in the food security module included in these surveys. Indeed, unlike the other three surveys, the third wave of the Ethiopia Socioeconomic Survey (2015/16) does not include a FIES module consistent with the one recommended by FAO (Ballard, Kepple and Cafiero, 2013). Although the questions on food security are similar to those recommended by FAO, the recall period of one week differs from that of other surveys. Since this was considered as a risk that could bias the results, the FIES results are not included in the analysis of Ethiopia. Similarly, there was limited information on the credit denial variable in the Niger and on social protection in Nigeria.

Given these data limitations, the weights of the indicators within different dimensions were rescaled, as indicated in Table 4, while maintaining equal weights across dimensions. The weights were redistributed equally within each dimension based on the number of indicators considered.

**Table 4. Country-specific weights**

| | | Weight (percent) | | | |
|---|---|---|---|---|---|
| **Dimension** | **Indicator** | **Ethiopia** | **Malawi** | **Niger** | **Nigeria** |
| **Food security and nutrition** | Food insecurity | – | 10.0 | 10.0 | 10.0 |
| | Child malnutrition | 20.0 | 10.0 | 10.0 | 10.0 |
| **Education** | Years of schooling | 10.0 | 10.0 | 10.0 | 10.0 |
| | School attendance | 10.0 | 10.0 | 10.0 | 10.0 |
| **Living standards** | Cooking fuel | 3.3 | 3.3 | 3.3 | 3.3 |
| | Improved sanitation | 3.3 | 3.3 | 3.3 | 3.3 |
| | Drinking water | 3.3 | 3.3 | 3.3 | 3.3 |
| | Electricity | 3.3 | 3.3 | 3.3 | 3.3 |
| | Housing | 3.3 | 3.3 | 3.3 | 3.3 |
| | Assets | 3.3 | 3.3 | 3.3 | 3.3 |
| **Rural livelihoods and resources** | Agricultural assets adequacy | 4.0 | 4.0 | 4.0 | 5.0 |
| | Low pay rate | 4.0 | 4.0 | 4.0 | 5.0 |
| | Social protection | 4.0 | 4.0 | 4.0 | – |
| | Child labour | 4.0 | 4.0 | 4.0 | 5.0 |
| | Extension services | 4.0 | 4.0 | 4.0 | 5.0 |
| **Risk** | Credit denial | 5.0 | 5.0 | – | 5.0 |
| | Risk exposure and coping strategies | 7.5 | 7.5 | 10.0 | 7.5 |
| | Risk of climate shocks | 7.5 | 7.5 | 10.0 | 7.5 |

*Source:* Authors'own elaboration, 2021.

## 2.2 MAIN RESULTS

The R-MPI reflects the share of the rural population that is multidimensionally poor – that is, the incidence of poverty or headcount ratio (H) – adjusted by the average proportion of indicators in which they are deprived – which is the average intensity of their poverty (A). The R-MPI is therefore the product of the headcount ratio and the average intensity of poverty. Following the global MPI, the R-MPI defines a person as poor if he or she belongs to a household deprived in at least one-third of the weighted indicators. In other words, the poverty cut-off (*k*) for the R-MPI is 33.3 percent (the same as in the global MPI). The individuals that live in rural households deprived in 20 to 33.3 percent of the weighted indicators are classified as being "vulnerable to poverty", whereas individuals belonging to households deprived in at least 50 percent of the weighted indicators are classified as in "severe poverty". The R-MPI is computed for rural areas only, using the national definitions of rural areas endorsed by the national statistical agencies. Table 5 shows the main results of the R-MPI for the four countries included in the analysis.

In all four countries, more than 50 percent of the rural population live in multidimensionally poor households (see the headcount ratio in Table 5). While the average intensity of poverty (A) varies only slightly among the four countries – fluctuating between 45.7 percent (Nigeria) and 56.2 percent (the Niger) – the incidence, or the headcount ratio of poverty, is, significantly, the highest in the Niger and the lowest in Nigeria. Consequently, the adjusted headcount ratio (the R-MPI) is the lowest in Nigeria (0.249) and the highest in the Niger (0.532). This means that the multidimensionally poor in rural Nigeria and rural Niger experience 24.9 percent and 53.2 percent, respectively, of the total deprivations that would be experienced if everyone in these rural societies were fully deprived in all indicators.

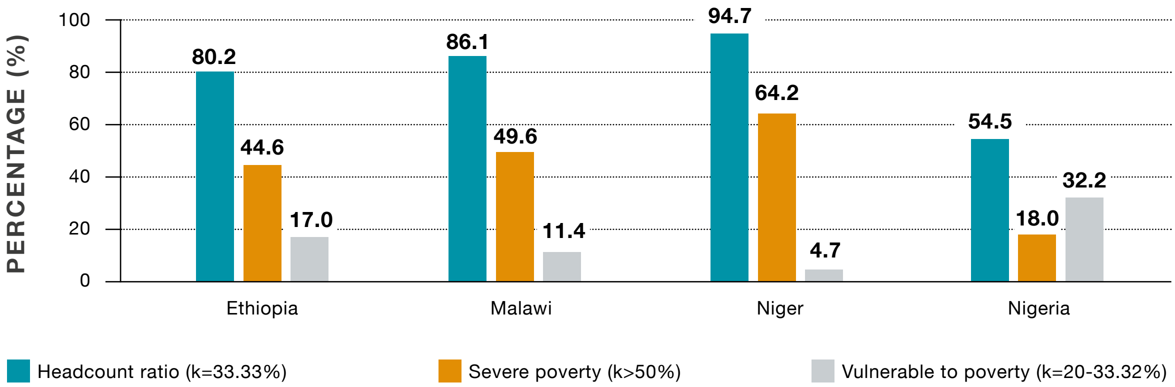
**Table 5. Main results of the R-MPI for the countries analysed**

| Country | R–MPI (H x A) | Headcount ratio (H) (percent) | Average intensity of poverty (A) (percent) |
|---|---|---|---|
| **Ethiopia** | 0.426 | 80.2 | 53.2 |
| **Malawi** | 0.448 | 86.1 | 52.0 |
| **Niger** | 0.532 | 94.7 | 56.2 |
| **Nigeria** | 0.249 | 54.5 | 45.7 |

*Source:* Authors' computations, 2021.

Figure 2 shows the incidence of poverty levels within each country using different poverty cut-offs (*k*). It depicts the percentage of the rural population that is multidimensionally poor, that is, the headcount ratio, along with the other two headcount ratios, namely "vulnerable to poverty" and "severe poverty". Countries with a high incidence of poverty tend to face low percentages of individuals being vulnerable to poverty and, simultaneously, also display a high proportion of severe poverty. In the Niger, for example, almost the entire rural population is multidimensionally poor (94.7 percent), whereas only 4.7 percent of the population belongs to households that are vulnerable to poverty. In fact, the vast majority is severely poor (64.2 percent).

**Figure 2: Incidence of different poverty levels by country**




Note: k = poverty cut-off.

*Source:* Authors' computations, 2021.

Figure 3 shows the uncensored and censored headcount ratios of multidimensional poverty. The uncensored headcount ratio is the percentage of the population that is deprived in each indicator, presented separately for each of the four countries. The censored headcount ratio of an indicator represents the proportion of individuals who are multidimensionally poor *and* simultaneously deprived in a specific indicator. In a hypothetical case where the entire population was multidimensionally poor, uncensored deprivations would be equal to the censored headcount ratios. A significant difference between the uncensored and censored headcount ratios may indicate the presence of a notable share of the population that is deprived in a specific indicator, while not being multidimensionally poor.

The first important finding is that, in all countries with available data, the proportion of the population that is deprived in the indicators related to the food security and nutrition dimension and the education dimension is almost always multidimensionally poor. Within each country (excluding Ethiopia, which lacked data on food insecurity), the uncensored and censored headcount ratios in the four indicators are nearly the same, which shows that the population deprived in these indicators is also predominantly multidimensionally poor. In the other dimensions, significant percentage point differences can be observed between the uncensored and censored headcount ratios in some of the indicators (for example, in extension services in Nigeria, or social protection in Ethiopia, which means that the non-multidimensionally poor also suffer from a lack of extension services and social protection in Nigeria and Ethiopia, respectively).

Second, while the uncensored headcount ratios vary significantly between indicators and across countries, a feature common to the four countries is the high level of deprivation in three indicators related to living standards, namely cooking fuel, electricity and housing. In each of these indicators, more than 70 percent of the rural population is deprived in at least three of the countries. In Malawi, for example, 40 percent of rural households have walls made out of natural or rudimentary material and over 80 percent of them have floors made out of the same rudimentary material. Subsequently, the substandard floors drive the high level of deprivation in the housing indicator. The analysis further shows that collected firewood is the primary source of cooking fuel among rural households in all four countries and ranges from 69 percent in Nigeria to 92 percent in the Niger, and thus causes the high deprivations in the cooking fuel indicator.

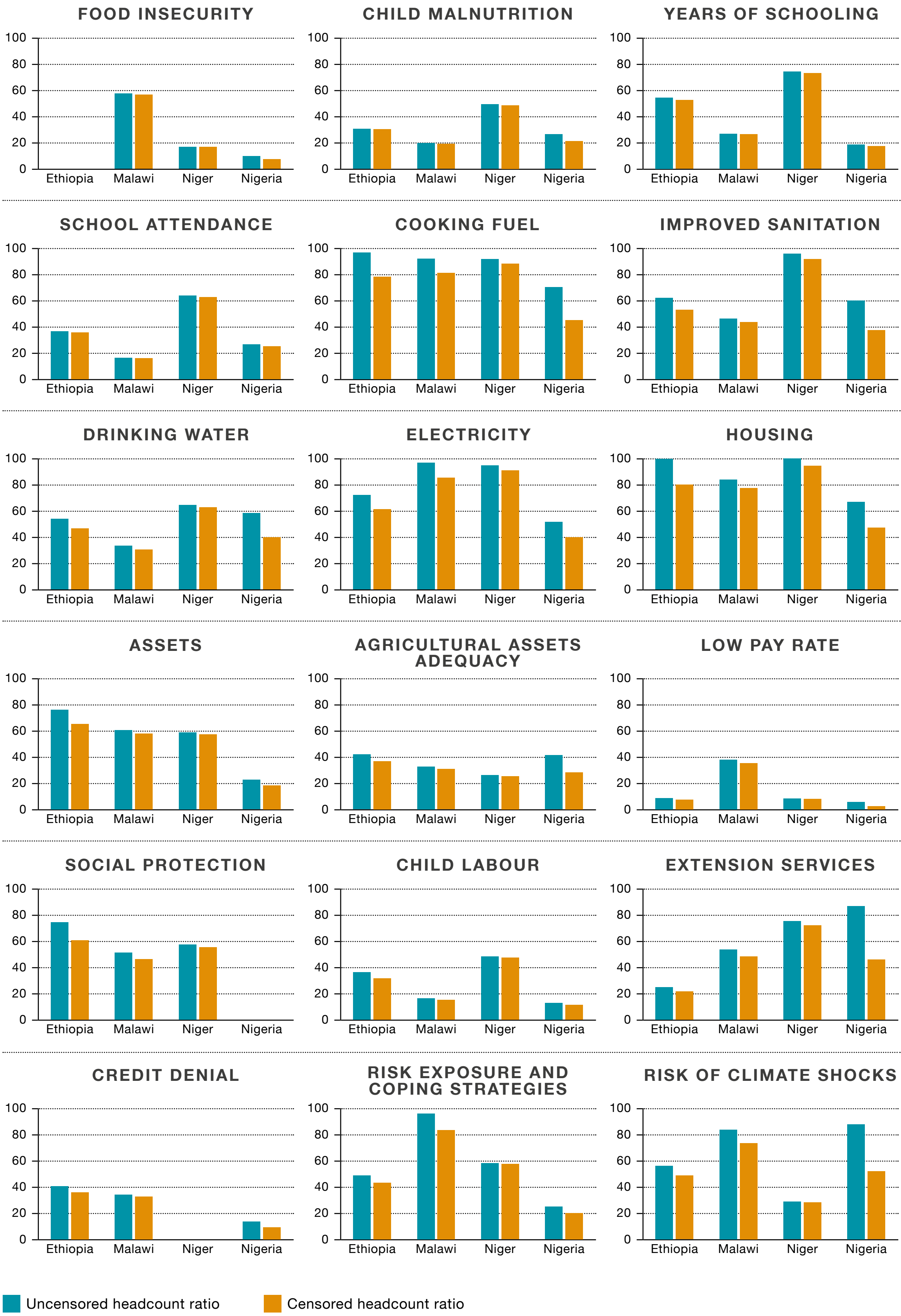
Third, the low pay rate indicator shows the lowest incidence of deprivation in all of the countries, being below 10 percent in three countries, with Malawi the exception. This is likely due to the construction of the indicator itself, as all individuals living in a household where none of its household members is a wage employee are automatically classified as being non-deprived.[22]

Lastly, it can be observed that the risk exposure and coping strategies indicator and the risk of climate shocks indicator under the risk dimension show high levels of headcount ratios in three of the four countries, though with some distinct differences between the uncensored and the censored headcount ratios. For example, Nigeria, the country with the lowest incidence of multidimensional poverty (54.5 percent), exhibits a notable percentage difference between the uncensored and censored headcount ratios in the risk of climate shocks indicator, while the risk exposure and coping strategies indicator displays a minimal difference.

---

22 Malawi is an exception because of the inclusion of *ganyu* labour as wage employment. In Malawi, *ganyu* is widely used to describe a range of informal and short-time wage labour, which is performed mostly in agriculture and by the poor. As a result, the percentage of households that receive any kind of agricultural wage is much higher in Malawi (60.5 percent) than in Ethiopia (1.9 percent), the Niger (2.8 percent) and Nigeria (1.3 percent). Overall, this leads to 73.3 percent of all Malawian households reporting being engaged in any kind of wage employment, compared to 34.1 percent of households in Ethiopia, 14.7 percent of households in the Niger and 22.9 percent of households in Nigeria.

**Figure 3: Uncensored and censored deprivation by indicator and country**



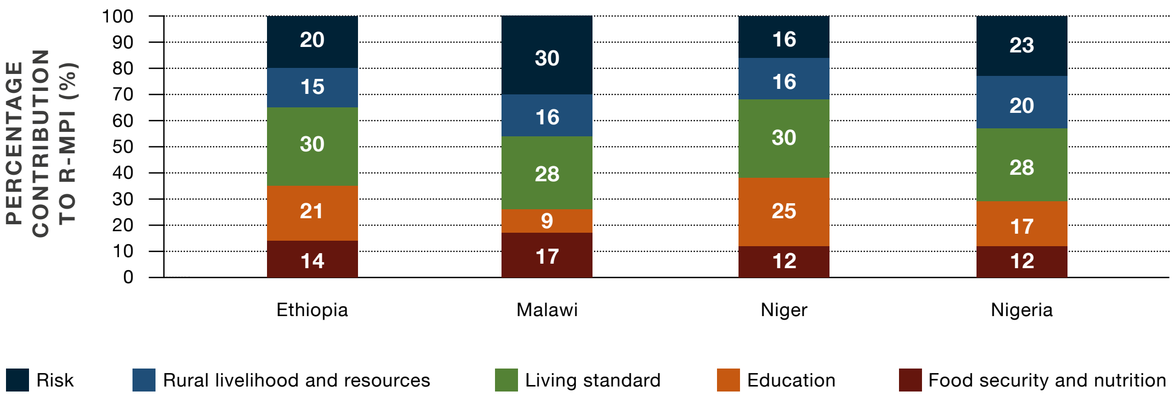

*Source:* Authors' computations, 2021.

As mentioned, this indicates that the indicator on risk of climate shocks depicts the covariate shocks to which both multidimensionally poor and non-poor rural households in Nigeria are exposed. In other words, being deprived in this indicator may not eventually lead people living in rural Nigeria to be characterized as multidimensionally poor. Even though credit denial also falls under the risk dimension, the proportion of the deprived population is very low compared to the other two variables included in that dimension.

While the censored headcount ratio shows the extent of deprivations among the poor, it does not capture the relative importance of the indicators or, therefore, their *contribution* to the R-MPI. The percentage contribution to poverty is equal to the censored headcount ratio times the weight assigned to that specific indicator in the R-MPI. As a result, it is possible for two indicators to have the same censored headcount ratios but very different contributions to overall poverty. Hence, the weights assigned to each indicator and the associated level of deprivation among the poor together play an important role when analysing the relative contribution of the indicators to the R-MPI.

First, Figure 4 shows the percentage contribution of each equally weighted dimension to the R-MPI by country, adding up to 100 percent. The results indicate that in each country the dimensions contribute differently to the R-MPI. For three out of the four countries, with Malawi being the exception, the living standards dimension contributes the most to the R-MPI – up to nearly 30 percent – while the food security and nutrition dimension contributes the least, with less than 15 percent. In Malawi, however, the risk dimension contributes the most, and the education dimension the least.

**Figure 4: Percentage contribution of each dimension to the R-MPI, by country**

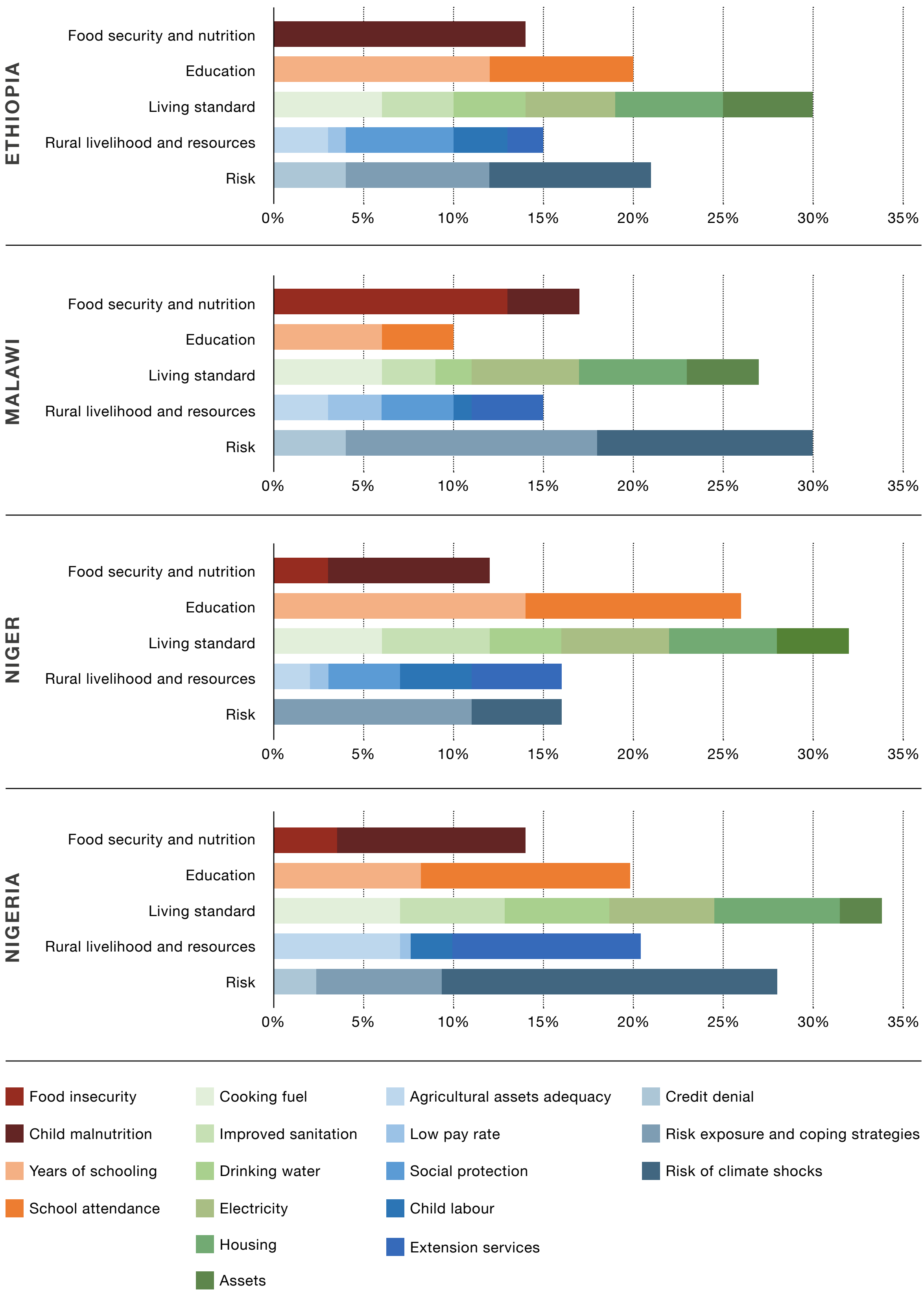



*Source:* Authors' computations, 2021.

Next, Figure 5 shows the contributions to the R-MPI by indicator, grouped within dimensions for each country. As mentioned above, the dimensions are assigned equal weights; however, the weights within each dimension are divided by the number of indicators included in it. Variations across countries are notable. For example, the indicator with the highest contribution to the R-MPI in Ethiopia is child malnutrition (14 percent),[23] while the low pay rate indicator contributed only 1 percent. In Malawi, risk exposure and coping strategies and food insecurity contribute the most

[23] In Ethiopia, child malnutrition is the only indicator in the food security and nutrition dimension and for this reason the indicator is assigned the entire weight of the dimension (20 percent). This is different from what applies to the computation for the other three countries.

**Figure 5: Percentage contribution to the R-MPI by indicator, by country**




*Source:* Authors' computations, 2021.

to the R-MPI, with 14 percent and 13 percent, respectively, and child labour contributes the least (1 percent). In the Niger, years of schooling contributes the most (13 percent) and low pay rate the least (1 percent) to the R-MPI, while in Nigeria, vulnerability to the risk of climate shocks constitutes the driving indicator for overall poverty at 16 percent. Assets, child labour and credit denial each contributes only 2 percent to the R-MPI in Nigeria. As indicated in Figure 5, the findings show that, across the countries, the drivers of poverty within the dimensions are different, highlighting the necessity to analyse every indicator in each dimension.

## 2.3 REDUNDANCY TESTS

With the purpose of unveiling possible associations across dimensions and exploring similarities among their indicators, an association and redundancy analysis has been implemented for all the indicators in the two new dimensions of the R-MPI (rural livelihoods and resources and risk). The reasons to focus only on the newly developed eight indicators of the new dimensions are that the indicators in the global MPI are well established to measure acute poverty globally, and that the tests are meant to inform the decision-making process on the new dimensions added to capture rural deprivations in particular. Two alternative measures that are drawn from contingency tables using the uncensored headcount ratios for each indicator have been used. One measure is based on correlations – Cramer's V – and the other is a measure proposed by Alkire *et al.* (2015, pp. 228–232), referred to as "Redundancy $R^0$", that assesses joint distributions directly (see also UNDP and OPHI, 2019, p. 77).

Cramer's V measures the strength of the relationship between two or more nominal (dichotomous) variables. Since all the proposed indicators included in the two new dimensions of the R-MPI are binary variables, Cramer's V is equal to the absolute value of the phi coefficient, which is also an association measure but specific to the analysis of two binary variables. It ranges between -1 and 1, where 0 stands for no association between variables, and 1 or -1 for the largest possible (positive or negative) association.

While informative, correlations are, however, affected by the extent to which deprivations between variables match. They are also affected by values of the headcount ratios and their difference (see Alkire *et al.*, 2015). With the aim of assessing joint distributions (and thus possible redundancies between indicator pairs directly), Alkire *et al.*, 2015 proposed to use the ratio between the proportion of people with simultaneous deprivation in any two indicators, and the proportion of people deprived in the indicator with the lower proportion of deprivation of the pair. The coefficient of this measure takes the value of 0 when no one is identified as deprived in both indicators, and 1 when every individual who is deprived in the indicator with the lower incidence of deprivation is also deprived in the other indicator. Thereafter, the $R^0$ displays the number of observations that have the same deprivation status in both variables, which reflects the joint distribution as a proportion of the minimum of the two uncensored headcount ratios. Logically, the higher any of the two headcounts, the higher the measure of redundancy, as the probability increases that people are deprived in both indicators.

However, a high $R^0$ at low frequencies of deprivations, that is, when the uncensored headcount ratios in both indicators are low, would mean that many individuals who are deprived in the indicator with the lower incidence of deprivation are also deprived in the other indicator. As a result, one indicator may be dropped for statistical reasons to maintain parsimony, that is, to reduce the number of indicators in an index for ease of analysis, communication and transparency. However, indicators could (and should) be retained if normative reasons exist to do so, even if high redundancies (simultaneous deprivations) exist.

In this analysis, little or no association is referred to when Cramer's V values range between -0.3 and 0.3; and a weak positive/negative association refers to values ranging from |0.7| to |0.3| . With respect to $R^0$, a high proportion of joint distributions would be determined by high $R^0$ values – for example, a value of 0.80 or higher. Table 6 shows the estimates of the $R^0$ (left) and Cramer's V coefficients (right) for each pair of indicators under the analysis. For instance, in the section on Ethiopia, second column, first row, the redundancy between "low pay rate" and "agricultural assets adequacy" is 0.30. That is, 30 percent of the possible matched deprivations overlap. On the other hand, the correlation between the two indicators is 0.03.

A number of observations stand out. In the three countries where available information allowed the computing of the social protection indicator (that is, Ethiopia, Malawi and the Niger), the estimate of $R^0$ shows many joint distributions with other indicators – the values are greater than 0.50 in most of the pairwise comparisons. This seems to be related to a high uncensored headcount ratio, where more than half of the rural population in each country was deprived in social protection. This increases the likelihood of observing joint distributions with the other indicators. In contrast, the Cramer's V coefficient shows a low correlation between social protection and the other indicators, hence little association.

Likewise, by looking at the $R^0$ coefficient between the risk exposure and coping strategies and the risk of climate shocks indicators, it seems that both capture the same population (ranging from 55 percent in Ethiopia to 93 percent in Malawi). Here there is greater variation in the uncensored headcount ratios, from 25 percent (Nigeria) to 96 percent (Malawi) in risk exposure and coping strategies, and 56 percent (Ethiopia) to 88 percent (Nigeria) in risk of climate shocks. As Malawi (0.93, or 93 percent) and Nigeria (0.89, or 89 percent) stand out as the two countries with high $R^0$ coefficients in this indicator pair, it can be explained by the high uncensored headcount ratios in the risk of climate shocks indicator in both countries (84 percent in Malawi and 88 percent in Nigeria). However, the Cramer's V coefficient depicts a rather small (or a lack of) association between the indicators.

Thus, for the three indicators analysed thus far, sufficient statistical reason has not been found to drop any one of them that would override the normative thinking for their selection. In particular, risk exposure and coping strategies and risk of climate shocks should still be seen as independent indicators in the risk dimension, as already worked out in the analysis on the censoring of the population in both indicators for Figure 3.

Moving on to the other indicators, the agricultural assets adequacy and low pay rate indicators show low uncensored headcount ratios (less than 42 percent and 9 percent, respectively) in Ethiopia, the Niger and Nigeria. With low headcounts, a high $R^0$ may indicate a statistical overlap that warrants closer scrutiny. It is therefore promising that the redundancy and association between both indicators is rather low for all countries, including Malawi, where values are less than 0.39 and -0.12 percent, respectively. In other words, the test shows that the agricultural assets adequacy and low pay rate indicators measure two distinct concepts and capture two different groups of people. This adds statistical weight to the normative argument that the two indicators measure different concepts (specialization in subsistence agriculture versus formalized employment in agriculture in particular).

In conclusion, a high deprivation overlap among indicators does not necessarily suggest that one of them should be dropped mechanically. As mentioned by Alkire *et al.* (2015), statistical approaches are relevant for informing the design of multidimensional poverty measures but not to determine it; normative and value judgments also constitute a fundamental element. The risk exposure and coping strategies and risk of climate shocks indicators are a case in point. They show high deprivation overlaps; however, they measure different concepts: the household's ability to cope under covariate risk and the ex-ante vulnerability of households to climate shocks, respectively.

### Table 6. Redundancy and correlation/association among indicators

| R0/Cramer's V | Agricultural assets adequacy | | Low pay rate | | Social protection | | Child labour | | Extension services | | Credit denial | | Risk exposure and coping strategies | | Risk of climate shocks | | Uncensored headcount ratio (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ethiopia** | | | | | | | | | | | | | | | | | |
| **Agricultural assets adequacy** | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 41.9 |
| **Low pay rate** | 0.30 | –0.03 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | . | . | 8.6 |
| **Social protection** | 0.78 | 0.05 | 0.62 | –0.10 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | 74.2 |
| **Child labour** | 0.37 | 0.03 | 0.26 | –0.03 | 0.70 | –0.08 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | 36.1 |
| **Extension services** | 0.26 | –0.20 | 0.49 | 0.06 | 0.74 | –0.03 | 0.23 | –0.21 | **1.00** | **1.00** | . | . | . | . | . | . | 24.8 |
| **Credit denial** | 0.44 | 0.03 | 0.51 | 0.06 | 0.75 | 0.01 | 0.37 | –0.06 | 0.45 | 0.06 | **1.00** | **1.00** | . | . | . | . | 40.6 |
| **Risk exposure and coping strategies** | 0.50 | 0.05 | 0.51 | 0.03 | 0.66 | –0.19 | 0.49 | 0.04 | 0.45 | –0.03 | 0.46 | –0.01 | **1.00** | **1.00** | . | . | 48.8 |
| **Risk of climate shocks** | 0.58 | –0.01 | 0.52 | –0.04 | 0.77 | 0.07 | 0.61 | 0.04 | 0.59 | 0.02 | 0.57 | –0.02 | 0.55 | –0.07 | **1.00** | **1.00** | 56.0 |
| **Malawi** | | | | | | | | | | | | | | | | | |
| **Agricultural assets adequacy** | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 32.6 |
| **Low pay rate** | 0.39 | 0.04 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | . | . | 38.0 |
| **Social protection** | 0.56 | 0.05 | 0.49 | –0.05 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | 51.2 |
| **Child labour** | 0.29 | 0.01 | 0.51 | 0.13 | 0.42 | –0.08 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | 16.3 |
| **Extension services** | 0.54 | –0.08 | 0.56 | –0.06 | 0.63 | 0.07 | 0.47 | –0.10 | **1.00** | **1.00** | . | . | . | . | . | . | 53.6 |
| **Credit denial** | 0.36 | 0.07 | 0.39 | 0.04 | 0.53 | 0.02 | 0.34 | 0.02 | 0.58 | –0.03 | **1.00** | **1.00** | . | . | . | . | 34.1 |
| **Risk exposure and coping strategies** | 0.96 | 0.05 | 0.94 | 0.01 | 0.95 | 0.06 | 0.96 | 0.03 | 0.92 | –0.08 | 0.96 | 0.06 | **1.00** | **1.00** | . | . | 96.0 |
| **Risk of climate shocks** | 0.81 | –0.05 | 0.83 | –0.04 | 0.88 | 0.10 | 0.81 | –0.04 | 0.86 | 0.06 | 0.85 | 0.00 | 0.93 | –0.03 | **1.00** | **1.00** | 83.6 |
| **Niger** | | | | | | | | | | | | | | | | | |
| **Agricultural assets adequacy** | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 26.0 |
| **Low pay rate** | 0.19 | –0.04 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | . | . | 8.3 |
| **Social protection** | 0.67 | 0.12 | 0.53 | –0.02 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | 57.4 |
| **Child labour** | 0.48 | 0.03 | 0.42 | –0.02 | 0.60 | 0.06 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | 48.2 |
| **Extension services** | 0.75 | –0.01 | 0.79 | 0.02 | 0.76 | 0.00 | 0.74 | –0.05 | **1.00** | **1.00** | . | . | . | . | . | . | 75.2 |
| **Credit denial** | | | | | | | | | | | – | **–** | . | . | . | . | . |
| **Risk exposure and coping strategies** | 0.57 | 0.00 | 0.56 | –0.01 | 0.61 | 0.09 | 0.59 | 0.04 | 0.79 | 0.08 | – | – | **1.00** | **1.00** | . | . | 58.1 |
| **Risk of climate shocks** | 0.28 | –0.02 | 0.26 | –0.03 | 0.57 | 0.01 | 0.49 | 0.05 | 0.79 | 0.05 | – | – | 0.59 | 0.03 | **1.00** | **1.00** | 28.7 |
| **Nigeria** | | | | | | | | | | | | | | | | | |
| **Agricultural assets adequacy** | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 41.3 |
| **Low pay rate** | 0.12 | –0.12 | **1.00** | **1.00** | . | . | . | . | . | . | . | . | . | . | . | . | 5.7 |
| **Social protection** | | | | | **–** | **–** | . | . | . | . | . | . | . | . | . | . | . |
| **Child labour** | 0.42 | 0.08 | 0.03 | –0.07 | – | – | **1.00** | **1.00** | . | . | . | . | . | . | . | . | 12.7 |
| **Extension services** | 0.83 | –0.15 | 0.95 | 0.05 | – | – | 0.71 | –0.20 | **1.00** | **1.00** | . | . | . | . | . | . | 86.7 |
| **Credit denial** | 0.34 | 0.03 | 0.14 | 0.00 | – | – | 0.13 | –0.01 | 0.87 | –0.03 | **1.00** | **1.00** | . | . | . | . | 13.6 |
| **Risk exposure and coping strategies** | 0.36 | 0.07 | 0.18 | –0.02 | – | – | 0.24 | 0.03 | 0.78 | –0.20 | 0.22 | 0.02 | **1.00** | **1.00** | . | . | 24.9 |
| **Risk of climate shocks** | 0.89 | 0.04 | 0.90 | 0.03 | – | – | 0.96 | 0.08 | 0.89 | –0.05 | 0.86 | –0.01 | 0.89 | 0.03 | **1.00** | **1.00** | 87.7 |

*Source:* Authors' computations, 2021.

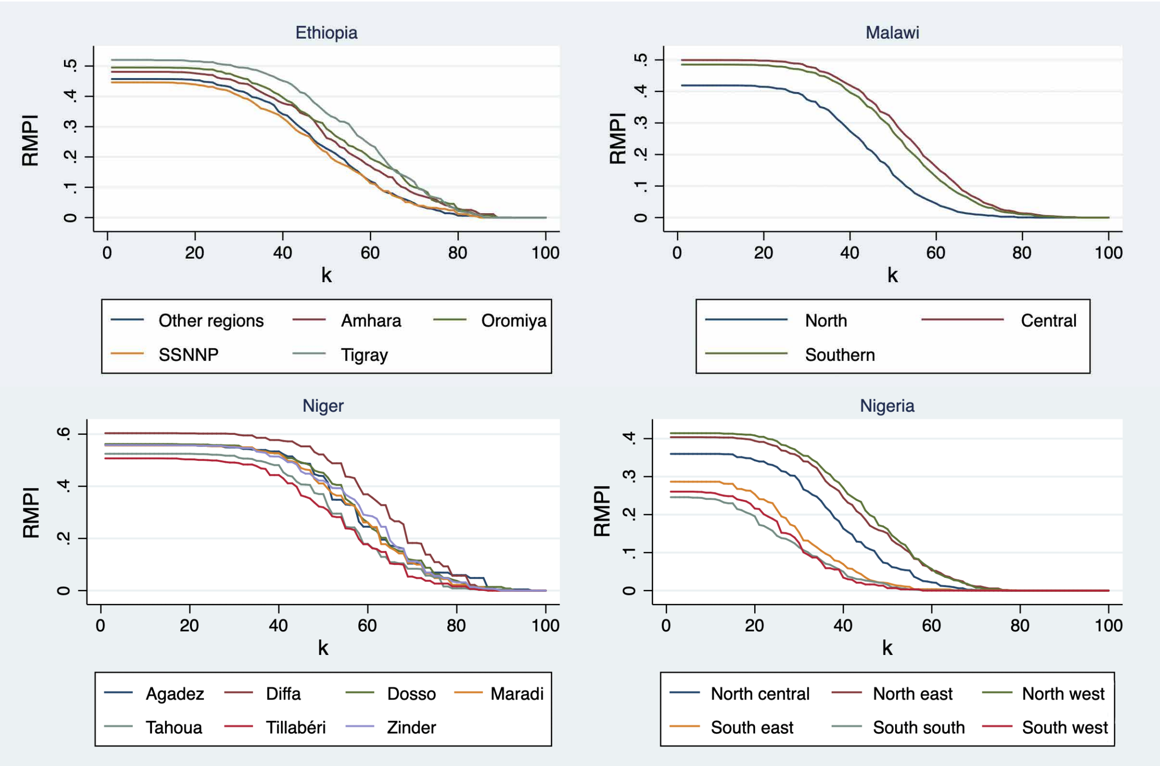
## 2.4 ROBUSTNESS ANALYSIS

The aim of this section is to assess the statistical strength of the identification function of the headcount ratio and the adjusted headcount ratio (R-MPI) in response to changes in the cross-dimensional cut-off *k*, which was originally set at 33.3 percent. The reason to focus on the poverty cut-off is that, different from the global MPI, the R-MPI comprises five dimensions yet adopts the poverty cut-off of the three-dimensional global MPI (where 33.3 percent corresponds to the weight of one dimension). Hence, analysing in greater detail the poverty cut-off seems reasonable. As the R-MPI is based on the same nested weighting structure as the global MPI, the existing robustness tests can be used on both the original global MPI of 2010 and the revised global MPI of 2018, which found that country orderings by the 2018 specification of the index were as highly stable as the original global MPI country orderings from 2010 to changes in the dimensional weights. In both cases, using a pairwise comparison, 88.9 percent (in the original 2010 global MPI) and 90 percent (in the revised 2018 global MPI) of country rankings was preserved across various alternative weighting structures (Alkire and Santos, 2014; Alkire *et al.*, 2020, p. 30). Similar results for the R-MPI are predicted, but future research will further explore this assumption.

Robustness tests – including first order stochastic dominance (SD) and Spearman and Kendall's rank correlation coefficients – have been conducted at the regional level. Besides statistical inference analysis, robust pairwise comparisons are used to assess the sensitivity of the results and the sampling error, given the sample population from which the two measures were computed (see Alkire *et al.*, 2015, p. 232 ff.; UNDP and OPHI, 2018, p. 97).

First, the robustness on the adjusted headcount ratio was tested with an SD analysis. SD is considered the strongest and most stringent form of robustness, thus testing the R-MPI values with it is crucial. Figure 6.a depicts for each region within the four countries a curve that maps an R-MPI value to its corresponding poverty cut-off value *k*, which ranges values between 0 and 100. These graphs allowed the SD analysis to be performed at the subnational level, where SD is established if and only if the curves do not intersect. However, as shown in Figure 6.a, in all four countries, curves tend to overlap for at least one level of *k*. This implies that, if all possible poverty cut-offs are allowed to be included in the analysis, it is impossible to retrieve a clear ranking between the subnational regions in terms of multidimensional poverty throughout. However, Figure 6.b clearly shows that, if the range of cut-off values is restricted to lie between 10 and 40, which is a reasonable range for possible cut-offs of the R-MPI and its five dimensions, then a robust ranking for all subnational regions in Ethiopia and Malawi can be observed, while in Nigeria only two regions show a crossing of lines for *k* values greater than 30 percent. In the Niger, four of the seven regions show overlaps; however, rankings are maintained throughout all alternative *k* values for the region with the highest R-MPI value (Diffa) and the two regions with the lowest R-MPI values (Tillabéri and Tahoua).

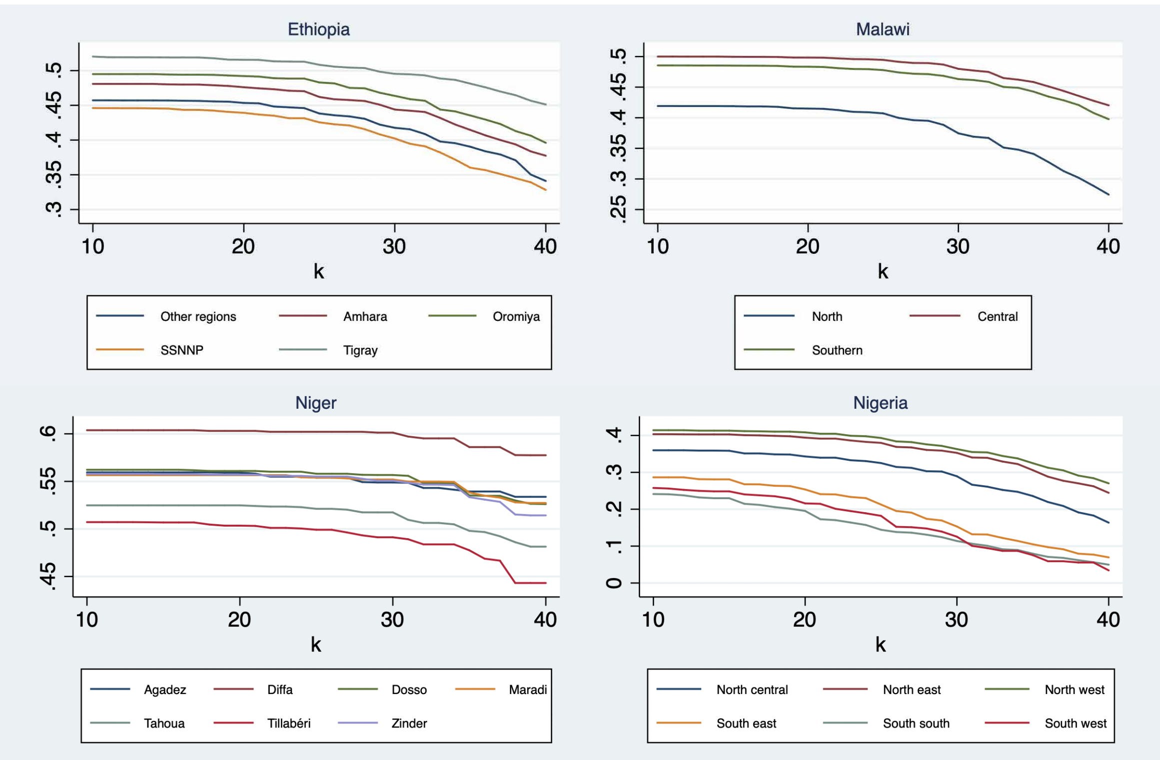
**Figure 6.a Subnational R-MPI values for different values of the poverty cut-off (*k*), where *k* = 0–100**




Note: SSNNP = Southern Nations, Nationalities and Peoples Region.

*Source:* Authors' computations, 2021.

**Figure 6.b Subnational R-MPI values for different values of the poverty cut-off (*k*), where *k* = 0–40**



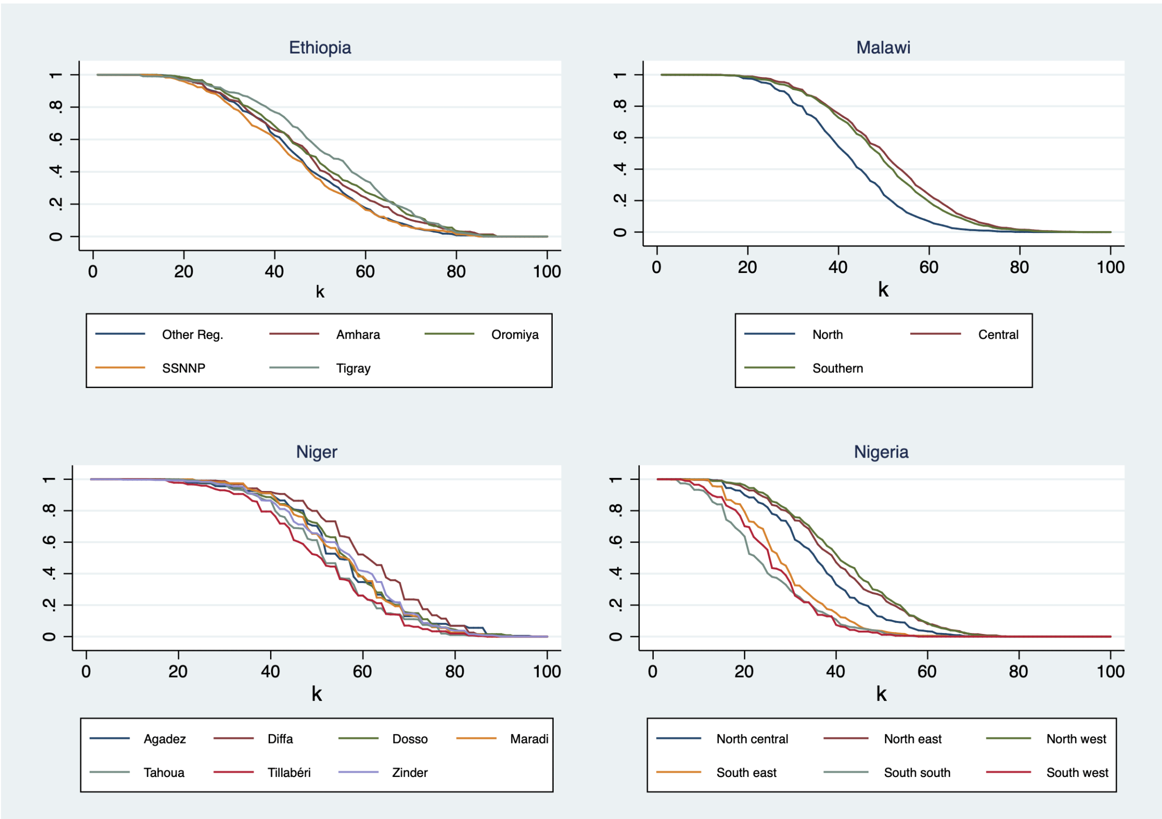

*Source:* Authors' computations, 2021.

Figure 7 presents the SD analysis at the subnational level for the headcount ratio. In comparison to the analysis performed for the R-MPI, curves overlap for several more levels of *k*, but in large, strengthen the conclusion derived above.

Overall, these results confer great confidence in the proposed R-MPI, as rankings remain robust to reasonable changes in the vicinity of the chosen *k* value at the regional level in all four countries studied, particularly in the important R-MPI value, which accounts both for the incidence and intensity of rural poverty. It is worth highlighting again that the SD is considered the strongest and most stringent form of robustness (Alkire *et al.*, 2015, pp. 235–238).

Next, the results of rank-robustness comparisons that are computed through the Kendall and Spearman's rank correlation coefficients are presented. Regions in the four countries are ranked from the poorest to the best off, by both the headcount ratio and the R-MPI value, using different *k* values. The Kendall rank correlation coefficient () compares concordant rankings (where one ranking dominates the other in both the initial and the alternative specification) against discordant rankings (where rankings change), divided by all possible rankings (see UNDP and OPHI, 2018, p. 97). The coefficient ranges from -1 to 1, and a perfectly negative $R^{\tau}$ indicates a dis-concordance of rankings under different scenarios, whereas a value of 1 shows a perfectly positive association between rankings. The Spearman's rank correlation coefficient ($R^{s}$) is also bounded between -1 and 1 and computes the square of the difference in the ranks of two specifications and averages it across all subgroups.

**Figure 7. Subnational poverty rates (headcount ratio) for different values of the poverty cut-off (*k*)**




*Source:* Authors' computations, 2021.

Table 7 presents the Spearman and Kendall's rank correlation coefficients between the subnational rankings at a selected *k* value of 33.3 percent, along with the ranking for alternative poverty cut-offs ranging from 20 percent to 50 percent. For the headcount ratio at *k* values of 30 percent, 40 percent and 50 percent, the Spearman coefficient is higher than 0.9 in Ethiopia, Malawi and Nigeria; however, it is lower in the Niger. Overall, discordant rankings are found outside the proximity of 33.3 percent, at a *k* value of 20 percent. This shows that, in three out of the four countries studied, the differences in the subregional rankings by headcount ratio are small, and almost all rankings are perfectly positively associated.

For the same three countries, the Spearman coefficient is higher than 0.94 for the R-MPI value, again showing that the differences in the rankings are minimal and almost perfectly positively associated. Importantly for the R-MPI, the Kendall coefficient in these three countries for the R-MPI value, the key figure of the new index, ranges from 0.86 (for *k* = 20 percent and *k* = 30 percent) to 1 (for *k* =40 percent and *k* = 50 percent). This implies that, in three out of the four countries studied, at a minimum 86 percent of the comparisons, using the headline figure of the R-MPI, are concordant to *k* values in the closest vicinity to the selected 33.3 percent.

These are encouraging findings, as ranks at the regional level under the selected poverty cut-offs are largely preserved under different choices for the majority of the countries analysed in this report, both for the headcount ratio and the R-MPI value.

**Table 7. Correlation of H and R-MPI among subnational ranks for different poverty cut-offs (*k*) (*k* = 33.3 percent baseline)**

| | | Ethiopia | | Malawi | | Niger | | Nigeria | |
|---|---|---|---|---|---|---|---|---|---|
| | | Headcount ratio (H) | R–MPI (H x A) | Headcount ratio (H) | R–MPI (H x A) | Headcount ratio (H) | R–MPI (H x A) | Headcount ratio (H) | R–MPI (H x A) |
| *k* = 20 percent | $R^s$ | 0.300*** | 1.000*** | 1.000*** | 1.000*** | 0.429*** | 0.750*** | 0.943*** | 0.943*** |
| | $R^T$ | 0.200*** | 1.000*** | 1.000*** | 1.000*** | 0.333*** | 0.619*** | 0.867*** | 0.867*** |
| | | (4.083) | (4.083) | (1.915) | ( .915) | (6.658) | (6.658) | (5.323) | (5.323) |
| *k* = 30 percent | $R^s$ | 1.000*** | 1.000*** | 1.000*** | 1.000*** | 0.786*** | 0.964*** | 0.943*** | 0.943*** |
| | $R^T$ | 1.000*** | 1.000*** | 1.000*** | 1.000*** | 0.619*** | 0.905*** | 0.867*** | 0.867*** |
| | | (4.083) | (4.083) | (1.915) | (1.915) | (6.658) | (6.658) | (5.323) | (5.323) |
| *k* = 40 percent | $R^s$ | 1.000*** | 1.000*** | 1.000*** | 1.000*** | 0.5714* | 0.786*** | 1.000*** | 1.000*** |
| | $R^T$ | 1.000*** | 1.000*** | 1.000*** | 1.000*** | 0.429*** | 0.714*** | 1.000*** | 1.000*** |
| | | (4.083) | (4.083) | (1.915) | (1.915) | (6.658) | (6.658) | (5.323) | (5.323) |
| *k* = 50 percent | $R^s$ | 1.000*** | 1.000*** | 1.000*** | 1.000*** | 0.5357* | 0.821*** | 1.000*** | 1.000*** |
| | $R^T$ | 1.000*** | 1.000*** | 1.000*** | 1.000*** | 0.429*** | 0.619*** | 1.000*** | 1.000*** |
| | | (4.083) | (4.083) | (1.915) | (1.915) | (6.658) | (6.658) | (5.323) | (5.323) |

Notes: Standard error in parenthesis *** p<0.01, **p<0.05, *p<0.1.
A = average intensity of poverty; H = headcount ratio.
*Source:* Authors' computations, 2021.

In the last step, statistical inference tests were run to explore the percentage of pairwise comparisons for different *k* values, ranging from 10 percent to 50 percent across the different subnational regions in each country. Given the previous results, the results are limited to the R-MPI values only. Here the confidence intervals are computed for different *k* values, and statistically significant robust rankings are achieved only if the 95 percent confidence intervals do not overlap. If they do overlap, a hypothesis test is required to assert that region A is poorer than region B.

Let *m* stand for the total number of subnational regions in a given country. The total number of possible pairwise comparisons is then given by (*m** (*m-1*)/*2*). For instance, in Ethiopia, given the five subnational rural regions in the sample of the Ethiopia Socioeconomic Survey, 10 possible pairwise comparisons were obtained. Comparisons are considered to be robust if the subnational ordering established at baseline, set at 33.3 percent, is preserved under alternative cut-offs. In Ethiopia, it was found that 9 of the possible 10 pairwise comparisons, that is, 90 percent of the possible cases, were statistically significant at baseline, and under all other alternatives (thus under all alternative *k* values). In other words, the overall ratio of robustness – which is the ratio of significant pairwise comparisons at baseline against all possible pairwise comparisons – is 90 percent.

Table 8 presents a synthesis of the results of the pairwise comparisons for the four countries. The overall ratio of robustness ranges from 71 percent to 100 percent. In Ethiopia, Malawi and Nigeria, the overall ratio is high, above 87 percent. The general conclusion is therefore that the subnational orderings are stable with respect to alternative poverty cut-offs in at least 71 percent of the cases.

**Table 8. Pairwise comparison on R-MPI rate across subnational ranks for different poverty cut-offs (*k*)**

| | Ethiopia | Malawi | Niger | Nigeria |
|---|---|---|---|---|
| Number of possible pairwise comparisons | 10 | 3 | 21 | 15 |
| Significant pairwise comparisons at baseline (confidence intervals overlap) | 9 | 3 | 15 | 15 |
| Robust pairwise comparisons | 9 | 3 | 15 | 13 |
| Ratio of robustness (all possible comparisons) | 90% | 100% | 71% | 87% |

*Source:* Authors' computations, 2021.

## 2.5 SENSITIVITY OF THE R-MPI

As a final statistical test to provide an understanding of how the proposed indicators impact the results of the R-MPI, a test was implemented where one indicator was excluded at a time and the percentage change in the R-MPI value was calculated. While this test is not a rank robustness analysis per se, it measures sensitivity and contributes to empirically validating the indicators in the proposed R-MPI.

The results are summarized in Table 9. The percentage change in the R-MPI value is calculated by excluding one indicator at a time, rescaling the weights of the remaining indicators within a dimension, computing the R-MPI value within the remaining indicators only and calculating the percentage change from the R-MPI value calculated with all indicators included. From the analysis, the R-MPI value increases by 14.8 percent in Ethiopia when the child malnutrition indicator is excluded and decreases by nearly 10 percent with the exclusion of years of schooling. In Malawi, the exclusion of the food insecurity indicator results in a 13 percent decrease in the R-MPI value, while the exclusion of the credit denial indicator increases it by about 10 percent. In the Niger, the indicator on risk exposure and coping strategies has the highest impact on the R-MPI value, decreasing it by 13.7 percent. Notably in Nigeria, the exclusion of the risk exposure and coping strategies indicator increases the R-MPI value by 33 percent. On the contrary, the exclusion of the indicators on the risk of climate shocks and on extension services, each at a time, reduces the rate of multidimensional rural poverty by 22 percent and 17 percent, respectively.

**Table 9. Trial measure analysis: percentage change in R-MPI values by exclusion of an indicator at a time**

| Indicator dropped | Percentage change in R–MPI | | | |
|---|---|---|---|---|
| | Ethiopia | Malawi | Niger | Nigeria |
| Food insecurity | – | –13.0 | 5.8 | 8.9 |
| Child malnutrition | 14.8 | 7.6 | –8.0 | –9.2 |
| Years of schooling | –9.7 | –3.2 | –4.1 | 2.6 |
| School attendance | 2.3 | 1.6 | 0.6 | –8.6 |
| Cooking fuel | –2.7 | –2.9 | –0.9 | –2.8 |
| Improved sanitation | 2.0 | 3.1 | –0.9 | 0.4 |
| Drinking water | 2.7 | 4.6 | 1.8 | – |
| Electricity | 0.5 | –3.6 | –1.3 | 1.3 |
| Housing | –3.2 | –1.6 | –1.8 | –3.6 |
| Assets | 0.2 | 1.9 | 2.2 | 8.9 |
| Agricultural assets adequacy | –0.1 | 1.6 | 1.6 | –2.4 |
| Low pay rate | 5.0 | 1.0 | 3.6 | 13.0 |
| Social protection | –6.1 | –1.3 | –1.9 | – |
| Child labour | 0.7 | 4.1 | –0.7 | 10.5 |
| Extension services | 2.4 | –1.4 | –3.7 | –17.0 |
| Credit denial | 2.5 | 9.9 | – | 14.0 |
| Risk exposure and coping strategies | 1.3 | –3.6 | –13.7 | 33.0 |
| Risk of climate shocks | –1.9 | 2.9 | –6.1 | –22.0 |

*Source:* Authors' computations, 2021.

Interestingly, there are many overlaps between the trial measure analysis and the contribution to the R-MPI by indicators presented in Figure 5. For example, in Nigeria, vulnerability to the risk of climate shocks constitutes the driving indicator for overall poverty at 16 percent, while excluding the indicator in the trial analysis caused a reduction in the R-MPI value by 22 percent. Similarly, in Malawi, food insecurity contributed the second most to the R-MPI, at 13 percent, while excluding the food insecurity indicator results in a 13 percent decrease in the R-MPI value.

Would a high reduction or an increase in the R-MPI value caused by the elimination of one indicator at a time signify that an indicator is to be excluded? By comparing the percentage change in R-MPI values across countries from eliminating one indicator at a time, it becomes apparent that there is no discernible pattern in the magnitude or direction of the change that the elimination causes. Using risk exposure and coping strategies as an example: the indicator stands out because the dropping of this indicator caused the greatest percentage change to the R-MPI value in two countries (the Niger and Nigeria, at -13.7 percent and 33 percent, respectively), while in Ethiopia and Malawi, the percentage change in the R-MPI value is moderate, at under 5 percent (1.3 percent in Ethiopia and -3.6 percent in Malawi). The effect of dropping the indicator also points in two different directions: to an increase in the R-MPI value in Ethiopia and Nigeria, and to a decrease in Malawi and the Niger.

Were one indicator to cause a significant increase or decrease across the four countries, thus pointing in one clear direction, there may be reason to exclude that indicator for statistical reasons, as it may bias the results. But what the test results demonstrate is the heterogeneous impact each indicator can have on multidimensional poverty in each rural area of these four countries. This strengthens the assumption that a comprehensive index is indeed needed to capture rural deprivations adequately.

## 2.6 A COMPARISON WITH OTHER MULTIDIMENSIONAL AND MONETARY POVERTY MEASURES

Having established that the R-MPI is statistically robust in its index design to measure rural multidimensional poverty, an intuitive question is to explore, in the final step, how the empirical results of the R-MPI compare to those of other multidimensional and unidimensional measures of poverty. First, the R-MPI results are compared with the global MPI results, as presented in Table 10.

Table 10 displays results of R-MPI values, headcount ratios and the intensity of deprivations among the poor for both the global MPI (rural populations only) and the R-MPI developed in this report. The global MPI is computed with data from Demographic and Health Surveys. For both indices, more than half of the rural population live in households that are multidimensionally poor, with the Niger having the highest headcount ratio (96.7 percent and 94.7 percent for the global MPI and the R-MPI, respectively), and Nigeria having the lowest (65.1 percent and 54.5 percent for the global MPI and the R-MPI, respectively). Similarly, the intensity is found to be the highest in the Niger (66.8 percent and 56.2 percent for the global MPI and the R-MPI, respectively) and the lowest in Malawi (46.5 percent) when it is based on the global MPI; however, if based on the R-MPI, it is the lowest in Nigeria (45.7 percent). It is also interesting to note that the R-MPI displays much higher levels of poverty in Malawi (86.1 percent) compared to the global MPI levels (57.9 percent).

**Table 10. A comparison of the global MPI and the R-MPI for households located in rural areas**

| Country | Survey | Year | MPI (H x A) | Headcount ratio (H–k = 33.3%) | Average intensity of poverty (A) | Vulnerable to poverty (k = 20–33.3%) | Severe poverty (k > 50%) |
|---|---|---|---|---|---|---|---|
| **Global MPI** | | | | | | | |
| **Ethiopia** | DHS | 2016 | 0.547 | 91.8 | 59.6 | 7.2 | 70.5 |
| **Malawi** | DHS | 2016 | 0.269 | 57.9 | 46.5 | 29.1 | 20.9 |
| **Niger** | DHS | 2012 | 0.647 | 96.7 | 66.8 | 2.5 | 83.0 |
| **Nigeria** | DHS | 2018 | 0.372 | 65.1 | 57.2 | 16.2 | 42.0 |
| **R–MPI** | | | | | | | |
| **Ethiopia** | ESS | 2016 | 0.426 | 80.2 | 53.2 | 17.0 | 44.6 |
| **Malawi** | HIS | 2017 | 0.448 | 86.1 | 52.0 | 11.4 | 49.6 |
| **Niger** | NSHLCA | 2014 | 0.532 | 94.7 | 56.2 | 4.7 | 64.2 |
| **Nigeria** | GHS | 2016 | 0.249 | 54.5 | 45.7 | 32.2 | 18.0 |

Note: DHS = Demographic and Health Survey; *k* = poverty cut-off; NSHLCA = National Survey on Household Living Conditions and Agriculture; ESS = Ethiopia Socioeconomic Survey; GHS = General Household Survey.

*Sources:* OPHI (https://ophi.org.uk/multidimensional-poverty-index/mpi-country-briefings) and authors' computations, 2021.

Results are heterogeneous when adding to the comparison the resulting proportion of vulnerable and severe poor for the global MPI and the R-MPI. In Ethiopia and the Niger results are similar for high poverty levels, but percentages of households deemed to be vulnerable to poverty are much different. On the contrary, the results for Malawi and Nigeria differ substantially. For instance, when looking at poverty dimensions using the global MPI, levels in Malawi are much lower compared to those using the R-MPI. At the same time, the R-MPI in Nigeria displays a lower headcount and severity but, not surprisingly, a higher vulnerability compared to the global MPI counterpart.

It should be reiterated that mismatches can be explained by the purpose statement of each measure. The global MPI aims to measure multidimensional poverty globally, for both rural and urban populations, whereas the R-MPI is clearly targeted at the rural poor. The inclusion of new poverty dimensions (on rural livelihoods and resources and risk) and the reshaping of the health dimension are the main factors in explaining the differences. For instance, in the case of Malawi, low pay rates in *ganyu* labour are a relevant contributor to the difference in the performance of the R-MPI compared to that of the global MPI.

Poverty level estimates are computed using data from different surveys as well, which were collected for different years. This prevents a full comparison of the results. To increase the comparability of the indices, thus addressing this limitation to the extent possible, a proxy global MPI was computed (named henceforth the "PG-MPI") using only the first three dimensions of the R-MPI – namely food security and nutrition, education and living standards – using the same microdata as for the R-MPI.

Table 11 shows the percentage of people identified as poor by the R-MPI and the PG-MPI, along with the World Bank's two poverty lines, at USD 1.90 and USD 3.20 per day, which are the common international monetary poverty measures, all computed from the same survey. Percentages of poor people based on the R-MPI and the PG-MPI are very close in Ethiopia in 2016 (80.2 percent and 77.9 percent, respectively) and the Niger in 2014 (94.7 percent and 95.8 percent, respectively); however, they are clearly different in Malawi and Nigeria: in these surveys the shares of poor people based on the R-MPI (86.1 percent and 54.5 percent, respectively) are much higher than the shares of poor people computed using the PG-MPI (72.7 percent and 47.5 percent, respectively).

Regarding the comparison between the R-MPI and the two monetary measures, there is not a clear pattern in the results. As can be observed in Table 11, in Ethiopia and in Nigeria the proportion of people identified as poor by both monetary measures are higher than the share of people that are poor according to the R-MPI. In Malawi, the proportion of people identified as poor by the R-MPI (86.1 percent) is higher than the proportion of poor people under the USD 1.90 per day line (80.0 percent), but lower than the share under the USD 3.20 per day line (95.9 percent). Lastly, the results for the Niger in 2014 show that the proportion of poor people under the R-MPI is significantly higher than the share of people identified as poor by both monetary approaches.

**Table 11. Poverty level (percentage of poor based on different measures)**

| | Multidimensional measures | | Monetary measures | | Differences | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | | | |
| | R–MPI (Headcount ratio) | PG–MPI (Headcount ratio) | USD 1.90/day | USD 3.20/day | (1–2) | (1–3) | (1–4) |
| **Ethiopia** | 80.2 | 77.9 | 83.5 | 96.9 | 2.3*** | –3.3 | –16.7 |
| **Malawi** | 86.1 | 72.7 | 80.0 | 95.9 | 13.4*** | 6.1*** | –9.8 |
| **Niger** | 94.7 | 95.8 | 53.1 | 85.2 | –1.1 | 41.6*** | 9.5*** |
| **Nigeria** | 54.5 | 47.5 | 79.7 | 93.4 | 7.1*** | –25.2 | –38.9 |

*** p<0.01, **p<0.05, *p<0.1

*Source:* Authors' computations, 2021.

Table 12 presents additional information showing that poverty measures based on monetary indicators (that is, household income or consumption) do not accurately map multidimensional poverty. It also confirms that the R-MPI provides useful information on rural poverty that is not provided by the PG-MPI.

More specifically, Table 12 shows the distribution of households in each country by poverty status. In the first panel of the table, the households are separated into four mutually exclusive and collectively exhaustive groups: group 1 – people identified as poor by both the R-MPI and the PG-MPI; group 2 – people identified as poor by the R-MPI, but identified as non-poor by the PG-MPI; group 3 – people identified as non-poor by the R-MPI, but identified as poor by the PG-MPI; and group 4 – people identified as non-poor by both the R-MPI and the PG-MPI.

The second panel presents a similar exercise, but instead of comparing the R-MPI against the PG-MPI, it is compared against a calculated monetary poverty measure, called the "Monetary Match". This matching method allows a poverty line to be set (that is based on daily consumption per capita) at the value that generates a proportion of monetary poor households corresponding to the proportion of households identified as poor by the R-MPI.[24] The Monetary Match therefore identifies "perfect matches" with the R-MPI when individuals are assigned the same poverty status (poor or non-poor) by the R-MPI and its Monetary Match proxy.

Results reported in Table 12 allow for some useful observations. First, consistent with the definition of the measures, the information on poverty status provided by the R-MPI is closer to the information on poverty status provided by the PG-MPI in comparison to the information provided by the Monetary Match. In three out of the four countries, namely Ethiopia, the Niger and Nigeria, the proportion of people sharing the same poverty status under the R-MPI and the PG-MPI is higher than the proportion of people sharing the same poverty status under the R-MPI and the Monetary Match. This is in line with existing findings given in the first section of the report, namely that mismatches between monetary and non-monetary deprivations are frequent.

Second, in the two countries where the percentage of people identified as poor by the R-MPI is much higher than the percentage of people identified as poor by the PG-MPI (that is, Malawi and Nigeria, as shown in Table 11), the share of the population belonging to group 3 (non-poor under the R-MPI, but poor under the PG-MPI) is relatively low. In other words, the mismatches between the two poverty measures are mostly explained by the proportion of the rural population that is identified as poor only by the R-MPI.

Third, consistent with the definition of the different measures, the proportion of people reported to be of the same poverty status under the R-MPI and the Monetary Match increases with the overall level of poverty. In other words, the proportion of people reported to be of the same poverty status under two alternative poverty measures is significantly higher for poverty measures identifying 95 percent of the population as poor than for poverty measures identifying 10 percent of the population as poor. For example, in the Niger, 94.7 percent and 95.8 percent of households are identified as multidimensionally poor by the R-MPI and the PG-MPI, respectively (see Table 11). Consequently, as shown in Table 12, 88.1 percent of households in the Niger are identified as poor in both the R-MPI and its Monetary Match. The findings imply that, with higher levels of poverty as measured by the comprehensive R-MPI, the likelihood increases that households are also identified as poor in alternative poverty measures. However, the findings are based only on a limited pool of four countries. Therefore, applying the index more widely in different contexts will further test these findings.

[24] For example, for Malawi 2017, the poverty line was set at a value higher than USD 1.90 per day, but lower than USD 3.20 per day, given that the proportion of people identified as poor by the R-MPI is higher than the proportion identified by the USD 1.90 per day line, but lower than the proportion identified as poor by the USD 3.20 per day line.

**Table 12. Mismatch analysis of monetary and multidimensional poverty levels in rural areas**

| Group | | | Ethiopia | Malawi | Niger | Nigeria |
|---|---|---|---|---|---|---|
| **R–MPI and PG–MPI** | **1** | R–MPI poor and PG–MPI poor | 74.1 | 72.5 | 92.1 | 40.8 |
| | **2** | R–MPI poor and PG–MPI non–poor | 5.6 | 14.1 | 1.6 | 10.7 |
| | **3** | R–MPI non–poor and PG–MPI poor | 3.3 | 0.9 | 3.6 | 4.8 |
| | **4** | R–MPI non–poor and PG–MPI non–poor | 17.0 | 12.5 | 2.7 | 43.7 |
| | | **Total** | **100.0** | **100.0** | **100.0** | **100.0** |
| | | **Difference (1–4)** | **57.1*** ** | **60.0*** ** | **89.4*** ** | **–2.9** |
| | | **Difference (2–3)** | **2.3*** ** | **13.2*** ** | **–2.0** | **5.9*** ** |
| **R–MPI and Monetary Match** | **1** | R–MPI poor and Monetary Match poor | 59.7 | 73.5 | 88.1 | 29.8 |
| | **2** | R–MPI poor and Monetary Match non–poor | 19.9 | 13.1 | 5.6 | 21.7 |
| | **3** | R–MPI non–poor and Monetary Match poor | 12.4 | 7.4 | 5.0 | 12.5 |
| | **4** | R–MPI non–poor and Monetary Match non–poor | 7.9 | 6.0 | 1.3 | 36.0 |
| | | **Total** | **100.0** | **100.0** | **100.0** | **100.0** |
| | | **Difference (1–4)** | **51.8*** ** | **67.5*** ** | **86.8*** ** | **–6.2** |
| | | **Difference (2–3)** | **7.5*** ** | **5.3*** ** | **0.6*** ** | **9.2*** ** |

*** p<0.01, **p<0.05, *p<0.1

*Source:* Authors' computations, 2021.

Overall, the results in Tables 11 and 12 confirm that the R-MPI provides information that is not provided by the PG-MPI or by monetary poverty measures when those in the second groups (R-MPI poor and PG-MPI non-poor; R-MPI poor and Monetary Match non-poor) are numerically more than those in the third groups (R-MPI non-poor and PG-MPI poor; R-MPI non-poor and Monetary Match poor), as this indicates that some dimensions of poverty are not taken into account in the computation based on the monetary equivalent line, but are taken into account by the R-MPI. This is the case in Malawi and Nigeria in the comparison of the R-MPI with the PG-MPI, and in Ethiopia to a lesser extent.

# PART 3

# AN EMPIRICAL VALIDATION OF THE R-MPI: FIELD TEST MALAWI

As the final step in the verification phase of the proposed R-MPI, a team from the Centre for Social Research at the University of Malawi, in close collaboration with FAO and OPHI, conducted a field test between September and November 2020 in Malawi. The test involved 64 focus group discussions (FGDs) in 16 villages across eight of the country's 18 livelihood zones, which were implemented at eight randomly selected sites.[25] The general objective of the field test was to assess the adequacy and relevance of the five dimensions of the proposed measure of rural poverty – the R-MPI – in estimating multidimensional poverty in a rural context, and to offer recommendations on how it could be improved.

The suitability, accuracy and relevance of the three adopted dimensions from the global MPI in measuring multidimensional poverty have been rigorously tested and validated in numerous studies over time. Therefore, the field test aimed more specifically at assessing the suitability and relevance of the two dimensions that are specific to the R-MPI, namely rural livelihoods and resources and risk. The objectives of the field test were therefore to:

- determine rural communities' understanding of well-being groups and their characteristics;
- assess communities' perceptions of the R-MPI dimensions and their related indicators; and
- evaluate the extent to which the R-MPI, as measured by its indicators, speaks to the living conditions of Malawians living in different rural areas and how it could be improved.

Two villages per study site were selected for four FGDs in each village. The focus groups consisted of community leaders, farmers (including crop and livestock farmers), fisherfolk, women-headed households, male and female traders, estate workers and the near landless. The first FGD in each village consisted of community leaders of various capacities but excluded the village head. The other three FGDs were dependent on livelihood activities (such as crop farmers, livestock-keepers, fisherfolk, estate workers and traders) and social status (such as mixed youth, female and male heads of households, older persons, the landless and those with constrained land resources) of the discussants. To gather information during the FGDs, two guides or questionnaires, one for the community leaders and the other for the specific groups of discussants (such as farmers, fisherfolk

[25] There are 18 livelihood zones in Malawi. A livelihood zone is an area within which people share broadly the same pattern of livelihood, including options for obtaining food and income and market opportunities. The Malawi livelihood zones were developed principally on the main biophysical and socioeconomic variables. These include agro-ecological characteristics, land cover patterns, climate, topography, principle crop production patterns, cattle or livestock activities, access to markets, rural population density and infrastructure.

In the field test, eight livelihood zones were randomly selected, namely Central Karonga, Mzimba Self-sufficient, Kasungu-Lilongwe Plain, Southern Lakeshore, Rift Valley Escarpment, Lake Chilwa-Phalombe Plain, Thyolo-Mulanje Tea Estates and Lower Shire Valley.

or youth), were used. The guide for community leaders was used to: (a) gather information on the distinguishing characteristics of three predefined well-being groups, namely the well-off, worse-off and in between; (b) list or use an already available list of all households in the community and randomly select up to 50 households from the list; (c) place sampled households into the three well-being groups while discussing the characteristics used to assign a household to a specific well-being category; (d) prompt discussants to discuss dimensions and indicators of the R-MPI not mentioned in the first instance and the reasons for their omission; and (e) recap the dimensions and indicators used to characterize well-being and rank them objectively in order of relevance or importance.

In the FGD guide for specific groups, the discussions covered almost the same steps, though participants did not rank households but focused the discussion on: (a) the community's definition of poverty; (b) distinguishing characteristics of well-being in the three predefined well-being groups; (c) the dimensions and indicators of the R-MPI not mentioned in the first instance and the reasons for their omission; and (d) a recap of the dimensions and indicators used to characterize well-being and ranking them objectively in order of relevance or importance. After having gathered information at each site or village, the facilitators of the FGDs analysed the information and provided the community with feedback the following day.[26]

While the main results provide important lessons learned for the R-MPI design, it should be noted that this is only one case study and the results would be further enriched with more field tests in the future.

## 3.1 MAIN RESULTS

One main finding of the field test was that the five dimensions of the R-MPI appear to be relevant across all focus groups and research sites. The field team was able to score each indicator and dimension of the R-MPI. The scoring of each indicator within a dimension was based on whether it was mentioned at least once, with or without probing, in each of the 64 FGDs conducted. The maximum score is therefore 64. Table 13 presents a summary of the scores for all of the dimensions and indicators.

[26] For the field test, all safety, data and ethical considerations were adhered to.

**Table 13. Scores for R-MPI dimensions and indicators**

| Dimension and indicators | Score (with or without probing) | Score (without probing) | Dimension and indicators | Score (with or without probing) | Score (without probing) |
|---|---|---|---|---|---|
| **Food security and nutrition** | **62** | **52** | **Risk** | **43** | **22** |
| Food insecurity | 64 | 63 | Risk of climate shocks | 62 | 32 |
| Access to health services | 59 | 41 | Credit denial | 56 | 25 |
| **Education** | **40** | **17** | **Access to family social support** | **47** | **25** |
| School attendance | 43 | 25 | Risk exposure and coping strategies | 39 | 19 |
| Years of schooling | 37 | 9 | Risk of climate shocks | 10 | 9 |
| **Living standards** | **58** | **39** | **Social exclusion** | **56** | **41** |
| Housing | 63 | 63 | Social and occupation status | | |
| Electricity | 58 | 46 | Power imbalances[1] | | |
| Improved sanitation | 61 | 37 | | | |
| Drinking water | 57 | 37 | | | |
| Cooking fuel | 56 | 16 | **Missed indicators** | **55** | **48** |
| Ownership of key assets | 50 | 34 | Clothing and bedding | 64 | 64 |
| *Motorbike* | *56* | *48* | Access to agricultural inputs | 63 | 62 |
| *Vehicle* | *52* | *47* | Ownership of livestock | 63 | 62 |
| *Bicycle* | *59* | *44* | Household nutrition | 62 | 57 |
| *Television* | *53* | *40* | Ownership of household items | 59 | 57 |
| *Radio* | *57* | *39* | Engagement in *ganyu* | 64 | 57 |
| *Refrigerator* | *41* | *30* | Support for child education | 63 | 55 |
| *Oxcart* | *47* | *29* | Physical appearance | 62 | 55 |
| *Telephone (mobile/fixed)* | *54* | *18* | Availability of cash | 64 | 52 |
| *Computer* | *32* | *11* | Ownership of/access to land | 62 | 51 |
| **Rural livelihoods and resources** | **44** | **26** | Ownership of income–generating assets | 58 | 51 |
| Low pay rate | 52 | 35 | Child nutrition status | 53 | 37 |
| Child labour | 58 | 35 | Adult nutrition status | 49 | 35 |
| Agricultural assets adequacy | 28 | 23 | State of mind | 35 | 25 |
| Social protection | 51 | 20 | Market access | 28 | 25 |
| Extension services | 33 | 16 | Road access | 23 | 17 |

[1] Information on the indicator on power imbalances was not collected during the field test as it not included in the estimation of the R-MPI

*Source:* Malawi field test authors' computations, 2021.

Among the five dimensions of the R-MPI, the food security and nutrition (and health) dimension scored the highest with 62 mentions overall and 52 without probing. However, of the indicators within this dimension, the indicator on food insecurity was scored highly, while child mortality was not considered as an indicator of well-being. Instead, access to health services was mentioned as an important indicator (scored 59 overall). In addition, discussants in some FGDs considered child morbidity due to undernourishment in food-insecure households as a precursor of child mortality.

Food security was considered as a determinant of well-being in two ways: first, by the amount of staple food produced and stored for consumption; and second, by the duration the food stocks would last until the next season. Well-off households were therefore described as those with: (a) enough food stocks for own consumption without rationing; (b) extra stocks for sale in the market or for in-kind payments to casual wage workers; or (c) enough stock to cater to the household's needs up to the next harvest. On the contrary, worse-off households were characterized as food deficient if their food stocks would last only a few months after a harvest, or if they had deteriorating food stocks due to the premature harvesting of crops. Worse-off households also rationed their food consumption, consumed poor quality food (such as maize bran or only vegetables or fruits in a meal) or took up casual wage labour (*ganyu*) to smoothen their consumption.

Two indicators in the education dimension, namely years of schooling and school attendance, were mentioned. Overall, the education dimension scored 40 and only 17 without probing. Generally, the number of years of formal schooling was not considered a clear determinant of well-being in the rural Malawi context. Notably, parental ability to afford and support their children's education, regardless of their own literacy level, was mentioned as an indicator of well-being even without probing. On school attendance, discussants found it to be fairly common among school-age children, but their stay in school up to the final grade was voluntarily reported as a distinguishing characteristic of children from poor and better-off households.

The living standards dimension scored 58 and its six indicators scored at least 50 with probing. On the main type of cooking fuel used, the FGDs revealed that, in rural Malawi, nearly all households used firewood, but the main distinguishing characteristic of well-being was the quantity and quality of firewood in stock, who collected the firewood and what the firewood was mainly used for. On one end, better-off households were described as those with large stocks and that would most likely use hired labour and transport to collect and deliver firewood. Similarly, the use of charcoal and electricity as cooking fuel was described as an indicator of being well-off. On the other end, poor or worse-off households were described as those using low-quality cooking fuel such as twigs, dung and crop residue.

Aspects of toilet facilities such as the type of facility, the type of building materials used for the floor, roof and walls, and cleanliness and the availability of hand-washing facilities were also considered important distinguishing characteristics of well-being. In addition to the state of the toilet facilities, the type of kitchen used by the household and the type of rack used for drying clean utensils were also reported as indicators of good sanitation and thus well-being.

Access to safe drinking water in itself was not reported as a clear indicator of well-being, as most of the water in rural Malawi is from boreholes provided by the Government or non-governmental organizations. Instead, participants reported ease of access, type of source and treatment, and ownership of the source of water as important aspects. Poor households were described as those unable to pay the user fees charged to access water from communal boreholes.

Access to and the use of clean lighting energy, such as electricity and solar panels, was reported as a characteristic of better-off households. Poor households were described as those using non-clean energy sources such as grass torches and firewood.

The quality of housing with respect to the type of building materials used for the floor, roof or walls was mentioned as a distinguishing characteristic of well-being. In most of the FGDs, the participants described houses of the well-off as those with plastered and painted walls, tiled or plastered floors, steel window frames, glass windows, strong doors with locks, good roofing materials and a well-constructed kitchen. On the contrary, poor people's households were described as those made of non-permanent materials such as mud or non-burnt brick walls, a grass-thatched roof and a dirt floor.

For access to key assets, in terms of quantity and quality, better-off households were described as those with high-quality assets such as an expensive mobile telephone or a digital television set. For worse-off households, they were described as those with few and poor-quality assets such as small portable radios, old bicycles and cheap mobile telephones. The poorest were described as those without any key asset.

The rural livelihoods and resources dimension scored 44 overall and 26 without probing. Out of the five indicators in the dimension, agricultural assets adequacy and extension services were scored the lowest, while the child labour indicator was scored the highest (58).

The agricultural assets adequacy indicator is quantitative and aims to capture economically vulnerable households for which agriculture is a relatively prominent source of income vis-à-vis other income-generating activities and that held relatively few agricultural assets (such as portions of land and livestock units). Although the indicator scored the lowest in the dimension, participants emphasized that the ownership of numerous diverse livestock and agricultural assets (such as oxcarts, oxen, ploughs and ridgers) was considered an indicator of well-being and, consequently, those with assets would produce enough market surplus such that agricultural income contributed significantly to their overall income.

Notably, the indicator on low pay rate, although mentioned 52 times, was not considered an important distinguishing characteristic of well-being. Indeed, participants considered having employment, regardless of wages, as a positive aspect of well-being. Such a view could be as a result of the low level of wage employment in rural Malawi, and any employment opportunity is a desired outcome. On the contrary, child labour was viewed as an important indicator of extreme poverty. However, discussants also noted that the high rates of adult unemployment meant that child labour was not prevalent.

The indicator on social protection elicited mixed responses. On the one hand, discussants viewed beneficiaries of social protection as poor or extremely poor. On the other hand, lapses in the targeting of beneficiaries meant that non-poor households became beneficiaries, therefore making it difficult to distinguish between the poor and non-poor. For access to extension services, there was a general consensus among discussants that extension services were a public good, and that access to the services was not dependent on well-being status but willingness to participate. A distinguishing characteristic was, however, the ability to implement extension services. Better-off households were described as those that were capable of purchasing the production inputs recommended and that could also access extension services privately.

The risk dimension was scored 43 overall and 22 without probing. People's ability to cope with shocks as a distinguishing characteristic captured by the risk exposure and coping strategies indicator scored highest (62), followed by credit denial (56). The indicator on risk exposure and coping strategies was discussed by participants through the exemplification of the coping strategies that households would employ when facing a shock. All the coping strategies mentioned referred to the use of household resources. Relatively well-off households were said to rely on their savings, business profits, and the sale of surplus crops and livestock. The poorest were said to rely on the sale of a few livestock and assets they might have had, as well as engagement in casual wage labour (*ganyu*). However, coping strategies such as receiving help from the Government or non-governmental organizations were not deemed as determinant factors when characterizing well-off/worse-off households. This may be a sign that coping with shocks is still considered a matter of household responsibility.

On credit denial, the FGDs revealed that aspects about the sources and size of the credit were important. On one end, the relatively well-off have access to a variety of sources (such as commercial banks, village banks and loans from family and friends), while the poor do not have such access despite having the greatest need. Their access is limited due to potential default and lack of collateral. Instead of loans, such households may sometimes receive handouts in amounts that are too small for them to fully recover and move forward. The new indicator on the risk of climate shocks was rarely used to characterize poverty (scored 10 and 9 with and without probing, respectively). This may indicate that being exposed to covariate shocks is not exclusively a characteristic of the poor.

Additional dimensions and indicators, which were not considered among the initial five dimensions and 18 indicators of the R-MPI, were mentioned in the FGDs. Among them, the dimension of social exclusion was frequently mentioned and scored 56 overall. The discussants described the poor as voiceless on community matters and thus often excluded in decision-making and social events.

As summarized in Table 13, a number of indicators not specifically included within the dimensions of the R-MPI were mentioned. However, some of these indicators can be grouped into the dimensions of the R-MPI, such as food security and nutrition (indicators on household nutrition, adult nutrition, child malnutrition and state of mind), education (indicator on support for child education), living standards (indicators on clothing and bedding, physical appearance and ownership of household items) and rural livelihoods and resources (indicators on access to agricultural inputs, ownership of livestock, engagement in *ganyu*, ownership/access to land, ownership of income-generating assets, road access and market access). On the latter, it is important to note that some of the proposed indicators are included in the indicator on agricultural assets adequacy (such as ownership of livestock) and the indicator on low pay rate (engagement in *ganyu*), and that adult nutritional information would have been used in the R-MPI had the data allowed it.

It is also important to note that, first, the type of clothing and bedding used was mentioned as an important distinguishing characteristic of well-being in all 64 FGDs, even without probing. The condition, quality and quantity of clothes and bedding were mentioned as important aspects to consider when distinguishing between the poor and the non-poor.

Second, an indicator on physical appearance was mentioned several times and the main focus was on body and hair care. The discussants argued that well-off individuals had the time and means to take care of their bodies while poorer ones prioritized working for basic necessities over self-care.

Third, although the R-MPI included low wage employment as an indicator of well-being, discussants in the majority of the FGDs clearly mentioned engagement in casual work (*ganyu*) as a clear indicator of well-being in rural Malawi, both for the poor and the non-poor. Poor households were described as those who frequently engaged in piecework casual labour (*ganyu*) while better-off households were described as those with the financial capability to hire casual wage workers.

Lastly, access to cash to meet daily needs was mentioned as an important indicator of well-being in almost all FGDs. Discussants argued that the constraints experienced in most of the dimensions resulted directly from cash constraints. In addition, the sustainability of cash sources and the timing when cash was received were mentioned as important aspects. Thus, cash at hand was considered a good indicator of a household's well-being status in comparison to the stored value of livestock, surplus crops or profit from business enterprises.

The rural Malawi field test set out to assess the adequacy of the R-MPI and the relevance of its dimensions and indicators. The field test used a participatory approach to assess rural communities' perception of poverty and the characteristics that they use to define poverty. Overall, the results from the field test found the R-MPI to be an adequate measure of rural poverty in Malawi, but some of its dimensions and indicators were considered less relevant or important in characterizing rural poverty in the country. The field test also revealed the great data demands in translating multidimensional poverty into a concrete index with indicators that have clear deprivation cut-offs to distinguish the poor from the non-poor.

With regard to the two proposed new dimensions, namely rural livelihoods and resources and risk, it is encouraging to report that they were found to be relevant. In the rural livelihoods and resources dimension, agricultural assets adequacy was discussed with respect to access to production assets and marketable surplus, while low pay rate was only used to specifically characterize poverty with respect to casual wage labour (*ganyu*). Participation in social programmes was found to be relevant in characterizing rural poverty, although lapses in the targeting of beneficiaries presented potential difficulties in the identification of the poor. Extension services were not deemed important as such services were a public good accessible to all. Overall, the rural livelihoods and resources dimension benefits from indicators that point to aspects of rural livelihoods comprehensively. These include the degree of specialization of agricultural production (mostly subsistence production), the participation in wage labour markets, access to social protection and child labour

In the risk dimension, access to credit services ("credit denial" indicator) was found to be an important indicator of rural poverty. Similarly, the indicator on risk exposure and coping strategies was also mentioned as relevant to defining poverty, and the coping strategies mentioned were mainly in reference to access to resources (such as savings and surplus crops and livestock for sale) that would enable households to cope with or mitigate shocks. Notably, the indicator on the risk of climate shocks was rarely used to characterize poverty. Overall, these results are in line with those from a thorough literature review and the expert consultation in May 2019, where consultants stated that they expected that rural households had to resort to coping strategies that were based predominantly on self-sufficiency. The consultants also expected covariate shocks to befall both poor and better-off households, but conceptually, risk of climate shocks is a useful indicator to include, as it is a clear distinguishing characteristic of the rural poor (even if the rural population may not consider it as such).

# SUMMARY AND CONCLUSIONS

Rural areas around the world are highly diverse due to the distinct characteristics of their natural environment and the historical reasons that have shaped their physical and human landscapes. This report proposes a multidimensional measure of rural poverty, the R-MPI, which builds on the elements that are deemed to be more frequently common to rural areas, in terms of the way in which rural dwellers organize their lives, earn their incomes and manage risks.

Given the complexity that surrounds the rural space, starting from its definition, the poverty measure proposed is multidimensional, as it seems difficult to capture a large number of rural characteristics within a unidimensional metric. The use of multiple dimensions, in this case, constitutes an attempt to obtain more direct insights on the capabilities in which rural populations are deprived, thus pointing to areas in which policy intervention should be directed. However, even in this case, the availability of accurate, consistent and granular information on specific areas is what dictates the effectiveness of the measurement. This seems to be, to a large extent, the main stumbling block on the road towards better measurement.

Despite recognizing that rural areas are highly dynamic and that their transformation is an ongoing process, the approach taken in developing the R-MPI was to use, at least in the first stage, the administrative definitions provided by countries, notwithstanding their diversity. As the work on the R-MPI develops further, advancements in the understanding and measurement of rurality will be considered.

The R-MPI builds upon the dimensions and structure of the global MPI, as proposed by UNDP and OPHI, and makes several adjustments to capture deprivations that are specific to rural populations, in the light of data availability. Based on a thorough literature review and expert consultations, as well as a data inventory and several trial measures of candidate MPIs, the proposed R-MPI considers two additional dimensions in the measurement of poverty to those included in the global MPI, which describe deprivations in the livelihood means of the households and in terms of risks faced, respectively. The R-MPI also modifies the health dimension by focusing on food security and nutrition. The addition of livelihoods and risks among the poverty dimensions was mostly driven by the literature and expert opinions; while the modification of the health dimension, and the emphasis on food security and nutrition, was more motivated by data availability during the implementation. The new dimensions of the R-MPI make use of innovations in the field of multidimensional poverty measurement – for instance, by combining household survey data with geospatial data in the risk dimension.

As the process moved from the design to the implementation of the measure with actual data, some compromises were made in terms of adjustments to available information. Section 2, which describes the proposed index, contains a discussion of the limitations associated with the actual indicators chosen for the proposed R-MPI, which touches upon other important aspects of the matter that would deserve attention, provided that data become available. The same applies for the level of the measurement, which, for the present report, was conducted only at the household level, while acknowledging the importance of bringing key information down to the individual level, which is where most deprivations manifest, to an extent that may well vary within households (such as intra-household differences by gender).

Results demonstrate the effectiveness of the approach in conveying detailed rural poverty profiles in the four countries in which it was applied. The results show a strong incidence of deprivation in the area of living standards, which means that rural areas tend to be systematically impaired, even with the modification undertaken compared to the global MPI. Different forms of deprivation apply in different contexts. For instance, food insecurity shows a higher incidence of deprivation in Malawi, whereas child malnutrition is more prominent in the Niger. Households in the Niger also show higher levels of deprivation in terms of school attendance compared to the other three countries, whereas the lack of access to electricity is less frequent in Nigeria, as is the availability of assets; however, with regard to those deprivations related to the adequacy of agricultural assets, Nigerian households still seem to be deprived at a level that is similar to that of the other three countries. The low pay rate indicator appears as a sign of deprivation especially in Malawi, as a consequence of the widespread *ganyu* labourers, whose salaries frequently fall in the low pay rate category, as established by ILO. In the other countries, the same indicator appears less prominently, likely because paid labour is less frequent in rural areas. Child labour appears to be relatively prominent in the Niger, whereas Ethiopia shows higher deprivation for extension services, and credit denial seems to be less of an issue in Nigeria. Malawi shows a high deprivation in terms of risk exposure and coping strategies.

The present report offers in Appendix C detailed country reports on all four case studies and is a rich source to understand each country profile and its drivers of poverty. As data allow, these profiles could be further enhanced with disaggregation by gender, age range and typologies of households. In this respect, the R-MPI has the potential to provide granular insights, if fed with a granular information base.

A number of comparisons and tests were run in order to gain further insights from the results and assess their degree of robustness, both in terms of the parameters of the computation (the *k* parameters) and in terms of the redundancy of the new indicators included, as well as their sensitivity. The comparison between censored and uncensored deprivation indicates that there are cases in which being deprived in a number of indicators – agricultural assets adequacy, extension services and risk of climate shocks in the case of Nigeria, for instance – may not necessarily befall only the multidimensionally poor. The R-MPI thus provides a clear picture of the idiosyncrasies of rural poverty.

The redundancy and association analysis, as well as the sensitivity analysis, highlighted the added value of the inclusion of the rural livelihoods and resources and risk dimensions in the R-MPI in particular. The results obtained proved also to be robust to reasonable alternatives in key parameters of the identification function of the index, such as the chosen poverty cut-off of 33.3 percent. Rankings and orderings of subnational entities are largely maintained under reasonable alternatives. The results of these tests are therefore encouraging in terms of the ability of the R-MPI to convey additional and useful information vis-à-vis other multidimensional measures. The other qualitative comparison run by overlapping results with those yielded by other poverty measures showed that the R-MPI has conveyed information that is qualitatively different from that of other measures, such as the PG-MPI. This speaks to the potential ability of the measure to provide additional evidence on poverty dimensions that are not captured by other metrics. Altogether, the results of the tests seem to convey interesting and useful information, and to show that the R-MPI, as proposed, does provide an insightful and specific measure of rural poverty. However, the R-MPI is not a perfect measure of rural poverty as unveiled by a field test in Malawi in September and October 2020. Overall though, the measure does capture the dimensions and indicators the most frequently referred to by the rural dwellers visited.

The main concern, in perspective, remains the availability of suitable and harmonized data to compute the R-MPI for a large number of countries in a comparable way. In fact, even by selecting very similar surveys – all from the Living Standards Measurement Study – Integrated Surveys on Agriculture pool – the results presented in this report are not entirely comparable for key aspects of the pool of indicators chosen, such as those in the food security and nutrition dimension. This happened notwithstanding a number of compromises made in the choice of indicators to allow for a wider information base. It was hard to find more than four surveys both within those included in the RuLIS projects – about 60 household surveys, and outside of such pool that report all the relevant information on rural areas required to compute the R-MPI, without giving up entire dimensions of the index. In order words, at present it is not possible to extend the computation of the R-MPI beyond a limited number of countries (and surveys) without losing significant ground in terms of comparability. This is a significant limitation not only in terms of comparability across countries, but also in terms of the comparability of and different surveys collected during different times in the same country, as even for panel surveys the questions are inevitably updated, revised and integrated across different waves.

The possibility to enhance the measurement of metrics such as the proposed R-MPI is, therefore, offered in perspective by large and harmonized data collection exercises, such as those promoted by the Agricultural Integrated Surveys Programme and, even more, by the 50x2030 Initiative. Through integrated and modular data collection, this project may serve the purpose of providing regular information on the many aspects considered in the R-MPI, thus catering to a wide applicability of the metric.

In line with the expert consultation that agreed that the proposed index should allow for “dimensional comparability” while attempting to increase “indicator comparability” over time as more and better data become available, this report argues that the proposed R-MPI adds important additional information on rural poverty to existing, and still highly relevant, measures of rural poverty.

## REFERENCES


**Alkire, S.** 2018. *The research agenda on multidimensional poverty measurement: important and as-yet unanswered questions*. Oxford Poverty and Human Development Initiative Working Paper No. 119. Oxford, University of Oxford.

**Alkire, S. & Foster, J.** 2011. Counting and multidimensional poverty measurement. *Journal of Public Economics,* 95(7–8): 476–487.

**Alkire, S., Foster, J.E., Seth, S., Santos, M.E., Roche, J.M. & Ballon, P.** 2015. *Multidimensional poverty measurement and analysis*. Oxford, Oxford University Press.

**Alkire, S. & Jahan, S.** 2018. *The new global MPI 2018: aligning with the Sustainable Development Goals.* Oxford Poverty and Human Development Initiative Working Paper No. 121. Oxford, University of Oxford.

**Alkire, S., Kanagaratnam, U., Nogales, R. & Suppa, N.** 2020. *Revising the global multidimensional poverty index: empirical insights and robustness*. Oxford Poverty and Human Development Initiative Research in Progress Paper No. 56a. Oxford, University of Oxford.

**Alkire, S. & Santos, M.E.** 2014. Measuring acute poverty in the developing world: robustness and scope of the multidimensional poverty index. *World Development,* 59: 251–274.

**Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N.J., Bauch, S., Börner, J., Smith-Hall, C. & Wunder, S.** 2014. Environmental income and rural livelihoods: a global-comparative analysis. *World Development,* 64(Supplement 1): S12–S28.

**Angelsen, A., Larsen, H.O., Lund, J.F., Smith-Hall, C. & Wunder, S., eds.** 2011. *Measuring livelihoods and environmental dependence: methods for research and fieldwork*. Bogor, Indonesia, Center for International Forestry Research.

**Angulo, R., Córdoba, C., Espinosa, F. & Solano, A.** 2018. *Hacia una nueva medición de pobreza multidimensional rural en América Latina y el Caribe: recomendaciones y análisis de viabilidad*. Mimeo. Bogota, Inclusión SAS.

**Atkinson, T., Cantillon, B., Marlier, E. & Nolan, B.** 2002. *Social indicators: the EU and social inclusion*. Oxford, Oxford University Press.

**Ballard, T.J., Kepple, A.W. & Cafiero, C.** 2013. *The food insecurity experience scale: development of a global standard for monitoring hunger worldwide*. Technical Paper. Rome, FAO. (also available at www.fao.org/3/a-as583e.pdf).

**Barrett, C.B., Reardon, T. & Webb, P.** 2001. Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications. *Food Policy,* 26(4): 315–331.

**Bourguignon, F., Bénassy-Quéré, A., Dercon, S., Estache, A., Gunning, J.W., Kanbur, R., Klasen, S., Maxwell, S., Platteau, J.-P. & Spadaro, A.** 2010. The Millennium Development Goals: an assessment. In R. Kanbur & M. Spencer (eds.). *Equity and growth in a globalizing world.* Washington, DC, World Bank.

**Bourguignon, F. & Chakravarty, S.R.** 2003. The measurement of multidimensional poverty. *Journal of Economic Inequality,* 1: 25–49.

**Castañeda, A., Doan, D., Newhouse, D., Nguyen, M.C., Uematsu, H. & Azevedo, J.P.** 2018. A new profile of the global poor. *World Development,* 101: 250–267.

**Central Statistical Agency of Ethiopia, National Bank of Ethiopia & World Bank.** 2017. *LSMS: Integrated Survey on Agriculture – Ethiopia Socioeconomic Survey (ESS) 2015/2016*. Central Statistical Agency of Ethiopia and World Bank. (also available at https://microdata.worldbank.org/index.php/catalog/2783/related-materials).

**Conchedda G., Khan, A. & Offutt, S.** 2018. *Pilot tests of an international definition of urban–rural territories: summary report*. Technical Report No. 37. Global Strategy Technical Report. Rome. (also available at www.fao.org/3/ca6420en/ca6420en.pdf).

**Davis, B., Di Giuseppe, S. & Zezza, A.** 2017. Are African households (not) leaving agriculture? Patterns of households' income sources in rural sub-Saharan Africa. *Food Policy,* 67(2): 153–174.

**de Brauw, A., Mueller, V. & Woldehanna, T.** 2018. Does internal migration improve overall well-being in Ethiopia? *Journal of African Economies,* 27(3): 347–365.

**de Campos Guimarães, J.P.** 2009. Participatory approaches to rural development and rural poverty alleviation. Paper prepared for the workshop "Emerging Issues in Rural Poverty Reduction: The Role of Participatory Approaches". Economic and Social Commission for Asia and the Pacific.

**de Haan, A.** 1999. Livelihoods and poverty: the role of migration. A critical review of the migration literature. *Journal of Development Studies,* 36(2): 1–47.

**de Janvry, A. & Sadoulet, E.** 2007. Toward a territorial approach to rural development. *Journal of Agricultural and Development Economics,* 4(1): 66–98.

**de la O Campos, A.P., Villani, C., Davis, B. & Takagi, M.** 2018. *Ending extreme poverty in rural areas: sustaining livelihoods to leave no one behind*. Rome, FAO.

**Dixon, J., Gulliver, A., Gibbon, D. & Hall, M.** 2001. *Farming systems and poverty: improving farmers' livelihoods in a changing world*. Rome and Washington, DC, FAO and World Bank.

**Ellis, F.** 2000. *Rural livelihoods and diversity in developing countries*. Oxford, Oxford University Press.

**FAO**. 2017a. *The State of Food and Agriculture 2017: leveraging food systems for inclusive rural transformation*. Rome.

**FAO.** 2017b. *Strategic work of FAO to reduce rural poverty*. Rome.

**FAO.** 2018. *The State of Food and Agriculture 2018: migration, agriculture and rural development*. Rome.

**FAO, IFAD, UNICEF, WFP & WHO.** 2018. *The State of Food Security and Nutrition in the World 2018: building climate resilience for food security and nutrition*. Rome, FAO.

**Filmer, D. & Pritchett, L.H.** 1999. The effect of household wealth on educational attainment: evidence from 35 countries. *Population and Development Review,* 25(1): 85–120.

**Filmer, D. & Pritchett, L.H.** 2001. Estimating wealth effects without expenditure data – or tears: an application to educational enrolments in states of India. *Demography,* 38(1): 115–132.

**Gautham, Y. & Andersen, P.** 2016. Rural livelihood diversification and household well-being: insights from Humla, Nepal. *Journal of Rural Studies*. 44: 239–249.

**Guio, A.-C., Marlier, E., Gordon, D., Fahmy, E., Nandy, S., & Pomati, M.** 2016. Improving the measurement of material deprivation at the European Union level. *Journal of European Social Policy*. 26(3): 219–233.

**Hazell, P.** 2017. Global trends in urbanization, agriculture and smallholder farming. In P. Pingali & R. Serraj, eds. *Agri-food systems into 2050: threats and opportunities.* World Scientific.

**Hazell, P.** 2020. Importance of smallholder farms as a relevant strategy to increase food security. In S. Gomez y Paloma, L. Riesgo & K. Louhichi, eds. *The role of smallholder farms in food and nutrition security*. Springer International Publishing.

**International Fund for Agricultural Development (IFAD).** 2016. *Rural development report 2016: fostering inclusive rural transformation*. Rome.

**Jones, G.A. & Corbridge, S.** 2010. The continuing debate about urban bias: the thesis, its critics, its influence and its implications for poverty reduction strategies. *Progress in Development Studies,* 10(1): 1–18.

**Malawi, National Statistics Office.** 2017. *Integrated Household Panel Survey 2016: household socio-economic characteristics report.* Zomba, Malawi. (also available at https://microdata.worldbank.org/index.php/catalog/2936/related-materials).

**Martin, S.M. & Lorenzen, K.** 2016. Livelihood diversification in rural Laos. *World Development,* 83: 231–243.

**Narayan, D., Chambers, R., Shah, M.K. & Petesch, P.** 2000. *Voices of the poor: crying out for change*. New York, Oxford University Press.

**Nigerian National Bureau of Statistics & World Bank.** 2016. *LSMS: Integrated Surveys on Agriculture and General Household Survey Panel 2015/2016.* (also available at https://microdata.worldbank.org/index.php/catalog/2734/related-materials).

**The Niger, National Institute of Statistics.** 2016. *2014 National Survey on Household Living Conditions and Agriculture (ECVM/A-2014): basic information document.* Niamey. (also available at https://microdata.worldbank.org/index.php/catalog/2676/related-materials).

**Oduro, A.D.** 2010. Formal and informal social protection in sub-Saharan Africa. Paper prepared for the workshop “Promoting Resilience through Social Protection in Sub-Saharan Africa”, organized by the European Report on Development, Dakar, 28–30 June 2010.

**Office of the United Nations High Commissioner for Human Rights (OHCHR) & United Nations Human Settlements Programme (UN-Habitat).** 2009. *The right to adequate housing.* Fact Sheet No. 21/Rev.1. Geneva.

**Oxford Poverty and Human Development Initiative (OPHI).** 2018. *Global multidimensional poverty index 2018: the most detailed picture to date of the world’s poorest people*. University of Oxford.

**Palacios-Lopez, A., Christiaensen, L. & Kilic, T.** 2017. How much of the labor in African agriculture is provided by women? *Food Policy,* 67: 52–63

**Pizzoli, E. & Gong, X.** 2007. *How to best classify rural and urban*. Mimeo. FAO.

**Pray, C., Masters, W. & Ayoub, S.** 2017. Impacts of agricultural research on poverty, malnutrition and resilience. USAID/Bureau for Food Security, Office of Agriculture, Research and Policy.

**Ravallion, M., Shaohua, C. & Prem, S.** 2007. *New evidence on the urbanization of global poverty*. Policy Research Working Paper No. 4199. Washington, DC, World Bank.

**Robles Aguilar, G. & Sumner, A.** 2019. *Who are the world’s poor? A new profile of global multidimensional poverty*. Center for Global Development Working Paper No. 499.

**Rosegrant, M., Sulser, T., Mason-D’Croz, D., Cenacchi, N., Nin-Pratt, A., Dunston, S. Zhu, T. *et al.*** 2017. *Quantitative foresight modeling to inform the CGIAR research portfolio*. Project Report. Washington DC, International Food Policy Research Institute.

**Ruggeri Laderchi, C.** 1997. Poverty and its many dimensions: the role of income as an indicator. *Oxford Development Studies,* 25(3): 345–360.

**Santos, M.E. & Ura, K.** 2008. *Multidimensional poverty in Bhutan: estimates and policy implications*. Oxford Poverty and Human Development Initiative Working Paper No. 14. Oxford, University of Oxford.

**Sen, A.K.** 1976. Poverty: an ordinal approach to measurement. *Econometrica,* 44(2): 219–231.

**Slavchevska, V., Brunelli, C., de la O Campos, A.P. & Doss, C.** 2016. *Beyond ownership: tracking progress on women's land rights in sub-Saharan Africa.* Global Strategy on Agricultural and Rural Statistics Working Paper No. 15. www.fao.org/3/c0356e/c0356e.pdf

**Stewart, F., Harriss-White, B. & Saith, R., eds.** 2007. *Defining poverty in the developing world*. UK, Palgrave Macmillan.

**Thornton, P., Ericksen, P., Herrero, M. & Challinor, A.** 2014. Climate variability and vulnerability to climate change: a review. *Global Change Biology,* 20(11): 3313–3328.

**Tomich, T.P., Lidder, P., Coley, M., Gollin, D., Meizen-Dick, R., Webb, P. & Carberry, P.** 2019. Food and agricultural innovation pathways for prosperity. *Agricultural Systems,* 172: 1–15.

**Tsui, K.** 2002. Multidimensional poverty indices. *Social Choice and Welfare,* 19: 69–93.

**United Nations.** 2007. *The Wye Group handbook. Rural households' livelihoods and well-being: statistics on rural development and agriculture household income*. Geneva and New York.

**United Nations Development Programme (UNDP) & Oxford Poverty Human Development Initiative (OPHI).** 2019. *How to build a national multidimensional poverty index (MPI): using the MPI to inform the SDGs*. New York, UNDP. (also available at www.fao.org/3/c0356e/c0356e.pdf).

**United Nations Statistics Division (UNSD).** 1990. Population density and urbanization. https://unstats.un.org/UNSD/Demographic/sconcerns/densurb/densurbmethods.htm

**Vollmer, F. & Alkire, S.** 2018. *Towards a global asset indicator: re-assessing the asset indicator in the global multidimensional poverty index*. Oxford Poverty and Human Development Initiative Research in Progress Paper No. 53a. Oxford, University of Oxford.

**Webb, P., & Block, S.** 2012. Support for agriculture during economic transformation: impacts on poverty and undernutrition. *PNAS,* 109(31): 12309–12314.

**World Bank.** 2008. *World development report 2008: agriculture for development*. Washington, DC.

**World Bank.** 2016. *Poverty and shared prosperity 2016: taking on inequality.* Washington, DC. (also available at https://openknowledge.worldbank.org/handle/10986/25078).

**World Bank.** 2017. *Monitoring global poverty: report of the Commission on Global Poverty.* Washington, DC. (also available at https://openknowledge.worldbank.org/handle/10986/25141).

**World Bank.** 2018. *Poverty and shared prosperity 2018: piecing together the poverty puzzle*. Washington, DC.

# Appendix A

## Alkire-Foster method to measure multidimensional poverty

In this appendix, the methodology developed by Alkire and Foster (2011) is described, as it forms the basis for the design and application of the rural multidimensional poverty index (R-MPI). The Alkire-Foster method extends the Foster-Greer-Thorbecke unidimensional poverty class of measures to a multidimensional setting. The information in this appendix is restricted to present the focal measure that is the adjusted headcount ratio ($M_0$), which is referred to as the R-MPI[27] throughout the results section in Part 2 of this report. Appendix A is based on chapter 5 of Alkire *et al.* (2015) ("The Alkire-Foster counting methodology"), and it summarizes and reproduces the most relevant notations and explanations from that chapter for the purpose of this report.

Poverty measurement can be described in two major stages: identification and aggregation. The first stage consists of defining a rule that serves to distinguish the poor from the rest of the population. Once the poor are identified, the second stage involves the aggregation of the deprivations of the poor into indices that summarize the degree of poverty. In the multidimensional poverty setting, the identification step in particular requires a number of conventions before the measure is set. These are: defining the set of indicators that will be considered in the multidimensional measure; setting the deprivation cutoffs for each indicator and one across them; and selecting the relative weight or value of each indicator.

It is convenient to first introduce useful notations that will be used through Appendix A. Let the number of person(s) within a society be denoted by $\mathrm{n}$, such that $\mathrm{n} \in \mathrm{N}$, where $\mathrm{N}$ is the set of positive integers. The performance of a household in a dimension is referred to as an achievement in a very general way, and it is assumed that achievements in each dimension can be represented by a non-negative real valued indicator.

The achievement of an individual $i$ in dimension $j$ is denoted by $x_{ij} \in \mathrm{R}^+$ for all $i=1,\ldots,\mathrm{n}$ and $j=1,\ldots,\mathrm{d}$; where $\mathrm{R}^+$ is the set of non-negative real numbers. The achievements of all individuals can be denoted then by an $n$x$d$- dimensional achievement matrix $X$ which can be represented as follows:

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1d} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{nd} \end{bmatrix}$$

The achievements of any person $i$ in all $d$ dimensions, which is row $i$ of matrix $X$, are represented by the d-dimensional vector $x_i$ for all $1,\ldots,\mathrm{n}$. The achievements in any dimension $j$ of matrix $X$ are represented by the n-dimensional vector $x_j$ for all $j=1,\ldots,\mathrm{d}$.

Each dimension $j$ is assigned a weight denoted by $w_j$ such that $w_j>0$ for all $j=1,\ldots,\mathrm{d}$. For convenience, the weights have been normalized such that $\Sigma_j w_j=1$. The weights attached to all $d$ dimensions can be represented by the vector $w=(w_1,\ldots, w_d)$.

## IDENTIFICATION

For each dimension, a threshold $z_j$ is defined as the minimum achievement required to be non-deprived, referred as the deprivation cut-off. Deprivation cut-offs are collected in the d-dimensional vector $z=(z_1,\ldots, z_d)$. Given each person's achievement in each dimension $x_{ij}$, if the $i^{th}$ person's

27 For a detailed explanation of all the Alkire-Foster measures, including their notations and properties, see Alkire and Foster (2011) and Alkire *et al.* (2015), chap. 5.

achievement level in a given dimension $j$ falls short of the respective deprivation cut-off $z_j$, the person is said to be deprived in that dimension (that is, if $x_{ij} < z_j$). If the person's achievement is at least as good as the deprivation cut-off, the person is not deprived in that dimension.

Along with the achievement's matrix $X$ and the deprivation cut-off vector $z$, one can obtain a deprivation matrix $g^0$ such that $g^0_{ij}=1$ if $x_{ij} < z_j$ (person $i$ is deprived in dimension $j$) and $g^0_{ij}=0$ otherwise.

Based on the deprivation profile, each person is assigned a deprivation score that reflects the breadth of each person's deprivations across all dimensions. The deprivation score of each person is the sum of her or his weighted deprivations. Formally, the deprivation score is given by $c_i = \sum_{j=1}^{d} w_j \, g^0_{ij} = \sum_{j=1}^{d} \bar{g}^0_{ij}$.

The score is such that, if a person is not deprived in any dimension, it has a deprivation score equal to 0. In this way the score increases as the number of deprivations a person experiences increases, and it reaches its maximum when the person is deprived in all dimensions. The deprivation score of person $i$ is denoted as $c_i$ and the column vector of deprivation scores for all persons by $c=(c_i,\ldots, c_n)$.

In addition to the deprivation cut-offs $z_j$ the Alkire-Foster method uses a second cut-off or threshold to identify the multidimensionally poor. This is called the poverty cut-off and is denoted by $k$. The poverty cut-off is the minimum deprivation score a person needs to exhibit in order to be identified as poor. This poverty cut-off is implemented using the identification function $\rho_k$ which depends upon each person's achievement vector $x_i$, the deprivation cut-off vector $z$, the weight vector $w$ and the poverty cut-off $k$. Given that the identification function depends on two cut-offs – one within dimensions and one across – it is referred as the dual cut-off identification method. Formally, the identification function is defined as $\rho_k(x_i,z)$ and it takes the value of 1 if the person is poor, that is, if $c_i \geq k$ and 0 otherwise. In other words, $\rho_k$ identifies person $i$ when her or his deprivation score is at least $k$; if the deprivation score falls bellow $k$, then the person $i$ is not poor according to $\rho_k$.

Before moving to the aggregation step, it is convenient to make a recapitulation of the methodology presented so far. By applying the deprivations cut-offs $z_j$ to the achievement matrix $X$, the deprivation matrix $g^0$ was constructed replacing each element in $X$ that is below the respective deprivation cut-off $z_j$ with 1 and each entry that is not below its deprivation cut-off with 0. This is the first censoring, because the achievements above their corresponding deprivation cut-off are converted into 0.

Subsequently, once the poor population has been identified by applying the poverty cut-off $k$, then a new matrix, which is the censored deprivation matrix, denoted by $g^0(k)$ can be obtained. This matrix is obtained by multiplying $g^0$ by the identification function $\rho_k(x_i,z)$. That is, $g^o_{ij}(k) = g^o_{ij} \times \rho_k(x_i,z)$ for all $i$ and for all $j$. Therefore, when the person $i$ is poor and thus $\rho_k(x_i,z)=1$, then the person's deprivation status in every dimension remains unchanged and so does the row containing the deprivation information of the person. On the other hand, when the person $i$ is not poor and thus $\rho_k(x_i,z)=0$ then her or his deprivation status in every dimension becomes 0, which is equivalent to censoring the deprivations of persons who are not poor.

From the censored deprivation matrix, a censored deprivation score can be obtained. This applies the identification function to the original deprivation score vector used to identify the poor. The censored deprivation score of person $i$ is denoted by $c_i(k)$ and can be obtained as $c_i(k) = \sum_{j=1}^{d} w_j \, g^o_{ij}(k)$. Thus, when $c_i \geq k$, then $c_i(k) = c_i$ (deprivation score of person $i$), but if $c_i < k$, then $c_i(k)=0$. The censored deprivation score vector is denoted by $c(k)$.

## AGGREGATION

Similar to the Foster-Greer-Thorbecke class of poverty measures, the Alkire-Foster measure can be viewed as the mean of an appropriate vector built from the original data and censored using the poverty line, the adjusted headcount ratio is the mean of the censored deprivation score vector:

$$R\_MPI = M_0 = \frac{1}{n} \times \sum_{i=1}^{n} c_i(k)$$

Alternatively, $M_0$ can be also expressed in terms of two partial indices. The first partial index is $H$, the percentage of population that is poor or the multidimensional headcount ratio, formally $H=q/n$, where $q$ is the number of people identified as poor using the dual cut-off approach. The second index is the intensity of poverty, which is the average deprivation score across the poor. Thus, $A=\sum_{i=1}^{n} c_i(k)/q$. The adjusted headcount ratio can then be expressed as:

$$R\_MPI = M_0 = H \times A$$

# Appendix B

## Indicators and dimensions in existing multidimensional poverty indices

**Table B1. Dimensions included in some existing national multidimensional poverty indices**

| Dimension | Global MPI | LAC–MPI | Arab MPI | Andhra Pradesh | Armenia | Bhutan | Chile | Colombia | Costa Rica | Dominican Rep. | Ecuador | El Salvador | Honduras | Mexico | Mozambique | Nepal | Nigeria | Panama | Pakistan | Rwanda | Viet Nam |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Education | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Health | ✓ |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |  |
| Housing, living standards &basic services | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Employment and social protection |  | ✓ |  |  | ✓ |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |  |  |  | ✓ |  | ✓ |  |
| Environment |  |  |  |  |  |  | ✓ |  |  | ✓ |  | ✓ |  |  |  |  |  | ✓ |  |  |  |
| Digital divide, networks and social cohesion |  |  |  |  |  |  | ✓ |  |  | ✓ |  | ✓ |  |  |  |  |  |  |  |  |  |
| Child and youth conditions |  |  |  |  |  |  |  | ✓ |  |  |  |  |  |  |  |  |  |  |  |  |  |

*Source:* UNDP and OPHI, 2019.

**Table B2. Indicators included in some existing national and state-level MPIs**

| Dimension | SDGs Indicator | Global MPI | LAC–MPI | Arab MPI | Andhra Pradesh | Armenia | Bhutan | Chile | Colombia | Costa Rica | Dominican Rep. | Ecuador | El Salvador | Honduras |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Years of schooling/school attainment | 4.1.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| School attendance | 4.1.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| School lag | 4.1.1 |  | ✓ |  | ✓ |  |  | ✓ | ✓ | ✓ | ✓ |  | ✓ |  |
| Early care for children | 4.2.1 |  |  |  |  |  |  |  | ✓ | ✓ | ✓ |  | ✓ |  |
| Proximity to education services |  |  |  |  |  | ✓ |  | ✓ |  |  |  |  |  |  |
| Educational quality | 4.c |  |  |  |  | ✓ |  |  |  |  |  |  |  |  |
| Child mortality | 3.2.1 | ✓ |  | ✓ | ✓ |  | ✓ |  |  |  | ✓ |  |  |  |
| Nutrition | 2.1.1 | ✓ |  | ✓ | ✓ |  |  | ✓ |  |  |  |  |  |  |
| Food security | 2.1.2 |  |  |  |  |  | ✓ |  |  |  | ✓ |  | ✓ |  |
| Early pregnancy/Female genital mutilation | 5.3.2 |  |  | ✓ |  |  |  |  |  |  |  |  |  |  |
| Ante–natal care | 3.8.1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Assisted delivery | 3.8.1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Immunization | 3.8.1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Health insurance | 3.8.2 |  |  |  |  |  |  | ✓ | ✓ | ✓ | ✓ |  |  |  |
| Impact of illnesses | 3.8 |  |  |  |  |  |  |  |  |  | ✓ |  |  |  |
| Access to health services | 3.8.2 |  |  |  |  | ✓ |  | ✓ | ✓ |  |  |  | ✓ |  |
| Quality of health services | 3.8 |  |  |  |  | ✓ |  |  |  |  |  |  |  |  |
| Termination of usual activity |  |  |  |  |  | ✓ |  |  |  |  |  |  |  | ✓ |

| Dimension | SDGs Indicator | Global MPI | LAC–MPI | Arab MPI | Andhra Pradesh | Armenia | Bhutan | Chile | Colombia | Costa Rica | Dominican Rep. | Ecuador | El Salvador | Honduras |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Electricity | 7.1.1 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | ✓ | | | ✓ |
| Cooking fuel | 7.1.2 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | ✓ | | | ✓ |
| Improved water | 6.1.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Improved sanitation | 6.2.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Housing materials (floors, walls, roof) | 11.1.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Adequate heating | 7.1 | | | | | ✓ | | | | | | | | |
| Overcrowding | 11.1.1 | | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Land and livestock | 1.4.2 | | | | | | ✓ | | | | | | | |
| Garbage disposal | 11.6.1 | | | | | ✓ | | | | ✓ | | ✓ | | |
| Access to transportation/roads | 11.2.1 | | | | | ✓ | ✓ | | | | | | | |
| House ownership | 1.4.2 / 11.1.1 | | ✓ | | | | | | | | | | ✓ | |
| Asset ownership | 1.4.2 | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | | | | ✓ |
| Access/use of Internet | 17.8.1 | | | | | | | | | ✓ | ✓ | | | |
| Income | 1.2.1 | | ✓ | | | ✓ | | | | | | ✓ | | |
| Bank Account | 8.10.2 | | | | | | | | | | | | | |
| Labor market participation | 8.5.2 | | | | | ✓ | | ✓ | | | | | | |
| Unemployment or subemployment | 8.5.2 | | ✓ | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Decent/formal jobs | 8.3.1 | | | | | ✓ | | | ✓ | ✓ | ✓ | | | |
| Child labor | 8.7.1 | | | | | | | | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Social security & registration | 8.3.1 | | ✓ | | | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Aid/remittances dependence | 17.3.2 | | | | | ✓ | | | | | | | | |
| Job diversity | 8.3.1 | | | | | | | | | | | | | |
| Safety and crime | 16.1 | | | | | | | ✓ | | | ✓ | | ✓ | |
| Access to public/leisure spaces | 11.7 | | | | | | | | | | | | ✓ | |
| Exposure to environmental hazards | 11.5.1 | | | | | | | | | | ✓ | | ✓ | |
| Proximity to polluted areas | 11.1.1 | | | | | | | ✓ | | | ✓ | | | |
| Discrimination/equal treatment | 103.1 16.b.1 | | | | | | | ✓ | | | ✓ | | | |
| Social networks | | | | | | | | ✓ | | | ✓ | | | |

*Source:* UNDP and OPHI, 2019.

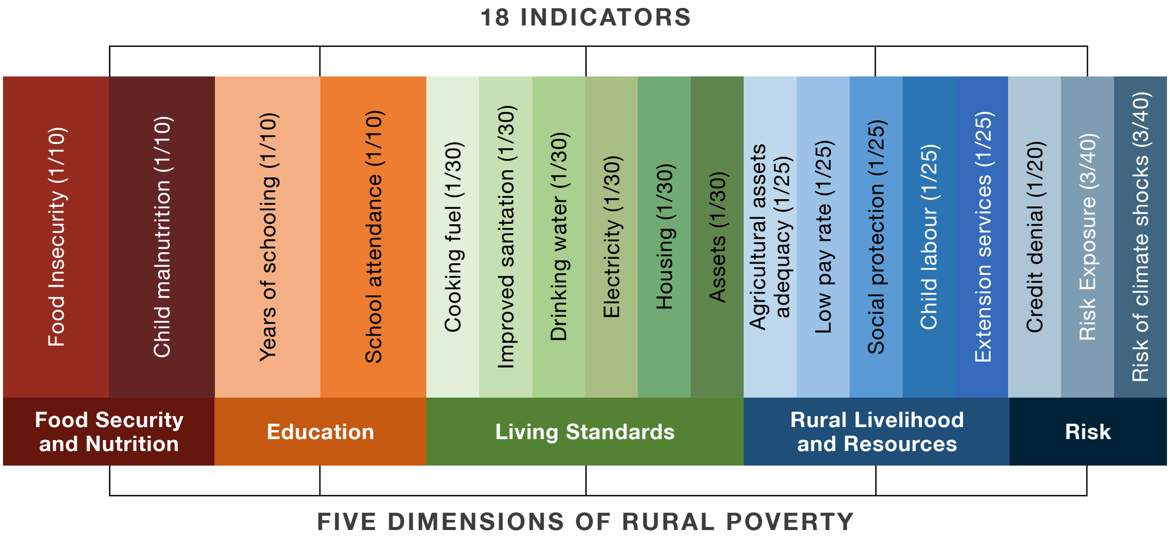
# Appendix C

Detailed results by country

## MALAWI

The rural multidimensional poverty index (R-MPI) in Malawi is composed of all 18 indicators distributed across five dimensions (see Figure C1), and it classifies a person or household as poor if the weighted deprivation score is equal to or higher than 33.3 percent.

**Figure C1. Composition of the R-MPI in Malawi**




*Source:* Authors' own elaboration, 2021.

The computation of the R-MPI in Malawi uses data from the fourth wave of the Integrated Household Survey (2016/17), which contains all the information needed for the computation of the R-MPI indicators. Within the food security and nutrition dimension, the indicator on food insecurity was estimated using FIES, while child malnutrition was estimated using anthropometric data. Under FIES, severe food insecurity implies that a person or household has a high probability of reduced food intake, while children under 5 years of age are considered malnourished if their z-score of either height-for-age (stunting) or weight-for-age (underweight) is below -2 standard deviations from the median of the reference population.

In Malawi, the official primary school entrance age is 6 years, and hence the eligible population for the indicator on years of schooling is 12 years or older, as the indicator describes as deprived any individual who has completed fewer than 6 years of education. Similarly, the eligible population for the indicator on school attendance is any individual studying in the eighth class or below, which in the case of Malawi includes all children between the ages of 6 and 14 years.

The indicators within the living standards dimension have country-specific conditions that are important in classifying households as deprived or non-deprived. For example, in Malawi, non-clean cooking fuels include collected firewood, charcoal, crop residue, sawdust, animal waste and others. Similarly, non-improved sanitation includes traditional latrines without a roof and shared or no toilet facilities. Non-safe drinking water includes unprotected wells, unprotected springs, tanker trucks, surface water (such as rivers or lakes) and carts with small tanks. Furthermore, non-adequate materials for housing are dirt, sand and dung for the floor; grass, mud and compacted earth for the walls; and grass, plastic sheeting and others for the roof.

With respect to the rural livelihoods and resources dimension, the indicator measuring access to social protection covers a wide range of national social assistance programmes, such as the free maize, free food, Malawi Social Action Fund, food/cash-for-work programme (non-Malawi Social Action Fund public works programme).[28] For this indicator, direct cash transfers from the Government (*Mtukula Pakhoma*), development partners and non-governmental organizations are also considered.

Similarly, the fourth wave of the Integrated Household Survey contains detailed information on access to agricultural extension services. The extension services covered include programmes fostering the access of the rural population to information and training on new seed varieties, pest control, fertilizer use, pit planting and irrigation, among others.[29] The sources of extension services include public and private agricultural and fishery extension institutions, non-governmental organizations, agricultural/fishing cooperatives, farmers' associations, farmer field days or farmer field schools, and an agricultural extension course.

Within the risk dimension, the risk exposure and coping strategies indicator assigns a household the deprived status if it suffered from at least one covariate rural shock. The list includes droughts, floods, unusually high levels of crop pests, unusually high levels of livestock disease, irregular rains, unusually high costs for agricultural inputs, unusually low prices for agricultural output, unusually high prices for food outputs that could not be responded to with an "adequate" coping strategy such as unconditional support from the Government or a non-governmental organization.

Lastly, the indicator on risk of climate shocks is based on geospatial and historical weather (temperature and precipitation) data. It gauges the degree to which households are exposed to weather-related shocks that characterize rural poverty. The indicator classifies a household as deprived if it is in a locality with either the probability of drought, flooding or temperatures above 35 degrees Celsius during the critical period for maize production, which is one of the principal crops produced in Malawi.

## Main results of the R-MPI

As described in Parts 1 and 2 of this report, the R-MPI reflects the share of the rural population that is multidimensionally poor – that is, the incidence of poverty or headcount ratio (H) – adjusted by the average proportion of indicators in which they are deprived, which is the average intensity of their poverty (A). Although the poverty cut-off (*k*) for the R-MPI is 33.3 percent, a headcount ratio is also estimated for two other ranges of poverty cut-offs. A person is identified as vulnerable to poverty if she or he is deprived in 20.0–33.3 per cent of the weighted indicators. Concurrently, a person is identified as living in severe poverty if she or he is deprived in 50–100 per cent of the weighted indicators.

Table C1 presents the main results for the R-MPI computed using the fourth wave of the Integrated Household Survey and compares it against two other multidimensional measures. The first measure is the original global MPI, computed for rural Malawi using the Demographic and Health Survey

[28] The other social assistance programmes covered are the inputs-for-work programme, the school feeding programme, free distribution of *likuni phala* (fortified soya enriched flour) to children and mothers (targeted nutrition programme), supplementary feeding for malnourished children at a nutritional rehabilitation unit, scholarships/bursaries for secondary education (such as the Creative Centre for Community Mobilization), scholarships for tertiary education (such as a university scholarship or upgrading teachers), or a tertiary loan scheme (a government loan for university and other tertiary education).

[29] The programmes listed also foster activities such as composting, marketing and selling crops, growing and selling tobacco, access to credit, forestry, general animal care, animal diseases and vaccinations, fishery production, contract farming and agroforestry.

for 2016. Given the comparability limitations that arise from using a different survey and indicators structure, a proxy global MPI (PG-MPI) composed of the first three dimensions of the R-MPI was computed using the same survey as that used for the R-MPI.

The results show a greater degree of multidimensional poverty in the adjusted headcount ratio (the R-MPI), where the average intensity of poverty (A) is added into the incidence of multidimensional poverty (H). With similar levels of prevalence of multidimensional poverty experienced by rural poor people in both measures, it is clear that the difference between the R-MPI results and the rural global MPI results is driven by the greater intensity of deprivations, at 86 percent.

**Table C1. Main results: Malawi 2017**

| | (H x A) | Headcount ratio (H) | Average intensity of poverty (A) | Vulnerable | Severe |
|---|---|---|---|---|---|
| **R–MPI** | 0.448 | 86.1 | 52.0 | 11.4 | 49.6 |
| **Global MPI (rural; 2016)** | 0.269 | 57.9 | 46.5 | 29.1 | 20.9 |
| **PG–MPI** | 0.376 | 72.70 | 51.7 | 15.0 | 37.7 |

*Source:* https://ophi.org.uk/2018-global-mpi-resources/ (for the global MPI); and authors' calculations, 2021.

In Figure C2, a comparison is presented between the R-MPI and the PG-MPI in the left panel, and between the R-MPI and the Monetary Match in the right panel. The PG-MPI was computed using only the first three dimensions of the R-MPI – food security and nutrition, education and living standards – using the same microdata as the R-MPI. Monetary Match is a calculated monetary poverty measure that allows the setting of a poverty line (that is based on the daily consumption per capita) at the value that generates a proportion of monetary poor households corresponding to the proportion of households identified as poor by the R-MPI.[30]

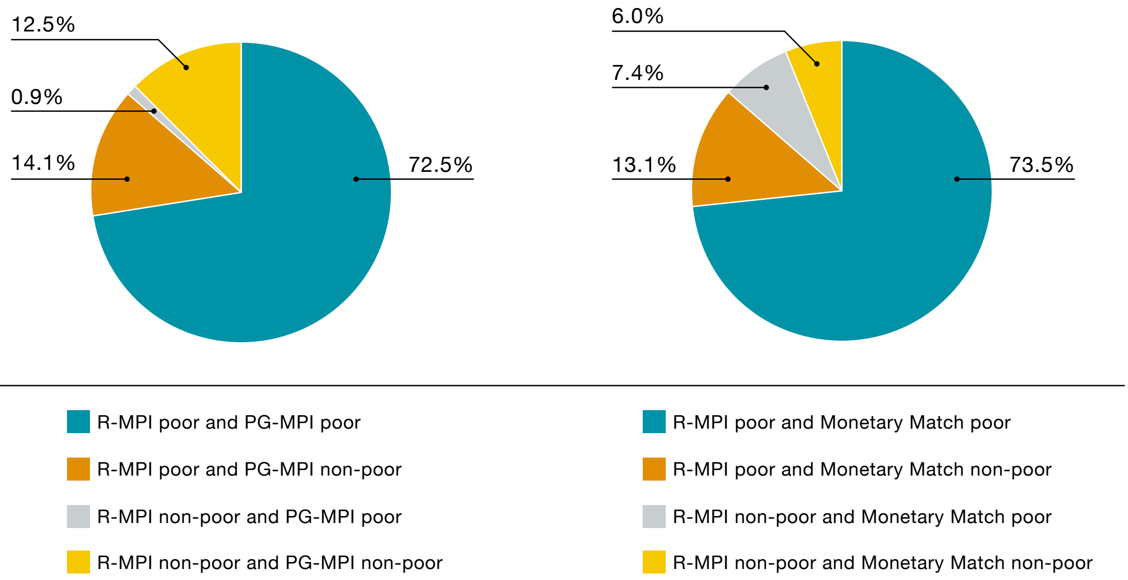
For the comparison in the left panel, the households are separated into four mutually exclusive and collectively exhaustive groups: people in group 1 are those identified as poor by both the R-MPI and the PG-MPI; people in group 2 are those identified as poor by the R-MPI but identified as non-poor by the PG-MPI; people in group 3 are those identified as non-poor by the R-MPI but identified as poor by the PG-MPI; and people in group 4 are those identified as non-poor by both the R-MPI and the PG-MPI. The panel on the right presents a similar exercise, but instead of comparing the R-MPI against the PG-MPI, the R-MPI is compared against the Monetary Match.

The comparisons show that the poverty measures based on monetary indicators (that is, household income or consumption) differ from multidimensional poverty measures. This can be determined by comparing the proportions of people in group 1 and group 3 between both panels. In Malawi, the proportion of people sharing the same poverty status under the R-MPI and the PG-MPI is similar to the proportion of people sharing the same poverty status under the R-MPI and the Monetary Match. This implies that the overlap between the R-MPI and the PG-MPI (group 1 in the left panel), and the R-MPI and the Monetary Match (group 1 in the right panel) is approximately the same. As a result, the relevance of a multidimensional approach is not explicitly evident. However, Figure C2 also shows that the percentage of people identified as poor by the R-MPI is relatively much higher than the percentage of people identified as poor by the PG-MPI. In other words, all those

[30] See Section 2.6 of the present report for a detailed description of the PG-MPI and the Monetary Match.

individuals who are identified as PG-MPI poor are almost always R-MPI poor as well (except in 0.9 percent of the cases), whereas all those individuals that are identified as Monetary Match poor are not recognized as R-MPI poor in 7.4 percent of the cases. In the case of Malawi, the mismatch between the monetary and the multidimensional poverty measures in rural areas is therefore better explained by comparing the proportion of individuals in group 3 in both panels.

**Figure C2. Mismatch analysis of monetary and multidimensional poverty levels in rural areas in Malawi**



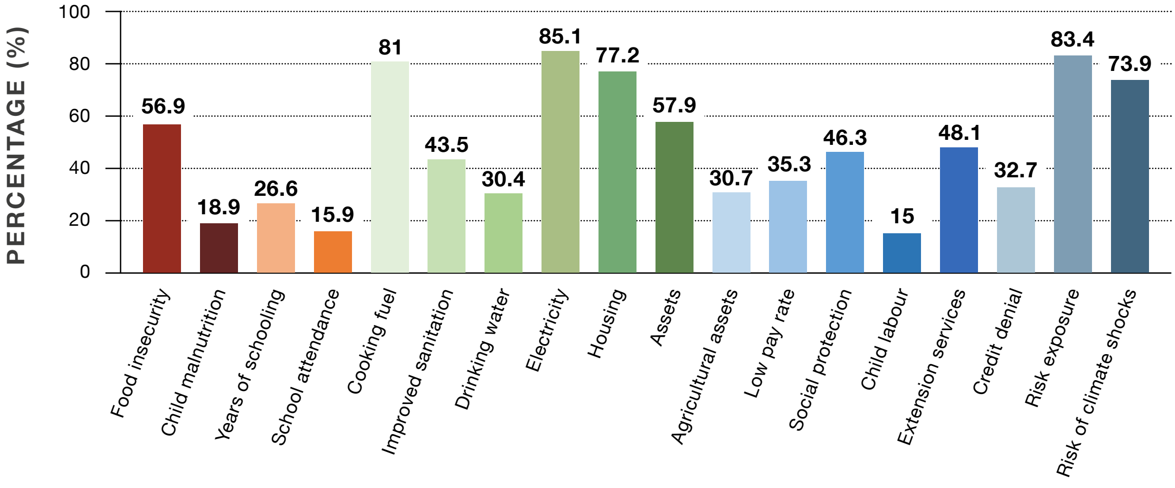

*Source:* Authors' computations, 2021.

## Composition of the R-MPI

Figure C3 shows the censored headcount ratios of multidimensional poverty in Malawi. The censored headcount ratio of an indicator represents the proportion of individuals who are multidimensionally poor and simultaneously deprived in the specific indicator. Malawi presents a high level of deprivation in the indicators related to the living standards dimension, including electricity, cooking fuel and housing, where for each of these indicators, more than 70 percent of the rural poor population is deprived. Similarly, indicators such as risk of climate shocks show that more than 80 percent of the poor population live in households that suffered from covariate shocks or suffered from a shock but had no access to formalized coping strategies. This implies that the above-mentioned indicators play an important role in determining whether the population is multidimensionally poor or not. Furthermore, the child labour and school attendance indicators show the lowest incidence of deprivation, at below 16 percent.

The censored headcount ratio shows the extent of deprivations among the poor but it does not reflect the relative value of the indicators. Two indicators may have the same censored headcount ratios but a different contribution to overall poverty because the contribution depends both on the censored headcount ratio and on the weight assigned to each indicator. As such, a complementary analysis to the censored headcount ratio is the percentage contribution of each indicator to overall multidimensional poverty.

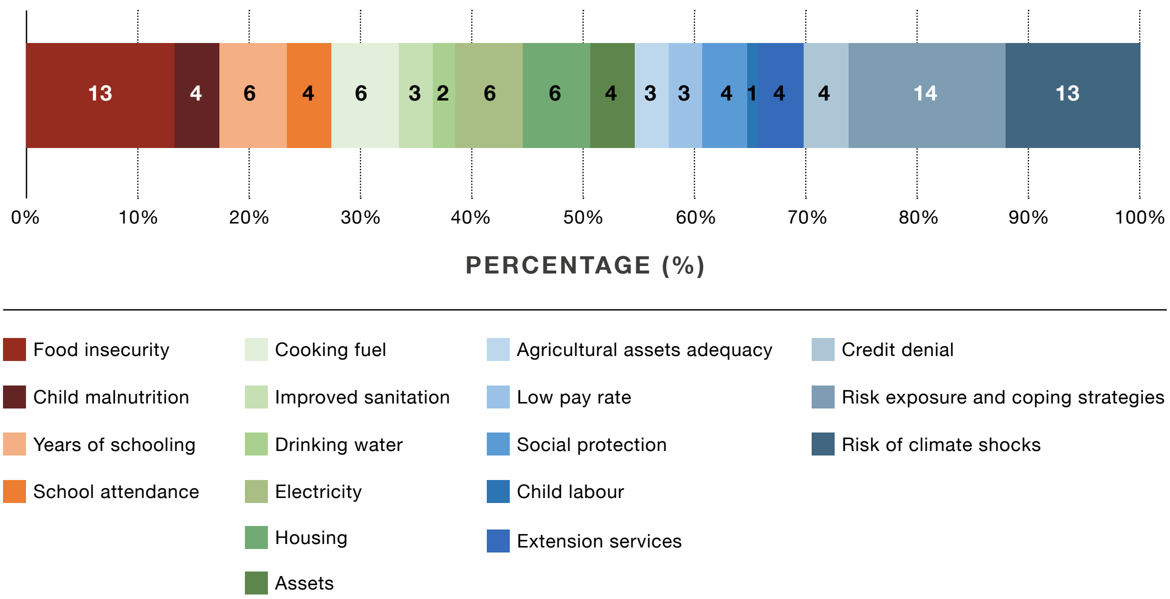
**Figure C3. Censored deprivation by indicator (percentage)**




*Source:* Authors' computations, 2021.

Figure C4 shows a bar graph that compares the percentage contribution of each indicator; the colours inside each bar denote the percentage contribution of each indicator to the overall R-MPI. In Malawi risk exposure and coping strategies is the indicator that contributes the most to the R-MPI (14 percent), followed by risk of climate shocks (13 percent) and food insecurity (13 percent).

**Figure C4. Contribution of indicators to the R-MPI (percentage)**




*Source:* Authors' computations, 2021.

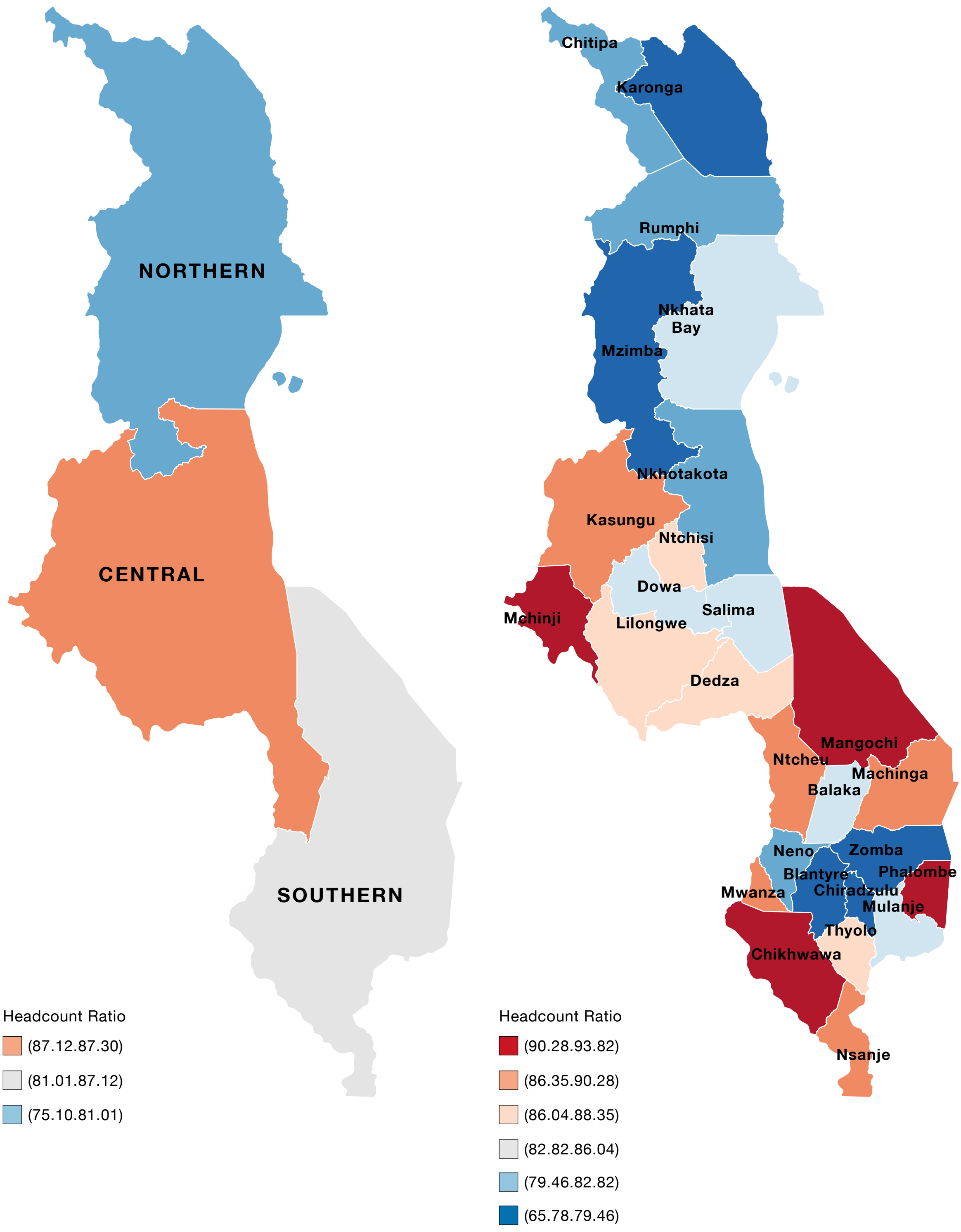
## Poverty maps to demonstrate regional breakdowns

The data are representative at the subnational level for the rural breakdown of the three regions of Malawi, namely the Northern, Central and Southern regions. Given that the population of Malawi is predominately rural, estimations of the main R-MPI results were also computed for the 28 non-urban districts of the country. Table C2 presents the results obtained for the regions and districts. It should be noted that, naturally, the maps present the entire country across rural and urban areas, but the colour-coded results present only rural poverty.

Figure C5 shows the decomposed results of the headcount ratios by region (left panel) and by district (right panel). Dark red indicates a higher headcount ratio (H) and therefore greater poverty, while dark blue indicates a lower headcount ratio (H) and therefore lower poverty. The Northern region is the least poor region, with a headcount ratio of 75 percent, whereas the poorer Southern and Central regions present statistically equal headcount ratios (see Table C2).

Although the estimates at the district level present wide confidence intervals (see Table C2), there are some observations that are worth mentioning. The breakdown of the Southern region shows important disparities across districts. The proportion of the poor population in Mangochi district is located in the higher poverty range level, whereas districts such as Zomba (rural), Chiradzulu and Blantyre are located within the higher poverty range level. Similar examples can be found within the districts of Mchinji and Nkhotakota in the Central region.

**Figure C5. Rural multidimensional poverty incidence (H) at regional and district levels**




The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

*Source:* DIVA-GIS. 2021. Administrative areas (boundaries) [shapefile]. Modified with the authors' computations, 2021.

## Table C2. Main results by region and district: Malawi

| | Region/district | Estimate | SD | Std. Err | L_CI | U_CI | Share of rural households (%) |
|---|---|---|---|---|---|---|---|
| **Headcount ratio (H)** | Northern | 75.10 | 43.25 | 0.48 | 74.16 | 76.04 | 18.7 |
| | Central | 87.30 | 33.30 | 0.28 | 86.76 | 87.84 | 34.2 |
| | Southern | 86.93 | 33.71 | 0.24 | 86.45 | 87.41 | 47.1 |
| **Average intensity of poverty (A)** | Northern | 46.76 | 8.99 | 0.12 | 46.53 | 46.98 | 18.7 |
| | Central | 53.16 | 11.57 | 0.10 | 52.96 | 53.37 | 34.2 |
| | Southern | 51.76 | 11.05 | 0.09 | 51.59 | 51.93 | 47.1 |
| **R–MPI (H x A)** | Northern | 0.419 | 0.117 | 0.001 | 0.417 | 0.422 | 18.7 |
| | Central | 0.499 | 0.138 | 0.001 | 0.497 | 0.502 | 34.2 |
| | Southern | 0.485 | 0.134 | 0.001 | 0.483 | 0.487 | 47.1 |
| **Headcount ratio** | Chitipa | 80.49 | 39.69 | 2.18 | 76.19 | 84.79 | 3.08 |
| | Karonga | 65.78 | 47.52 | 2.66 | 60.55 | 71.02 | 3.98 |
| | Nkhata Bay | 84.66 | 36.09 | 1.98 | 80.76 | 88.56 | 2.73 |
| | Rumphi | 79.68 | 40.30 | 2.25 | 75.24 | 84.11 | 1.93 |
| | Mzimba | 67.38 | 46.95 | 2.56 | 62.35 | 72.41 | 5.83 |
| | Likoma | 52.61 | 50.10 | 4.05 | 44.60 | 60.61 | 0.28 |
| | Kasungu | 89.75 | 30.37 | 1.66 | 86.48 | 93.03 | 3.50 |
| | Nkhotakota | 79.88 | 40.15 | 2.18 | 75.60 | 84.16 | 1.27 |
| | Ntchisi | 86.35 | 34.38 | 1.82 | 82.76 | 89.94 | 2.35 |
| | Dowa | 86.04 | 34.71 | 1.86 | 82.39 | 89.69 | 3.15 |
| | Salima | 84.93 | 35.83 | 1.95 | 81.10 | 88.76 | 1.55 |
| | Lilongwe | 86.93 | 33.74 | 1.44 | 84.10 | 89.75 | 7.40 |
| | Mchinji | 91.09 | 28.53 | 1.52 | 88.10 | 94.08 | 2.30 |
| | Dedza | 86.67 | 34.04 | 1.82 | 83.10 | 90.25 | 4.25 |
| | Ntcheu | 90.28 | 29.67 | 1.54 | 87.24 | 93.31 | 2.98 |
| | Mangochi | 93.82 | 24.12 | 1.28 | 91.29 | 96.34 | 5.55 |
| | Machinga | 90.04 | 29.98 | 1.59 | 86.92 | 93.16 | 3.45 |
| | Zomba (rural) | 76.84 | 42.25 | 2.22 | 72.47 | 81.20 | 3.65 |
| | Chiradzulu | 78.94 | 40.83 | 2.15 | 74.72 | 83.17 | 1.18 |
| | Blantyre | 79.46 | 40.46 | 2.11 | 75.31 | 83.61 | 2.12 |
| | Mwanza | 89.59 | 30.58 | 1.66 | 86.33 | 92.86 | 0.75 |
| | Thyolo | 87.10 | 33.56 | 1.76 | 83.63 | 90.57 | 3.65 |
| | Mulanje | 83.76 | 36.94 | 2.00 | 79.83 | 87.69 | 2.95 |
| | Phalombe | 93.68 | 24.37 | 1.28 | 91.15 | 96.20 | 1.48 |
| | Chikwawa | 91.79 | 27.49 | 1.48 | 88.89 | 94.70 | 2.83 |
| | Nsanje | 89.81 | 30.29 | 1.65 | 86.57 | 93.06 | 0.47 |
| | Balaka | 84.83 | 35.93 | 1.94 | 81.02 | 88.64 | 2.20 |
| | Neno | 81.88 | 38.57 | 2.03 | 77.90 | 85.87 | 0.23 |

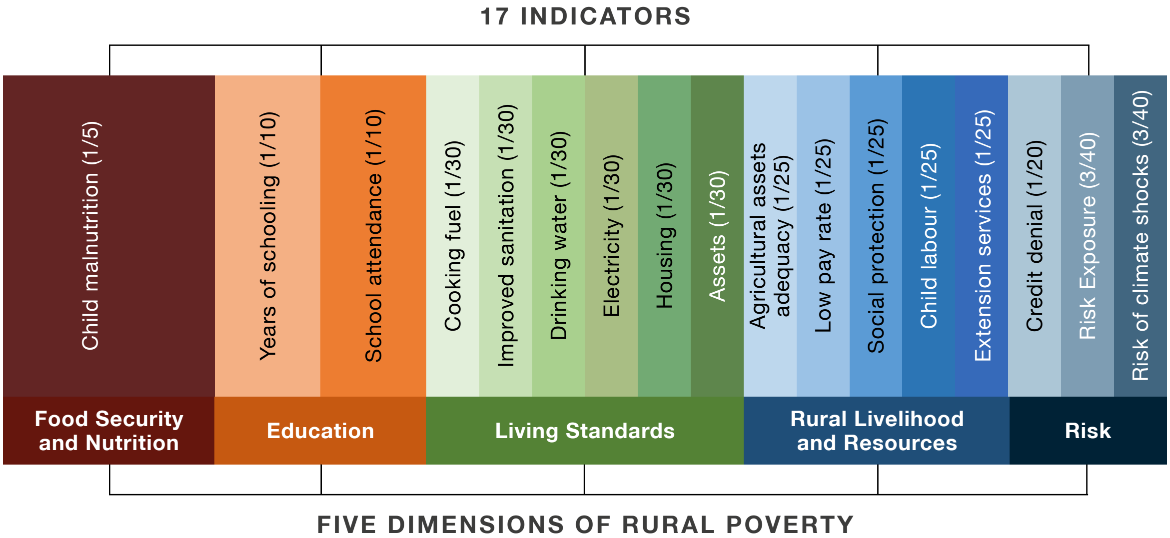
Note: L_CI = lower confidence interval; SD = standard deviation; Std. Err. = standard error; U_CI = upper confidence interval.

*Source:* Authors' computations, 2021.

## ETHIOPIA

The R-MPI in Ethiopia is composed of 17 indicators distributed across five dimensions (see Figure C6), and it classifies a person as poor if the weighted deprivation score is equal to or higher than 33.3 percent.

**Figure C6. Composition of the R-MPI in Ethiopia**




*Source:* Authors'own elaboration, 2021.

The computation of the R-MPI uses survey data from the third wave of the Ethiopia Socioeconomic Survey for 2015/16. However, the data do not include a FIES module consistent with the one recommended by FAO (Ballard, Kepple and Cafiero, 2013). FIES is largely considered an appropriate approach to capture information on access to food – the main dimension in which a household can be food insecure. Although the questions on food security available in the Ethiopia Socioeconomic Survey data are similar to those recommended by FAO for the estimation of FIES, data were gathered over a seven-day recall period, which differs significantly from the recommended 12-month reference period. As a consequence, the indicator on food insecurity was excluded in the estimation of the R-MPI in Ethiopia, as an estimation of FIES based on a shorter recall period could potentially result in biased estimates. With the exclusion of the indicator on food insecurity, the indicator on child malnutrition, which is computed using available anthropometric data on children, is the only indicator within the food security and nutrition dimension. For the indicator, children under 5 years of age are considered malnourished if their z-score of either height-for-age (stunting) or weight-for-age (underweight) is below -2 standard deviations from the median of the reference population. The weight in the dimension has been adjusted accordingly, such that child malnutrition is assigned the entire weight of the dimension in the nested weighting structure.

In Ethiopia, the official primary school entrance age is 7 years, and hence the eligible population for the indicator on years of schooling is 13 years or older, as the indicator describes as deprived any individual who has completed fewer than six years of education. Similarly, the eligible population for the indicator on school attendance is any individual studying in the eighth class or below, which in the case of Ethiopia includes all children between the ages of 7 and 15 years.

The indicators within the living standards dimension have country-specific conditions that are important in classifying households as deprived or non-deprived. For example, in Ethiopia, non-clean cooking fuels include collected firewood, charcoal, crop residue, sawdust and animal waste. Similarly, non-improved sanitation covers traditional latrines without a slab, and shared, or no, toilet facilities.

Non-safe drinking water includes unprotected wells, unprotected springs, tanker trucks, piped water from a kiosk, surface water (such as rivers or lakes) and carts with small tanks. Furthermore, in Ethiopia, non-adequate materials for housing are dirt, sand and dung for floors; grass, mud and compacted earth for walls; and grass and plastic sheeting for roofs. Unlike for Malawi, Nigeria and the Niger, the assets indicator does not consider computers in the list of assets owned (or not) by the households, as there is no information regarding the same in the Ethiopia Socioeconomic Survey.

The rural livelihoods and resources dimension is one of the two new dimensions included in the R-MPI and it covers five new indicators. The indicator on child labour has an age threshold of 7–11 years, which has been selected based on the ILO Minimum Age Convention, 1973 (No. 138) on child labour. Along with the general questions on household members receiving a pension income or social assistance from the Government, the social protection indicator in Ethiopia is based on an interesting question on "*Iddir*".

*Iddir* are mutual aid funeral associations responsible for providing social support to members following the death of a family member. The funeral ceremony in many parts of Ethiopia is often expensive and can also be labour- and resource-intensive. Membership in *Iddir* provides any member with access to the financial resources required to organize and pay for a burial ceremony and to support the member's family during the mourning period. Moreover, unlike in Malawi, where the questionnaire lists the types of extension services received by the household, the extension services indicator in Ethiopia was created based on whether or not the households benefited from an extension programme and/or received any advisory services.

The risk dimension is the second new addition to the index and covers three new indicators in Ethiopia. One of the important aspects of this dimension is to provide an understanding of the type of shocks that are considered as covariate. Covariate shocks in Ethiopia refer to droughts, floods, heavy rains preventing work, crop damage, an increase or decrease in the price of food items, an increase in the price of agricultural inputs, the death of livestock, fire and displacement. Under the indicator on risk exposure and coping strategies, selling household assets, changing eating patterns and working more are some of the non-formal/non-adequate coping strategies.

Lastly, data on the probability of extreme temperatures during the productive stage of key crops are not yet available for Ethiopia. As such, the indicator on risk of climate shocks is based on both geospatial and historical weather (temperature and precipitation) data, where households are considered deprived if the probability of experiencing drought or flooding is greater than the respective median probability.

## Main results of the R-MPI

As described in Parts 1 and 2 of this report, the R-MPI reflects the share of the rural population that is multidimensionally poor – that is, the incidence of poverty or headcount ratio (H) – adjusted by the average proportion of indicators in which they are deprived, which is the average intensity of their poverty (A). Although the poverty cut-off ($k$) for the R-MPI is 33.3 percent, a headcount ratio is also estimated for two other ranges of poverty cut-offs. A person is identified as vulnerable to poverty if she or he is deprived in 20.0–33.3 per cent of the weighted indicators. Concurrently, a person is identified as living in severe poverty if she or he is deprived in 50–100 per cent of the weighted indicators.

Table C3 presents the main results for the R-MPI using the Ethiopia Socioeconomic Survey for 2015/16 and compares it against two other multidimensional measures. The first measure is the original global MPI, computed for rural Ethiopia using the Demographic and Health Survey for 2016. Given the comparability limitations that arise from using a different survey and indicator structure, a PG-MPI composed of only the first three dimensions of the R-MPI was computed using the same survey as the R-MPI.

The results show a greater degree of multidimensional poverty in the adjusted headcount ratio (the R-MPI), where the average intensity of poverty (A) is added into the incidence of multidimensional poverty (H). With similar levels of prevalence of multidimensional poverty experienced by rural poor people in both measures, it is clear that the difference between the R-MPI results and the rural global MPI results is driven by the greater intensity of deprivations, at 92 percent.

**Table C3. Main results: Ethiopia 2016**

| | H x A | Headcount ratio (H) | Average intensity of poverty (A) | Vulnerable | Severe |
|---|---|---|---|---|---|
| **R–MPI** | 0.426 | 80.2 | 53.2 | 17.0 | 44.6 |
| **Global MPI (rural, 2016)** | 0.547 | 91.8 | 59.6 | 7.2 | 70.5 |
| **PG–MPI** | 0.459 | 77.9 | 59.0 | 16.3 | 49.2 |

*Source:* https://ophi.org.uk/2018-global-mpi-resources/ (for the global MPI), and authors' calculations, 2021.

Figure C7 presents a comparison between the R-MPI and the PG-MPI in the left panel, and between the R-MPI and the Monetary Match in the right panel. The PG-MPI was computed using only the first three dimensions of the R-MPI – food security and nutrition, education and living standards – using the same microdata as those used in the R-MPI computation. The Monetary Match is a calculated monetary poverty measure that allows the setting of a poverty line (that is based on daily consumption per capita) at the value that generates a proportion of monetary poor households corresponding to the proportion of households identified as poor by the R-MPI.[31]

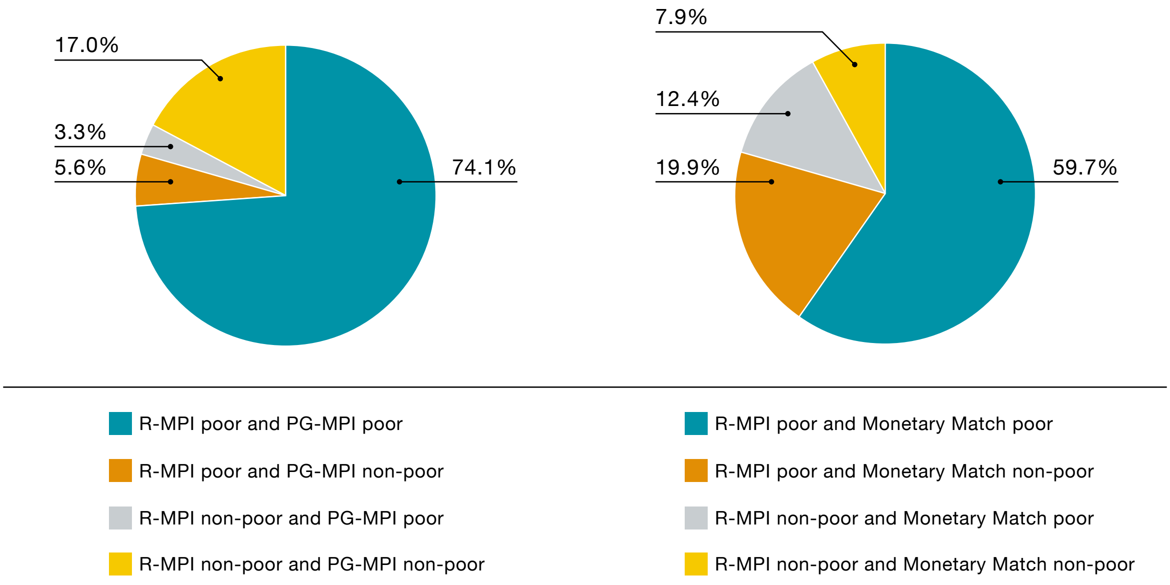
For the comparison in the left panel, the households are separated into four mutually exclusive and collectively exhaustive groups: people in group 1 are those identified as poor by both the R-MPI and the PG-MPI; people in group 2 are those identified as poor by the R-MPI but identified as non-poor by the PG-MPI; people in group 3 are those identified as non-poor by the R-MPI but identified as poor by the PG-MPI; and people in group 4 are those identified as non-poor by both the R-MPI and the PG-MPI. The panel on the right presents a similar exercise, but instead of comparing the R-MPI against the PG-MPI, the R-MPI is compared against the Monetary Match.

The idea behind the comparisons is to show how the poverty measures based on monetary indicators (that is, daily consumption per capita) differ from multidimensional poverty by comparing the proportions of people in group 1 and group 3 between both panels. In Ethiopia, the proportion of people sharing the same poverty status under the R-MPI and the PG-MPI is much higher than the proportion of people sharing the same poverty status under the R-MPI and the Monetary Match. This

31 See Section 2.6 of the present report for a detailed description of the PG-MPI and the Monetary Match.

implies that the overlap between the R-MPI and the PG-MPI (group 1 in the left panel) is relatively higher than the overlap between the R-MPI and the Monetary Match (group 1 in the right panel). This is in line with existing findings of the first section of the present report, that is, that mismatches between monetary and non-monetary deprivations are frequent. Moreover, Figure C7 also shows that all those individuals who are identified as PG-MPI poor are not R-MPI poor in 3.3 percent of the cases; whereas, all those individuals who are identified as Monetary Match poor are not recognized as R-MPI poor in 12.4 percent of the cases. The above two comparisons therefore imply that the mismatch between the R-MPI and the Monetary Match is more prominent compared to the mismatch between the R-MPI and the PG-MPI.

**Figure C7. Mismatch analysis of monetary and multidimensional poverty levels in rural areas in Ethiopia**



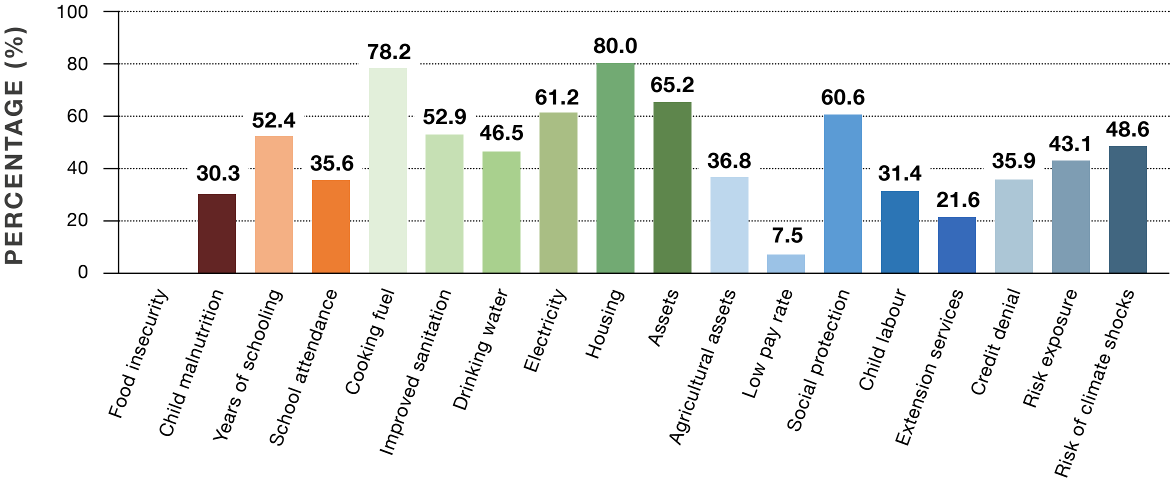

*Source:* Authors' computations, 2021.

## Composition of the R-MPI

Figure C8 shows the censored headcount ratios of multidimensional poverty in Ethiopia. The censored headcount ratio of an indicator represents the proportion of individuals who are multidimensionally poor and simultaneously deprived in the specific indicator. Indicators within the living standards dimension, such as cooking fuel, electricity, assets and housing, show the highest level of censored headcount ratios. In each of these indicators, more than 60 percent of the rural poor population is deprived. This implies that the above-mentioned indicators play an important role in determining whether the population is multidimensionally poor or not. The analysis further shows that collected firewood is the primary source of cooking fuel among rural households, and thus causes high deprivation in the cooking fuel indicator.

Furthermore, the low pay rate indicator shows the lowest incidence of deprivation, being below 10 percent. This is likely due to the construction of the indicator itself, as all individuals living in a household where none of its household members is a wage employee are automatically classified as being non-deprived.

**Figure C8. Censored deprivation by indicator (percentage)**

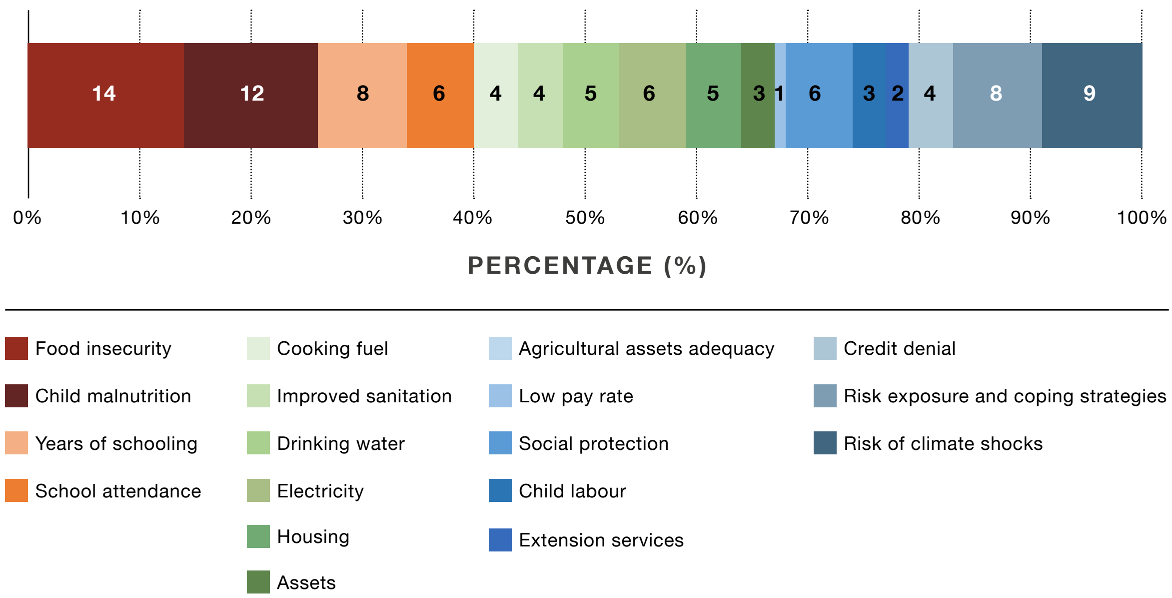



*Source:* Authors' computations, 2021.

## Percentage contribution of indicators to the R-MPI

As indicated in Parts 1 and 2 of this report, the censored headcount ratio shows the extent of deprivations among the poor but it does not reflect the relative value of the indicators. Two indicators may have the same censored headcount ratios but a different contribution to overall poverty because the contribution depends both on the censored headcount ratio and on the weight assigned to each indicator. As such, a complementary analysis to the censored headcount ratio is the percentage contribution of each indicator to overall multidimensional poverty.

**Figure C9. Percentage contribution of indicators to the R-MPI**




*Source:* Authors' computations, 2021.

The bar graph in Figure C9 shows a comparison of the percentage contribution of each indicator, where the colours inside each bar denote the percentage contribution of each indicator to the overall R-MPI. It is worth highlighting that, on the one hand, child malnutrition (14 percent) and years of schooling (12 percent) are the indicators that contribute the most to the R-MPI, followed by school attendance (9 percent) and risk of climate shocks (9 percent). On the other hand, the indicators that contribute the least to the R-MPI are low pay rate (1 percent) and extension services (2 percent), both belonging to the rural livelihoods and resources dimension.

## Poverty map to demonstrate regional breakdowns

Data are representative at the subnational level for five regions in Ethiopia: Amhara; Oromiya; Southern Nations, Nationalities and Peoples; Tigray; and "other regions", where Afar, Benishangul-Gumaz, Dire Dawa, Gambela, Harari and Somali are smaller regions that are often grouped together. Figure C10 shows the decomposed results of the headcount ratios by region, where dark red indicates a higher headcount ratio (H) and therefore greater poverty, while dark blue indicates a lower headcount ratio (H) and therefore lower poverty. It should be noted that, naturally, the map presents the entire country across rural and urban areas, but the colour-coded results present only rural poverty. Looking at the four regions that are not grouped together, it can be seen that Tigray is the least poor region, with a headcount ratio of 75 per cent, followed by Amhara with 77 percent, Oromia with 80 percent, and Southern Nations, Nationalities and Peoples with 81 percent.

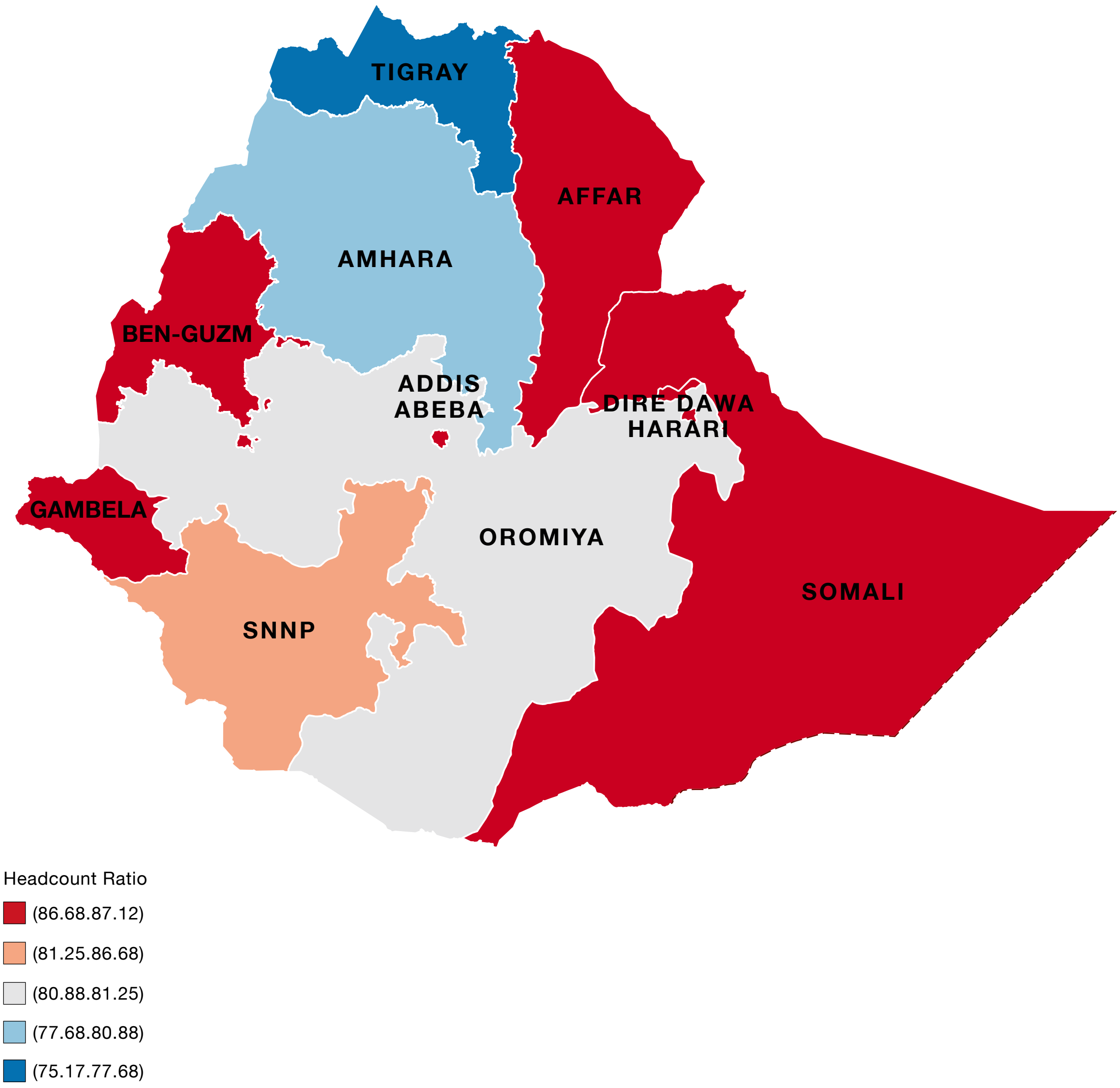
**Table C4. Main results by region: Ethiopia**

| | Region | Estimate | SD | Std.Err | L_CI | U_CI | Share of rural households (%) |
|---|---|---|---|---|---|---|---|
| **Headcount ratio (H)** | Amhara | 77.68 | 41.65 | 0.77 | 76.17 | 79.18 | 21.3 |
| | Oromiya | 80.88 | 39.33 | 0.70 | 79.51 | 82.25 | 19.3 |
| | SNNP | 81.25 | 39.04 | 0.61 | 80.06 | 82.43 | 25.7 |
| | Tigray | 75.17 | 43.22 | 1.07 | 73.06 | 77.28 | 10.5 |
| | Others | 87.12 | 33.50 | 0.54 | 86.06 | 88.18 | 23.3 |
| **Average intensity of poverty (A)** | Amhara | 51.23 | 11.57 | 0.24 | 50.76 | 51.70 | 21.3 |
| | Oromiya | 53.41 | 13.51 | 0.27 | 52.88 | 53.94 | 19.3 |
| | SNNP | 54.65 | 13.75 | 0.24 | 54.19 | 55.11 | 25.7 |
| | Tigray | 50.85 | 12.16 | 0.35 | 50.16 | 51.54 | 10.5 |
| | Others | 56.09 | 12.93 | 0.23 | 55.65 | 56.54 | 23.3 |
| **R–MPI (H x A)** | Amhara | 0.457 | 0.146 | 0.003 | 0.452 | 0.463 | 21.3 |
| | Oromiya | 0.481 | 0.165 | 0.003 | 0.475 | 0.487 | 19.3 |
| | SNNP | 0.495 | 0.165 | 0.003 | 0.490 | 0.500 | 25.7 |
| | Tigray | 0.446 | 0.154 | 0.004 | 0.439 | 0.454 | 10.5 |
| | Others | 0.520 | 0.162 | 0.003 | 0.515 | 0.525 | 23.3 |

Note: L_CI = lower confidence interval; SNNP = Southern Nations, Nationalities and Peoples; SD = standard deviation; Std. Err. = standard error; U_CI = upper confidence interval.

*Source:* Authors' computations, 2021.

**Figure C10. Rural multidimensional poverty incidence (H) at the regional level**




The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

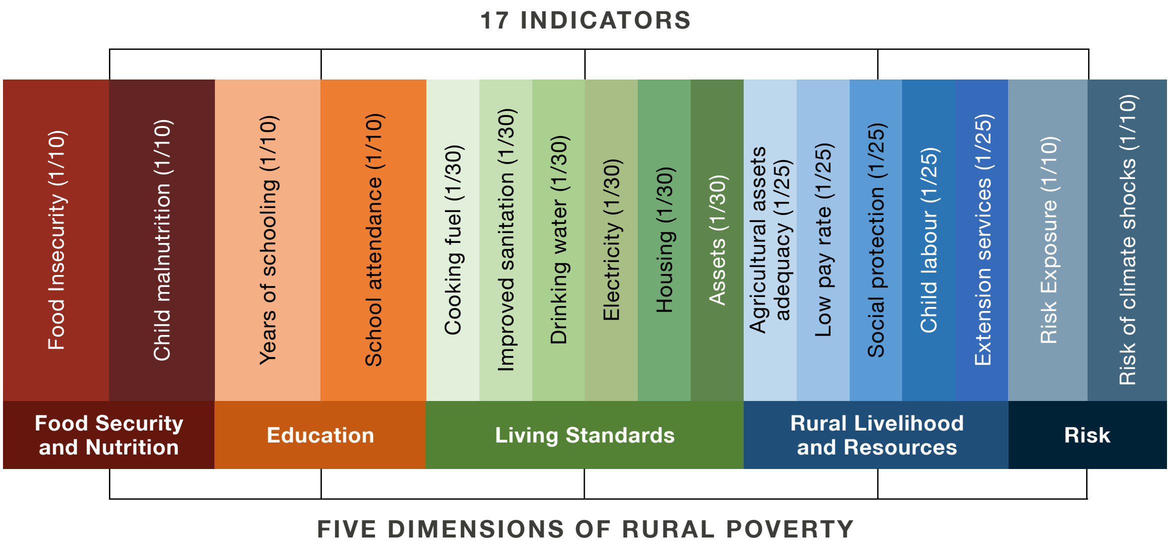
Note: SNNP = Southern Nations, Nationalities and Peoples.

*Source:* DIVA-GIS. 2021. Administrative areas (boundaries) [shapefile]. Modified with the authors' computations, 2021.

## THE NIGER

The R-MPI in the Niger is composed of 17 indicators distributed across five dimensions (see Figure C11). Unlike in Malawi and Ethiopia, where the risk dimension includes a third indicator on credit denial, this indicator is excluded in the Niger due to insufficient information. As a result, only two indicators, namely risk exposure and coping strategies and risk of climate shocks, are included within the risk dimension and are weighted equally (see Figure C11). By taking into account the five dimensions and the 17 indicators available, the R-MPI classifies a person or household as poor if the weighted deprivation score is equal to or higher than 33.3 per cent.

**Figure C11. Composition of the R-MPI of the Niger**




*Source:* Authors.

The computation of the R-MPI in the Niger uses data from the National Survey on Household Living Conditions and Agriculture conducted in 2014. As noted earlier, the survey data contain sufficient information for the computation of the R-MPI with the exception of the indicator on credit denial. Within the food security and nutrition dimension, the indicator on food insecurity was estimated using FIES, while child malnutrition was estimated using anthropometric data. Under FIES, severe food insecurity implies that a person or household has a high probability of reduced food intake, while children under 5 years of age are considered malnourished if their z-score of either height-for-age (stunting) or weight-for-age (underweight) is below -2 standard deviations from the median of the reference population.

In the Niger, the official primary school entrance age is 8 years, and hence the eligible population for the indicator on years of schooling is 14 years or older, as the indicator describes as deprived any individual who has completed fewer than six years of education. Similarly, the eligible population for the indicator on school attendance is any individual studying in the eighth class or below, which in the case of the Niger includes all children between the ages of 8 and 16 years.

The indicators within the living standards dimension have country-specific conditions that are important in classifying households as deprived or non-deprived. For example, in the Niger, clean cooking fuels include purchased firewood, gas, electricity, petrol and biomass. Similarly, improved sanitation covers flush toilets, improved and covered latrines, and uncovered and improved latrines. Non-safe drinking water includes open wells, surface water (from a non-protected source), rivers, lakes, dams, tanker trucks and traveling vendors. Water from a mini AEP (the acronym is from the French "*mini adduction d'eau potable*"), which is a borehole system that feeds standpipes serving populations of under 2 000 people, is considered as a safe water source. An important assumption for classifying households as non-deprived is that the water source has to be considered safe in both dry and wet seasons, or at least in one of the seasons.

Furthermore, in the Niger, non-adequate materials for housing are soil and sand for floors; dirt, stones with mud, wood/straw and stabilized earth for walls; and hides/skins, wood, dirt/soil and straw for roofs. A household is considered to be deprived in the assets indicator if it does not own more than one of the following assets: television, radio, telephone/mobile telephone, refrigerator, bicycle, motorbike, or computer or oxcart, and it does not own a vehicle. Vehicle ownership refers to all motorized assets, such as a car, truck or tractor.

The rural livelihoods and resources dimension is one of the two new dimensions included in R-MPI and it covers five new indicators. The indicator on child labour has an age threshold of 5–11 years, which has been selected based on the ILO Minimum Age Convention, 1973 (No. 138). Furthermore, the indicator on extension services in the Niger covers services such as information and training on new seed varieties, pest control, fertilizer use, pit planting, irrigation, composting, marketing and selling of crops, growing/selling tobacco, access to credit, forestry, general animal care, animal diseases/vaccination, fishery production, contract farming and agroforestry. Key sources of extension services include government and private agricultural extension providers such as non-governmental organizations, agricultural cooperatives, farmer associations, farmer field schools and village extension services.

The risk dimension is the second addition to the index and it covers two new indicators in the Niger. One of the important aspects of this dimension is to provide an understanding of the type of shocks that are considered as covariate. Covariate shocks in the Niger refers to droughts, floods, unusually high levels of crop pests, unusually high levels of livestock disease, irregular rains, unusually high costs for agricultural inputs, unusually low prices for agricultural outputs and unusually high prices for food outputs. For the indicator on risk exposure and coping strategies, the sale of household assets, changing eating patterns and working more are some of the coping strategies considered as non-formal or non-adequate. One single episode of non-adequate coping qualifies as a deprivation.

Lastly, the indicator on risk of climate shocks is based on geospatial and historical weather (temperature and precipitation) data. It gauges the degree to which households are exposed to weather-related shocks that characterize rural poverty. In the Niger, the indicator classifies a household as deprived if it is in a locality with the probability of facing either a drought or a flood.

### Main results of the R-MPI

As described in Parts 1 and 2 of this report, the R-MPI reflects the share of the rural population that is multidimensionally poor – that is, the incidence of poverty or headcount ratio (H) – adjusted by the average proportion of indicators in which they are deprived, which is the average intensity of their poverty (A). Although the poverty cut-off (*k*) for the R-MPI is 33.3 percent, a headcount ratio is also estimated for two other ranges of poverty cut-offs. A person is identified as vulnerable to poverty if she or he is deprived in 20.0–33.3 per cent of the weighted indicators. Concurrently, a person is identified as living in severe poverty if she or he is deprived in 50–100 per cent of the weighted indicators.

Table C5 presents the main results for the R-MPI computed using the National Survey on Household Living Conditions and Agriculture for 2014 and compares it against two other multidimensional measures. The first measure is the original global MPI computed for rural Niger using the Demographic and Health Survey for 2016. Given the comparability limitations that arise from using a different survey and indicator structure, a proxy global MPI (PG-MPI) composed of only the first three dimensions of the R-MPI was computed using the same survey as the R-MPI.

The results show a greater degree of multidimensional poverty in the adjusted headcount ratio (the R-MPI), where the average intensity of poverty (A) is added into the incidence of multidimensional poverty (H). With similar levels of prevalence of multidimensional poverty experienced by rural poor people in both measures, it is clear that the difference between the R-MPI results and the rural global MPI results is driven by the greater intensity of deprivations, reaching approximately 67 per cent.

**Table C5. Main results: the Niger 2014**

| | (H x A) | Headcount ratio (H) | Average intensity of poverty (A) | Vulnerable | Severe |
|---|---|---|---|---|---|
| **R–MPI** | 0.532 | 94.7 | 56.2 | 4.7 | 64.2 |
| **Global MPI (rural, 2016)** | 0.647 | 96.7 | 66.8 | 2.5 | 83.0 |
| **PG–MPI** | 0.611 | 95.8 | 63.8 | 3.7 | 79.3 |

*Source:* https://ophi.org.uk/2018-global-mpi-resources/ (for the global MPI), and authors' calculations.

In Figure C12 a comparison is presented between the R-MPI and the PG-MPI in the left panel, and between the R-MPI and the Monetary Match in the right panel. The PG-MPI was computed using only the first three dimensions of the R-MPI – food security and nutrition, education and living standards – using the same microdata as those used for the R-MPI. The Monetary Match is a calculated monetary poverty measure that allows for the setting of a poverty line (that is based on the daily consumption per capita) at the value that generates a proportion of monetary poor households corresponding to the proportion of households identified as poor by the R-MPI.[32]

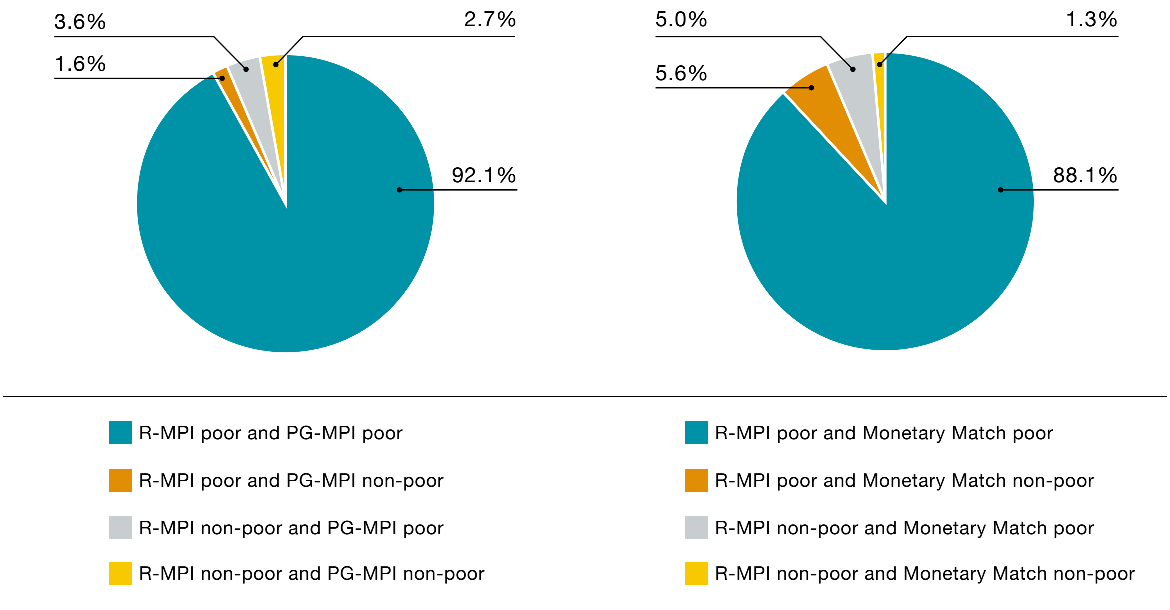
For the comparison in the left panel, the households were separated into four mutually exclusive and collectively exhaustive groups: people in group 1 are those identified as poor by both the R-MPI and the PG-MPI; people in group 2 are those identified as poor by the R-MPI but identified as non-poor by the PG- MPI; people in group 3 are those identified as non-poor by the R-MPI but identified as poor by the PG-MPI; and people in group 4 are those identified as non-poor by both the R-MPI and the PG-MPI. The panel on the right presents a similar exercise, but instead of comparing the R-MPI against the PG-MPI, the R-MPI is compared against the Monetary Match.

The comparisons show how poverty measures based on monetary indicators (that is, household income or consumption) differ from multidimensional poverty. This can be determined by comparing the proportions of people in group 1 and group 3 between both panels. In the Niger, the proportion

32 See Section 2.6 of the present report for a detailed description of the PG-MPI and the Monetary Match.

of people sharing the same poverty status under the R-MPI and the PG-MPI is much higher than the proportion of people sharing the same poverty status under the R-MPI and the Monetary Match. This implies that the overlap between the R-MPI and the PG-MPI (group 1 in the left panel) is much larger compared to the overlap between the R-MPI and the Monetary Match (group 1 in the right panel). This is in line with the findings described in the first section of the report – that is, that mismatches between monetary and non-monetary deprivations are frequent. Moreover, Figure C12 also shows that all those individuals who are identified as PG-MPI poor are not R-MPI poor in 3.6 percent of the cases, whereas all those individuals who are identified as Monetary Match poor are not recognized as R-MPI poor in 5 percent of the cases. Therefore, the above two comparisons imply that the mismatch between the R-MPI and the Monetary Match is more prominent compared to the mismatch between the R-MPI and the PG-MPI.

**Figure C12. Mismatch analysis of monetary and multidimensional poverty levels in rural areas in the Niger**

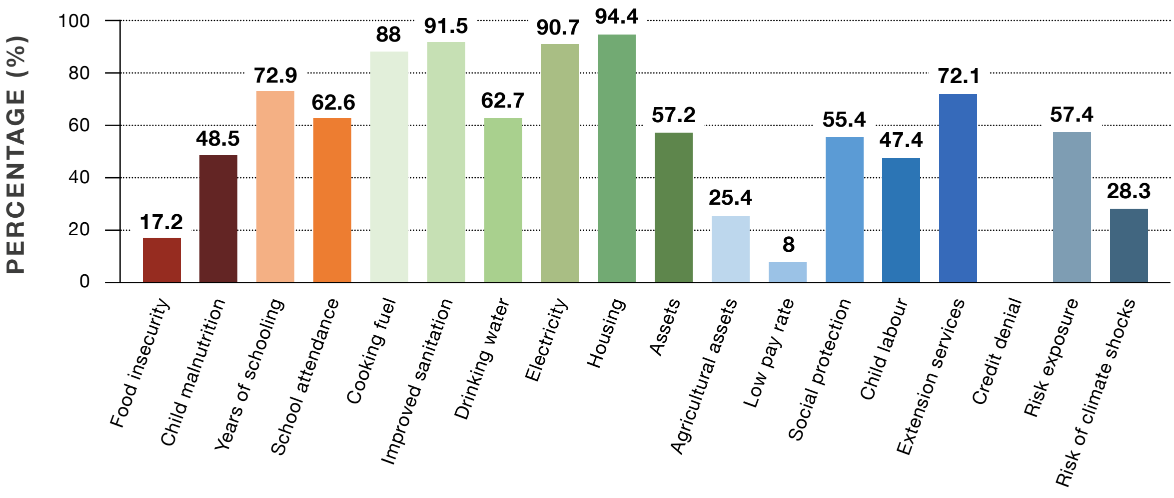



*Source:* Authors' computations, 2021.

## Composition of the R-MPI

Figure C13 shows the censored headcount ratios of multidimensional poverty in the Niger. The censored headcount ratio of an indicator represents the proportion of individuals who are multidimensionally poor and simultaneously deprived in the specific indicator. Indicators within the living standards dimension, such as cooking fuel, improved sanitation, electricity and housing, show the highest level of censored headcount ratios. In each of these indicators, more than 85 percent of the rural poor population is deprived. This implies that the above-mentioned indicators play an important role in determining whether the population is multidimensionally poor or not. The analysis further shows that collected firewood is the primary source of cooking fuel among rural households, reaching 92 per cent in the Niger, and thus causes the high deprivation in the cooking fuel indicator (88 percent).

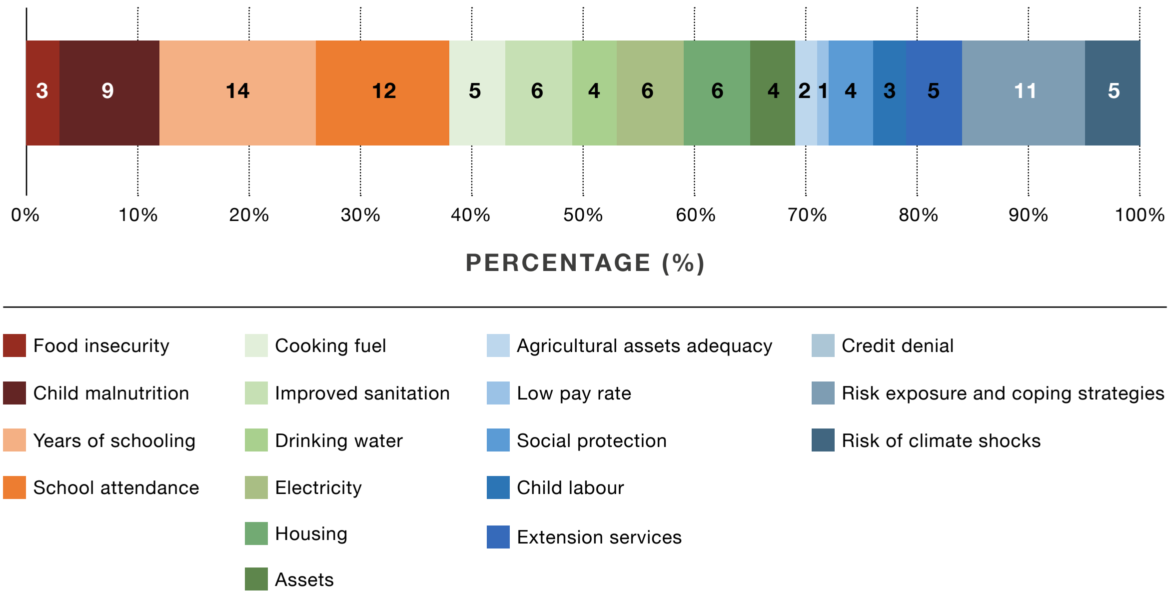
**Figure C13. Censored deprivation by indicator (percentage)**




*Source:* Authors' computations, 2021.

Furthermore, the low pay rate indicator shows the lowest incidence of deprivation, being below 10 percent. This is likely due to the construction of the indicator itself, as all individuals living in a household where none of its household members is a wage employee are automatically classified as being non-deprived.

**Figure C14. Contribution of indicators to the R-MPI (percentage)**




*Source:* Authors' computations, 2021.

## Percentage contribution of indicators to the R-MPI

The censored headcount ratio shows the extent of deprivations among the poor but it does not reflect the relative value of the indicators. Two indicators may have the same censored headcount ratios but different contributions to overall poverty because the contribution depends both on the censored headcount ratio and on the weight assigned to each indicator. As such, a complementary analysis to the censored headcount ratio is the percentage contribution of each indicator to overall multidimensional poverty.

The bar graph in Figure C14 shows a comparison of the percentage contribution of each indicator, where the colours inside each bar denote the percentage contribution of each indicator to the overall R-MPI. It is worth highlighting that, on the one hand, years of schooling (13 percent) and risk of climate shocks (12 percent) are the indicators that contribute the most to the R-MPI, followed by school attendance (11 percent) and risk exposure and coping strategies (10 percent). On the other hand, the indicators that contribute the least to the R-MPI are low pay rate (1 percent) and agricultural assets adequacy (2 percent), both within the rural livelihoods and resources dimension.

## Poverty map to demonstrate regional breakdowns

The data are representative at the subnational level for seven regions in the Niger, namely Agadez, Diffa, Dosso, Maradi, Tahoua, Tillaberi and Zinder. Figure C15 shows the decomposed results of the headcount ratios by region, where dark red indicates a higher headcount ratio (H) and therefore greater poverty, while dark blue indicates a lower headcount ratio (H) and therefore lower poverty. It should be noted that, naturally, the map shows the entire country across rural and urban areas, but the colour-coded results present only rural poverty. From the figure, it can be seen that Tillaberi is the least poor region, with a headcount ratio of 90.62 percent, followed by Tahoua with 93.41 percent. The two poorest regions are Maradi and Diffa, both with a headcount ratio of 97 percent.

**Table C6. Main results by region: the Niger**

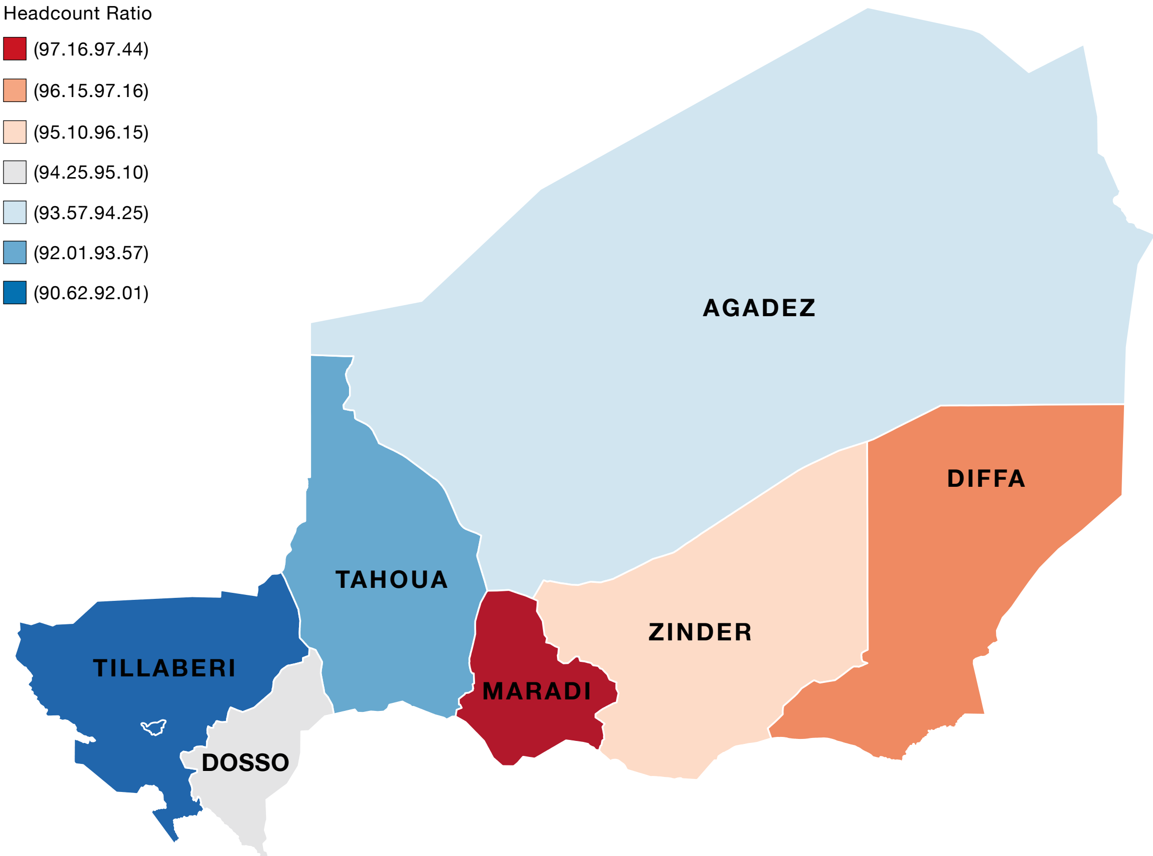
| | Region | Estimate | SD | Std.Err | L_CI | U_CI | Share of rural households (%) |
|---|---|---|---|---|---|---|---|
| Headcount ratio (H) | Agadez | 93.72 | 24.26 | 0.606 | 92.536 | 94.914 | 13.4 |
| | Diffa | 96.87 | 17.41 | 0.41 | 96.07 | 97.67 | 14.3 |
| | Dosso | 94.78 | 22.25 | 0.51 | 93.78 | 95.78 | 14.3 |
| | Maradi | 97.44 | 15.8 | 0.34 | 96.78 | 98.11 | 14.7 |
| | Tahoua | 93.41 | 24.82 | 0.59 | 92.26 | 94.57 | 14.2 |
| | Tillaberi | 90.62 | 29.17 | 0.67 | 89.31 | 91.93 | 14.1 |
| | Zinder | 95.43 | 20.89 | 0.46 | 94.53 | 96.33 | 15.1 |
| Average intensity of poverty (A) | Agadez | 57.95 | 12.12 | 0.31 | 57.34 | 58.56 | 13.4 |
| | Diffa | 61.45 | 12.31 | 0.29 | 60.87 | 62.02 | 14.3 |
| | Dosso | 57.83 | 12.02 | 0.28 | 57.27 | 58.38 | 14.3 |
| | Maradi | 56.42 | 11.96 | 0.26 | 55.91 | 56.93 | 14.7 |
| | Tahoua | 54.2 | 11.4 | 0.28 | 53.65 | 54.76 | 14.2 |
| | Tillaberi | 53.39 | 11.73 | 0.28 | 52.84 | 53.94 | 14.1 |
| | Zinder | 57.28 | 12.76 | 0.29 | 56.72 | 57.84 | 15.1 |

| | Region | Estimate | SD | Std.Err | L_CI | U_CI | Share of rural households (%) |
|---|---|---|---|---|---|---|---|
| R–MPI (H x A) | Agadez | 0.559 | 0.141 | 0.004 | 0.553 | 0.566 | 13.4 |
| | Diffa | 0.604 | 0.135 | 0.003 | 0.598 | 0.61 | 14.3 |
| | Dosso | 0.562 | 0.136 | 0.003 | 0.556 | 0.568 | 14.3 |
| | Maradi | 0.557 | 0.127 | 0.003 | 0.551 | 0.562 | 14.7 |
| | Tahoua | 0.525 | 0.128 | 0.003 | 0.519 | 0.531 | 14.2 |
| | Tillaberi | 0.507 | 0.14 | 0.003 | 0.501 | 0.513 | 14.1 |
| | Zinder | 0.558 | 0.142 | 0.003 | 0.552 | 0.564 | 15.1 |

Note: L_CI = lower confidence interval; SD = standard deviation; Std. Err. = standard error; U_CI = upper confidence interval.

*Source:* Authors' computations, 2021.

**Figure C15. Rural multidimensional poverty incidence (H) at the regional level**



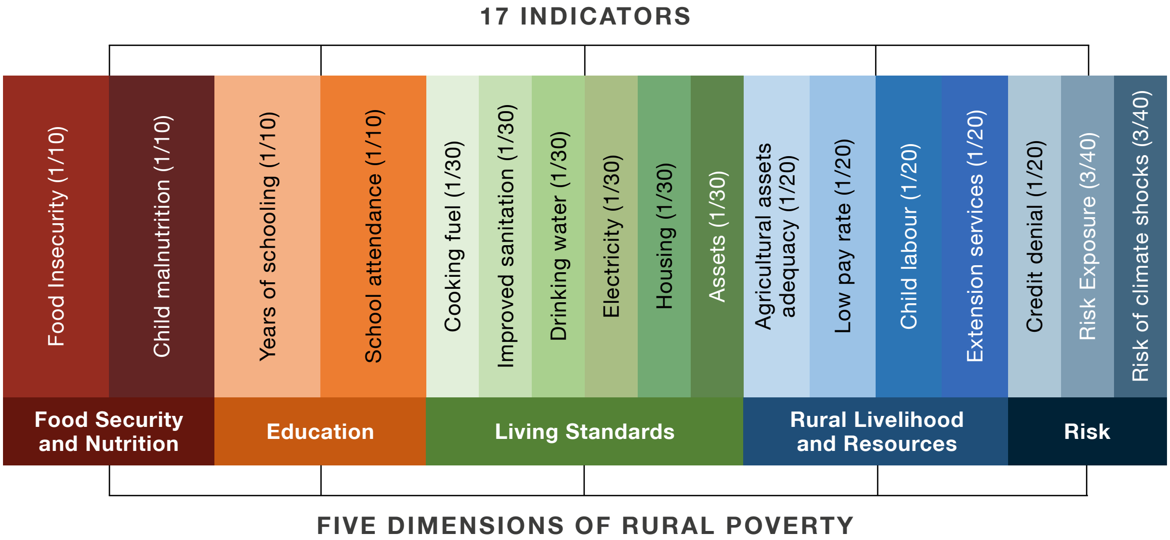

The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

*Source:* DIVA-GIS. 2021. Administrative areas (boundaries) [shapefile]. Modified with the authors' computations, 2021.

## NIGERIA

The R-MPI in Nigeria is composed of 17 indicators distributed across five dimensions (see Figure C16), and it classifies a person or household as poor if the weighted deprivation score is equal to or higher than 33.3 percent.

**Figure C16. Composition of the R-MPI in Nigeria**




*Source:* Authors'own elaboration, 2021.

The computation of the R-MPI in Nigeria uses data from the General Household Survey for 2015/16. The data contain nearly all of the information required for the computation of the R-MPI but lack sufficient information on the indicator on social protection. That indicator aims to cover formal national social assistance programmes, job pensions and health insurance schemes, social safety nets and/or conditional cash transfers. In the General Household Survey, information was available only on pensions, thus narrowing the scope of sources of social protection. Consequently, the indicator on social protection is excluded from the analysis, and the weighting of the remaining indicators within the rural livelihoods and resources dimension was adjusted accordingly.

Within the food security and nutrition dimension, the indicator on food insecurity was estimated using FIES, while child malnutrition was estimated using anthropometric data. Under FIES, severe food insecurity implies that a person or household has a high probability of reduced food intake, while children under 5 years of age are considered malnourished if their z-score of either height-for-age (stunting) or weight-for-age (underweight) is below -2 standard deviations from the median of the reference population.

In Nigeria, the official primary school entrance age is 6 years, and hence the eligible population for the indicator on years of schooling is 12 years or older, as the indicator describes as deprived any individual who has completed fewer than six years of education. Similarly, the eligible population for the indicator on school attendance is any individual studying in the eighth class or below, which in the case of Nigeria includes all children between the ages of 6 and 14 years.

The indicators within the living standards dimension have country-specific conditions that are important in classifying households as deprived or non-deprived. For example, in Nigeria, non-clean cooking fuels include collected firewood, charcoal, crop residue, sawdust, animal waste and others. Similarly, non-improved sanitation includes toilets on water, pails/buckets, uncovered pit latrines and shared, or no, toilet facilities. Non-safe drinking water sources are unprotected wells, unprotected springs, tanker trucks, piped water from kiosks, surface water (such as rivers and lakes), carts with a small tank and other unspecified sources. Furthermore, non-adequate materials for housing are dirt, sand, straw and smoothed mud for floors; grass, mud, compacted earth and unfired mud bricks for walls; and grass, clay tiles and plastic sheeting for roofs.

The information on agricultural extension services is vast in Nigeria. The indicator on extension services takes into consideration programmes fostering the access of the rural population to information and training on new seed varieties, pest control, fertilizer use, irrigation, composting and others, and fostering and providing advice on such activities as marketing and selling crops, growing and selling tobacco, access to credit, forestry, general animal care, animal diseases/vaccination and fishery production. Key sources of extension services include the Government and private agricultural extension providers such as non-governmental organizations, agricultural cooperatives, farmer associations, farmer field schools and agricultural extension courses.

Within the risk dimension, the indicator on risk exposure and coping strategies assigns a household the deprived status if it suffered from at least one covariate rural shock. The list includes the destruction of harvest by fire, poor rains and flooding that cause harvest failure, pest invasions that cause harvest failure or storage loss, loss of land, the death of livestock due to illness, increases in the price of inputs, variations in the price of outputs and increases in the price of major food items consumed that could not be responded to with an adequate coping strategy such as unconditional support from the Government or a non-governmental organization.

Lastly, the indicator on risk of climate shocks is based on geospatial and historical weather (temperature and precipitation) data. It gauges the degree to which households are exposed to weather-related shocks that characterize rural poverty. In Nigeria, the indicator classifies a household as deprived if it is in a locality with a probability of facing a drought or a flood.

## Main results of the R-MPI

As described in Parts 1 and 2 of this report, the R-MPI reflects the share of the rural population that is multidimensionally poor – that is, the incidence of poverty or headcount ratio (H) – adjusted by the average proportion of indicators in which they are deprived, which is the average intensity of their poverty (A). Although the poverty cut-off (*k*) for the R-MPI is 33.3 percent, a headcount ratio is also estimated for two other ranges of poverty cut-offs. A person is identified as vulnerable to poverty if she or he is deprived in 20.0–33.3 per cent of the weighted indicators. Concurrently, a person is identified as living in severe poverty if she or he is deprived in 50–100 per cent of the weighted indicators.

Table C7 presents the main results for the R-MPI using the General Household Survey for 2015/16 and compares the results against two other multidimensional measures. The first one is the original global MPI computed for rural Nigeria using the Demographic and Health Survey for 2016. Given the comparability limitations that arise from using a different survey and indicator structure, a PG-MPI composed of the first three dimensions of the R-MPI was computed using the same survey as the R-MPI.

In Nigeria, the R-MPI shows an equal degree of multidimensional poverty in the adjusted headcount ratio (the R-MPI) as in the PG-MPI. However, differences with respect to the average intensity of poverty (A) and the incidence of multidimensional poverty (H) are worth mentioning. While the R-MPI identifies less of the population as multidimensionally poor, the average intensity is higher in the PG-MPI and global MPI measures.

**Table C7. Main results: Nigeria 2016**

| | (H x A) | Headcount ratio (H) | Average intensity of poverty (A) | Vulnerable | Severe |
|---|---|---|---|---|---|
| **R–MPI** | 0.249 | 54.5 | 45.7 | 32.2 | 18.0 |
| **Global MPI (rural, 2017)** | 0.372 | 65.1 | 57.2 | 16.2 | 42.0 |
| **PG–MPI** | 0.249 | 47.5 | 48.8 | 23.4 | 22.6 |

*Source:* https://ophi.org.uk/2018-global-mpi-resources/ (for the global MPI) and authors' own calculations, 2021.

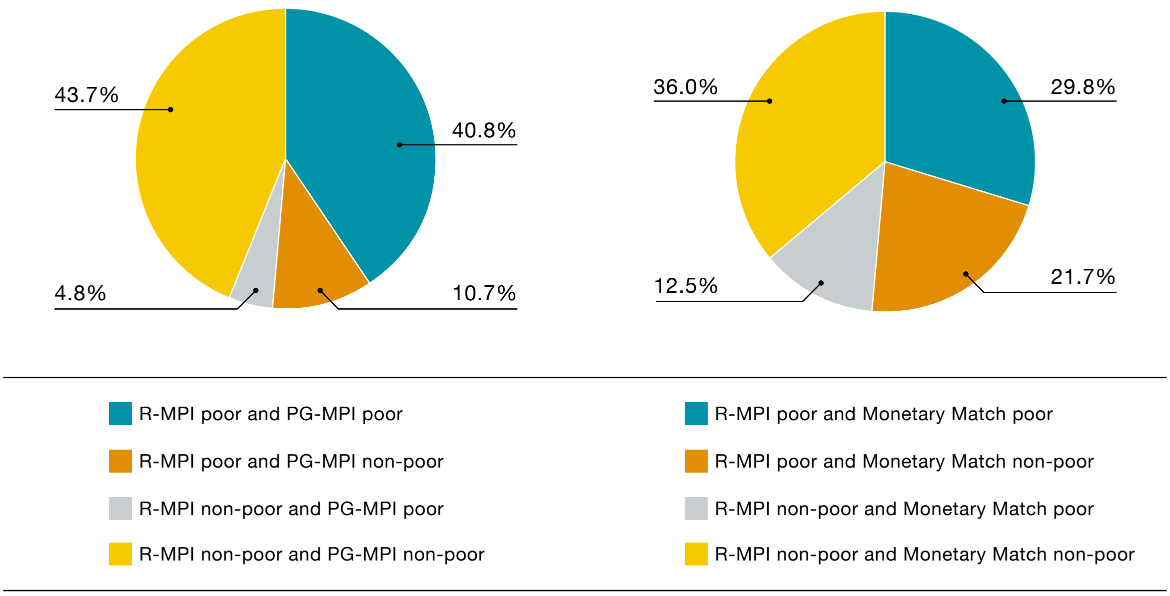
In Figure C17, a comparison is presented between the R-MPI and the PG-MPI in the left panel, and between the R-MPI and the Monetary Match in the right panel. The PG-MPI was computed using only the first three dimensions of the R-MPI – food security and nutrition, education and living standards – using the same microdata as for the R-MPI. The Monetary Match is a calculated monetary poverty measure that allows for the setting of a poverty line (that is based on the daily consumption per capita) at the value that generates a proportion of monetary poor households corresponding to the proportion of households identified as poor by the R-MPI.[33]

For the comparison in the left panel, the households are separated into four mutually exclusive and collectively exhaustive groups: people in group 1 are those identified as poor by both the R-MPI and the PG-MPI; people in group 2 are those identified as poor by the R-MPI but identified as non-poor by the PG-MPI; people in group 3 are those identified as non-poor by the R-MPI but identified as poor by the PG-MPI; and people in group 4 are those identified as non-poor by both the R-MPI and the PG-MPI. The panel on the right presents a similar exercise, but instead of comparing the R-MPI against the PG-MPI, it is compared against the Monetary Match.

The comparisons show how the poverty measures based on monetary indicators (that is, household income or consumption) differ from multidimensional poverty by comparing the proportions of people in group 1 and group 3 between both panels. In Nigeria, the proportion of people sharing the same poverty status under the R-MPI and the PG-MPI is much higher than the proportion of people sharing the same poverty status under the R-MPI and the Monetary Match. This implies that the overlap between the R-MPI and the PG-MPI (group 1 in the left panel) is much larger compared to the overlap between the R-MPI and the Monetary Match (group 1 in the right panel). This is in line with existing findings of the first part of the report, namely that mismatches between monetary and non-monetary deprivations are frequent. Moreover, Figure C17 also shows that all those individuals that are identified as PG-MPI poor are not R-MPI poor in 4.8 percent of the cases, whereas all those individuals that are identified as Monetary Match poor are not recognized as R-MPI poor in 12.5 percent of the cases. Therefore, the above two comparisons imply that the mismatch between the R-MPI and the Monetary Match is more prominent compared to the mismatch between the R-MPI and the PG-MPI.

[33] See Section 2.6 of the present report for a detailed description of the PG-MPI and the Monetary Match.

**Figure C17. Mismatch analysis of monetary and multidimensional poverty levels in rural areas**




*Source:* Authors' computations, 2021

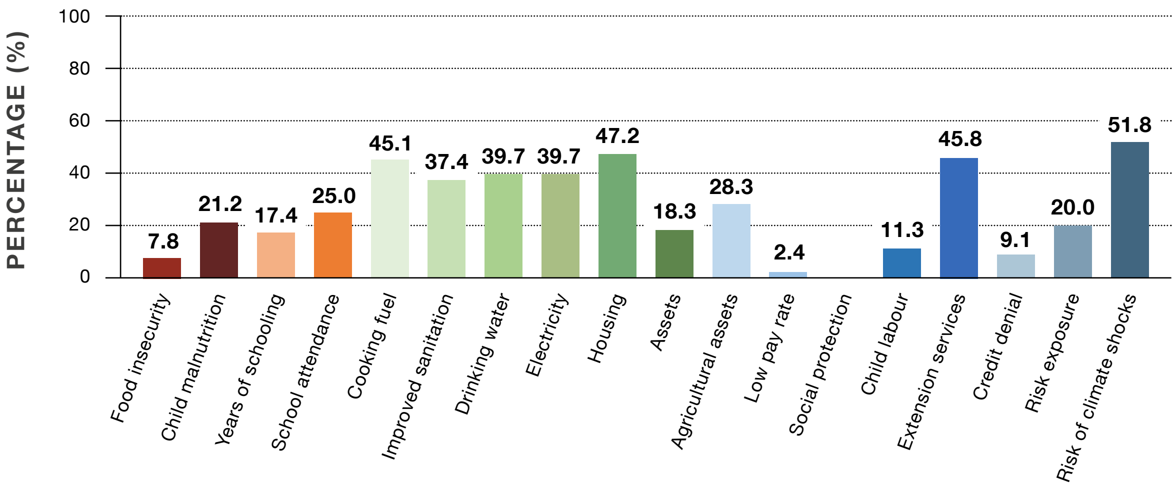
## Composition of the R-MPI

Figure C18 shows the censored headcount ratios of multidimensional poverty. The censored headcount ratio of an indicator represents the proportion of individuals who are multidimensionally poor and simultaneously deprived in the specific indicator. Two indicators within the new dimensions of rural livelihoods and resources and risk show the highest levels of the censored headcount ratio. About half of the poor population live in households located in areas with a high risk of drought or flooding. More than 40 percent of the poor population live in households where no member has received any extension service. This implies that the above-mentioned indicators play an important role in determining whether the population is multidimensionally poor or not. The analysis further shows that 45 percent of the population live in households whose dwelling is built with inadequate materials for their floor, walls or roof.

The low pay rate indicator shows the lowest incidence of deprivation, at below 10 percent. This is likely due to the construction of the indicator itself, as all individuals living in a household where none of its household members is a wage employee are automatically classified as being non-deprived. It is also worth mentioning that only 7 percent of the poor population live in households with a high probability of being severely food insecure.

The censored headcount ratio shows the extent of deprivations among the poor but it does not reflect the relative value of the indicators. Two indicators may have the same censored headcount ratios but different contributions to overall poverty because the contribution depends both on the censored headcount ratio and on the weight assigned to each indicator. As such, an analysis complementary to the censored headcount ratio is the percentage contribution of each indicator to overall multidimensional poverty.

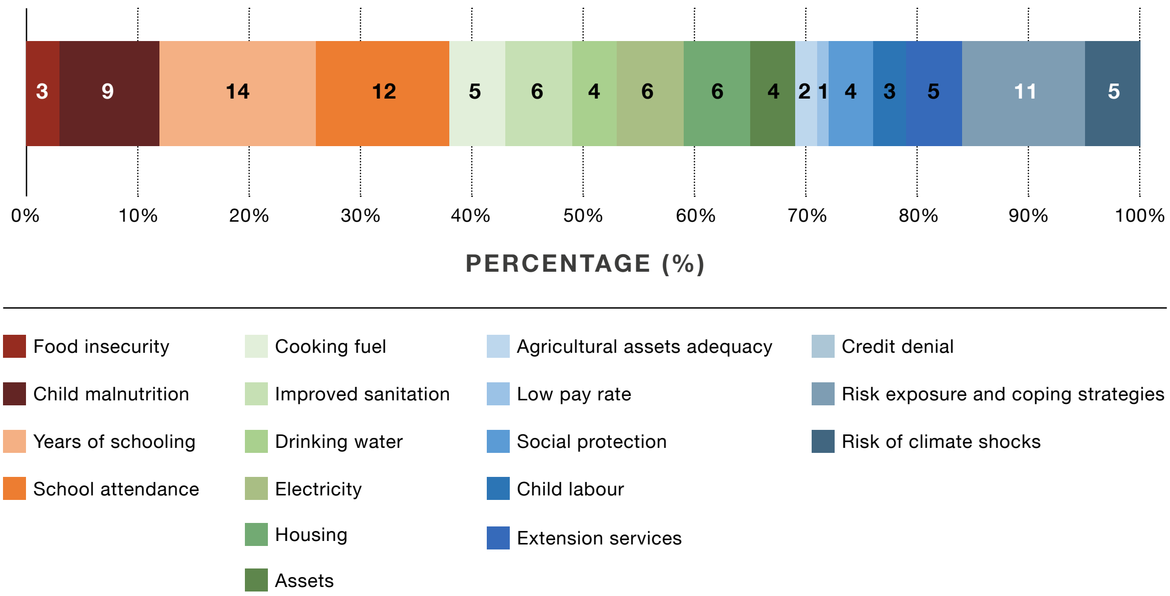
**Figure C18. Censored deprivations by indicator (percentage)**




*Source:* Authors' computations, 2021.

Figure C19 shows a bar graph that compares the percentage contribution of each indicator; the colours inside each bar denote the percentage contribution of each indicator to the overall R-MPI. In Nigeria, risk of climate shocks is the indicator that contributes the most to the R-MPI (16 percent), followed by child labour (10 percent). Extension services and child malnutrition each contribute 9 percent.

**Figure C19. Contribution of indicators to the R-MPI (percentage)**




*Source:* Authors' computations, 2021.

## Poverty map to demonstrate regional breakdowns

The data are representative at the subnational level for six geopolitical zones: North-West, North-East, North Central, South-West, South-East and South-South. Figure C20 shows the decomposed results of the headcount ratios by zone. Dark red indicates a higher headcount ratio (H) and therefore greater poverty, while dark blue indicates a lower headcount ratio (H) and therefore lower poverty. Naturally, the maps depicts the entire country across rural and urban areas, but the colour-coded results present only rural poverty. The North-West and North-East zones are the poorer zones, while the South-West and the South-South zones less so. Overall, there is an important gap between the headcount ratio of the poorer zones of the north compared to the better-off zones of the south. This implies that in Nigeria the rural multidimensionally poor are significantly concentrated in the northern part of the country.

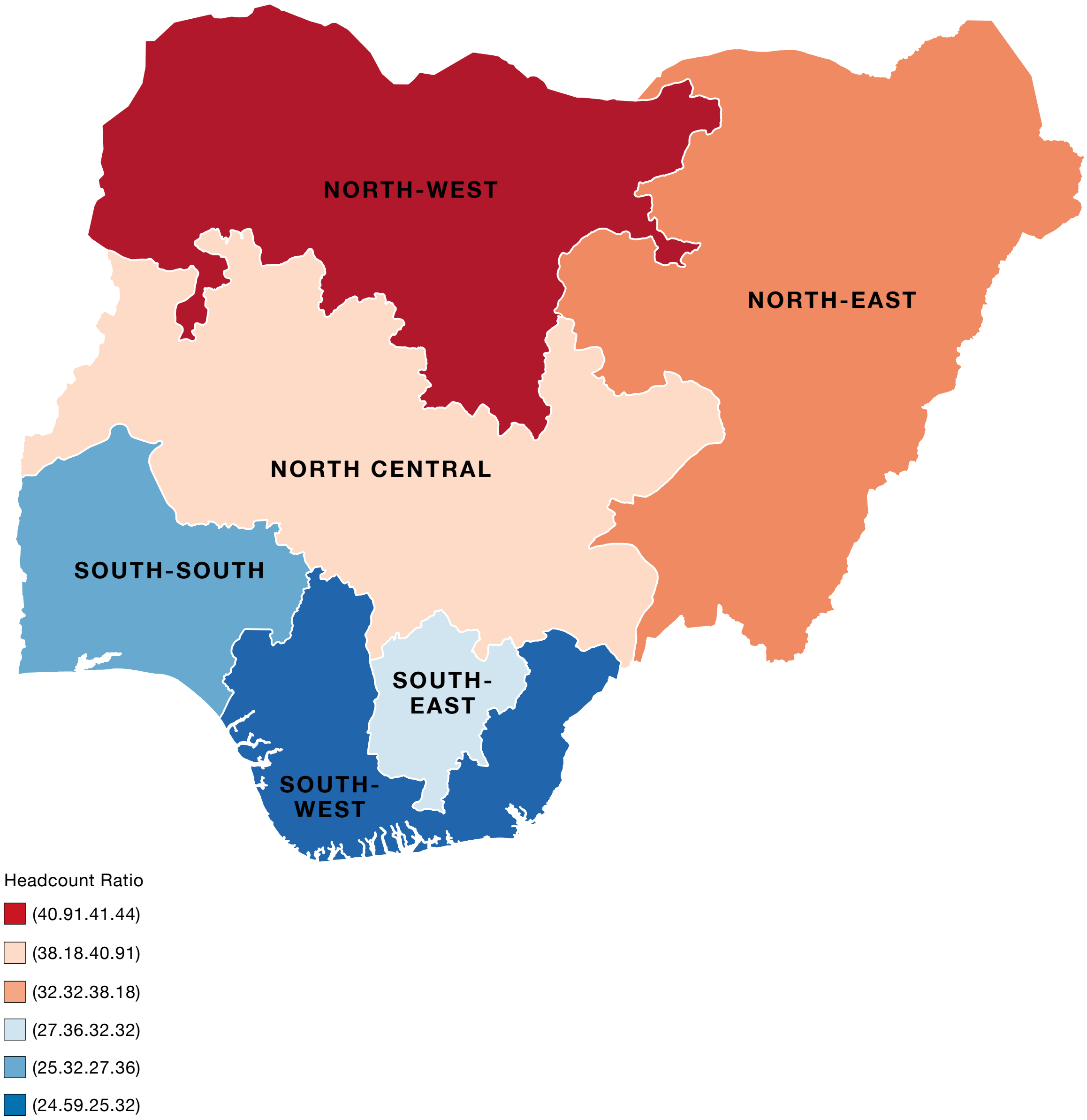
**Table C8. Main results by geopolitical zone: Nigeria**

| | Zone | Estimate | SD | Std.Err | L_CI | U_CI | Share of rural households (%) |
|---|---|---|---|---|---|---|---|
| **Headcount ratio (H)** | North Central | 57.29 | 49.47 | 0.82 | 55.68 | 58.90 | 18.3 |
| | North–East | 70.52 | 45.60 | 0.71 | 69.14 | 71.90 | 17.3 |
| | North–West | 72.64 | 44.59 | 0.60 | 71.45 | 73.82 | 23.0 |
| | South–East | 29.56 | 45.64 | 0.88 | 27.84 | 31.28 | 18.0 |
| | South–South | 22.30 | 41.64 | 0.80 | 20.73 | 23.88 | 16.5 |
| | South–West | 21.80 | 41.31 | 1.40 | 19.04 | 24.55 | 6.9 |
| **Average intensity of poverty (A)** | North Central | 44.07 | 8.41 | 0.18 | 43.71 | 44.43 | 18.3 |
| | North–East | 46.72 | 10.21 | 0.19 | 46.35 | 47.08 | 17.3 |
| | North–West | 47.42 | 9.76 | 0.16 | 47.12 | 47.73 | 23.0 |
| | South–East | 41.33 | 6.87 | 0.24 | 40.86 | 41.80 | 18.0 |
| | South–South | 41.02 | 6.28 | 0.23 | 40.57 | 41.47 | 16.5 |
| | South–West | 39.96 | 5.52 | 0.38 | 39.21 | 40.70 | 6.9 |
| **R–MPI (H x A)** | North Central | 0.360 | 0.119 | 0.002 | 0.356 | 0.364 | 18.3 |
| | North–East | 0.404 | 0.134 | 0.002 | 0.400 | 0.408 | 17.3 |
| | North–West | 0.414 | 0.131 | 0.002 | 0.411 | 0.418 | 23.0 |
| | South–East | 0.287 | 0.102 | 0.002 | 0.283 | 0.291 | 18.0 |
| | South–South | 0.246 | 0.111 | 0.002 | 0.242 | 0.250 | 16.5 |
| | South–West | 0.261 | 0.098 | 0.003 | 0.254 | 0.267 | 6.9 |

Note: L_CI = lower confidence interval; SD = standard deviation; Std. Err. = standard error; U_CI = upper confidence interval.

*Source:* Authors' computations, 2021.

**Figure C20. Rural multidimensional poverty incidence by geopolitical zone**




The boundaries and names shown and the designations used on these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

*Source:* DIVA-GIS. 2021. Administrative areas (boundaries) [shapefile]. Modified with the authors' computations, 2021.

This report is the result of the collaboration between the Food and Agriculture Organization of the United Nations (FAO) and the Oxford Poverty and Human Development Initiative (OPHI), aimed at improving the conceptualization of poverty in rural areas, while proposing, discussing, and testing a new multidimensional measure of rural poverty, called the Rural Multidimensional Poverty Index (R-MPI).

While a high number of people live in poverty are in rural areas worldwide, the measurement of rural poverty must be improved, to better understand who the poor are, where they live and which specific constraints prevent them from escaping poverty. Harmonized information on rural poverty are needed to inform a sound and homogeneous measurement and to allow policy makers to identify those being left behind in rural areas and target their programmes more effectively.

Relying on a multidimensional approach, the work included in this report fills an important gap in the measurement of rural poverty. The R-MPI is a metric that encompasses five dimensions, namely food security and nutrition, education, living standards, rural livelihoods and resources and risk. This new metric can be applied in a variety of contexts, using data at the household or individual level.

Results presented in this report demonstrate the effectiveness of the approach taken with the R-MPI, in building operational rural poverty profiles and the potential that this tool has in providing additional evidence on poverty dimensions that are not captured by other metrics.

ISBN 978-92-5-135618-0 ISSN 1014-3378

9 789251 356180

CB8269EN/1/01.22