OPHI MPI METHODOLOGICAL NOTE 51

The Global Multidimensional Poverty Index (MPI) 2021

Sabina Alkire*, Usha Kanagaratnam* and Nicolai Suppa*

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* The Oxford Poverty and Human Development Initiative (OPHI), Oxford Department of International Development, University of Oxford. Contact details: ophi@qeh.ox.ac.uk Tel +44 1865 271915.

This note has been prepared within the OPHI theme on multidimensional poverty measurement.

Citation for this document and global MPI 2021 data tables, namely Table 1 (National Results), Table 2 (Other Poverty Cutoff Results), Table 3 (Age Results), Table 4 (Rural/Urban Area Results), Table 5 (Subnational Results), Table 6 (Trends Results), Table 7 (Female/Male Headship Results) and Table 8 (All MPI Data Ever Published 2010-2021):

Alkire, S., Kanagaratnam, U., and Suppa, N. (2021). 'The global Multidimensional Poverty Index (MPI) 2021', OPHI MPI Methodological Note 51, Oxford Poverty and Human Development Initiative, University of Oxford.

We standardised and harmonised indicators across 221 survey data sets to produce the results for global MPI 2021. The technical files can be downloaded from www.ophi.org.uk > Global MPI > Data Tables and Do-files. Our country briefings that show country-specific results can be downloaded from www.ophi.org.uk > Global MPI > Country Briefings. Our databank that provides a powerful visual of the results can be viewed at www.ophi.org.uk > Global MPI > Global MPI Databank.

Contents

1. Overview

This 51st Methodological Note presents the methodology and technical decisions behind the global Multidimensional Poverty Index (MPI) 2021 and the results presented in Tables 1–8. This document is part of OPHI MPI Methodological Notes series. A Methodological Note is published for every release of the global MPI.

The 2021 global MPI presents results on multidimensional poverty, using the most recent data from 109 countries, covering 5.9 billion people, and including trends over time in 84 countries. The estimation of MPI and its partial indices are further disaggregated by age groups, rural/urban areas, and subnational regions. A new element in this 2021 round is that we have disaggregated by gender of household head (female and male) and present results for three points in time for 28 of the 84 countries with harmonised estimates. This document jointly presents the policies that underlie our current margin estimates and the harmonised over time estimates.[1]

This document is structured as follows. Section 2 presents the global MPI structure and indicator definitions. Section 3 provides an outline of the global MPI and its partial indices that we estimate and publish. Section 4 summarises the changes over time methodology. Section 5 outlines the data management policies of the global MPI; while section 6 details the decisions that underlie our harmonisation work. Section 7 provides a summary of survey details. Section 8 summarises the country-specific technical decisions that were applied for each of these new surveys. We conclude with a couple of closing remarks.

2. The global MPI structure[2]

The global MPI, published annually since 2010, captures acute multidimensional poverty in the developing regions of the world. This measure is based on the dual-cutoff counting approach to poverty developed by Alkire and Foster (2011). The global MPI was developed in 2010 by Alkire and Santos (2014, 2010) in collaboration with the UNDP's Human Development Report Office (HDRO). Since its inception, the

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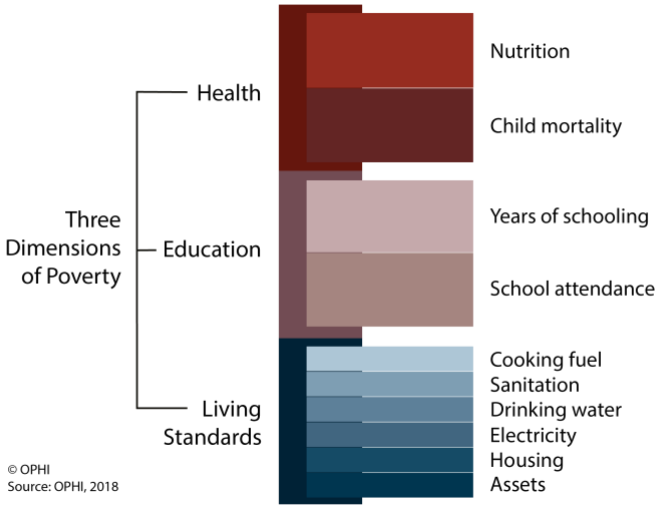
1 This 51st Methodological Note marks an important development in our global workline. We revised the global MPI workflow, to include (1) indicator standardisation and harmonisation for each country survey; and (2) estimation of harmonised levels and changes over time. The aim was to ensure the production of the standardised and harmonised estimates are done concurrently and efficiently on an annual basis. In 2020, an eighty-country study of changes over two points in time was produced as a research output by Alkire, S., Kovesdi, F., Mitchell, C., Pinilla-Roncancio, M. and Scharlin-Pettee, S. (2020). It may be the case that for a number of countries there is slight differences between the harmonised estimates published last year and this year because of minor corrections.

2 The text in this section draws on methodological notes published for previous rounds of the global MPI and the book by Alkire, Foster, Seth et al. (2015). It is useful to include similar text in each methodological note, in order to provide an overview of the global MPI structure, as well as MPI and its partial indices to first-time users of the global MPI data.

global MPI has used information from 10 indicators, which are grouped into three equally weighted dimensions: health, education, and living standards (Figure 1). These dimensions are the same as those used in the UNDP's Human Development Index.

In 2018, the first major revision of the global MPI was undertaken, in order to take into account improvements in survey microdata and better align to the 2030 development agenda insofar as possible (Alkire and Jahan, 2018). The revision consisted of adjustments in the definition of five out of the ten indicators, namely child mortality, nutrition, years of schooling, housing and asset (Alkire and Kanagaratnam, 2020; Vollmer and Alkire, 2020).

Figure 1. Composition of the Global MPI – Dimensions and Indicators



The global MPI begins by establishing a deprivation profile for each person, showing which of the 10 indicators they are deprived in. Each person is identified as deprived or non-deprived in each indicator based on a deprivation cutoff (Table 1). In the case of health and education, each household member may be identified as deprived or not deprived according to available information for other household members. For example, if any household member for whom data exist is malnourished, each person in that household is considered deprived in nutrition. Taking this approach – which was required by the data – does not reveal intrahousehold disparities, but it is intuitive and assumes shared positive (or negative) effects of achieving (or not achieving) certain outcomes. Next, looking across indicators, each person's deprivation score is based on a weighted average of the deprivations they experience. The indicators use a nested weight structure: equal weights across dimensions and an equal weight for each indicator within a dimension.

Table 1. Global MPI – Dimensions, Indicators, Deprivation Cutoffs, and Weights

Dimensions of poverty	Indicator	Deprived if...	SDG area	Weight
Health	Nutrition	Any person under 70 years of age for whom there is nutritional information is **undernourished**.[1]	SDG 2	1/6
	Child mortality	A child **under 18** has **died** in the household in the five-year period preceding the survey.[2]	SDG 3	1/6
Education	Years of schooling	**No** eligible household member has completed **six years** of **schooling**.[3]	SDG 4	1/6
	School attendance	Any school-aged child is **not attending** school **up to** the age at which he/she would complete **class 8**.[4]	SDG 4	1/6
Living Standards	Cooking fuel	A household cooks using **solid fuel**, such as dung, agricultural crop, shrubs, wood, charcoal, or coal.[5]	SDG 7	1/18
	Sanitation	The household has **unimproved** or **no** sanitation **facility** or it is improved but **shared** with other households.[6]	SDG 6	1/18
	Drinking water	The household's source of **drinking water** is **not safe** or safe drinking water is a **30-minute** or **longer walk** from home, roundtrip.[7]	SDG 6	1/18
	Electricity	The household has **no electricity**.[8]	SDG 7	1/18
	Housing	The household has **inadequate** housing materials in **any** of the three components: **floor**, **roof**, or **walls**.[9]	SDG 11	1/18
	Assets	The household does **not own more than one** of these **assets**: radio, TV, telephone, computer, animal cart, bicycle, motorbike, or refrigerator, and does not own a car or truck.	SDG 1	1/18

Source: Alkire, S., Kanagaratnam, U. and Suppa, N. (2020). 'The Global Multidimensional Poverty Index (MPI) 2020', OPHI MPI Methodological Notes 49, Oxford Poverty and Human Development Initiative, University of Oxford.

Notes: The global MPI is related to the following SDGs: No Poverty (SDG 1), Zero Hunger (SDG 2), Health and Well-being (SDG 3), Quality Education (SDG 4), Clean Water and Sanitation (SDG 6), Affordable and Clean Energy (SDG 7), and Sustainable Cities and Communities (SDG 11).

[1] Children under 5 years (60 months and younger) are considered undernourished if their z-score of either height-for-age (stunting) or weight-for-age (underweight) is below minus two standard deviations from the median of the reference population. Children 5–19 years (61–228 months) are identified as deprived if their age-specific BMI cutoff is below minus two standard deviations. Adults older than 19 to 70 years (229–840 months) are considered undernourished if their Body Mass Index (BMI) is below 18.5 m/kg^2.

[2] The child mortality indicator of the global MPI is based on birth history data provided by mothers aged 15 to 49. In most surveys, men have provided information on child mortality as well but this lacks the date of birth and death of the child. Hence, the indicator is constructed solely from mothers. However, if the data from the mother are missing, and if the male in the household reported no child mortality, then we identify no child mortality in the household.

[3] If all individuals in the household are in an age group where they should have formally completed 6 or more years of schooling, but none have this achievement, then the household is deprived. However, if any individuals aged 10 years and older reported 6 years or more of schooling, the household is not deprived.

[4] Data source for the age children start compulsory primary school: DHS or MICS survey reports; and http://data.uis.unesco.org/.

[5] If the survey report uses other definitions of solid fuel, we follow the survey report.

[6] 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, provided that they are not shared. If the survey report uses other definitions of adequate sanitation, we follow the survey report

[7]A household has access to clean drinking water if the water source is any of the following types: piped water, public tap, borehole or pump, protected well, protected spring, or rainwater, and it is within a 30-minute walk, round trip. If the survey report uses other definitions of clean or safe drinking water, we follow the survey report.

[8]A number of countries do not collect data on electricity because of 100% coverage. In such cases, we identify all households in the country as non-deprived in electricity.

[9] Deprived if floor is made of natural materials or if dwelling has no roof or walls or if either the roof or walls are constructed using natural or rudimentary materials. The definition of natural and rudimentary materials follows the classification used in country-specific DHS or MICS questionnaires.

3. The global MPI and its partial indices

In the global MPI, a person is identified as multidimensionally poor or MPI poor if they are deprived in at least one-third of the weighted MPI indicators. In other words, a person is MPI poor if the person's weighted deprivation score is equal to or higher than the poverty cutoff of 33.33%. After the poverty identification step, we aggregate across individuals to obtain the **incidence** of poverty or headcount ratio (H) which represents the proportion of poor people. We then compute the **intensity** of poverty (A), representing the average number of weighted deprivations experienced by the *poor*. We then compute the adjusted poverty headcount ratio (M_0) or **MPI** by combining H and A in a multiplicative form (MPI = H x A).

Both the incidence and the intensity of these deprivations are highly relevant pieces of information for poverty measurement. The incidence of poverty is intuitive and understandable by anyone. People always want to know how many poor people there are in a society as a proportion of the whole population. Media tend to pick up on the incidence of poverty easily. Yet, the proportion of poor people as the headline figure is not enough (Alkire, Oldiges and Kanagaratnam, 2021).

Imagine two countries: in both, 30% of people are poor (incidence). Judged by this piece of information, these two countries are equally poor. However, imagine that in one of the two countries poor people are deprived – on average – in one-third of the dimensions, whereas in the other country, the poor are deprived – on average – in two-thirds. By combining the two pieces of information – the intensity of deprivations and the proportion of poor people – we know that these two countries are not equally poor, but rather that the second is poorer than the first because the intensity of poverty is higher among the poor. The MPI will show this difference.

A headcount ratio is also estimated for two other ranges of poverty cutoffs. The global MPI measure identifies those who are close to the one-third threshold, that is, individuals are **vulnerable** to multidimensional poverty if they are deprived in 20% to 33.33% of weighted indicators. The measure also specifies a higher poverty cutoff to identify those in **severe poverty**, meaning those deprived in 50% or more of the dimensions.

The AF methodology has a property that makes the global MPI even more useful—dimensional breakdown. This property makes it possible to compute the percentage of the population who are multidimensionally poor and simultaneously deprived in each indicator. This is known as the **censored headcount ratio** of an indicator.

The censored headcount ratio shows the extent of deprivations among the poor but 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.

In principle, each national survey allows for the estimation of MPI and its partial indices. As such, we publish estimates for each country that is covered in the global MPI. As the global MPI relies on the AF method, the national estimates can be **disaggregated by subgroups** insofar as data permits (see Alkire, Kanagaratnam, Nogales, and Suppa, 2019; 2020, 2021). Specifically, the global MPI and its partial indices are disaggregated by age groups, rural-urban area, subnational regions, and gender of household head. This year, through a research collaboration with HDRO, disaggregation results by ethnicity are included in the global MPI 2021 report.

The global MPI also captures an important component of poverty: inequality across the poor, known as the **variance** measure. The computation and publication of the variance measure follows the methodology discussed in Seth and Alkire (2017) and Alkire and Foster (2019).

Since 2020, as part of the global MPI output, we publish the proportion of **MPI poor who are destitute**. The destitution measure has precisely the same structure as the global MPI but applies extreme deprivation cutoffs for each indicator. The destitute are all MPI poor but also experience a more extreme level of deprivation. This measure builds on a work that was first published by Alkire, Conconi, and Seth (2014). The destitution cutoffs were revised in 2019 (see details in Alkire, Kanagaratnam and Suppa, 2020, p.9).

4. Changes over time methodology[3]

An important aspect of the global MPI work is the estimation of changes in poverty over time. In this set of work, indicator definitions are harmonised across survey years so we are sure that varying indicator definitions do not influence the observed change in poverty levels. Second, we estimate the levels of MPI and its partial indices using the harmonised indicators. However, in poverty analysis, the headline interest

[3] The changes over time methodology is widely described across many publications by former and present OPHI colleagues. The first set of global MPI work on changes over time was published in the 2013 round covering 22 countries (Alkire, Conconi and Roche, 2013; Alkire and Roche, 2013; Alkire and Seth, 2013a, 2013b, 2015). In the 2014 round, trends over time results was available for 34 countries (Alkire, Roche and Vaz, 2014, 2017), and this was further updated to 50 countries in the 2016 round (Alkire, Jindra, Robles and Vaz, 2016, 2017). In the 2018 global MPI, we published India's momentous progress in reducing multidimensional poverty within a decade using the revised global MPI methodology (Alkire, Oldiges and Kanagaratnam, 2018, 2020, 2021; Alkire, Kanagaratnam and Suppa, 2018; and OPHI, 2018). The 2020 global MPI presented a study of 80 countries with changes over two points in time (Alkire, Kovesdi, Mitchell et al., 2020; Alkire, Kovesdi, Pinilla-Roncancio and Scharlin-Pettee, 2020). This 2021, we have developed a workline with the aim to produce trends over time on an annual basis for all possible countries in the global MPI, data permitting. In this round, 84 of the 109 countries in the global MPI have harmonised estimates over time.

is often the overall change in MPI and its partial indices. People want to know whether poverty has reduced, increased, or remain unchanged over time. Therefore, the prominent component of poverty comparisons is the absolute pace of change across periods or points in time.

The absolute rate of change is the simple difference in poverty levels between two periods. We denote the initial period by t^1 and the final period by t^2. The corresponding achievement matrices for these two periods by X_{t^1} and X_{t^2}, respectively. Note that the parameters of the poverty measure – deprivation cutoff z, weight w_j and poverty cutoff k – used in each period remain unchanged. The absolute rate of change (Δ) is the difference in MPIs between two periods and is computed as (and similarly for H and A, which are not presented):

$$\Delta MPI = MPI(X_{t^2}) - MPI(X_{t^1}).$$

The significance of the difference is determined by t-tests and is reported at 90% (*), 95% (**), and 99% (***) confidence levels in Table 6 'Trends Results MPI 2021'.

The absolute rate of change is indifferent to the initial level. For example, a 10-percentage point reduction could mean that the headcount ratio decreased from 80% to 70% or from 15% to 5%. The relative rate of change is the difference in poverty as a percentage of the initial poverty level. Interpreting the analysis of absolute and relative changes together provides a clear sense of overall progress. The relative rate of change $(\delta)$is computed for the MPI (and similarly for H and A, which are not presented) as:

$$\delta MPI = \frac{MPI(X_{t^2}) - MPI(X_{t^1})}{MPI(X_{t^1})} \times 100.$$

However, the absolute and relative changes are not comparable for different countries when the reference periods (duration between survey years) are of different length. To compare the rates of poverty reduction across countries that have different periods of reference, annualised changes are used. The annualised absolute rate of change $(\bar{\Delta})$ is computed for the MPI as:

$$\bar{\Delta} MPI = \frac{MPI(X_{t^2}) - MPI(X_{t^1})}{t^2 - t^1}.$$

The annualised relative rate of change $(\bar{\delta})$ is computed for the MPI as:

$$\bar{\delta} MPI = \left[\left(\frac{MPI(X_{t^2})}{MPI(X_{t^1})}\right)^{\frac{1}{t^2 - t^1}} - 1\right] \times 100.$$

We have used the same formula to compute and report annualised changes in the other partial indices, namely H, A, and censored headcounts. For surveys that are fielded between two survey years, the analysis takes the average of the years for calculating annualised change. For instance, in the case of Haiti, the first survey is from 2012, the second from 2016/2017. The difference is then 2016.5 - 2012 = 4.5 years.

The reductions in MPI can be broken down by indicators. An analysis of changes in MPI considers both changes in the raw or uncensored headcount ratios and in the censored headcount ratios. The changes in censored headcount ratios depict changes in deprivations among the poor.

In addition, we have disaggregated changes in the national-level MPI by age groups, rural-urban area and subnational region. Our analyses of poverty changes by population subgroups allows us to identify if the poorest subgroups reduced poverty faster than less poor subgroups and to see the dimensional composition of reduction across subgroups.

Note that the population shares for each period must always be analysed alongside subgroup trends in order to consider demographic shifts such as migration or population growth, as these can significantly influence the interpretation of results.

5. Policies for the global MPI

Calculating the global MPI involves producing numerous measures for over 100 countries, disaggregated for over 1,000 subnational regions, rural/urban areas, age groups and gender of household head, followed by compulsory sensitivity checks to multiple parametric choices at a given time. A well-conceived workflow is vital for a large-scale project like the global MPI. The policies related to the global MPI undergird comparability and replicability of the estimates, transparency of underlying necessary decisions, and the efficiency of the workflow for every round of updates. In this section, we highlight key policies that relate to the use of new survey, the use of new information to improve existing indicators, the computation of the global poor population, the exclusion of non-usual household members, the treatment of household members about whom information in certain indicators is lacking, the treatment of datasets that lack any one of the 10 global MPI indicators, and the treatment of households with missing indicators.

5.1 New survey data

The global MPI is updated when new data become available from the following sources: Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), and national surveys. We also explore whether there are new national surveys in the public domain that have indicators comparable to those included in the global MPI. National surveys are considered in the absence of surveys produced by DHS and MICS, or if DHS and MICS data are more than three years older than the national surveys. The latter is a criterion introduced in 2019, so as to maximise the possibility of using internationally comparable surveys such as DHS and MICS.

5.2 Indicator availability

Survey instruments such as DHS and MICS improve over time. Our policy while producing the current margin estimates, is to use as much of the information that is available for the 10 global MPI indicators and to incorporate improvements in the new surveys. For example, in recent MICS surveys, the electricity variable in the data included additional categories, going beyond the usual question on 'Does your household have electricity' that is limited to the 'yes' or 'no' categories. Households with access to electricity were further probed on whether they were 'interconnected to the grid' or 'off-grid with generator or isolated system. For the purpose of the global MPI, we identified households on the electricity grid and households that were powered by alternative sources of energy as non-deprived. Another example is when data on ownership of a computer or any hitherto missing asset in the past becomes available in recent surveys, these will be incorporated into the assets indicator.

In summary, MPI estimation for a given year will be the most accurate possible figure using the available data but may not be comparable across time. Indicator definitions must be harmonised for comparability over time. This we cover in detail in section 6 of this document.

5.3 Population-weighted global aggregates

Since 2010 we have used a fixed population year to produce the global aggregations. We have also provided the population data for the related survey year in the Data Tables for those who prefer this information. The headcount ratio for each country in the global MPI 2021 is multiplied by the total population for 2019, regardless of the year of the survey, in order to identify the number of MPI poor in any given country or across countries:

$$\text{Number of MPI poor} = H * \text{Total Population}$$

This approach has the important advantage of comparison: it is possible to aggregate across countries to develop regional rankings, analyse country groupings such as low-income countries, and aggregate across regions. For example, using this approach we can generate the figure that 22% of the inhabitants in the 109 countries are MPI poor. Suppose the year of the population count (2019) is after the year of the survey. In that case, this approach provides an incentive for governments to update their poverty data, because after updating the 'number of poor' will decline if poverty rates have gone down and if these are not overturned by strong population growth. The approach also has limitations. In using a headcount ratio that is older than (or more recent than) the reference year of the survey, the assumption is being made that the level of poverty in the year of the survey and the year of population count are identical. We acknowledge that this is a strong assumption, but it is clear that changes in the global MPI over time do not justify alternative assumptions such as linear extrapolation.

The population count years used for aggregate estimates of the global MPI are updated by one year, annually. As in past years, the current data tables also include the population during the year of the survey, as well as population figures for both the reference year and the year before it (in this case, 2019 and 2018). The source of population data is the *World Population Prospects* medium-fertility variant, which is published by the Population Division of the Department of Economic and Social Affairs of the United Nations.

5.4 Excluding *non-usual* residents

The DHS datasets define ***de jure*** residence as **usual** or legal residence. The hv102 variable in DHS datasets distinguishes *de jure* (usual) from non-*de jure* (non-usual) household members. In the global MPI, we only use information from usual residents and exclude information from non-usual household members. We exclude the information from the non-usual members because this makes it comparable to MICS, which collect information only from usual household members. In addition, the achievement of an occasional visitor (for example, in years of schooling) could cause the household to be non-deprived (in education), which would be misleading.

5.5 Applicable and non-applicable populations

Four of the 10 global MPI indicators are not applicable to the whole population. Households that do not have the relevant population are classed as non-deprived in that indicator.

Children's nutrition is not applicable to households with no children within the eligibility criteria (under 5 years old for most surveys) to be weighed and measured. We consider households that did not have any eligible children as non-deprived in child nutrition.

Adult BMI is not applicable to households where there were no eligible women or men to be measured anthropometrically. In the global MPI, data on adult BMI is mostly taken from DHS surveys and national surveys. In DHS surveys, information on adult nutrition is usually collected from eligible women aged 15 to 49 years who are *de jure* (usual) members of the household. Women eligible for anthropometric measures are identified using the *eligibility* variable provided by DHS data providers. In some countries, such as Egypt, eligibility criteria exclude women who have never been married. In a number of DHS surveys, nutrition data is also collected from a subsample of adult men. In some other national surveys, nutrition data is collected from all members of the household (e.g. China, Ecuador, and Mexico). The global MPI uses all available data on nutrition, up to the age of 70 years (<=840 months in age) to construct the nutrition indicator. The aim of the global MPI is to capture an accurate representation of the household situation with maximum information from members of the household.

If a household is deprived in children's nutrition, adult BMI or both, then the household is deprived in nutrition. We consider households that have no eligible members to assess children's nutrition or adult BMI to be non-deprived.

Child mortality is based on birth history data provided by mothers aged 15 to 49. The birth history data has the date of birth and death of each child. This tells us how old the child was when they died and how long before the survey year the death occurred. We consider households having no eligible women available to be interviewed as non-deprived in child mortality. In most DHS and MICS surveys, men have provided information on child mortality as well, but this lacks the date of birth and death of the child. Hence, the indicator is constructed solely from mothers. However, if the data from the mother are missing, and if the male in the household reported no child mortality, then we identify no child mortality in the household. In a few country surveys, detailed birth history data was not collected, such as the date of birth and date of death of the child. In such cases, we have constructed the child mortality indicator using any child death reported by eligible women and men as we cannot distinguish deaths that occurred in the past five years and the age of the child who died. In these countries, households that did not have eligible women and men for individual interviews are identified as non-deprived.

School attendance is not applicable to households without children of school-age. We identify households that did not have children of school-age as non-deprived (we consider an eight-year span starting at the age at which a child should begin school in each country). The data sources for the age at which children start compulsory primary school are the MICS and DHS country survey reports, followed by confirmation using the UIS Global Database.

5.6 Treatment of dataset with missing indicators

If a survey dataset is missing any of the 10 indicators that make up the global MPI, then that indicator cannot be used in the computation of the poverty measure. Indicator weights are re-adjusted accordingly, such that each dimension continues to be given a weight of one-third. For example, if suppose one living standards indicator is missing. In that case, while originally each of the living standards indicators received a relative weight of 1/18 (5.56%), the remaining indicators will receive a relative weight of 1/15 (6.66%). If one health or education indicator is missing, the other indicator will receive the full weight of one-third. If both indicators in health or education are missing, the dataset does not qualify to be included in the global MPI.

5.7 Dropping households who are missing any indicator

Once each indicator has been constructed, we only use households that have complete information in all the constructed indicators for the poverty estimates. Households that lack data on any indicator are

dropped from the final analytical sample. The percentage of the sample that is dropped is reported in the relevant data tables. However, there is a need to review the definition of missing information for future global MPIs. For instance, if households are deprived in 33.33% of the weighted indicators despite having missing indicators, it is perhaps useful to identify these households as multidimensionally poor. This decision is under review through our ongoing investigation of sample drop and bias analysis. This methodological exploration is also timely as it corresponds with increasing non-response rates observed among urban householders in indicators related to anthropometric measures in recently released surveys. For example, in the Montenegro MICS 2018 data, the final nutrition indicator showed that some 14% of individuals lived in households where children under 5 who should have been measured were not measured. More than two-thirds of the individuals with missing information are living in urban areas of the country.

6. Harmonisation principles and decisions[4]

It is common for indicator definition to vary across survey years because it may be the case that survey providers may have changed how questions are asked, from whom these are collected or response categories in the questionnaire may have changed over time. Another reason may be that we are using different survey sources with comparable sampling design to capture changes over time in a country, and as such indicator definitions may require adjustment across these survey sources (e.g., comparing DHS and MICS). Harmonisation seeks to make two or more MPI estimations comparable by aligning the indicator definitions. In other words, harmonisation, where necessary, re-creates the indicators in the global MPI so that they are using the same information and deprivation cutoffs across survey years.

6.1 General harmonisation principles

Several general principles are applied in the global MPI harmonisation process. In cases of difference between available indicators between the two surveys, we resort to the most restricted condition. For example, if one year of the surveys did not collect information needed to construct the nutrition indicator and the other year did, the indicator was dropped from the year that includes the information, and the indicators within the dimensions were re-weighted to maintain equal weights across dimensions and match the survey with the more restricted data. In our sample of 84 countries, five countries dropped the nutrition indicator from one year to match the year that did not collect anthropometric measurements (Colombia, Dominican Republic, Trinidad and Tobago, Viet Nam, and Yemen), two countries (North Macedonia and

[4] The text in this section is drawn from OPHI MPI Methodological Note 50 (Alkire, Kovesdi, Mitchell et al., 2020). It is useful to include such a text in each methodological note, in order to be transparent of the principles and decisions that are applied while harmonising indicators over survey years.

Suriname) dropped the child mortality indicator from one year, we removed the school attendance indicator in one country (Philippines) and cooking fuel indicator in two countries (Lesotho and Turkmenistan). The next section builds on these general principles to describe the indicator-specific decisions required in the harmonisation process.

6.2 Indicator-specific decisions

Health

The dimension of health includes the nutrition and child mortality indicators. For the nutrition indicator, if the reference populations can be adjusted, they are restricted to the year with the more limited eligibility conditions. For example, in Peru ENDES 2018, eligible women for height and weight measurement included all women aged 12 to 49 years, whereas in Peru DHS 2012, eligible women included all women aged 15 to 49 years. As a result, in Peru, only women aged 15 to 49 years are considered as eligible for nutrition measurement for both years. This restricted condition principle also applies when one year includes nutrition information from men and the other year does not; in that case, men's nutritional information would be excluded from the harmonised over time indicator.

Most MICS surveys used in this analysis collect anthropometric measurements only for children under 5 years. In comparisons where in one year the survey is a DHS and in the other the survey is a MICS, the nutrition indicator is harmonised to include anthropometric information only for children under 5 years.

For the child mortality indicator, attention was paid to which individuals provide information on child mortality to ensure the applicable populations match between the two years. For instance, in the Bolivia 2016 data set, women who are eligible to provide child mortality information are all women aged 14 to 49 years, and in the 2008 and 2006 data sets, eligible women are aged 15 to 49 years. Therefore, only child mortality information from women aged 15 to 49 years is included in the indicator for all three years, following the more restricted condition principle. However, child mortality information from eligible men was not excluded even when not present in the other year, as it is only used to identify zero child mortality at the household level in the absence of information from eligible women. Additionally, birth history information – whether the mother gave birth in the last five years preceding the survey and how old the child was when they died – is used to construct the child mortality indicator. Often, the older MICS surveys do not include a birth history questionnaire and thus do not have information on the age and time of passing of the child. When one year includes birth history information and the other does not, the more restricted condition principle is followed, and information on age and year of death are removed from the survey that has them, as was the case in Central African Republic, for instance. In this case, the child mortality indicator then takes on the deprivation cutoff from the 2010 global MPI specifications, which

considers whether any child has died in the household. The same rule applies when neither survey has birth history information.

Education

The dimension of education includes two indicators: years of schooling and school attendance. For the years of schooling indicator, DHS data contains a variable that states the total number of years of education for the individual. In contrast, the MICS data does not provide an equivalent variable. Instead, when using MICS data, the total number of years of schooling is computed by combining the education level and highest-grade variables, taking into consideration the country's national education system, as described in the survey report. In cases where this information is not included in the survey report, we refer to the UNESCO Institute for Statistics (UIS) databank. In cases of mismatch between the survey report and the national guidance, we always follow the MICS report. For the DHS and MICS comparisons, the DHS variable was treated as equivalent to the MICS composite variable (e.g. six years of schooling in the DHS variable corresponds to the first six years of primary education in MICS). For the 37 countries, we adopt the revised 2020 version of this indicator for which the youngest eligible persons are specified using country-specific age cutoffs that correspond to the age at which they are expected to complete class six (Alkire, Kanagaratnam, and Suppa 2020).

The school attendance indicator is manually computed using the age range for the indicator based on the national entry age to compulsory schooling. The official national entry age to compulsory schooling is selected using either the survey report (where possible) or the UNESCO Institute for Statistics data (if not available in the survey report). In cases of mismatch between the report and the UNESCO guidance, the indicator follows the report. For most countries included in the changes over time analysis, the official entry age for primary schooling is six years, although this differs for a few countries. For example, the official entry age is 7 years for Indonesia, and for Pakistan, the official entry age is five years. When the official entry age changes between the two surveys, often due to education policy changes, we retain the exact official entry age in each survey and do not harmonise across the years in order to fully capture the range of eligible children.

Living Standards

The dimension of living standards includes six indicators: electricity, sanitation, drinking water, housing, cooking fuel, and assets. The first indicator, electricity, does not have any indicator-specific harmonisation decisions, beyond the general principles of only using information that is available in datasets from both survey years. For the sanitation indicator, two conditions are used – whether other households share the toilet facility and whether the toilet facility is considered an improved or unimproved facility – to define a household's access to adequate sanitation. If, there is no information on whether the facility is shared in

one year, but the other year does have that information, the more limited information is considered in both years. Regarding categorising labelled types of toilet facilities as improved or unimproved, if survey report classifications differ between the two years, we consider the more recent data's definition of improved facilities for both years. If a first-year survey specifies a category for sanitation facilities that the second year does not; we would leave the category labelled as is in the first year.

For the drinking water indicator, there are two conditions to consider – how long it takes the respondent to fetch water from the main drinking water source of the household and whether the main drinking water source is considered an improved or unimproved source – to define a household's access to safe and adequate drinking water. If in one year, there is no information on how long it takes to fetch water, but the other year does have that information, that information is dropped to accord with the year that has the more limited information. Further, when different main drinking water sources are considered improved between the two years, as in the case for sanitation facilities, we follow the standard in the more recent survey. Lastly, unless directly specified otherwise by the report, because the quality of bottled water is unknown, households that use bottled water for drinking are classified as using an improved source only if the water they use for cooking and hand washing comes from an improved source. This information exists in a non-drinking water variable, which often is not present in the earlier surveys. When there is no information on non-drinking water in one year, as in Tajikistan DHS 2012, but the second year does have that information, as in Tajikistan DHS 2017, the condition is dropped to accord with the year that has the more limited information. Often, when this is the case, the reports specify that bottled water is an improved source, and, consequently, it is coded as such. In newer surveys released since 2020, bottled water is considered as improved source of drinking water. The information on non-drinking water is no longer considered to determine the quality of bottled water. This is consistent with the SDG definition of safe drinking water. In such case, we consider bottled water as improved source of drinking water across survey years even if older surveys applied the non-drinking water criterion.

For the cooking fuel indicator, households are defined as deprived when they cook with solid fuels: dung, agricultural crop, shrubs, wood, charcoal, or coal. To follow the principle of harmonising to the latest survey, when one survey codes a fuel source as solid fuel and the other does not, both years are coded to consider that fuel source to be solid whatever the classification is in the later year. In the rare instance where a report does not specify a list of solid fuels, we follow the global MPI and consider 'other' cooking fuel responses to reflect non-deprived sources.

For the housing indicator, the household is considered as deprived if they live in inadequate housing, where the floor is of natural materials, or the roof or walls are of natural or rudimentary materials. Following the principle of differing classifications reverting to the more recent standard, when the first

year considers a housing material (constituting the dwelling's floor, roof, or walls) as natural or rudimentary and the second (more recent) year does not, both years are coded to consider that housing material as an improved housing material. Further, when information on one or more of the three categories (floor, roof, walls) is missing in one year, the information from the year where it exists is removed to match the missing year. For example, Palestine MICS 2010 does not collect information on the material used for walls and roof, but Palestine MICS 2014 and 2019-2020 does; therefore, the information on wall and roof material in the recent years was removed, following the restricted condition principle.

The assets indicator considers whether a household owns a radio, television, telephone, computer, animal cart, bicycle, motorbike, refrigerator, or car/truck. When in one year there is no information on certain assets, as in Gambia MICS 2005/06, which is missing data on computer ownership, but the later survey years does have that information, as in Gambia DHS 2013 and MICS 2018, those assets are dropped from the assets indicator in the later years to accord with the more limited information available. Our definition of telephone ownership includes information on whether a household owns a landline or mobile telephone. In earlier surveys, as is the case in Mozambique DHS 2003, the questionnaire did not include a question on whether the household owned a mobile telephone (as they were not as common a telecommunications device as they are today). In these cases, for the second year, as in the case of Mozambique DHS 2011, we kept the telephone information from both the landline and mobile phone questions (as opposed to excluding the information on whether the household owns a mobile phone), as we believe the changes in phone ownership are best reflected with the inclusion of all available information on telephone devices because individuals may own a mobile phone instead of, rather than in addition to, a landline.

7. Survey details of global MPI 2021

The 2021 global MPI estimations are based on survey data from 109 countries. By contrast, the global MPI 2020 covered 107 countries, while the global MPI 2019 and 2018 covered 101 countries and 105 countries respectively. The number of countries covered in each round varies for two reasons: (1) new surveys are available; and (2) countries from previous rounds are excluded from the recent round as the surveys for these countries are considered outdated.

7.1 New and updated country surveys

This 2021 round covers two new countries (Costa Rica and Tonga) and 21 more recent survey datasets (Table 2). Collectively, the 23 new and updated surveys represent close to 449 million or 8% of the population living in the developing regions of the world. Sixteen of these new or updated surveys were released by MICS, while five were released by DHS in a period of 13 months, that is, from 15 April 2020

to 15 May 2021. In addition, we updated Bolivia using a national survey that closely follows the DHS format and is available in the public domain. We also updated Morocco using the latest available survey from PAPFAM. The cleaning and standardisation of the new and updated surveys follows the 2019 global MPI indicator specifications, in addition to the minor innovations introduced in 2020 for the years of schooling, drinking water, and sanitation indicators (see Alkire, Kanagaratnam and Suppa 2019, 2020 for details on the specifications).

7.2 Survey coverage in 2021

The survey coverage for the 109 countries included in the global MPI 2021 is between 2009 and 2019-2020. A total of seventy-nine countries—home to 84 percent of multidimensionally poor people—have data fielded in the last five years, that is in 2014-2015 or later. Only one survey was fielded earlier than 2010: the survey in Syria was carried out in 2009. We have made use of this survey since it was collected in the last decade, and we believe the pre-war results may be of interest to researchers.

Table 2. List of new and updated surveys used in the global MPI 2021

	Country	Survey	Year
1	Bolivia	EDSA	2016
2	Central African Republic	MICS	2018-2019
3	Cameroon	DHS	2018
4	Costa Rica	MICS	2018
5	Cuba	MICS	2019
6	Algeria	MICS	2018-2019
7	Ethiopia	DHS	2019
8	Ghana	MICS	2017-2018
9	Guinea-Bissau	MICS	2018-2019
10	Guyana	MICS	2019-2020
11	Liberia	DHS	2019-2020
12	Morocco	PAPFAM	2017-2018
13	North Macedonia	MICS	2018-2019
14	Nepal	MICS	2019
15	Palestine, State of	MICS	2019-2020
16	Senegal	DHS	2019
17	Sierra Leone	DHS	2019
18	Serbia	MICS	2019
19	Sao Tome and Principe	MICS	2019
20	Chad	MICS	2019
21	Thailand	MICS	2019
22	Turkmenistan	MICS	2019
23	Tonga	MICS	2019

The primary data sources for the global MPI are the DHS (45 countries) and MICS (51 countries) surveys that are open access. For three countries, the source of the data is the Pan Arab Project for Family Health (PAPFAM) surveys. In the countries for which none of these internationally comparable surveys were available, national surveys that contained information on the MPI indicators were used if high-quality

surveys with the same indicators were available, and if they were in the public domain or if countries requested to be included in the global MPI. For example, in the global MPI 2021, we have used national data for 10 countries, namely Bolivia, Botswana, Brazil, China, Ecuador, Jamaica, Mexico, Peru, Seychelles, and Sri Lanka.

7.3 Harmonised over time data sets

The 2021 global MPI includes results for trends with up to three points in time for 28 countries and two points in time for 56 countries. Collectively, we standardised and harmonised indicators across 196 survey data sets [(28*3) + (56*2)] across these 84 countries. In 32 countries, we harmonised DHS data sets across all time points, while it was strictly MICS in 23 countries. For three countries (China, Jamaica and Mexico), the harmonisation work is exclusively based on national data sets, while for Morocco we have used PAPFAM across time points. For 25 countries we have used a mix of DHS and MICS across time points, namely Afghanistan, Bangladesh, Benin, Burkina Faso, Cameroon, Chad, Congo, Côte d'Ivoire, Democratic Republic of Congo, Dominican Republic, Gambia, Ghana, Guinea, Guyana, Lesotho, Madagascar, Mali, Moldova, Nepal, Sao Tome and Principe, Sierra Leone, Togo, Ukraine, Yemen, and Zimbabwe. The decision to use mix data sources between time points was possible because MICS and DHS are highly comparable data sources.

For 25 countries that are part of the global MPI 2021–Angola, Barbados, Bhutan, Botswana, Brazil, Comoros, Costa Rica, Cuba, Ecuador, El Salvador, Georgia, Guatemala, Kiribati, Libya, Maldives, Myanmar, Papua New Guinea, Paraguay, Saint Lucia, Seychelles, South Africa, South Sudan, Sri Lanka, Syria and Tonga– trends over time analysis is not possible. This is because these countries (1) lack surveys for earlier time period or (2) the older and newer surveys have incomparable sampling designs.

7.4 Surveys excluded from previous round

In this round, we would have excluded any survey that was fielded in 2008. In the last round, we used Bolivia DHS 2008, but since a 2016 national survey was available, we instead updated the numbers for Bolivia using the updated survey. In the 2020 round, we excluded Vanuatu as the survey was fielded in 2007 and is considered out of date. Four countries from the global MPI 2018 publication were excluded in the 2019 round, namely, Azerbaijan, Djibouti, Somalia, and Uzbekistan, as their surveys were very out of date. All four surveys were fielded in 2006.

7.5 Disaggregation by subgroups: age group and rural-urban area

All 109 countries included in the global MPI are disaggregated by four major age categories: 0 to 9 years, 10 to 17 years, 18 to 59 years, and 60+ years. In addition, we also publish the disaggregation by two major

age groups: for children aged 0 to 17 years and for adults 18 years and older. Out of the 109 countries included in the 2021 global MPI, disaggregation results by urban and rural areas were produced for 108 countries – all except Seychelles. Information on the division between rural and urban areas was not available in Seychelles QFLS 2019 datasets.

We have also disaggregated changes in the national-level MPI and its partial indices by age groups for all 84 countries that have harmonised estimates. At the area level, we were able to produce changes in multidimensional poverty by rural-urban area for all countries – except for Trinidad and Tobago, as the initial survey period (MICS 2006) lacked this information.

7.6 Countries that qualify for subnational disaggregation

Disaggregation of results was possible for 100 countries at the subnational level. The decision whether national estimates could be disaggregated at the subnational level was determined by three criteria that were established in our earlier work.[5] These criteria were (1) the sample was representative of subnational regions; (2) the national MPI and H estimates were large enough for a meaningful subnational analysis, though, as is explained below, this criterion is no longer considered since the 2020 round; and (3) the sample size after the treatment of missing data was reasonably high. We review each of these qualifying criteria.

The first criterion for disaggregation is that the survey report must establish that the sample is representative at the subnational level following the survey metadata on sample design. In 2021, 105 country surveys fulfilled this criterion. Four countries – Armenia, Bosnia and Herzegovina, Saint Lucia, and Seychelles – have sample sizes that are representative at the national level but not at the subnational level. Hence, these four countries were excluded at this stage.

In the 2019 and earlier rounds, the second criterion establishes that the national poverty headcount ratio (H) and the MPI must be large enough (H more than 1.5% and MPI greater than 0.005) to allow for a meaningful subnational analysis. Since 2018, however, our estimates are reported along with standard errors estimates and confidence intervals. Poverty measures should be accompanied by standard errors to evaluate their precision and properly rank regions of a country. Because of this, from 2020, we retain countries with low poverty levels for disaggregation hence dropping this criterion. In cases where the subnational estimates are zero, the standard errors establish whether these are true zeros. However, it is useful to review the number of countries that have H<=1.5% and MPI<=0.005.

[5] See Alkire and Santos (2014); Alkire, Roche, Santos and Seth (2011).

Of the 105 country surveys for which we know the sample allows for disaggregation, the results indicate that 20 countries showed a combination of H<=1.5% and MPI<=0.005. These are Albania, Algeria, Costa Rica, Cuba, Georgia, Jordan, Kazakhstan, Kyrgyzstan, Maldives, Moldova, Montenegro, North Macedonia, the State of Palestine, Serbia, Thailand, Tonga, Trinidad and Tobago, Tunisia, Turkmenistan, and Ukraine. Though the third criterion, as explained below, ruled out Georgia, Maldives, and Montenegro from disaggregation analysis. Collectively, the remaining 17 low poverty countries have 130 subnational regions representing some 4% of the population living in the developing regions of the world. Despite recording low levels of poverty, the standard errors for 117 of the 130 subnational regions in these 17 countries were significantly different from zero; while only 13 subnational regions had zero poverty. Three of the 13 subnational regions that had zero poverty are located in Cuba (Artemisa, Isla de la Juventud, and La Habana), four are in Kazakhstan (Astana City, East Kazakhstan, Karaganda, and West Kazakhstan), three are in Kyrgyzstan (Bishkek, Chui, and Naryn), two are in North Macedonia (Pelagonia, and Southwest), while one is in Turkmenistan (Dashoguz).

In the earlier rounds of the global MPI, we would have excluded these 17 countries from the disaggregation analysis. However, since our 2020 publication, we have retained such countries despite the low headcount ratio and low MPI value. We publish the standard errors estimates by which users can assess the extent of multidimensional poverty in the subnational regions of low poverty countries.

The third and final criterion emphasises that the sample size after the treatment of missing data must be reasonably high at the national and subnational levels. For borderline cases, bias analyses are conducted to exclude those cases where the sample reduction leads to statistically significant bias. We specify the third criterion in three ways.

First, the national sample size must be at least 85% of the original sample after missing data is treated. This is because a lower sample size may affect accurate comparability across subnational estimations. Following this specific criterion, we identified five countries that did not meet this cutoff. In the Maldives, we retained 83% of the weighted sample for estimation after dropping observations that had missing data in any of the 10 global MPI indicators. For Georgia MICS 2018, the weighted retained sample at the national level was 82%. In South Africa, the retained sample was 81%. In Montenegro and South Sudan, the retained samples were 80% and 71%, respectively. Montenegro MICS 2018 was updated in this round, replacing MICS 2013 from the last round. Montenegro had the lowest retained weighted sample among the latest updated surveys in this round of the global MPI.

Second, every subnational region in a country must have a retained sample size of at least 75% of the original sample. A smaller sample creates a problem of representativeness for that particular subnational region, which may distort the subnational comparisons. Our analyses indicate that a total of 11 subnational

regions across four countries fall short with respect to this sub-criterion. Two of the six regional islands of Maldives had a retain sample of 74% for Malé and 74% in the Central region. The retained sample in two of the nine provinces in South Africa – Western Cape and Gauteng – was 56% and 71%, respectively. In Montenegro, the Centre region recorded a sample drop of 27%. Six of the 10 regions of South Sudan have a retained sample between 70% to 59%. Given that all 11 subnational regions are within the countries that have a retained national sample of less than 85%, we move on to the final step.

Third, a bias analysis test is carried out for each region whose sample size is lower than 75% and whose national sample size is lower than 85% of the original. We identify the major cause of the sample reduction (in this case, nutrition for all four countries listed above) and divide the entire sample into two groups based on this cause and check the headcount ratios of the other indicators across these two groups. Suppose there is a systematic and statistically significant difference (at a significance level of 1%) between the headcount ratios across these two groups. In that case, that region does not satisfy the bias analysis test. If a region with a large population share (more than 20%) within a country does not pass the test, we exclude the country from our analysis.

Following this sub-criterion, we carried out the bias test for the four countries with a low retained sample, as well as for Georgia. The results for the four countries (Maldives, South Africa, Montenegro, and South Sudan) indicate that the likelihood of being deprived in child mortality (as well in other indicators) is not the same for those who are missing the nutrition indicator and those who are not missing this indicator. Those without a missing nutrition indicator are systematically more likely to be deprived in child mortality (or in other indicators). This suggests that the sampling structure would need to be revised to assure representativity. Thus, these four countries are excluded from the subnational analysis.

Georgia has a weighted sample loss of more than 15% at the national level, leaving it at the borderline. Two of the 10 subnational regions within the country had a retained sample of 76.71% (Kakheti) and 76.91% (Shida Kartli). Both regions had the highest missing values for nutrition and child mortality. Those without missing nutrition indicators are systematically more likely to be deprived in child mortality, suggesting that non-poor people are being excluded. Given that the national sample loss is high and two of its subnational regions indicate biased estimates, we exclude Georgia from subnational disaggregation.

In summary, although subnational disaggregation is theoretically possible for 105 of the 109 countries, only 100 countries with 1,291 regions satisfy all three criteria and are thus used for our subnational analysis. This is the first year we have published disaggregation for 100 countries. In the past, our subnational coverage was lower.

Among the 84 countries with harmonised estimates, we automatically excluded Armenia, Bosnia and Herzegovina, and Montenegro from the harmonised MPI computation at the subnational level based on

the criteria discussed above. In addition, we were not able to produce harmonised subnational estimates for Burkina Faso, Morocco, Sudan, and Yemen because the subnational regions have changed boundaries or have been split into new regions over the years. This means the region variable between the survey years was incomparable for these countries. In summary, we estimated changes of MPI and its partial indices by 793 subnational regions across 77 of the 84 countries that are included in trends over time.

7.7 Disaggregation by gender of household head

This is the first year in which we have disaggregated the MPI and its partial indices by the gender of household head. Out of the 109 countries included in the 2021 global MPI, disaggregation results by female-headed and male-headed households were produced for 108 countries – all except China. Information on household head and relationship to head of household based on the household listing was not available in China CFPS 2014 data sets.

Across all the surveys, household head is a self-reported category. In its interviewer's manual, the DHS survey (ICF, 2020: 27) defines the identification of household head as follows:

> "The person who is identified as the head of the household has to be someone who usually lives in the household. This person may be acknowledged as the head on the basis of age (older), sex (generally, but not necessarily, male), economic status (main provider), or some other reason. It is up to the respondent to define who heads the household."

In its survey tool, the MICS survey (MICS, 2019) defines the selection of household head among householders as follows:

> "The head of household is defined as a usual resident member of the household who is acknowledged by the other members of the household as the household head. Enumerators are expected to list the name of the head of the household as stated by the household members or neighbours."

In summary, the self-reported nature of this information means that the definition of headship provided in the survey is mixed. The identification of household head across countries may vary to include a person's economic status (main provider), age hierarchy (older), or cultural preference (men). However, the value of presenting a global account of multidimensional poverty by the gender of household head is considerable despite the limitation by the mixed definition of headship. We view this work as a starting lens in our on-going research on gendered analysis using the global MPI data.

In our microdata work, we constructed the 'gender of household head' variable using information drawn from two variables in the data sets - sex and relationship to household head. It is useful to summarise a

couple of data decisions that we made. In a minute number of cases, there is missing household head information. In such cases, if information of spouse was available (male or female), we replace them as household head. The number of replacements made was less than 25 observations across the 108 countries. The replacement to the missing value made no difference to the final aggregate numbers.

In the region of Haa of Bhutan, 10 households (home to 84 members) reported two heads: one male head within the economically active age group and one elderly female head. We recoded these households as headed by the male from the economically active age group. In the same region, one household (home to 5 members) reported 2 female heads, one from the economically active group and the other an elderly female head. We recoded the household as headed by the female from the economically active age group. The justification for this is that the majority of households in that cluster reported heads in the economically active age group. However, the number of observations with this particular issue is small that it does not affect the final results observed for Bhutan.

8. Country-specific considerations

This section details the country-specific standardised and harmonised decisions concerning indicator availability and data treatment for each of the 23 new or updated countries included in the global MPI 2021.

Algeria (MICS 2018-2019): The child mortality indicator was constructed using information from ever-married women. This is because birth history was collected only for women aged 15 to 49 years who are married or were married in the past, rather than all women in the age group. The MPI results are disaggregated by seven major regions (Directorate of the Population of the Ministry of Health, Population and Hospital Reform and UNICEF, 2020, p.26). This survey is harmonised with an earlier survey, MICS 2012-2013. The information on non-drinking water is no longer considered to determine the quality of bottled water. As such, we consider bottled water as improved source of drinking water across the survey years.

Bolivia (EDSA 2016): This is a national survey that is open access but requires registration. Height and weight measurements were collected from all children 0-5 years and for all women aged 14 to 49 years living in the households sampled. The data indicate a total of 6,451 children aged 0-5 years. In terms of age in months, these children are between 0-69 months old. We computed underweight and stunting measures for children up to 60 months; followed by BMI-for-age measures for children from 61-69 months old. Information on child mortality was collected for all women aged 14 to 49 who slept the night before in the household. This survey defines the eligibility of women in the fertile age group from 14 to

49 years instead of the usual 15 to 49 years. The MPI estimates are disaggregated by 9 departments since the survey sample is representative at this level.

This survey is harmonised with two earlier surveys, DHS 2008 and DHS 2003. In the 2016 survey, anthropometric measurements were collected from children 0-5 years and women 14-49; while in the earlier survey it was collected from children under 5 and women 15-49 years. For harmonisation purposes, we use the anthropometric information from children under 5 and women 15-49, to accord with the earlier surveys. In this survey, data on child mortality was collected from women 14-49. For harmonisation purposes, we use the data from women 15-49 to accord with the earlier survey.

Cameroon (DHS 2018): Anthropometric data is available for children under 5 and women 15-49 years living in one-half of all sampled households. The MPI estimates are disaggregated by 10 administrative regions and the cities of Yaoundé and Douala since the survey sample is representative at this level (INS and ICF, 2020, p.449). This survey is harmonised with two earlier surveys, DHS 2011 and MICS 2014. The DHS survey collected anthropometric information from children under 5, as well as women in the reproductive age group. The MICS survey has anthropometric data only for children under 5. For harmonisation purposes, we only use the anthropometric information from children, to accord with the MICS data. Additionally, for the school attendance indicator in the MICS survey, we harmonised the school-age variable using individual's age from the household roster instead of the 'schage' variable. Drinking water obtained from tanker trucks and carts are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time.

Central African Republic (MICS 2018-19): Anthropometric data is available for all children under 5. The MPI estimates are disaggregated by 7 administrative regions of the country (ICASEES, 2021, p. xviii). This survey is harmonised with two earlier surveys, MICS 2000 and MICS 2010. For harmonisation purposes, we have removed the birth history information from the 2018-2019 survey to match the 2010 and 2000 data sets, which did not include a birth history questionnaire. So, the harmonised child mortality indicator considers a household deprived if there is any child who died in the household. Additionally, for the school attendance indicator, we harmonised the school-age variable using individual's age from the household roster instead of the 'schage' variable because the initial MICS survey lacked the 'schage' variable. There is also no information on shared toilets between households for MICS 2000, hence the sanitation indicator was harmonised over time to exclude the information on shared toilet from MICS 2018-2019 and 2010 as well. Bottled water is considered as an improved source of drinking water over time. The initial MICS does not include information on whether the household owns a telephone landline, mobile telephone, computer, or an animal cart. Likewise, the harmonised over time assets indicator does not include these items.

Chad (MICS 2019): Anthropometric data is available for all children under 5. The MPI estimates are disaggregated by 22 provinces (INSEED and UNICEF, 2020, p. 23 of 859). This survey is harmonised with two earlier surveys, DHS 2014-2015 and MICS 2010. The DHS data set has anthropometric information from all children aged under 5 years and a subsample of women aged 15 to 49; however, for harmonization purposes, we only use the anthropometric information from children, to accord with the 2019 and 2010 MICS data sets. In addition, for harmonisation purposes, we have removed the birth history information from the recent two surveys to match the 2010 data set, which did not include a birth history questionnaire. So, the harmonised child mortality indicator considers a household deprived if there is any child who died in the household. For the school attendance indicator, we harmonised the school-age variable using individual's age from the household roster instead of the 'schage' variable across the MICS data sets so this is consistent with the DHS data. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. The two earlier data sets do not include information on whether the household owns a computer; likewise, the harmonised over time assets indicator does not include this item. The regions of Ennedi West and Ennedi East are independent regions in the MICS 2019 survey but are grouped in the earlier surveys. For the purpose of comparability over time, we have grouped these regions across data sets.

Costa Rica (MICS 2018): A high percentage of children 0-59 months old had missing weight or/and height measurements and missing date of birth. It was not possible to construct the underweight indicator for 13.4% of the under-5 sample, and the stunting indicator for 13.6% of the same sample. As a result, the final nutrition indicator showed that some 4% of individuals lived in households where there was child or children under 5 who were eligible for measurement but were not successfully measured. This survey data lacks information on cooking fuel. It may be the case that 100% of the households in this country have access to clean fuels and technologies for cooking. However, we are not able to verify this assumption from the survey report or other reliable data sources such as the World Bank. As such, we have treated this indicator as missing and hence the remaining five indicators (sanitation, drinking water, electricity, housing and assets) of the living standards are re-weighted to receive 1/15 of the indicator weight each, which sums to 1/3 of the dimension weight. The MPI estimates are disaggregated by seven provinces (MS, INEC and UNICEF, 2018, p. 198). This country was not included in the trends over time analysis because surveys from earlier years are not available.

Cuba (MICS 2019): Anthropometric data is available for all children under 5. There is no data on birth history in the last five years, so the child mortality indicator considers individuals deprived if there is any child who died in the household. The MPI estimates are disaggregated by 15 provinces and the special municipality of Isla de la Juventud (Directorate of Medical Records and Health Statistics and UNICEF,

2020, p.22). This country was excluded from the trends over time analysis because of incomparable sample design between the recent survey (MICS) and the Encuesta Nacional De Ocupación (ENO) 2017 data.

Ethiopia (DHS 2019): The 2019 Mini-DHS is the second mini survey conducted in Ethiopia.

The first Mini-DHS was conducted in 2014; while four full-scale DHS surveys were conducted in 2000, 2005, 2011, and 2016. We have used the full-scale DHS survey when computing the MPI and its partial indices for Ethiopia in our past work. Since this is a Mini-DHS, height and weight measurements were recorded for only children aged 0-59 months. In contrast, the full-scale DHS usually measures all adults in the reproductive age group. The MPI estimates are disaggregated by 11 regions (EPHI and ICF, 2021, p.105). This survey is harmonised with two earlier DHS surveys, 2011 and 2016. For harmonization purposes, we only use the anthropometric information from children, to accord with the most recent data set. In addition, while the older surveys listed the 'flush to don't know where' response to be an unimproved sanitation facility, we harmonised this facility to be improved to match the more recent classification in the 2019 data. Likewise, drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. The earlier data from 2011 does not include information on whether the household owns a computer, so it is therefore not included in the asset indicator for harmonization purposes.

Ghana (MICS 2017-18): Anthropometric data is available for all children under 5. The toilet categories: 'pit latrine with seat' and 'mobile toilet' are unique to Ghana. Following the country survey report, these categories are identified as improved latrine (Ghana Statistical Service, 2018, p.298). The indicator on motorbike (under assets) included information on motorcycle and tri-cycle. The indicator on television (under assets) included black and white television, old-coloured television and plasma/LCD television. The MPI estimates are disaggregated by 10 administrative regions (Ghana Statistical Service, 2018, p.214). This survey is harmonised with two earlier surveys, DHS 2014 and MICS 2011. The DHS data set has anthropometric information from a subsample of women aged 15 to 49, men aged 15 to 59, and children aged under 5 years; however, for harmonization purposes, we only use the anthropometric information from children, to accord with the MICS data sets. For the school attendance indicator, we harmonised the school-age variable using individual's age from the household roster instead of the 'schage' variable across the MICS data sets so this is consistent with the DHS data. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time.

Guinea-Bissau (MICS 2018): Anthropometric data is available for all children under 5. The MPI estimates are disaggregated by nine regions (Ministry of Economy and Finance, General Directorate of the

Plan/National Statistics Institute, 2020, p. 23 of 859). This survey is harmonised with an earlier survey, MICS 2014. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time.

Guyana (MICS 2019-2020): Anthropometric data is available for all children under 5. The MPI estimates are disaggregated by 10 provinces (Government of Guyana and UNICEF, 2021, p. 23). This survey is harmonised with two earlier surveys, MICS 2014 and DHS 2009. The DHS data set has anthropometric information from all children aged under 5 years and adults aged 15 to 49 years; however, for harmonization purposes, we only use the anthropometric information from children, to accord with the 2019-2020 and 2014 MICS data sets. For the school attendance indicator, we harmonised the school-age variable using individual's age from the household roster instead of the 'schage' variable across the MICS data sets so this is consistent with the DHS data. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time.

Liberia (DHS 2019-2020): Anthropometric measurements were collected from women aged 15 to 49 and children aged under 5 years living in half of households sampled for the male interview. The MPI estimates are disaggregated by 15 counties (LISGIS, Ministry of Health and ICF, 2021, p. 373). This survey is harmonised with two earlier DHS surveys, 2013 and 2007. Across all three DHS surveys, anthropometric measurements were collected from women aged 15-49 years and children under 5 years living in a subsample of households; with an exception in the 2013 survey that also collected this data from a subsample of men aged 15 to 49. However, for harmonization purposes, we only include nutrition information from women and children in the harmonised nutrition indicator across the three survey periods. In addition, while the older surveys listed the 'flush to don't know where' response to be an unimproved sanitation facility, we harmonised this facility to be improved to match the more recent classification in the 2019-2020 data set. Likewise, drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. The 2007 data set indicates that households using bottled water as the main source of drinking water were classified into improved or unimproved drinking water users according to the water source used for other purposes such as cooking and handwashing. We do not use this condition and instead harmonised bottled water as improved to match the 2013 and 2019-2020 classification. All three data sets do not include information on whether the household owns an animal cart, and likewise the assets indicator for Liberia does not include this item.

Morocco (PAPFAM 2017-2018): The PAPFAM data is not available on an open access platform. We obtained the microdata from UNESCWA and UNICEF country teams with permission from the Haut Commissariat au Plan – National Office of Statistic in Morocco and the Ministry of Health in Morocco

solely for computing and publishing the global MPI aggregates. Anthropometric measurements were collected from all children aged under 5 years. The child mortality indicator was constructed using information from ever-married women. This is because birth history was collected only for women aged 15 to 49 years who are married or were married in the past, rather than all women in the age group. The survey has no direct question on whether household has electricity or not. As the best alternative, the electricity indicator for this survey was drawn from the variable 'main type of lighting'. The response categories are: (1) electricity; (2) oil lamps/candles; (3) solar energy; (4) other. We identified households as not deprived in electricity if their lights are powered by electricity or solar energy; while households that relied on oil lamps, candles or other sources to power the lights at home are identified as deprived in electricity. The toilet categories for this survey differ slightly from the standardised version found in DHS and MICS data sets: (1) toilet with siphon connected to the sewer; (2) toilet with siphon not connected to sewer; (3) toilet without siphon connected to sewer; (4) toilet latrine; (5) in nature/open defecation; (6) other. Following the advice from the UNICEF team, we identified categories 1-4 that are not shared among other households as improved sanitation. In this survey, bottled mineral water and water delivered via water tanker is considered as unimproved source of drinking water. In terms of housing, we identified householders as deprived in housing if the type of dwelling is traditional, tent, temporary shelter, or other. We identified those who reported having other types of flooring as having improved floor since checks using additional variables revealed the type of dwelling as apartment or modern house.

The survey does not include information on whether the household owns a bicycle, so the assets indicator does not include this item. The MPI estimates are disaggregated by 12 regions of Morocco. This survey is harmonised with an earlier survey, PAPFAM 2011. For harmonisation purposes, we have removed the birth history information from the recent survey to match the 2011 data set, which did not include a birth history questionnaire. So, the harmonised child mortality indicator considers a household deprived if there is any child who died in the household. The earlier PAPFAM data set does not have information on the material used for walls, but the most recent survey does; therefore, the information on wall material in the second year has been removed, following the restricted condition principle. The surveys do not include information on whether the household owns a bicycle, and likewise the assets indicator does not include this item across both surveys. In addition, the earlier data set does not include information on whether the household owns an animal cart; therefore, we remove this asset from the harmonised assets indicator.

Nepal (MICS 2019): Anthropometric measurements were collected from all children aged under 5 years. The child mortality indicator was constructed using information from ever-married women. This is because birth history was collected only for women aged 15 to 49 years who are married or were married in the past, rather than all women in the age group. The MPI estimates are disaggregated by seven provinces (CBS, 2020, p. 30 of 959). This survey is harmonised with two earlier DHS surveys, 2016 and

2011. The DHS data sets has anthropometric information from adults, and children aged under 5 years; however, for harmonization purposes, we only use the anthropometric information from children, to accord with the current MICS data set. For the school attendance indicator, we harmonised the school-age variable using individual's age from the household roster instead of the 'schage' variable for the MICS data set so this is consistent with the DHS data sets. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. For harmonization purposes, we regroup the 13 regions that exist in the DHS 2011 into seven provinces to accord with the subnational disaggregation of the DHS 2016 and MICS 2019 surveys.

North Macedonia (MICS 2018-2019): Anthropometric data is available for all children under 5. However, our data analysis and the survey report by the State Statistical Office and UNICEF (2020, p.162) confirms that it was not possible to construct the underweight indicator for some 14% of the under-5 sample, and stunting indicator for 16% of the same sample. The final nutrition indicator showed that close to 5% of individuals lived in households where there was child or children under 5 who were eligible for measurement but was not successfully measured. The MPI estimates are disaggregated by eight regions (State Statistical Office and UNICEF, 2020, p.317). This survey is harmonised with two earlier MICS surveys, 2011 and 2005-2006. The initial survey did not include a birth history questionnaire. So, the child mortality indicator considers a household deprived if there is any child who died in the household. Child mortality data was not available in the MIC 2011 survey. The most recent survey has information on birth history and child mortality. For harmonization purposes, we remove all data on child mortality to accord with the MICS 2011 data and re-weight the indicators to assure equal weighting among the three dimensions. In MICS 2005-2006, the official entry age to primary school is 7 years, and in MICS 2011 and 2018-2019, the official entry age to primary school is 6 years. We keep the age ranges as they are (in this case, 7 to 15 in the first survey and 6 to 14 in the second and third period) to capture the range of eligible children fully. Additionally, we harmonised the school age variable using the individual's age from the household roster instead of the 'schage' variable for the attendance indicator because the initial MICS survey lacked the 'schage' variable. In addition, the initial survey listed the 'flush to don't know where' response to be an unimproved sanitation facility, we harmonised this facility to be improved to match the classification in the 2018-2019 and 2011 data sets. Likewise, drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time.

Palestine, State of (MICS 2019-2020): Anthropometric measurements were collected from all children aged under 5 years. The child mortality indicator was constructed using information from ever-married women. This is because birth history was collected only for women aged 15 to 49 years who are married

or were married in the past, rather than all women in the age group. The television indicator includes the ownership of LCD, LED, or 3D TV. This survey lacks data on animal cart. The MPI estimates are disaggregated by two major regions (Palestinian Central Bureau of Statistics, 2021, p. 30 of 959). This survey is harmonised with two earlier MICS surveys, 2014 and 2010. There is no information on wall or roof materials in the 2010 data set, and therefore this information is not included in the harmonised housing indicator. The 2010 data set does not include information on the time needed to collect drinking water; therefore, we drop this criterion from the harmonised water indicator. In addition, drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. The 2010 data set also does not include information whether the household owns a bicycle, a motorcycle, or an animal cart; therefore, we remove these asset items from the harmonised assets indicator even if these were available in later surveys.

Sao Tome and Principe (MICS 2019): Anthropometric measurements were collected from all children aged under 5 years. The survey provider indicated incorrect skip on questions 'ws1' and 'ws3' in the questionnaire. As a result, the time needed to collect drinking water was not asked for households reporting having water piped to a neighbour. For these households, variable 'time to collect water' has system missing values. This category represents about 12% of the survey sample. In our work, we continue to identify these households as using improved drinking water source, solely based on the information provided in the ws1 (Main source of drinking water) variable. The global MPI results is disaggregated for 5 study domains of Sao Tome and Principe (INE and UNICEF, 2020, p.4). This survey is harmonised with two earlier surveys, MICS 2014 and DHS 2008-2009. The DHS data set has anthropometric information from all children aged under 5 years, women aged 15 to 49 years and men aged 15 to 59 years; however, for harmonization purposes, we only use the anthropometric information from children, to accord with the 2019-2019 and 2014 MICS data sets. For the school attendance indicator, we harmonised the school-age variable using individual's age from the household roster instead of the 'schage' variable across the MICS data sets so this is consistent with the DHS data. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. The initial survey did not collect information on wall and roof materials. Therefore, we do not include these components as part of the harmonised housing indicator despite the availability of these data in the later surveys. The initial survey does not include information on whether the household owns an animal cart, and likewise the harmonised assets indicator does not include this item despite the availability of this information in later surveys. The DHS 2008-2009 and MICS 2014 surveys are representative for four regions of the country, while the 2019 survey is representative for five regions. This is because Distrito de Mé-Zóchi and Distrito de Água Grande in the

2019 survey was previously part of Região Centro Oeste. For the purpose of comparability over time, we regroup these regions in the 2019 survey.

Senegal (DHS 2019): Anthropometric measurements were collected from all children aged under 5 years. The MPI results is disaggregated for 14 subnational regions (ANSD and ICF, 2019, p.3). This survey is harmonised with two earlier DHS surveys, 2017 and 2005. The initial DHS data set has anthropometric information from a subsample of women aged 15 to 49 and children aged under 5 years; while this data is limited to children aged under 5 years in DHS 2019 and 2017. For harmonization purposes, we only use the anthropometric information from children, to accord with the later DHS data sets. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. The initial survey did not collect information on wall and roof materials. Therefore, we do not include these components as part of the harmonised housing indicator despite the availability of these data in the later surveys. The initial survey does not include information on whether the household owns an animal cart, and likewise the harmonised assets indicator does not include this item despite the availability of this information in later surveys. The 2019 and 2017 surveys have three additional regions compared to DHS 2005. A comparison of the maps reveals that larger regions in the initial survey year have been divided into smaller regions. Tambacounda split into Tambacounda and Kedougou; while Kolda split into Kolda and Sedhiou; and Kaolack split into Kaffrine and Kaolack. For harmonisation purposes, we grouped these regions to match the 11 regions in the initial data set.

Serbia (MICS 2019): Anthropometric measurements were collected from all children aged under 5 years. However, a high percentage of children had missing weight or/and height measurements. It was not possible to construct the underweight indicator for 32% of the under-5 sample, and stunting indicator for 36% of the same sample. Our data analysis and the survey report by the Statistical Office of the Republic of Serbia and UNICEF (2019, p.243) confirms that a large proportion of the children with missing measurements were from Belgrade and the richest wealth quintile. As a result, the final weighted nutrition indicator showed that 14% of individuals lived in households with a missing nutrition indicator. In addition, some 5% of individuals live in households where there is missing child mortality information. This corresponds with the slightly low response rate among women aged 15 to 49 years who provide the birth history data (p.iii). Collectively, the high missing observations for nutrition and children mortality indicators meant that we were only able to retain 89% of the weighted analytical sample. This is because the global MPI only retains observations that are complete across the 10 indicators. There is no data on birth history in the last five years, so the child mortality indicator considers individuals deprived if there is any child who died in the household (this applies for earlier surveys as well). We also observed that this dataset lacked a specific definition for rural areas. Instead, the official statistics in Serbia applied an

administrative-legal criterion that designates settlements as either 'urban' or 'other'. In the global MPI, we have recoded the category 'other' as 'rural' because other includes predominantly rural settlements. The MPI results are disaggregated by four regions since the survey sample is representative at this level (p.43 of 827 of survey report). This survey is harmonised with two earlier MICS surveys, 2014 and 2010. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time.

Sierra Leone (DHS 2019): Anthropometric data collection was applied to children under 5 years, to women 15-49 years and to men 15-59 years in a subsample of households. The MPI results is disaggregated by 16 districts (Stats SL and ICF, 2020, p.369). This survey is harmonised with two earlier surveys, DHS 2013 and MICS 2017. The DHS surveys collected anthropometric information from children under 5, as well as women and men in the reproductive age group. The MICS survey has anthropometric data only for children under 5. For harmonisation purposes, we only use the anthropometric information from children, to accord with the MICS data. Additionally, for the school attendance indicator in the MICS survey, we harmonised the school-age variable using individual's age from the household roster instead of the 'schage' variable. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. We regroup the 14 regions that exist in the earlier two surveys and the 16 regions in the most recent survey into four major regions for harmonization purposes. We present the harmonised MPI results and its partial indices by four major regions of Sierra Leone.

Thailand (MICS 2019): Anthropometric measurements were collected from all children aged under 5 years. There is no data on birth history in the last five years, so the child mortality indicator considers individuals deprived if there is any child who died in the household (this applies for earlier surveys as well). The MPI estimates are disaggregated by 5 major regional domains since the survey sample is representative at this level (National Statistical Office of Thailand, 2020, p.251). This survey is harmonised with two earlier MICS surveys, 2015-2016 and 2012. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. The recent data sets also does not include information whether the household owns an animal cart; therefore, we remove this asset item from the harmonised assets indicator despite the availability of this information in the initial survey.

Tonga (MICS 2019): Anthropometric measurements were collected from all children aged under 5 years. The MPI estimates are disaggregated by five divisions of the country (Tonga Statistics Department, 2020, p. 335 of 546). This country was not included in the trends over time analysis because surveys from earlier years are not available.

Turkmenistan (MICS 2019): Anthropometric measurements were collected from all children aged under 5 years. This survey data lacks information on cooking fuel. We have treated this indicator as missing and hence the remaining five indicators (sanitation, drinking water, electricity, housing and assets) of the living standards are re-weighted to receive 1/15 of the indicator weight each, which sums to 1/3 of the dimension weight. The survey data does not include information on whether the household owns an animal cart, and likewise the assets indicator does not include this item (the lack of cooking fuel indicator applies for earlier surveys in Turkmenistan as well). The MPI estimates are disaggregated by six regions of the country since the survey sample is representative at this level (The State Committee of Turkmenistan for Statistics and UNICEF, 2020, p. 212). This survey is harmonised with two earlier MICS surveys, 2015-2016 and 2006. For harmonisation purposes, we have removed the birth history information from the two recent surveys to match the 2006 data set, which did not include a birth history questionnaire. So, the harmonised child mortality indicator considers a household deprived if there is any child who died in the household. Drinking water obtained from tanker truck and cart are harmonised as improved following the most recent survey. Bottled water is considered as an improved source of drinking water over time. The recent data sets also does not include information whether the household owns an animal cart; therefore, we remove this asset item from the harmonised assets indicator despite the availability of this information in the initial survey.

Concluding remarks

In sum, the global MPI 2021 covers 109 countries, of which two are new countries (Costa Rica and Tonga), and 21 countries have updated surveys. Collectively these 23 new or updated countries represent some 449 million individuals living in the developing regions. Estimates are disaggregated by six age groups across all countries, by rural and urban areas for 108 countries (excluding Seychelles due to lack of data on rural-urban area) and 1,291 subnational regions across 100 countries (excluding 9 countries due to constraints in sample representation or bias in regional estimates). This year, for the first time, we have also disaggregated the gender of the household head for 108 countries (excluding China due to lack of information on household head).

In addition, the global MPI includes harmonised over time estimates for 84 of the 109 countries. The changes in MPI and its partial indices are further disaggregated by age groups for all countries, rural-urban areas for 83 countries (excluding Trinidad and Tobago due to lack of data on rural-urban area in earlier survey) and 793 subnational regions across 77 countries (excluding 7 countries due to constraints in sample representation, bias in regional estimates or incomparability across regional units over time).

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