



OPHI MPI METHODOLOGICAL NOTE 48

Changes Over Time in the Global Multidimensional Poverty Index: A Ten-Country Study

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Introduction

This brief methodological note presents a ten-country study of changes over time in multidimensional poverty, using the 2019 global MPI specifications.¹ Accompanying tables release the full results in these categories: national, rural, urban, subnational regions, age groups and complete estimations, as well as complementary data, indicator breakdowns, and standard errors. This note first explains the choice of the ten countries for this preliminary study of changes over time. It then describes the principles used to guide the data harmonisation process and the estimation procedures. Then, it provides the methodological details of harmonisation for the estimation of each dataset used. The results of these estimations are presented in Table 6, available [online](#).

1. A Ten-Country Study of Changes over Time in the Global MPI

Selection of Countries

[Table 6](#) of the 2019 global MPI presents harmonised intertemporal estimations using 20 datasets from 10 countries (Bangladesh, Cambodia, Democratic Republic of Congo, Ethiopia, Haiti, India, Nigeria, Pakistan, Peru, and Viet Nam). Harmonised datasets are presented in order to make rigorous comparisons of changes in the MPI and its associated statistics over time. Strict harmonisation requires using the same information from both the older and newer datasets to ensure that any differences observed are due to changes in the conditions of the country rather than changes in the questionnaire. The harmonisation process is further detailed in Section 3, ‘Harmonisation Principles and Decisions’.

The 10 countries in this study span multiple world regions (Latin America and the Caribbean, South Asia, East Asia and the Pacific, and Sub-Saharan Africa), various World Bank income categories (e.g. upper-

¹ For full details on the global MPI structure and specifications, see Alkire et al. (2019), as well as [previous methodological notes](#).

middle income, lower-middle income, and low income), and include four of the top ten most populated countries in the world (India, Pakistan, Nigeria, and Bangladesh).

These ten countries were selected jointly with the Human Development Report Office team at the United Nations Development Programme (UNDP) in order to have a preliminary study of change over time for a diverse set of countries.

The countries launched in July 2019, together with the surveys used and years, are as follows: Bangladesh (DHS 2004, DHS 2014), Cambodia (DHS 2010, DHS 2014), Democratic Republic of Congo (DHS 2007, DHS 2013/14), Ethiopia (DHS 2011, DHS 2016), Haiti (DHS 2012, DHS 2016/17), India (DHS 2005/06, DHS 2015/16), Nigeria (DHS 2013, MICS 2016/17), Pakistan (DHS 2012/13, DHS 2017/18), Peru (DHS-Cont. 2006, DHS-Cont. 2012), and Viet Nam (MICS 2010/11, MICS 2014). The survey data used to estimate changes over time using the 2019 MPI specifications are dated from 2004 to 2018.

Policies Regarding Population Figures and Complementary Information

As in previous years, the surveys are dated according to the year in which the fieldwork took place, as detailed in the survey report. If the fieldwork took place during two calendar years, the data will be labelled with both years, e.g. 2010/11, and the analysis will consider the average between the two periods (e.g. $2010-11 = 2010.5$). In this case, the population figures indicated as those of the year of the survey, as well as the complementary information, correspond to the second calendar year, or the closest available year with information.

Population figures are reported for the year of the survey, using the 2017 *Revision of World Population Prospects* (UNDESA, 2017). When, for illustrative purposes, regional aggregates are presented, 2017 population data are also employed.

2. The Global MPI: Measuring Multidimensional Poverty

The global MPI is a measure of acute global poverty developed by the Oxford Poverty and Human Development Initiative (OPHI) with the UNDP's Human Development Report Office (Alkire et al., 2019). The index is an application of the method developed by Sabina Alkire and James Foster (2007, 2011; Alkire et al., 2015).

The global MPI 2019 assesses multidimensional poverty for people in 101 countries overall, including new data for 14 countries.² As summarised in Table 1, the MPI uses information from 10 indicators that are

² All ever-published MPI estimations are available in Table 7 of the [MPI online resources](#).

organised into three dimensions:³ health, education, and living standards, following the same dimensions and weights as the UNDP's Human Development Index (HDI). Each person is identified as deprived or non-deprived in each indicator based on a deprivation cutoff (See Table 1 as well as Alkire and Santos, 2014). Each person's deprivation score is constructed based on a weighted average of the deprivations they experience, using a nested weight structure: equal weight across dimensions and equal weight for each indicator within dimensions. Finally, a poverty cutoff of 33.33% identifies as multidimensionally poor those people whose deprivation score meets or exceeds this threshold.

The MPI reflects both the **incidence** or headcount ratio (H) of poverty – the proportion of the population that is multidimensionally poor – and the average **intensity** (A) of their poverty – the average proportion of indicators in which poor people are deprived. The MPI is calculated by multiplying the incidence of poverty by the average intensity across the poor ($H \times A$).

Table 1 presents the dimensions, indicators, deprivation cutoffs, and weights used in the global MPI 2019. For a more detailed look at the specifications of the global MPI 2019, please refer to Alkire et al. (2019).

Table 1: Global MPI 2019 - dimensions, indicators, deprivation cutoffs and weights

Dimensions of poverty	MPI indicator	SDG Area	Deprived if...	Weight
Health	Nutrition	SDG 2	Any person under 70 years of age, for whom there is nutritional information, is malnourished. ¹	1/6
	Child Mortality	SDG 3	A child under 18 years of age has died in the family in the five-year period preceding the survey. ²	1/6
Education	Years of schooling	SDG 4	No household member aged 10 years or older has completed six years of schooling.	1/6
	School Attendance	SDG 4	Any school-aged child is not attending school up to the age at which he/she would complete class 8. ³	1/6
Living Standard	Cooking Fuel	SDG 7	A household cooks with dung, agricultural crop, shrubs, wood, charcoal or coal.	1/18
	Sanitation	SDG 11	The household's sanitation facility is not improved (according to SDG guidelines) or it is improved but shared with other households. ⁴	1/18
	Drinking Water	SDG 6	The household does not have access to improved drinking water (according to SDG guidelines) or safe drinking water is at least a 30-minute walk from home (as a roundtrip). ⁵	1/18
	Electricity	SDG 7	The household has no electricity. ⁶	1/18

³ For a more detailed description of the indicator definitions, see Alkire et al. (2019).

	Housing	SDG 11	The household has inadequate housing: the floor is made of natural materials or the roof or walls are made of rudimentary materials. ⁷	1/18
	Assets	SDG 1	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.	1/18
		<p>Notes:</p> <p>¹ Adults 20 to 70 years are considered malnourished if their Body Mass Index (BMI) is below 18.5 m/kg. Those 5 to 19 years of age are identified as malnourished if their age-specific BMI cutoff is below minus two standard deviations. Children under 5 years of age are considered malnourished if their z-score of either height-for-age (stunting) or weight-for-age (underweight) is below minus two standard deviations from the median of the reference population. In the global MPI, most surveys had anthropometric information for children under 5 years. In addition, most DHS surveys had nutrition information for women 15 to 49 years of age, and a few had nutrition information for men 15 to 59 years of age.</p> <p>² The child mortality indicator of the global MPI is based on birth history data provided by mothers aged 15-49. In most surveys, men have provided information on occurrence of 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 is missing, and if the male in the household reported no child mortality, then we identify no occurrence of child mortality in the household.</p> <p>³ Data source for age children start compulsory primary school: DHS or MICS survey reports; UIS.Stat: http://data.uis.unesco.org/</p> <p>⁴ 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 survey report uses other definitions of adequate sanitation, we follow the survey report.</p> <p>⁵ 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 30 minutes' walk (round trip). If survey report uses other definitions of 'safe' drinking water, we follow the survey report.</p> <p>⁶ A number of countries do not collect data on electricity because access to electricity is 100%. In such cases, we identify all households in the country as non-deprived in electricity.</p> <p>⁷ Deprived if floor is made of mud/clay/earth, sand, or dung; or if dwelling has no roof or walls or if either the roof or walls are constructed using natural materials such as cane, palm/trunks, sod/mud, dirt, grass/reeds, thatch, bamboo, sticks, or rudimentary materials such as carton, plastic/polythene sheeting, bamboo with mud/stone with mud, loosely packed stones, adobe not covered, raw/reused wood, plywood, cardboard, unburnt brick, or canvas/tent.</p>		

3. Harmonisation Principles and Decisions

General Principles

This study presents harmonised intertemporal estimations using two data points for each of the 10 countries (20 datasets in total). It follows the same basic principles as previous harmonisation of the original MPI over time.⁴ The harmonisation process guarantees that it is possible to make rigorous comparisons of changes in MPI and its associated statistics over time. Unlike *standardisation* – the process used to compute the global MPI for over 100 countries by obtaining the same (or as similar as possible,

⁴ For more details, see Alkire and Roche (2013) and Alkire et al. (2017a, 2017b).

following defined rules) general indicator definitions from different datasets – *harmonisation* seeks to make two or more MPI estimations comparable by precisely aligning the indicator definitions. Put differently, harmonisation, where necessary, re-creates the indicators in the global MPI so that they are using exactly the same information and deprivation cutoffs in both years. For instance, if a survey in one year collects nutrition information from women aged 15–49 years and in the other year it collects nutrition information from women aged 15–54, the harmonised computations will only use information from women aged 15–49 in both years, so that any changes in the nutrition indicator are due to changes in the nutrition status of women in the country rather than the inclusion of a new group of women who may tend to be more (or less) malnourished. This enables better identification of changes in the situation on the ground and minimises noise caused by changes in the questionnaires. This section describes the guiding principles and decisions used in our harmonisation procedure for changes over time estimation.

Given the comparability of the survey design and information collected for DHS and MICS surveys, the datasets for each country were selected based on the length of time between the surveys, and datasets were chosen from years that were far enough apart to expect that change could be observed (at least three years apart). Often, this principle allowed for matching (DHS-DHS or MICS-MICS) comparisons, as countries often administer the same surveys over time. In cases where countries have switched from one to another, a DHS-MICS comparison was used (e.g. Nigeria DHS 2013 and MICS 2016/17).

Several other general principles directed our harmonisation process. In cases of mismatch between the two years, we resort to the condition that is the most restricted. If, for example, one year of the survey did not collect information needed to construct an 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. In our sample of ten countries, only one indicator was dropped and that was for Viet Nam. The Viet Nam MICS 2010/11 collected anthropometric measurements for children under five years, while the Viet Nam MICS 2014 did not; therefore, the Viet Nam nutrition indicator for 2010/11 was not computed.

Efforts were also made to allow for subnational disaggregation of the global MPI and associated statistics by making regions comparable across the two years. Several countries redrew their subnational boundaries in between the two years (e.g. Bangladesh and Pakistan), and others simply disaggregated the regions using different criteria (e.g. Haiti and Peru). Where possible, the variables for subnational regions were adjusted to accord between the two years, making sure the sample was representative according to the regions. Where this was not possible, we made country-specific subnational comparability decisions, based on the structure of the data, sample weighting scheme, and geography. Details of these country-specific decisions

are included in the final section, ‘Considerations by Country’. Where the spelling or names of the regions differed between the two years, the most recent survey’s naming conventions were used.

Lastly, during estimation, in cases where the survey was conducted over two years, the average of the years was used to compute the annualised changes. For example, for Nigeria (DHS 2013 and MICS 2016/17), the difference used to estimate poverty trends was a 3.5-year period. The next section builds on these general principles to describe the indicator-specific decisions required in the harmonisation process.

Indicator-specific Decisions

Education

The first dimension, education, includes two indicators: years of schooling and school attendance. For the years of schooling indicator, DHS data includes a variable that states the total number of years of education for the individual, whereas the MICS data does not provide an equivalent variable. Instead, when using MICS data, the total number of years of education is computed by combining these two 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, a reliable country reference is used instead, either the UNESCO Institute for Statistics (UIS) databank or the International Bureau of Education-UNESCO World Data on Education reports⁵. In cases of mismatch between the survey report and the national guidance, we always follow the MICS report. For the DHS-MICS comparison, 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).

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 to primary schooling is six years, although for two countries, this differs – for Ethiopia, the official entry age is seven years, and for Pakistan, the official entry age is five years. If the official entry age were to differ between the two years (e.g. age six in Year 1 and age seven in Year 2), the surveys would be harmonised to accord to the later age (in this example, age seven) to fully capture the range of eligible children.

⁵ See www.ibe.unesco.org/en/resources/world-data-education and <http://data.uis.unesco.org> for further details.

Health

The second dimension, health, includes the nutrition and child mortality indicators. For the nutrition indicator in the case of DHS, the eligible subsample of individuals for anthropometric measurement, as defined by the report, are used and compared between the two years. If the subsamples cannot be adjusted without compromising the representativeness of the survey – for instance, if in one-year anthropometric data is collected from two out of every three households, and in the other year, it is collected from all households – no adjustments are made, and instead the original sub-samples are used to construct the nutrition indicator. If the sub-samples can be adjusted, they are restricted to the year with the more limited eligibility conditions. For example, in Bangladesh DHS 2004, eligible women for height and weight measurement included ever-married women age 10 to 49 years, whereas in Bangladesh DHS 2014, eligible women included only ever-married women aged 15 to 49 years. As a result, in Bangladesh, only ever-married women aged 15–49 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 indicator in both years of the DHS.

All MICS surveys used here collect anthropometric measurements only for children under five years. Additionally, in the MICS surveys, there are two variables – children’s age in days and age in months – which can be used to compute the nutrition statistics, although, some MICS do not include the age in days variable. As the calculation of the nutrition statistics differs slightly based on the precision of the age unit, the age unit is harmonised between the two years in a MICS-MICS comparison. So, if in the second year both the ‘age in months’ and ‘age in days’ variables exist and in the first year only the ‘age in months’ variable exists, then the ‘age in months’ variable is used for both surveys when calculating the nutrition statistics for children.

For the child mortality indicator, attention was paid to which individuals provide information on child mortality to ensure the sub-samples match between the two years. For instance, in Bangladesh DHS 2004, women who are eligible to provide child mortality information are ever-married women aged 10–49 years, and in Bangladesh DHS 2014, eligible women are ever-married women aged 15–49 years. Therefore, only child mortality information from ever-married women aged 15–49 years is included in the indicator, for both years, following the more restricted condition principle. Additionally, birth history information – whether the mother gave birth in the last five years preceding the survey, and how old the child was when he or she died – is used to construct the child mortality indicator. Often, the older 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 these conditions are removed from the survey that has them, as in the case of Viet Nam. The same rule applies when neither survey has birth history information.

Living Standards

The third and final dimension, 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 the toilet facility is shared by other households, and whether the toilet facility is considered an improved or unimproved facility – to define a household’s access to adequate sanitation. If in one year, there is no information on whether the facility is shared, but the second year does have that information, the condition from the second year is dropped to accord to the more limited information in the first year. Further, when different toilet facilities are considered improved between the two years, the definition of improved facilities is limited to the more restricted range of facilities. For example, in Nigeria MICS 2016/17, the report considers the ‘flush to unknown place/not sure/don’t know where’ response to be an improved sanitation facility, whereas the DHS 2013 report considers the response to be an unimproved facility; the facility is thus coded as unimproved in both years. Additionally, some surveys include a category for responses of ‘missing’ or ‘non-response’ to the question about toilet type (often coded as 99). This separate category is *not* equivalent to a truly missing observation, which is not included in the list of categories. If in the second year, the ‘missing’ (99) response is not included as a sanitation facility (as is the case in Cambodia DHS 2014), but the first year specifies ‘missing’ (99) as unimproved, this category is left as unimproved 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 second year does have that information, the condition is dropped from the second year to accord to the more restricted condition. Further, when different main drinking water sources are considered improved between the two years, we limit the definition of improved sources to the more restricted range of sources. The same procedure for ‘missing’ (99) responses is followed as described above for sanitation facilities. 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 in one year,

there is no information on non-drinking water, as in Pakistan DHS 2012/13, but the second year does have that information, as in Pakistan DHS 2017/18, the condition is dropped from the second year to accord to the more limited information in the first year. Often, when this is the case, the reports specify that bottled water is an improved source, and consequently it is coded as such.

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 Ethiopia DHS 2011, which is missing data on computer ownership, but the second year does have that information, as in Ethiopia DHS 2016, those assets are dropped from the assets indicator in the second year to accord to the more limited information available.

For the cooking fuel indicator, households are defined as deprived when they cook with solid fuels: dung, agricultural crop, shrubs, wood, charcoal, or coal. Following the restricted condition principle, when one year codes a fuel source as solid fuel and the other does not, in the harmonised version of the measure, both years are coded to consider that fuel source as solid fuel.

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 rudimentary materials. Following the restricted condition principle, when one year codes a housing material (constituting the dwelling's floor, roof, or walls) as natural or rudimentary and the other does not, both years are coded to consider that housing material as natural or rudimentary. 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. For example, Democratic Republic of Congo DHS 2007 does not collect information on the material used for walls, but Democratic Republic of Congo DHS 2013/14 does; therefore, the information on wall material in the second year has been removed, following the restricted condition principle.

4. Changes Over Time Estimation

A strong motivation for computing multidimensional poverty is to track and analyse changes over time. This section describes how to compare the MPI and its associated partial indices over time using repeated cross-sectional data, which are the most widely available data.

The basic component of poverty comparisons is the absolute pace of change across periods. 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 , and the corresponding achievement matrices for these two periods by X_{t^1} and X_{t^2} , respectively. The same set of parameters – deprivation cutoff vector \mathbf{z} , weight vector \mathbf{w} and poverty cutoff k – are used in each period.

The **absolute rate of change** (Δ)⁶ is the difference in MPIs between two periods and is computed as

$$\Delta MPI = MPI(X_{t2}) - MPI(X_{t1}).$$

Similarly, for H and A :

$$\Delta H = H(X_{t2}) - H(X_{t1}).$$

$$\Delta A = A(X_{t2}) - A(X_{t1}).$$

The absolute rate of change is indifferent to the initial level. For example, a 5 percentage point reduction of H could mean that H decreased from 75% to 70% or from 10% to 5%.

Changes (increases or decreases) in poverty across two time periods are also evaluated using relative rates. 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** (δ) is computed for the MPI (and similarly for H , and A which are not presented) as

$$\delta MPI = \frac{MPI(X_{t2}) - MPI(X_{t1})}{MPI(X_{t1})} \times 100.$$

The absolute and relative changes, however, are not comparable for different countries when the reference periods 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 the difference in the MPI between two periods divided by the difference in the two time periods ($t^2 - t^1$) and is computed for the MPI as

$$\bar{\Delta} MPI = \frac{MPI(X_{t2}) - MPI(X_{t1})}{t^2 - t^1}.$$

The **annualised relative rate of change** ($\bar{\delta}$) is the compound rate of reduction in the MPI per year between the initial and the final periods, and is computed for the MPI as

$$\bar{\delta} MPI = \left[\left(\frac{MPI(X_{t2})}{MPI(X_{t1})} \right)^{\frac{1}{t^2 - t^1}} - 1 \right] \times 100.$$

The same formula can be used to compute and report annualised changes in the other partial indices, namely H , A , censored headcounts, or percent contributions. And all of these formulas may be used for MPI or for destitution measures.

⁶ This section draws on Chapter 9 of Alkire et al. (2015) and the papers by Alkire et al. (2016) and Alkire et al. (2017b).

The reductions in MPI can be broken down by dimensions. An analysis of changes in MPI considers both changes in the raw or uncensored headcount ratios (h_j) and in the censored headcount ratios ($h(k)$). The changes in censored headcount ratios depict changes in deprivations among the poor.

Changes in the national-level MPI can be decomposed by subnational regions, ethnic groups, or other population subgroups. That is, poverty in each period can be expressed as $MPI = \sum_{\ell=1}^m v^{\ell} MPI(X^{\ell})$,

where $MPI(X^{\ell})$ and $v^{\ell} = n^{\ell}/n$ denote the MPI and the population share of subgroup ℓ , respectively. It can be extremely useful to analyse poverty changes by population subgroups, to see if the poverty in the poorest subgroups reduced faster than in less poor subgroups, and to see the dimensional composition of reduction across subgroups (Alkire and Roche, 2013; Alkire and Seth, 2015; Alkire et al., 2017a, 2017b). Population shares for each period must be analysed alongside subgroup trends in order to take into account demographic shifts such as migration or population growth.

Countries, data, and time periods

For this round of changes over time in multidimensional poverty, data for 10 countries was harmonised and analysed. Bangladesh, Cambodia, Democratic Republic of Congo, Ethiopia, Haiti, India, Nigeria, Pakistan, Peru, and Viet Nam are included in the analysis.

Eight of the ten countries used DHS data for both years (see Table 3),⁷ although the comparison for Peru uses the DHS-Continuous, which replaces a standard DHS conducted at the typical five-year interval with a continuous survey operation in which DHS data is collected and reported on annually by a permanently maintained DHS office and field staff.⁸ The comparison for Viet Nam is based on MICS data for both years. Only one comparison, Nigeria, uses DHS data in the first period, and MICS data in the second.

The average range between the two periods is 5.8 years for the 10 country comparisons. Eight countries have a time range between 3.5 and 8 years, while for Bangladesh and India, we compare surveys conducted 10 years apart. The effective sample size ranges from 22,543 for the Democratic Republic of Congo in 2007 to 2,702,677 in India in 2015/16, while the average sample size is 220,356.

⁷ The fourth round of the National Family Health Survey or NFHS-4 was conducted in 2015/16. In the global MPI, the dataset is identified as India DHS 2015/16 (Alkire et al., 2018). This is because the micro data was obtained from the Demographic and Health Survey (DHS) website. Similarly, NFHS-3 that was carried out in 2005/06 is identified as India DHS 2005/06 in OPHI's global work.

⁸ See USAID (2014), p.vii.

Table 3: Countries, time periods, and data use for the analysis of changes over time

Country	Time period	Surveys	Sample size (t ₁)	Sample Size (t ₂)
Bangladesh	2004–14	DHS-DHS	50,939	74,510
Cambodia	2010–14	DHS-DHS	36,895	46,805
Congo, Democratic Republic	2007–13/14	DHS-DHS	22,543	46,482
Ethiopia	2011–16	DHS-DHS	72,938	69,889
Haiti	2012–16/17	DHS-DHS	38,458	58,054
India	2005/06–15/16	DHS-DHS	484,462	2,702,677
Nigeria	2013–16/17	DHS-MICS	169,768	167,179
Pakistan	2012/13–17/18	DHS-DHS	30,034	33,764
Peru	2006–12	DHS-Cont.-DHS-Cont.	120,497	98,462
Viet Nam	2010/11–14	MICS-MICS	44,064	38,785

5. Considerations by Country

This section comments on the methodological details of the analyses of the 10 country datasets presented in July 2019.

a) New country datasets

Bangladesh (DHS 2004): Anthropometric information was collected among all eligible children under five years and ever-married women 10–49 years; however, for the purposes of harmonisation, we derived nutrition estimates only from eligible children aged 0–5 and ever-married women aged 15–49 years. Child mortality information is provided by ever-married, eligible women, aged 10 to 49, living in all households sampled; this was restricted to women aged 15–49 to align with Bangladesh DHS 2014. Regarding sanitation, Table 2.8 on page 21 of the survey report does not establish eligibility conditions for improved sanitation facilities, but page 20 does note that ‘adequate sanitation facilities’ refers to hygienic toilets (‘septic tank/modern toilets’, ‘water-sealed/slab latrines’, and ‘pit latrines’). We follow this definition for improved sanitation, and we consider the remaining categories (‘open latrine’, ‘hanging toilet’, and ‘no facility/bush/field’) to be unimproved sanitation facilities. The 2004 survey also has no information on whether the toilet was shared with other households. Table 2.8 on page 21 of the report also does not differentiate between improved and unimproved sources of drinking water. Drawing on the guidelines for the Millennium Development Goals (MDGs), we consider the following sources as improved: ‘piped inside dwelling’, ‘piped outside dwelling’, ‘tubewell’, ‘shallow tubewell’, and ‘deep tubewell’, and we consider the other sources as unimproved (‘surface well/other well’, ‘pond/tank/lake’).

‘river/stream’, and ‘other’). Furthermore, data on the time it takes to procure water for the household is not present, nor is information about the source of non-drinking water used for cooking and handwashing, nor if bottled water is the main source of drinking water and used to determine the quality of drinking water in the household. The report does not set a national definition for solid fuels, so we code the sources of cooking fuel according to the MDG guidelines. Further, information on whether the household owns a refrigerator, car, computer, or animal cart is not present and therefore not included in the assets ownership indicator. Survey estimates are disaggregated by rural and urban areas and six divisions. The global MPI for Bangladesh 2004 was first published in July 2015.

Bangladesh (DHS 2014): Anthropometric information was collected among all eligible children under five years and ever-married women aged 15-49 years. Child mortality information is provided by eligible ever-married women aged 15 to 49 living in all households sampled. For harmonisation purposes, the sanitation indicator does not include information on whether the household’s toilet was shared by other households. Also for harmonisation purposes, we do not include estimates on the time it takes to procure drinking water for the household; further, we do not have information about the source of non-drinking water if bottled water is the main source of drinking water in the household. Further, to accord with the 2004 definition of rudimentary roofing materials, the category ‘tin’ is considered unimproved. Table 2.6 on page 15 of the survey report does not consider ‘no food cooked’ and ‘other’ responses to reflect inadequate clean cooking fuel, and the MPI estimation follows that categorisation for the cooking fuel indicator. For harmonisation purposes with 2004, information on whether the household owns a refrigerator, car, computer, or animal cart is not included in the assets ownership indicator. Survey estimates are disaggregated by rural and urban areas and seven divisions; however, we have combined Rajshahi and Rangpur into one region (Rajshahi), in order to match the 2004 subnational estimates. Thus, for harmonisation purposes, we disaggregate only by six comparable regions. The global MPI for Bangladesh 2014 was first published in December 2016.

Cambodia (DHS 2010): Anthropometric measurements were collected from women aged 15-49 and children aged 0–5 living in half of the sampled households selected for the male interviews. Child mortality information was provided by eligible women aged 15 to 49 living in all sampled households and eligible men aged 15 to 49 living in half of the households selected for the male questionnaire. The question classifying non-drinking water sources is not included in the survey; however, Table 2.6 of the report (pages 17 and 18) codes the sources of drinking water as improved or unimproved based on the dry and wet seasons, as does the MPI. Additionally, Table 2.7 considers ‘missing’ responses as unimproved sanitation facilities. Table 2.8 on page 20 of the report

does not consider ‘no food cooked’ and ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for cooking fuel. Further, the report does not include information on whether the household owns a computer, and likewise the assets indicator was computed without this variable. Survey estimates are disaggregated by rural and urban areas and by the 19 provinces. The global MPI for Cambodia 2010 was first published in March 2013.

Cambodia (DHS 2014): Anthropometric measurements were collected from women aged 15–49 and children aged 0–5 living in two-thirds of the sampled households not selected for the male interview. Child mortality information was provided by eligible women aged 15 to 49 living in all sampled households and eligible men aged 15 to 59 living in one-third of the households selected for the male questionnaire. The question classifying non-drinking water sources is not present; however, Table 2.6 on page 19 of the report codes the sources of drinking water as improved or unimproved based on the dry and wet seasons, as does the MPI. Table 2.9 on page 22 of the report does not consider ‘no food cooked in household’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for cooking fuel. Further, the report does not include information on whether the household owns a computer, and likewise the assets indicator is missing this variable. Survey estimates are disaggregated by rural and urban areas and the 19 provinces. The global MPI for Cambodia 2014 was first published in December 2015.

Democratic Republic of Congo (DHS 2007): Anthropometric measurements were collected from women aged 15–49 and children aged 0–5 living in half of the sampled households selected for the male interview. Child mortality information was provided by eligible women aged 15 to 49 living in all sampled households and eligible men aged 15 to 59 living in half of the sampled households selected for the male questionnaire. Table 2.7 on page 21 of the survey report establishes that ‘traditional pit toilet (covered)’ is considered an improved sanitation facility, but ‘traditional pit toilet (uncovered)’ is considered unimproved, as are ‘missing’ responses. Table 2.6 on page 20 states that bottled water was considered an unimproved water source and this MPI follows that categorisation. There is also no variable for non-drinking water used by the household. The report does not state whether the categories ‘open well in dwelling’, ‘open well in yard/plot’, and ‘open public well’ are improved or unimproved, but we consider them as unimproved water sources. Additionally, there is no information on wall materials in the report, and therefore this information is not included in the housing indicator. Table 2.8 on page 22 of the report does not consider ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. Further, information on whether the household owns a computer or animal cart is not present and therefore not included in the assets indicator.

Survey estimates are disaggregated by rural and urban areas and the 11 provinces. The global MPI for the Democratic Republic of Congo 2007 was first published in October 2011.

Democratic Republic of Congo (DHS 2013/14): Anthropometric measurements were collected from women aged 15–49 and children aged 0–5 living in half of the sampled households selected for the male interview. Child mortality information was provided by eligible women aged 15 to 49 living in all sampled households and eligible men aged 15 to 59 living in half of the households selected for the male questionnaire. As in 2007, the question classifying non-drinking water sources is not present. For harmonisation purposes, we have removed information on wall material, so while it does exist in the report, we do not include it as part of the housing indicator in the MPI. Table 2.3 on page 21 of the survey report does not consider ‘no food cooked’ and ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. To correspond with the 2007 data, we have removed information on whether the household owns a computer or animal cart as part of the assets indicator. The global MPI for the Democratic Republic of Congo 2013/14 was first published in December 2015.

Ethiopia (DHS 2011): Anthropometric measurements were collected from women aged 15–49, men aged 15–59, and children aged 0–5 living in all of sampled households. Child mortality information is provided by eligible women aged 15–49 and eligible men aged 15–59. While Table 2.2 on page 16 of the survey report considers the ‘missing’ response to be an unimproved sanitation facility, we impute these categories as missing values to match the 2016 data. Table 2.3 on page 17 of the report does not consider ‘no food cooked’ and ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for cooking fuel. Further, the report does not include information on whether the household owns a computer, and likewise this variable is missing from the assets indicator. Survey estimates are disaggregated by rural and urban areas and the 11 regions. The global MPI for Ethiopia 2011 was first published in March 2013.

Ethiopia (DHS 2016): Anthropometric measurements were collected from women aged 15–49, men aged 15–59, and children aged 0–5 living in all of the sampled households. Child mortality information is provided by eligible women aged 15–49 and eligible men aged 15–59. Table 2.4 on page 21 of the report does not consider ‘no food cooked in household’ and ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. For harmonisation purposes, the assets indicator does not consider whether a household owns a computer. Survey estimates are disaggregated by rural and urban areas and the 11 regions. The global MPI for Ethiopia 2016 was first published in September 2018.

Haiti (DHS 2012): Anthropometric measurements were collected from women aged 15–49 and children aged 0–5 living in two-thirds of the sampled households selected for the male interview. Child mortality information was provided by eligible women aged 15–49 living in all sampled households and eligible men aged 15–59 living in two-thirds of the households selected for the male questionnaire. Table 2.1 on page 13 of the survey report establishes that the category ‘other’ types is not an improved source of drinking water, nor ‘sales company of water’, and the estimation of the MPI follows this definition. Table 2.3 on page 16 of the report does not consider ‘no food cooked in household’ to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. Survey estimates are disaggregated by rural and urban areas and the 10 departments plus camps; for harmonisation purposes, we disaggregate by the 10 departments, with the camps’ population redistributed among the departments. The global MPI for Haiti 2012 was first published in December 2015.

Haiti (DHS 2016/17): Anthropometric information was collected from all children under five years. Among a sub-sample of two-thirds of households selected for the domestic violence module, these parameters were also recorded among women aged 15–49. In the other sub-sample of one in three households not selected for the domestic violence module, weight and height measurements were also recorded for men and women aged 35–64 and children aged 5–14. For harmonisation purposes, we only use nutrition information from children aged 0–5 and women aged 15–49 living in two-thirds of sampled households. Child mortality information is provided by eligible women aged 15–49 living in all sampled households and eligible men aged 15–64 living in the subsample of two-thirds of the households. Table 2.4 on page 25 of the report does not consider ‘no food cooked in household’ to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for cooking fuel. Survey estimates are disaggregated by rural and urban areas and the 10 departments and the Metropolitan area; for harmonisation purposes, we combine the Metropolitan and Reste-Ouest areas to accord with the subnational disaggregation of the 2012 survey that presents results by 10 departments. The global MPI for Haiti 2016/17 was first published in September 2018.

India (DHS 2005/06):⁹ Anthropometric data was collected for all eligible children under five years, all women aged 15–49 years, and a subsample of men aged 15–54 years. Child mortality information was provided by eligible women aged 15–49 living in all sampled households and eligible men aged 15–54 living in households selected for the male questionnaire. The NFHS-3 survey identifies

⁹ All decisions related to harmonising India over the two-year period is exclusively based on the work by Alkire et al. (2018).

households that drink bottled water as having an improved source of water only if the source of water they use for cooking and/or hand washing is from an improved source, following the general principle; however, the NFHS-4 considers bottled water to be an unimproved source because the quality of bottled water is not known (IIPS and ICF, 2017, p. 24). The indicators were harmonised for the two time periods following the decision in NFHS-4 survey report. Some 3% of individuals were dropped from the NFHS-3 dataset because they were identified as non-usual residents. Non-usual residents were excluded because poverty estimates are usually based on usual or permanent residents of a household. The final analytical sample for NFHS-3 (2005/06) covered some 484 thousand people. Survey estimates are disaggregated by rural and urban areas and 29 states. The global MPI for India 2005/06 was first published in October 2011.

India (DHS 2015/16):¹⁰ Anthropometric data was collected for all eligible children under five years, all women aged 15–49 years and a subsample of men aged 15–54 years. These men, who lived in one-third of the sampled households, were selected for the state module questionnaire. The weight and height of children under five years were measured regardless of whether their mothers were interviewed in the survey. The anthropometric data from women aged 15–49 excluded pregnant women and those who had given birth in the last two months of the survey. Child mortality information was provided by eligible women aged 15–49 living in all sampled households and eligible men aged 15–54 living in households selected for the male questionnaire. The NFHS-4 survey report identifies bottled water as unimproved source because the quality of bottled water is not known (IIPS and ICF, 2017, p.24). The NFHS-4 data also identified an additional source of drinking water, which is the community RO plant. All those whose source of drinking water is from this particular category are identified as non-deprived following the survey report (IIPS and ICF, 2017, p.24). Furthermore, the category ‘other water source’s is listed as neither improved nor non-improved in the NFHS-4 survey report (IIPS and ICF, 2017, Table 2.1, p. 24). As such, this estimation followed the internationally agreed guideline, where other drinking sources are listed as deprived (UNICEF and WHO, 2019). In the NFHS-4 survey report, three of the cooking fuel categories – that is, kerosene, other and no food cooked in house – were neither listed as clean fuel nor solid fuel (IIPS and ICF, 2017, Table 2.3, p.26). As part of the harmonisation work, we followed the internationally agreed guideline of identifying these three categories as clean or non-solid fuel for indoor cooking (WHO, 2014). Some 2% of individuals were dropped from the NFHS-4 dataset because they were identified as non-usual residents. Non-usual residents were excluded because poverty estimates are usually based on usual or permanent residents of

¹⁰ Alkire et al. (2018).

a household. The final analytical sample for NFHS-4 (2015/16) covered some 2.7 million individuals. Survey estimates are disaggregated by rural and urban areas and 29 states. The global MPI for India 2015/16 was first published in September 2018.

Nigeria (DHS 2013): Anthropometric measurements were collected from women aged 15–49 and children aged 0–5 living in all of the households sampled; however, for harmonisation purposes, we only use the anthropometric information from children, to accord with the MICS 2016/17 data. Child mortality information was provided by eligible women aged 15–49 living in all households sampled and eligible men aged 15–49 living in the half of the households selected for the male questionnaire. Table 2.1 on page 12 of the survey report notes that ‘sachet water’ (in a bag) was considered an unimproved source of drinking water, a definition we follow for the MPI estimation. The question classifying non-drinking water sources is not present, thus bottled water was considered an improved source of drinking water. Table 2.3 on page 14 of the report does not consider ‘no food cooked in household’ to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. The category ‘other’ was not mentioned in the report but appears in the data; since it is not mentioned in the list of solid fuels in Table 2.3 on page 14, we consider it as improved. Survey estimates are disaggregated by rural and urban areas and six zones. The global MPI for Nigeria 2013 was first published in December 2015.

Nigeria (MICS 2016/17): Anthropometric measurements were collected from children aged 0–5 living in all of the sampled households. Child mortality information was provided by eligible women aged 15–49 years and men aged 15–49 years. While Table WS.5 starting on page 120 of the survey report considers the ‘flush to unknown place/not sure/don’t know where’ response to be an improved sanitation facility, we code this facility to be unimproved to match the 2013 data. Table WS.1 starting on page 110 considers ‘sachet (pure) water’ to be an improved source of drinking water, but we code this source to be unimproved to match the 2013 data. Although Table WS.1 also 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 code all bottled water as improved to match the 2013 data. Table CH.12 on page 83 of the report does not consider ‘no food cooked in household’ and ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. Survey estimates are disaggregated by rural and urban areas and the six zones. The global MPI for Nigeria 2016/17 was first published in September 2018.

Pakistan (DHS 2012/13): Anthropometric measurements were collected from ever-married women aged 15–49 and children aged 0–5 living in one-third of the sampled households selected for the male interview. Child mortality information was provided by eligible ever-married women aged 15–49 living in all households sampled and eligible ever-married men aged 15–49 living in one-third of the households selected for the male questionnaire. While Table 2.2 on page 11 of the survey report considers the ‘missing’ response to be an unimproved sanitation facility, we impute these categories as missing values to match the 2017/18 data. The question classifying non-drinking water sources is not present, thus bottled water was considered an improved source of drinking water, following Table 2.1 on page 10. Table 2.1 also specifies that ‘filtration plant’ is defined as an improved source of drinking water, a classification we follow. Table 2.3 on page 12 of the report does not consider ‘no food cooked in household’ and ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. Survey estimates are disaggregated by rural and urban areas and five of the provinces (Balochistan, Sindh, Punjab, Islamabad Capital Territory and Khyber Pakhtunkhwa). The sixth region, Gilgit Baltistan, is excluded for comparability with the 2017/18 survey. The global MPI for Pakistan 2012/13 was first published in December 2015.

Pakistan (DHS 2017/18): Anthropometric measurements were collected from ever-married women aged 15–49 and children aged 0–5 living in one-third of the sampled households selected for the male interview. Child mortality information was provided by eligible ever-married women aged 15–49 living in all households sampled and eligible ever-married men aged 15–49 living in one-third of the households selected for the male questionnaire. Although Table 2.1 on page 18 indicates that households using bottled water as the main source of drinking water are 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 code all bottled water as improved to match the 2012/13 data. Table 2.1 also specifies that ‘filtration plant’ was defined as an improved source of drinking water, a classification we follow. Table 2.4 on page 20 of the report does not consider ‘no food cooked in household’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for cooking fuel. Survey estimates are disaggregated by rural and urban areas and five provinces. The report allows for subnational disaggregation by the four provinces of Punjab, Sindh, Khyber Phaktunkhwa, and Balochistan; for two regions, including Azad Jammu and Kashmir (AJK), and Gilgit Baltistan; for the Islamabad Capital Territory; and for Federally Administered Tribal Areas (FATA). To match the 2012/13 survey, we do not include the territories of AJK and FATA, and Gilgit Baltistan (due to individual sample weights). Thus, we only present results for the five regions of Balochistan, Sindh, Punjab,

Islamabad Capital Territory and Khyber Phaktunkwha. The global MPI for Pakistan 2017/18 was first published in July 2019.

Peru (DHS-Continuous 2004/06): Anthropometric measurement was collected from women aged 15–49 and children aged 0–5 living in all of the sampled households. Child mortality information was provided by eligible women aged 15–49. Table 2.1.1 on page 17 of the survey report does not classify the sanitation facilities by improved or unimproved status; however, we consider the following facilities to be improved: ‘inside dwelling’, ‘outside dwelling’, ‘ventilated latrine’, ‘septic well’, and the remaining categories (‘latrine (ciego o negro)’, ‘latrine over river/lake’, ‘river, canal’, ‘no service’, and ‘other’) to be unimproved. Neither does Table 2.1.1 classify the household’s main drinking water source as improved or unimproved; however, we consider the following sources to be improved: ‘piped into dwelling’, ‘piped outside dwelling but within building’, ‘public tap/standpipe’, ‘rainwater’, and ‘bottled water’, and the remaining categories (‘public well’, ‘well inside dwelling’, ‘spring’, ‘river/dam/lake/ponds/stream/canal/irrigation channel’, ‘tanker truck’, and ‘other’) to be unimproved. The report does not set a national definition for solid fuels, so we code the sources of cooking fuel according to the MDG guidelines. Survey estimates are disaggregated by rural and urban areas, and while the report allows for regional disaggregation by five natural regions, but for harmonisation purposes, we combine ‘Selva Alta’ and ‘Selva Baja’ into one region, allowing subnational disaggregation by four natural regions. The global MPI for Peru 2004/06 was first published in October 2011.

Peru (DHS-Continuous 2012): Anthropometric measurements were collected from women aged 15–49 and children aged 0–5 living in all of the households sampled. Child mortality information was provided by eligible women aged 15–49. Table 1.1 on page 43 of the survey report does not classify the sanitation facilities by improved or unimproved status; however, we consider the following facilities to be improved: ‘inside dwelling’, ‘outside dwelling’, ‘ventilated latrine’, and ‘septic well’, and the remaining categories (‘latrine (ciego o negro)’, ‘latrine over river/lake’, ‘river, canal’, ‘no service’, and ‘other’) to be unimproved. Table 1.1 does not classify the household’s main drinking water source as improved or unimproved; however, we consider the following sources to be improved: ‘piped into dwelling’, ‘piped outside dwelling but within building’, ‘public tap/standpipe’, ‘rainwater’, and ‘bottled water’, and the remaining categories (‘public well’, ‘well inside dwelling’, ‘spring’, ‘river/dam/lake/ponds/stream/canal/irrigation channel’, ‘tanker truck’, and ‘other’) to be unimproved. The report does not set a national definition for solid fuels, so we code the sources of cooking fuel according to the MDG guidelines. Survey estimates are disaggregated by rural and urban areas and the four natural regions. The global MPI for Peru 2012 was first published in December 2015.

Viet Nam (MICS 2011): While anthropometric measurements were collected from children aged 0–5 living in all of the sampled households, for harmonisation purposes, we exclude the nutrition indicator, as the MICS 2013/14 did not collect anthropometric information. Child mortality information was provided by eligible women aged 15–49; however, there is no data on birth history in the last five years, so the child mortality indicator considers a household deprived if the mother reports having had any child die (the MPI-O definition of deprivation for child mortality). Table CH.9 on page 96 of the report does not consider ‘no food cooked in household’ and ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. Further, the report does not include information on whether the household owns an animal cart, and likewise the assets indicator does not include this variable. Survey estimates are disaggregated by rural and urban areas and the six regions. The global MPI for Viet Nam 2011 was first published in March 2013.

Viet Nam (MICS 2013/14): Anthropometric data was not part of the Viet Nam MICS 2014 dataset. Previously, nutrition data was collected as part of Viet Nam MICS 2011; however, page 61 of the survey report details how the data was not collected in this round due to time and resource constraints as well as the availability of national nutrition survey data. Child mortality information was provided by eligible women aged 15–49. While there is data on birth history in the last five years, for harmonisation purposes, we have coded the child mortality indicator to match the 2011 data, which does not have birth history data. Hence, we consider a household deprived if the mother reports having had any child die (the MPI-O definition of deprivation for child mortality). Although Table WS.5 starting on page 122 considers the ‘flush to somewhere else’ response to be an improved sanitation facility, we code this facility to be unimproved to match the 2011 data. Table CH.12 on page 107 of the report does not consider ‘no food cooked in household’ and ‘other’ responses to reflect inadequate clean cooking fuel, and this MPI estimation follows that categorisation for the cooking fuel indicator. Further, the report does not include information on whether the household owns an animal cart, and likewise the assets indicator does not include this variable. Survey estimates are disaggregated by rural and urban areas and the six regions. The global MPI for Viet Nam 2014 was first published in December 2016.

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