National Statistics Bureau
Royal Government of Bhutan

BHUTAN

Multidimensional Poverty Index 2017

OPHI
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UNIVERSITY OF OXFORD

BHUTAN

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National Statistics Bureau (NSB)
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University of Oxford

Bhutan: Multidimensional Poverty Index

Published by
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ISBN 978-99936-28-49-1

Photo on front cover: © James Jewell
Photo on title page: © UNICEF Bhutan

Printed in Bhutan

Acknowledgements

This report has been prepared by Dorji Lethro (Sr. Statistical Officer) of the National Statistics Bureau (NSB) of Bhutan, with Monica Pinilla and Sabina Alkire of the Oxford Poverty and Human Development Initiative (OPHI) at the University of Oxford. Design and layout were done by Maarit Kivilo (OPHI).

Mr. Chhime Tshering (Director, NSB) and Mr. Phub Sangay (Chief Statistical Officer), provided guidance and suggestions based on their extensive knowledge of the Bhutan Living Standards Survey (BLSS) 2017 and deserve special thanks.

Hiroki Uematsu from the World Bank supported the consumption poverty analysis and was a valued colleague. The work also benefited from files created by the MPI 2012 team. Finally, the MPI 2017 team wish to thank the entire UNICEF country office in Bhutan, who provided pivotal financial and visual support for this report and also supported the section on child disaggregation.

Foreword

Bhutan's Multidimensional Poverty Index (MPI) is based on the data from the Bhutan Living Standards Survey (BLSS) 2017, conducted by the National Statistics Bureau (NSB) with financial and technical support from the World Bank. In the five years since the previous update, Bhutan's MPI has become a strong instrument for resource allocation, targeting, and policy design, complementing Bhutan's monetary poverty measure.

The 2017 national MPI value is 0.023, indicating that poor people in Bhutan experience only 2.3% of the deprivations that could be experienced if all Bhutanese were deprived in all indicators. The multidimensional poverty rate stands at 5.8% of the population, with the urban and rural poverty rates of 1.2% and 8.1%, respectively. The MPI complements the monetary poverty measure. As in 2012, we find that the people that are monetary poor are not necessarily multidimensionally poor – in fact, while 5.8% of people are MPI poor and 8.2% are monetary poor, only about 1.0% of Bhutanese are now poor by both measures. Both measures are needed to adequately illuminate poverty in its many forms and dimensions.

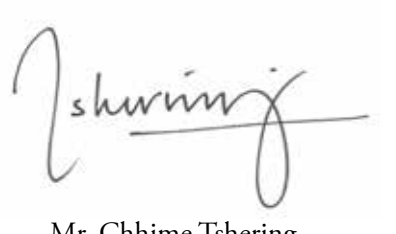
An innovation in this report is an added chapter on child poverty, which disaggregates the national MPI by age groups and shows how the composition of poverty varies by age cohort. Sadly, these findings show that children under the age of nine are the poorest – 7.1% of them are MPI poor.

The report also covers the change in the MPI over a ten-year period using three datasets: BLSS 2007, 2012, and 2017. The intertemporal analysis uses indicators with strictly comparable definitions and analyses changes nationally and by *Dzongkhag* and area. Overall, the 2017 MPI paints a picture of lightning-fast progress, with MPI reducing by far more than half from 2007 to 2017 and

by nearly half since 2012, with rural areas progressing rapidly and a pro-poor pattern of progress across *Dzongkhags*. There are some complexities – for example, internal migration is also a part of the urban story, leading to small increases in MPI in some urbanised *Dzongkhags*. But it is a good time to redouble the effort to go the last mile – which can be the most difficult – and end acute poverty in these important dimensions.

Bhutan's MPI – which reflects acute poverty – has proven to be a useful input into the formulation of plans and policies as we collectively address poverty in all its dimensions in the era of the Sustainable Development Goals (SDGs). It may be that there is an emerging need to define a second MPI reflecting moderate poverty

Finally, NSB would like to thank the UNICEF country office in Bhutan for their much-appreciated financial, visual, and intellectual support in producing this report. And the data analysis and report writing team provided very thorough and careful analysis of this period of accelerated MPI reduction.



Mr. Chhime Tshering
Director

Executive Summary

MULTIDIMENSIONAL POVERTY: LEVEL AND COMPOSITION

In 2017, the multidimensional poverty rate is estimated at 5.8% of the population. The average intensity of deprivation, which reflects the share of deprivations each poor person experiences on average, is 39%. The MPI, which is the product of the percentage of poor people and the average intensity of poverty, stands at 0.023. This indicates that poor people in Bhutan experience merely 2.3% of the deprivations that would be experienced if all people were deprived in all indicators. The urban poverty rate is 1.2% while rural poverty stands at 8.1% – and 93% of Bhutanese poor live in rural areas.

In terms of the percentage contribution of each of the 13 indicators to overall multidimensional poverty, the largest contributors to national poverty are deprivations in years of education (32%), followed by child mortality (23%) and school attendance (13%). When aggregating by dimensions, the largest contributor is the education dimension (45%). The living standards and health dimensions contribute 21% and 34%, respectively, to overall poverty.

MULTIDIMENSIONAL POVERTY ACROSS *DZONGKHAGS*

Across *Dzongkhags*, there is not a clear ranking due to overlapping confidence intervals. What is clear is that Gasa appears to be the poorest and certainly is poorer than 10 other *Dzongkhags*, and that Paro and Pema Gatshel and Thimphu are less poor than 12 *Dzongkhags*.

Considering the poverty level together with population is also very important. Roughly 25% of Bhutan's poor people live in Chhukha and Samtse, and – this is surprising – fully 8% of MPI poor people live in Thimphu – despite Thimphu having a very low MPI – due to its large population.

MULTIDIMENSIONAL POVERTY AND MONETARY POVERTY

In 2017, as before, the MPI complements monetary poverty figures in two ways. First, the pattern of poverty across *Dzongkhags* differs, with much lower rates of multidimensional poverty

than monetary poverty in Zhemgang, Monggar, and Haa, and much higher rates of MPI in Thimphu and Gasa. Second, both measures identify different persons as poor. While 5.8% of the population are MPI poor and 8.2% are consumption poor, only 1.0% of the Bhutanese population experience both kinds of poverty simultaneously.

Looking across the consumption quintiles, 58% of MPI poor people have consumption levels that are above the bottom 20% of the population. This surprising finding confirms the mismatch between definitions of who is poor and supports the complementary use of both poverty measures.

MPI AMONG CHILDREN AND ACROSS SOCIAL GROUPS

Across age cohorts, multidimensional poverty is highest for children aged 0–9 years, of whom 7.1% are poor. This finding that children are especially vulnerable – which is also common in other countries – highlights the need to analyse child poverty further and invest explicitly in its reduction.

When comparing households whose head is male with those where the head is female, there is no difference in the level of multidimensional poverty. As expected, the educational level and literacy status of the household head play an important role. The higher the level of educational attainment of the household head, the lower the poverty rate. Across households of different sizes, there is not much variation in the level of poverty.

MULTIDIMENSIONAL POVERTY REDUCTION

Between 2007 and 2017, MPI had a very rapid and significant reduction from 0.160 to 0.019, less than one-seventh of its original value. The poverty rate and intensity also declined sharply and significantly. Statistically significant reductions occurred in each of the 13 component indicators – a great achievement.

The most recent period 2012–2017 bears special attention. In this shorter period, there were statistically significant reductions (at 99% confidence) in H, A, MPI, and in each indicator,

with the fastest reductions occurring in deprivations in cooking fuel, years of schooling, sanitation, and electricity.

Amongst the *Dzongkhags*, 16 *Dzongkhags* had statistically significant reductions in MPI, in incidence, and in intensity of people's poverty. In absolute terms, the highest reductions in the poverty rate occurred in Monggar and Wangdue Phodrang, followed by Trongsa and Chhukha. There were very small increases in poverty in Bumthang, Haa, Sarpang, and Thimphu, perhaps in part reflecting migration.

The pace of poverty reduction tended to be fastest in the poorer *Dzongkhags*, showing a tendency not to leave the poorest behind, but rather for them to catch up.

RECOMMENDATIONS

The report concludes with a set of recommendations. These include promoting the use of both MPI and income poverty data for resource allocation, since both measures can complement each other in public policy; promoting the use of the MPI for *Dzongkhag*-level policies; and providing information on MPI levels and composition to inform provincial level actions including targeting poor households.

Based on the 2017 MPI, intensified poverty reduction efforts are particularly needed in *Dzongkhags* like Gasa where poverty rates according to the index are high. When designing poverty reduction policies, the composition of poverty of different subgroups must be taken into consideration in order to ultimately eradicate multidimensional poverty.

The other recommendations include promoting research into the pathways of poverty reduction; promoting parental education levels and literacy; and exploring child-focused policies, given that children 0–9 are the poorest age cohort.

Given the low current level of MPI, it may be possible to go the last mile: targeting MPI poor households and eradicating this level of acute poverty from Bhutan. There is also a need to design a 'moderate' MPI whose indicators reflect the higher aspirations prevalent in Bhutan. Such a moderate MPI would, in the future, enable policy makers to fight deprivations in a new set of indicators that are now coming to be considered as vital to human flourishing in Bhutan.

Contents

I. Introduction

This chapter serves as an introduction to the report on the Multidimensional Poverty Index (MPI) of Bhutan and has the following sections:

1.1 History of monetary and multidimensional poverty measurement;
1.2 Context and framework;
1.3 Purpose of Bhutan's National MPI.

1.1. HISTORY OF MONETARY AND MULTIDIMENSIONAL POVERTY MEASUREMENT

Prior to 2000, the government had already addressed poverty in many dimensions through the expansion of social services, rural development, and income generation activities.

Bhutan's first official monetary poverty measurement was carried out in 2000, based on the pilot Household Income and Expenditure Survey 2000. Since 2000, monetary poverty rates based on consumption and expenditure have been estimated using data from the corresponding Bhutan Living Standards Survey (BLSS) in 2003, 2007, 2012, and 2017.

Bhutan's first official MPI was released in 2010 using the Bhutan Multiple Indicator Cluster Survey (MICS). As the first country in the world to publish a national MPI based strictly on the Alkire and Foster methodology, Bhutan was a true pioneer in creating and using a national MPI for policy purposes. Now many countries are doing likewise – for example Colombia launched its national MPI in 2011, and now over 50 countries participate in a South-South Multidimensional Poverty Peer Network (MPPN), with many using or designing national MPIs as official permanent statistics that localize the SDGs in a monitoring and policy tool.

Bhutan's national MPI was re-estimated in 2012 with slight modifications in indicator specifications due to the data limitations in the BLSS 2012 dataset – the same dataset used for monetary poverty measurement. Back-estimations were performed using the 2007 BLSS dataset to explore changes

over time. This report updates Bhutan's 2012 MPI, using the same specifications and the BLSS 2017 dataset.

1.2. CONTEXT AND FRAMEWORK

In Bhutan, poverty reduction is accorded a high priority at the national and *Dzongkhag* level. The 10th Five Year Plan had poverty reduction as its overarching and cross-cutting objective. According to the 11th Five Year Plan, presented in the National Assembly in 2013, by the end of the Plan in 2018 both monetary and multidimensional poverty should be sharply reduced. This means Bhutan should have more people who not only have a better income, but also have better achievements in health and education and enjoy a decent standard of living. Thus, the priority for the 11th Plan has been to target the poor, to monitor poverty reduction in a multidimensional manner, and advance informed and clear policies to redress it. Building on earlier work under the 10th plan, the 11th Plan proposes to...

...focus on further reducing income and multidimensional poverty, address emerging social issues and improve social outcomes in health and education sectors. The targeted key interventions include the Rural Economy Advancement Programme (REAP) to address extreme rural poverty at village and community levels; the National Rehabilitation Programme (NRP) to enhance the productive asset base of marginalized households; the Local Government Empowerment Programme (LGEP) to enhance decision-making capacity and improve service delivery through provision of essential equipment, machinery, and Nu. 2 million per year per Gewog; a special programme for vulnerable groups such as senior citizens, differently-abled persons, and youth; and targeted health and education interventions to reach the unreached for Dzongkhags with poor health and education outcomes (p. 14, 11th National Plan).

Bhutan's national plan may have been prescient, for in 2015, when the world gathered to affirm the Sustainable Development Goals (SDGs) and Agenda 2030, the greatest global challenge was recognised to be ending poverty 'in all its forms and dimensions'. This objective is embodied in Goal 1 and given priority throughout the associated documents. Bhutan's national MPI, thus, is likewise a headline indicator in the SDGs – and one that reflects deprivations that are interlinked in the lives of poor men, women, and children. It is a statistic whose analysis – as this report, as well as Bhutan's experience, more widely illustrates – can inform integrated and multi-sectoral policy making at national and local levels. And the disaggregated analysis of MPI over time illuminates

who is poorest and is used to monitor whether they are catching up with less poor groups.

The MPI accords well with the objective of expanding Gross National Happiness (GNH). GNH is itself a multidimensional wellbeing concept, and some shortfalls in GNH constitute poverty. The MPI could also be framed using the concept of capability. Nobel Laureate Amartya Sen has proposed that policies should aim to expand capabilities – the freedoms that people have to further activities and states of being that they value and have reason to value. Poverty in this framework is 'capability failure' – people's lack of the capabilities to enjoy key 'beings and doings' that are basic to human life. For Sen, too, poverty is inherently multidimensional.

1.3. PURPOSE OF BHUTAN'S NATIONAL MPI

Bhutan's national MPI indicators were selected in order to provide a clearer way of designing programs that deliberately target the poor and eradicate multidimensional poverty. The MPI is used in monitoring and evaluating plans and programs. This requires comparing *Dzongkhags* (districts) and other population groups in terms of MPI poverty, so that government and other stakeholders are able to direct services and policies accordingly. Poverty reduction can thus be achieved more efficiently given a limited fiscal envelope.

The 2012 MPI was given policy prominence and visibility. It shaped district allocations, informed the targeting of poor households, as well as sectoral policies. This 2017 update monitors progress in reducing poverty over the intervening five years. It can thus help the Royal Government of Bhutan to assess how various policies have affected the poor. While light analysis is conducted for the years 2007–2017, to pinpoint the extent and patterns of progress over the past five years, in-depth comparisons are made for the period 2012–2017.

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II. Methodology

Bhutan's MPI is estimated using the Alkire Foster (AF) methodology. This chapter presents the AF methodology in general terms along with the measurement design and dataset used; the appendix has a more formal treatment.

This chapter covers

2.1 Alkire Foster Methodology;

2.2 Measurement Design;

2.3 National Uncensored Headcount Ratios of the MPI Indicators.

2.1. ALKIRE FOSTER METHODOLOGY

Bhutan's MPI uses the AF methodology – the same methodology that underlies Bhutan's innovative GNH Index. First, a poverty profile is constructed for each household. The profile shows in which of the 13 indicators this household is deprived according to national definitions. Next, the deprivations are aggregated for each person or household into a weighted deprivation score. The weights reflect normative judgements and accord equal importance to each of the three dimensions of health, education, and living standards. Each person is then identified as poor or non-poor, depending on whether their deprivation score is less than a poverty cutoff (non-poor), or meets or exceeds the poverty cutoff (poor). The cutoff is 4/13 or 30.7% of the weighted indicators. If the indicators were equally weighted (they are not) it would reflect deprivations in four of the 13 indicators. To estimate the MPI, information on the poor is aggregated into the adjusted headcount ratio or MPI. The MPI combines two aspects of poverty:

MPI = H x A

1) Incidence (H) – the percentage of people who are poor, or the poverty rate or headcount ratio;

2) Intensity (A) – the average percentage of dimensions in which poor people are deprived, or the average deprivation score of poor persons.

The MPI can be equivalently computed as the weighted sum of censored headcount ratios – which show the percentage of people who were identified as poor and are deprived in an indicator.

Because of this structure, the MPI can be broken apart by indicators to show the composition of poverty. This feature of dimensional detail brings added policy relevance to the analysis.

2.2. MEASUREMENT DESIGN

Bhutan's national MPI utilizes a set of dimensions, indicators, and cutoffs that reflect its priorities as expressed in the 10th and 11th national plans.

2.2.1. Dimensions, indicators, and cutoffs

Bhutan's MPI builds upon the global MPI and retains its three dimensions of health, education, and living standards. The indicator choice is shaped by the BLSS datasets. Eight indicators are the same as the global MPI and five are tailored to Bhutan. Instead of the nutrition indicator (in the health dimension), food security is used. Four tailored indicators – access to roads, land ownership, livestock ownership, and a modified assets indicator (in the living standards dimension) – are included (as shown in Table 2.1).

2.2.2. Weights

Bhutan's MPI uses equal nested weights, assigning a weight of 1/3 to each of the three dimensions of education, health, and living standards. Within health and education, each of the two indicators are again equally weighted (1/6). Within the living standards dimension, nine indicators are used. One-seventh of the weight (1/21) is assigned to six indicators: electricity, sanitation, water, housing material, cooking fuel, and road access, and the remaining one-seventh of the weight is equally distributed among assets, land ownership, and livestock ownership, with a weight of 1/63 each.

2.2.3. Poverty and deprivation cutoffs

Two kinds of thresholds are used to decide whether a person is deprived and whether they are poor: (a) an indicator-specific poverty cutoff (deprivation cutoff), where a person is considered deprived in each indicator if their achievement falls below the cutoff, and (b) a cross-indicator cutoff (or poverty cutoff), which sets the minimum share of deprivations (or deprivation score) needed for a person to be considered poor. In Bhutan, the poverty cutoff was set at 30.7% or roughly one-third of indicators. In particular, as the MPI has 13 indicators, a person who is deprived in 4/13 of the weighted indicators (30.7% of dimensions) is considered multidimensionally poor. One can also

TABLE 2.1 Dimensions, Indicators, and Weights of Bhutan's MPI

Dimension	Indicator	Deprivation cutoff	Weight
Health	Child mortality	A child has passed away in the household.	1/6
	Food security	The household has suffered a shortage of food in the last 12 months.	1/6
Education	School attendance	Any school-aged child (6-14) in the household is not attending school up to class 8.[a]	1/6
	Schooling	No household member has completed five years of schooling.	1/6
Living Standards	Cooking fuel	The household mainly cooks with wood, coal or dung cake.	1/21
	Sanitation	The household's sanitation facility is not improved, or is shared with other households.[b]	1/21
	Electricity	The household has no access to electricity.	1/21
	Water	The household does not have access to safe drinking water, or safe water is more than a 30-minute walk (round trip).[c]	1/21
	Road access	The household is more than 30 minutes walk from a tarred road, a feeder road, or a farm road..	1/21
	Housing	The household does not have adequate materials in any two of: floor, roof and walls.[d]	1/21
	Assets	The household does not own more than one small asset: (radio, TV, mobile phone, rice cooker, sewing machine, sofa, wrist watch or bicycle) AND does not own one large asset: car, computer, washing machine, power tiller, refrigerator, sesho gho/kira, motorbike, or foreign bow.	1/63
	Land ownership	The rural household does not own one acre or more of land. Urban households are treated as non-deprived	1/63
	Livestock	The rural household does not own more than three of: cattle, horses, sheep, goats, chicken, pigs, buffalos or yaks Urban households are treated as non-deprived.	1/63

Source: Authors' calculations based on data from BLSS 2017

Notes:

a. If a household has no school-aged children, the household is treated as non-deprived.
b. Deprived in sanitation if the latrine is without slab/open, long drop, bucket toilet, or no facility.
c. Deprived in water if source is an unprotected well, unprotected spring, tanker truck, cart with small tank, surface water or 'other'.
d. Deprived in floor if the floor material is clay or earthen. Deprived in walls if the wall material is mud, wood/branches or 'other'; and deprived in roof if the roof material is thatch or 'other'.

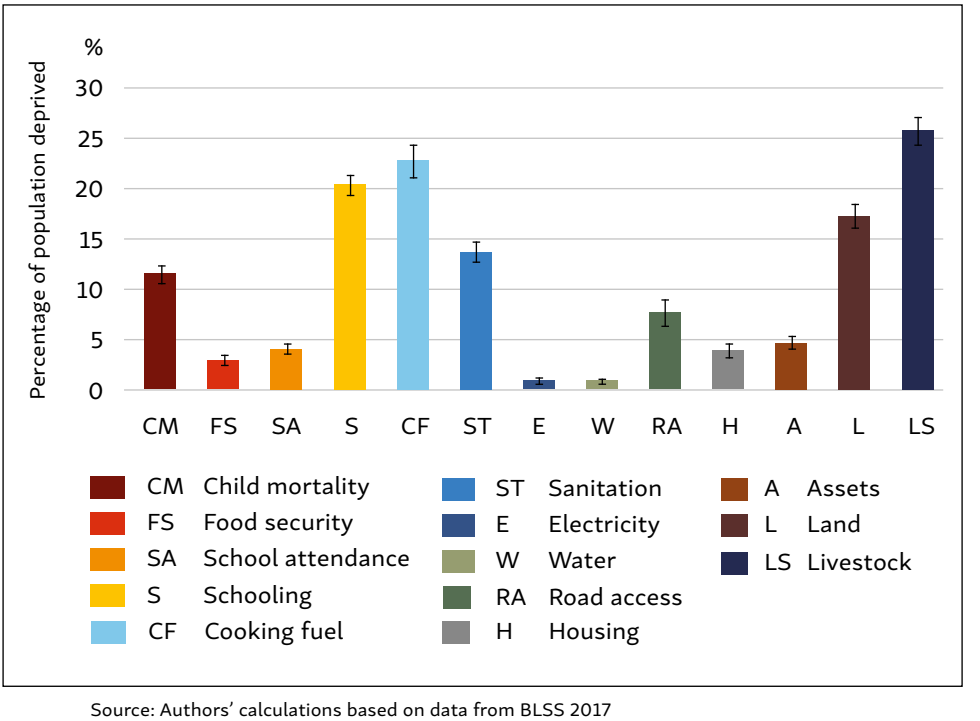
consider a person intensely poor if they are deprived in more than 50% of the indicators.

2.3. DATA

The data used for the national poverty measure is the BLSS 2017, which is the latest and fourth in a series of national household surveys that have been conducted by the NSB. The survey followed the World Bank's Living Standard Measurement Study methodology. For comparison purposes, and specifically to show trends over time, the report also used data from BLSS 2012 and BLSS 2007.

The BLSS 2017 is slightly larger than the BLSS 2012 survey. The BLSS 2012 surveyed 8,968 households while BLSS 2017 surveyed 11,660 households across the country and 48,639 individuals from a planned sample size of 11,812 households, what corresponds to a response rate of 98.7%. BLSS 2017 is representative for the twenty *Dzongkhags* and for the four major Thromdes (Thimphu, Phuentsholing, Gelephu and Samdrup Jongkhar).

FIGURE 2.1 National Uncensored Headcount Ratios, 2017



Source: Authors' calculations based on data from BLSS 2017

2.4 NATIONAL UNCENSORED HEADCOUNT RATIOS OF THE MPI INDICATORS

The uncensored headcount ratio of each indicator represents the proportion of the population who are deprived in each indicator, irrespective of their poverty status. As Figure 2.1 shows, the highest deprivations are found for livestock (with 25.7% of the population deprived in this indicator), cooking fuel (22.8%), years of schooling (20.4%), access to land (17.3%), and sanitation and child mortality (both with rates higher than 10%). On the other hand, some indicators show much lower rates of deprivation. In particular, deprivations are the lowest for access to a clean source of water (0.8%), access to electricity (0.8%), and food security (2.9%).

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III. Results

This chapter presents the national MPI results for Bhutan using the 2017 BLSS. We first present the national MPI as well as the poverty rate and intensity among the poor. We then present disaggregated results by household and individual characteristics. The third section presents robustness tests for the choice of weights and of the k-value. This chapter has the following sections:

3.1 Bhutan's National MPI – Key Results;

3.2 Disaggregation by Rural and Urban Areas, and by *Dzongkhag*;

3.3 Robustness of MPI to Alternative Weights and Poverty Cutoffs;

3.4 Multidimensional Poverty and Monetary Poverty;

3.5 Performance across Household Characteristics.

3.1 BHUTAN'S NATIONAL MPI – KEY RESULTS

Table 3.1 shows Bhutan's MPI for 2017, as well as its partial indices: the incidence of poverty (or the proportion of people identified as multidimensionally poor, H) and the intensity of poverty (or the average proportion of weighted indicators in which the poor are deprived, A). As can be seen in the table, the incidence of multidimensional poverty is 5.8%. Since this estimate is based on a sample, it has a margin of error. Thus, the 95% confidence interval is also presented in the table. This means that we can say with 95% confidence that the true multidimensional poverty headcount ratio of the population is between 5.1% and 6.5%.

The average intensity of poverty, which reflects the share of deprivations each poor person experiences on average, is 39.4%. That is, each poor person is, on average, deprived in nearly half of the weighted indicators.

The MPI, which is the product of H and A, has the value of 0.023. This means that multidimensionally poor people in Bhutan experience 2.3% of the total deprivations that would be experienced if all people were deprived in all indicators. The MPI is the official statistic of poverty used to declare

TABLE 3.1 Incidence, Intensity and Multidimensional Poverty Index (MPI), 2017

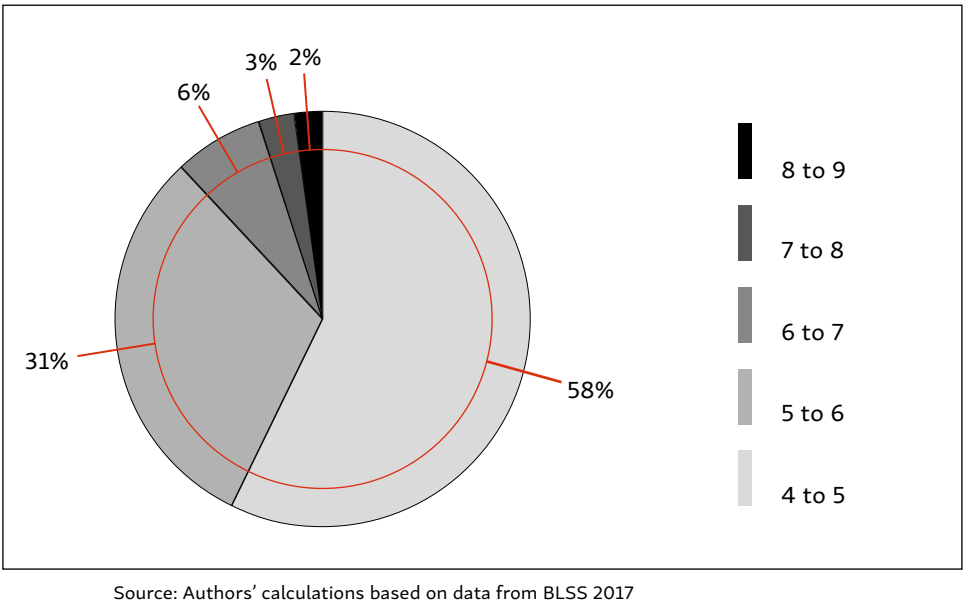
Poverty cutoff (*k*)	Index	Value	Confidence interval (95%)	
***k*-value = 4**	MPI	0.023	0.020	0.026
	Headcount ratio (H)	5.8%	5.1%	6.5%
	Intensity (A)	39.4%	38.6%	40.1%

Source: Authors' calculations based on data from BLSS 2017

whether poverty has fallen or risen over time, because it takes into account progress at two levels – H and A. There are situations in which only one statistic goes down over time and not the other – but both are important. If we used only the headcount ratio, for example, we might have a rise in poverty some years, whereas if we used MPI the fuller picture would see a fall if there were a sufficiently large decrease in A.

Figure 3.1 depicts the distribution of the intensity of poverty among the poor. More than half (58%) of all poor people in Bhutan are in the lowest intensity band, which is between four and five weighted indicators (deprivation scores

FIGURE 3.1 Intensity Gradient among the Poor, 2017



Source: Authors' calculations based on data from BLSS 2017

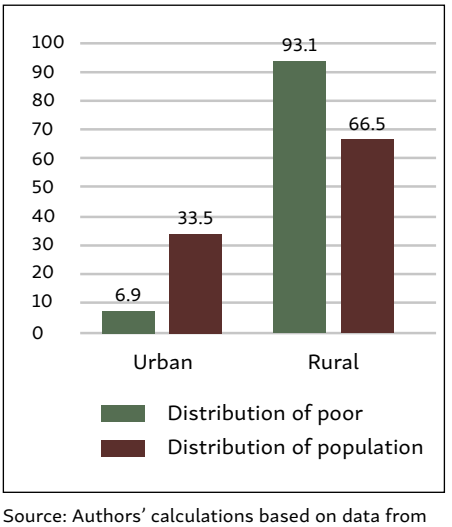
of 30.7% to 38.5%) and 89% of the poor have deprivation scores less than 6/13 or 46%. This suggests that further progress in MPI could be made quite easily, as most of the poor are very near to the poverty line. About 2% of the poor experience the highest intensities of poverty, between eight and nine of the weighted indicators.

3.2 DISAGGREGATION BY RURAL AND URBAN AREAS, AND *DZONGKHAGS*

Applying the property of subgroup decomposability, we disaggregate the levels of poverty by rural and urban areas, and by *Dzongkhags*. In Table 3.2, the MPI, incidence and intensity of poverty are shown by urban and rural areas. As can be seen in table, the rural poverty headcount ratio is much higher than that for urban areas – 8.1% and 1.2%, respectively. About two thirds of Bhutan's population live in rural areas. Figure 3.2 compares the distribution of the poor and general population by area. Although only 66.5% of the population reside in rural areas, more than 93% of the multidimensionally poor people live in rural areas. Only 6.9% of the country's multidimensionally poor people reside in urban areas.

One feature of the BLSS 2017, like the BLSS 2012, is that the sampling errors on the survey are still relatively high due to its moderate size. Because of this, as well as relative equity, many of the *Dzongkhags*' poverty levels cannot be distinguished. We can say, for example, that Gasa is poorer than 10 other *Dzongkhags*, and that Paro and Thimphu are less poor than twelve *Dzongkhags*. But we cannot rank many *Dzongkhags*.

FIGURE 3.2 Distribution of Poor and Population by Rural/Urban Areas, 2017



Source: Authors' calculations based on data from BLSS 2017

TABLE 3.2 Multidimensional Poverty by Rural/Urban Areas, 2014

Index	Urban				Rural			
	Population share (%)	Value	Confidence interval (95%)		Population share (%)	Value	Confidence interval (95%)	
MPI	33.5	0.004	0.003	0.005	66.5%	0.032	0.028	0.036
Headcount ratio (H)		1.2%	0.85%	1.5%		8.1%	7.1%	9.1%
Intensity (A)		35.2%	34.3%	36.0%		39.7%	38.9%	40.5%

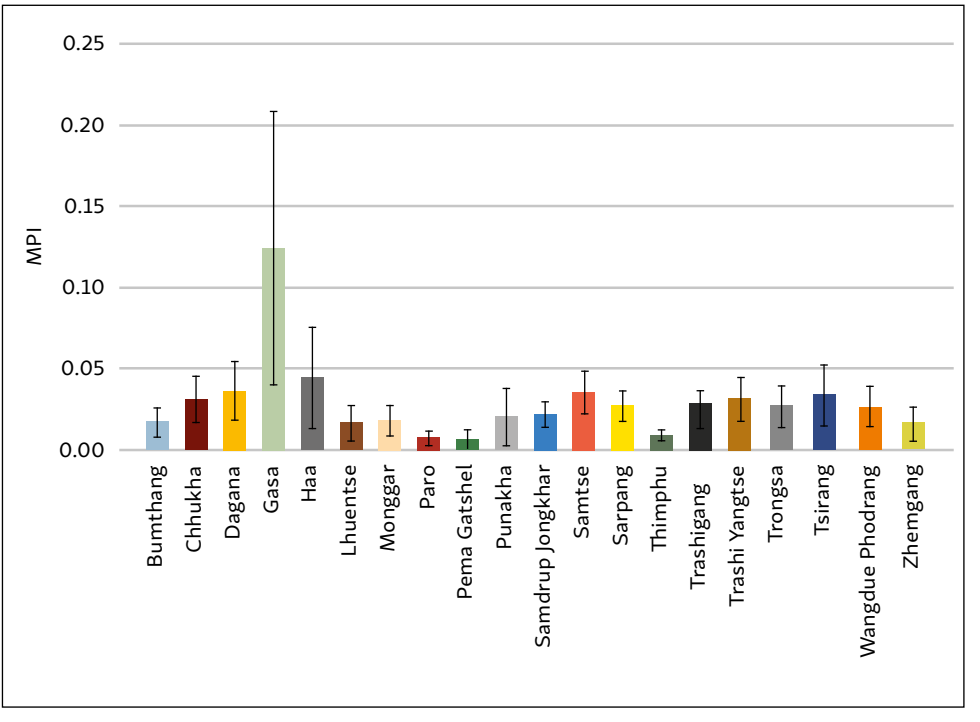
Source: Authors' calculations based on data from BLSS 2017

TABLE 3.3 Multidimensional Poverty by *Dzongkhag*, 2017

Subnational Region	Population share (%)	MPI			Headcount Ratio (H, %)			Intensity (A, %)		
		Value	Confidence interval (95%)		Value	Confidence interval (95%)		Value	Confidence interval (95%)	
Bumthang	2.30	0.017	0.008	0.027	3.9	1.9	5.9	44.3	38.2	50.3
Chhukha	9.14	0.031	0.017	0.045	7.9	4.5	11.3	39.6	37.6	41.6
Dagana	3.38	0.036	0.018	0.054	8.8	4.6	12.9	41.6	38.7	44.5
Gasa	0.52	0.125	0.040	0.209	29.0	9.8	48.2	43.0	38.0	48.0
Haa	1.59	0.045	0.013	0.076	11.4	3.6	19.2	39.1	36.4	41.9
Lhuentse	2.24	0.017	0.006	0.027	4.5	1.4	7.5	37.0	33.7	40.2
Monggar	6.06	0.018	0.009	0.028	4.8	2.4	7.2	38.2	36.9	39.4
Paro	5.24	0.008	0.003	0.012	2.1	0.8	3.3	36.9	35.6	38.1
Pema Gatshel	3.99	0.007	0.000	0.013	1.7	0.0	3.5	37.9	33.9	41.9
Punakha	3.86	0.020	0.003	0.038	5.2	0.9	9.6	39.1	35.1	43.1
Samdrup Jongkhar	5.22	0.022	0.014	0.030	5.7	3.6	7.8	38.6	36.7	40.5
Samtse	9.11	0.035	0.022	0.049	8.7	5.7	11.7	40.6	37.3	43.9
Sarpang	5.95	0.027	0.018	0.036	7.2	4.7	9.6	37.9	36.3	39.5
Thimphu	18.12	0.009	0.006	0.013	2.6	1.7	3.5	36.5	34.9	38.1
Trashigang	6.80	0.029	0.017	0.041	7.2	4.2	10.3	39.8	37.2	42.3
Trashi Yangtse	2.22	0.032	0.018	0.045	8.1	4.8	11.5	38.9	37.0	40.9
Trongsa	2.56	0.027	0.014	0.040	6.8	3.7	10.0	39.4	37.3	41.6
Tsirang	2.95	0.034	0.015	0.053	8.2	3.6	12.7	41.4	39.2	43.5
Wangdue Phodrang	5.98	0.026	0.014	0.039	6.7	3.7	9.7	39.6	36.1	43.0
Zhemgang	2.77	0.017	0.006	0.027	4.3	1.8	6.8	38.8	34.4	43.2

Source: Authors' calculations based on data from BLSS 2017

FIGURE 3.3 MPI by *Dzongkhag* 2017

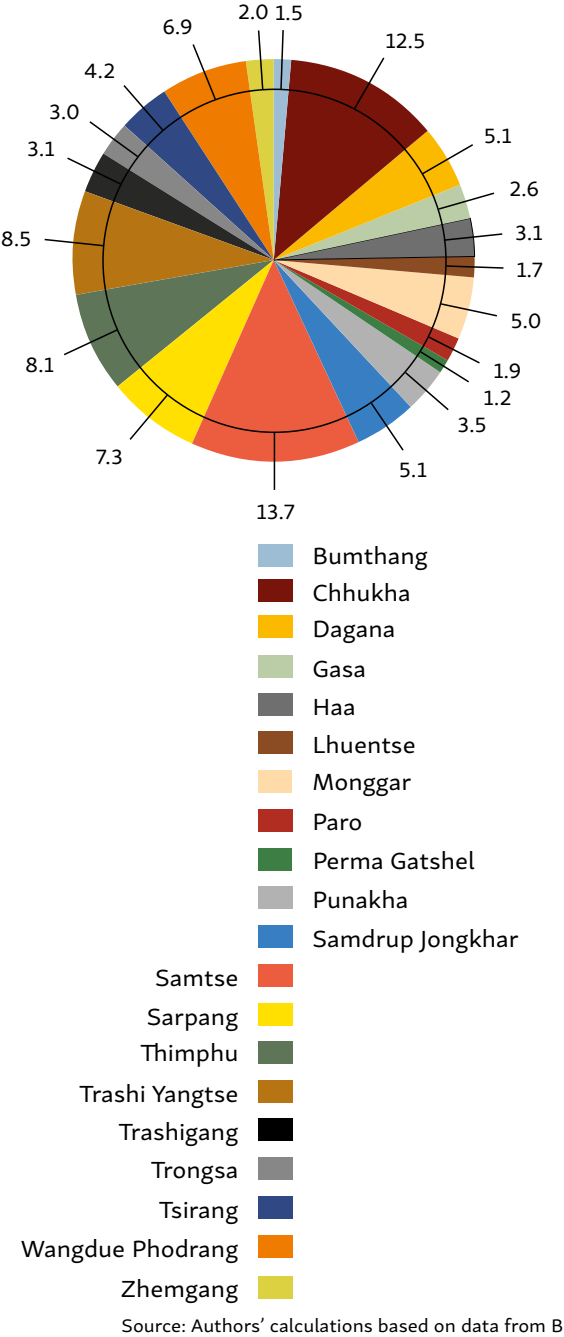


Source: Authors' calculations based on data from BLSS 2017

Table 3.3 shows the *Dzongkhag*-level estimates for MPI, incidence of poverty, and intensity of poverty. The broad pattern suggests that Gasa has the highest levels of MPI and incidence of poverty, and Samtse houses the largest number of multidimensionally poor.

Figure 3.3 illustrates the level of MPI in each *Dzongkhag*. The figure confirms that due to overlapping confidence intervals, it is not possible to rank all *Dzongkhags* in terms of poverty. Still, the graph suggests that Gasa, Haa, Dagana, and Samtse have higher levels of poverty than the other *Dzongkhags*.

FIGURE 3.4 Distribution of MPI Poor by *Dzongkhag*, 2017

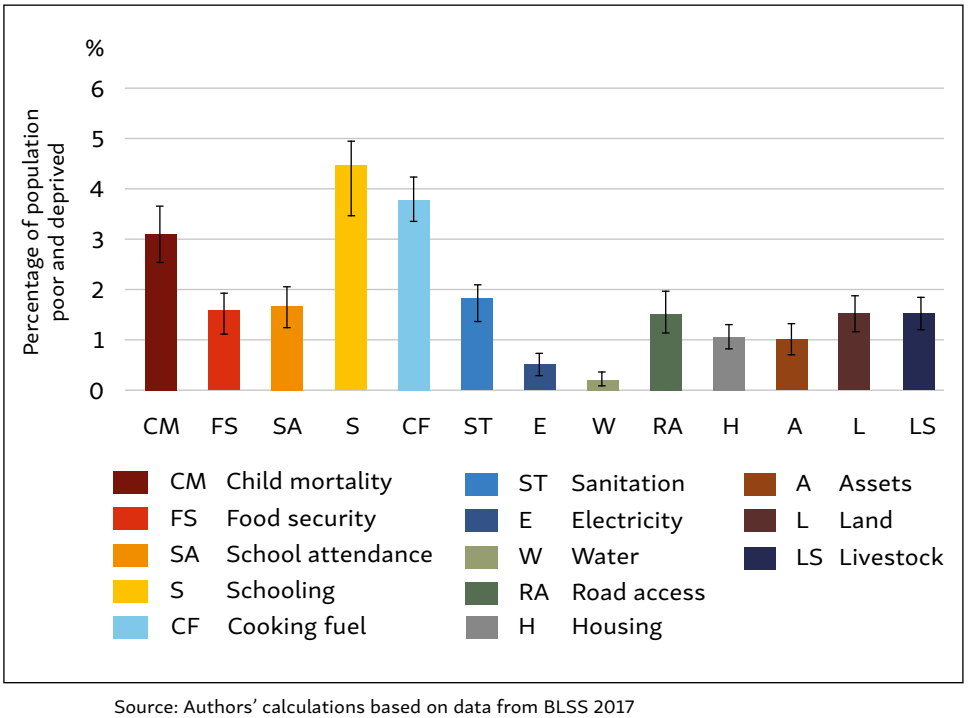


Source: Authors' calculations based on data from BLSS 2017

Figure 3.4 depicts where the MPI poor people live, across the different *Dzongkhags*. This is important because, some of the *Dzongkhags* with lower levels of poverty nonetheless house many more poor people than the poorest *Dzongkhags*. Samtse houses the largest number of multidimensionally poor (13.7%) followed by Chhukha (12.5%). Most striking of all is that Thimphu houses 8% of Bhutan's poor people. Pema Gatshel has the lowest share of poor people in Bhutan (1.2%).

What deprivations create this poverty – and how can they be reduced? To answer these questions, we break the MPI down by indicator and examine its composition. The censored headcount ratio of an indicator represents the proportion of the population that is multidimensionally poor and also deprived in that indicator. The MPI can also be computed as the sum of the weighted censored headcount ratios. So reducing any of the censored headcount ratios changes poverty. Figure 3.5 shows that the largest deprivation is for people

FIGURE 3.5 National Censored Headcount Ratios, 2017



Source: Authors' calculations based on data from BLSS 2017

living in households in which no one has completed five years of schooling. In 2017, 4.4% of the population is multidimensionally poor and deprived in this schooling indicator. Over 3.8% people are poor and live in households that cook with dung, wood, or charcoal. In turn, 3.1% people live in households that are multidimensionally poor and in which at least one child has died.

For a more in-depth view on multidimensional poverty, it is useful to see the percentage contribution of each of the 13 indicators to overall multidimensional poverty in both rural and urban areas of Bhutan.

In Figure 3.6, the weighted percentage contribution of each indicator is depicted to show the composition of multidimensional poverty in rural and urban areas.[1] Recall that the weights for most of the health and education indicators are higher than those for the living standard indicators. While all dimensions are equally weighted, the indicators carrying higher weights – in education and health – are expected to contribute relatively more to overall poverty.

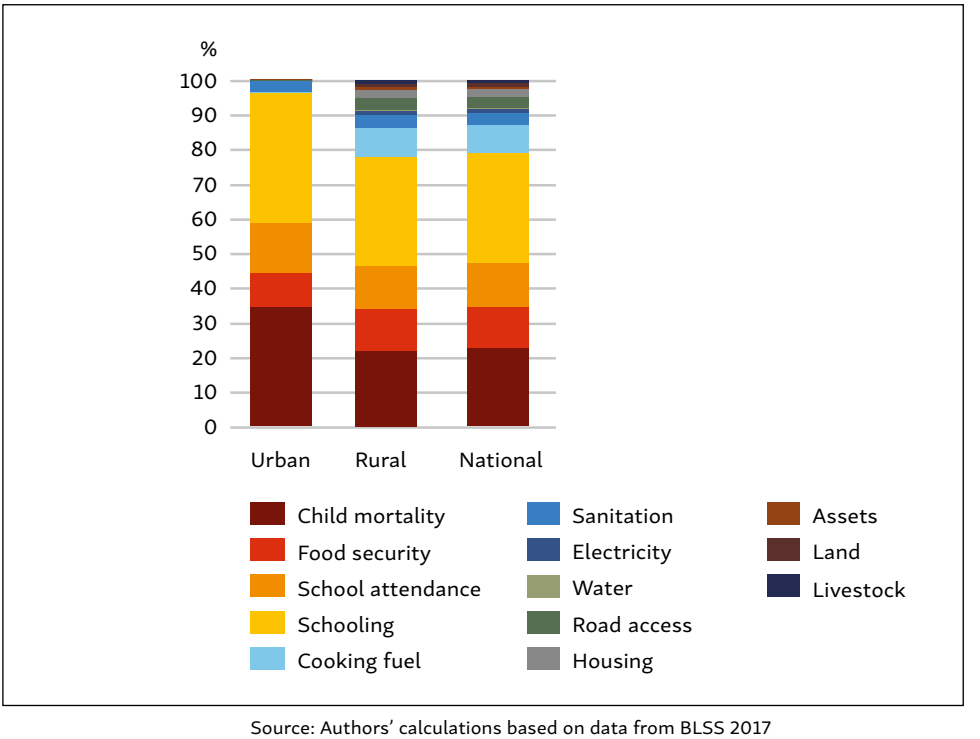
In terms of the percentage contribution of each of the 13 indicators to overall multidimensional poverty, the largest contributors to national poverty are deprivations in years of education (32%), followed by child mortality (23%) and school attendance (13%). When aggregating by dimensions, the largest contributor is the education dimension (45%). The living standards and health dimensions contribute 21% and 34%, respectively, to overall poverty.

The figure shows that the largest contributor to urban poverty is years of schooling (37.7%), followed by child mortality (34.3%) and school attendance (14.2%). In terms of dimensions, education is clearly the largest contributor to multidimensional poverty in urban areas, with a contribution of 51.8%. The dimensions of health and living standards contribute 44.2% and 3.9%, respectively.

Rural multidimensional poverty is largely influenced by deprivation in years of schooling, which contributes 31.5% to the rural MPI. The second and third largest contributors to the rural MPI are child mortality (21.7%) and school attendance (12.6%). Across dimensions, education contributes the most to rural poverty (44.1%). However, for rural areas the dimension of living standards contributes 22.2%.

1. The share of the population of rural areas is 66.5% and of urban areas is 33.5%.

FIGURE 3.6 Percentage Contribution of Each Indicator to Rural and Urban MPI, 2017

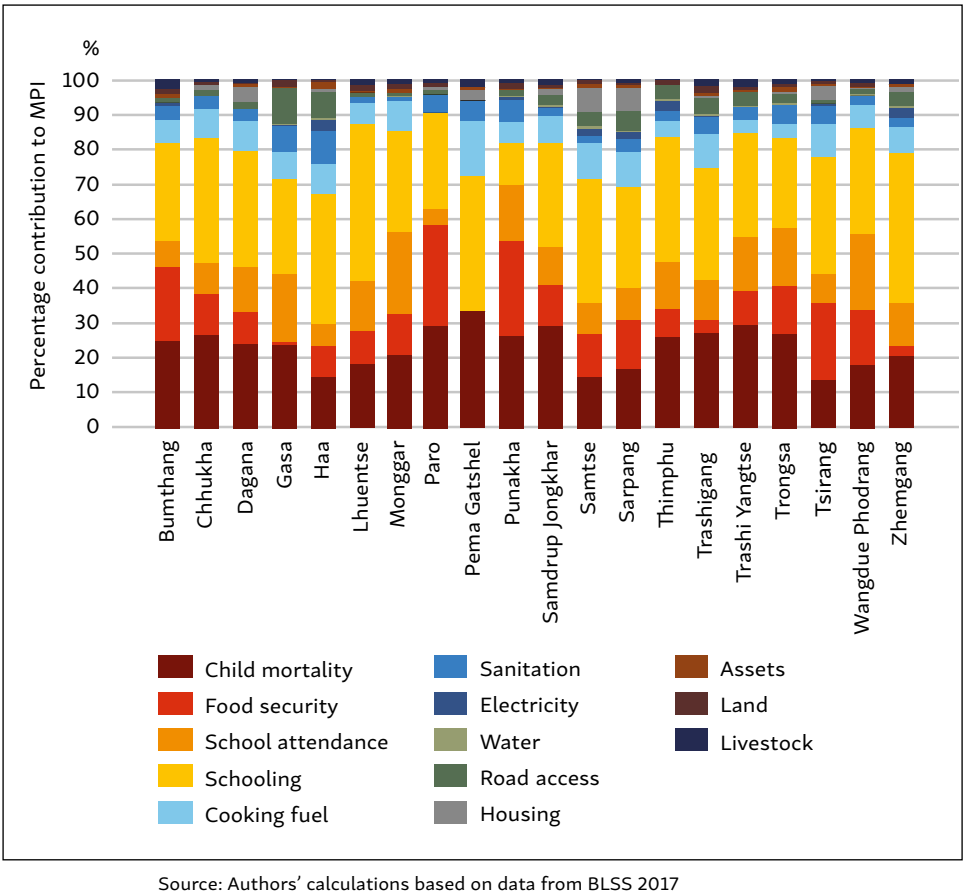


Source: Authors' calculations based on data from BLSS 2017

Since the Alkire Foster method allows for subgroup decomposability and dimensional breakdown, it is possible to explore the dimensional composition of the MPI not only at the national and urban/rural levels but also at the *Dzongkhag* level. As Figure 3.7 highlights, decomposition by provinces is particularly important because multidimensional poverty varies substantially across *Dzongkhags*.

Figure 3.7 illustrates the percentage contribution of each indicator to multidimensional poverty for each *Dzongkhag*. At first glance, it is clear that the composition of multidimensional poverty is fairly similar across *Dzongkhag*. For instance, the education dimension contributes more than 35% to overall poverty in most *Dzongkhags*, with the exception Punakha, where the contribution is 28%. In *Dzongkhags* such as Zhemgang and Lhuentse, the years schooling indicator contributes more than 50% to overall poverty. Depending on the *Dzongkhag*, health contributes 30% to 40% to overall poverty.

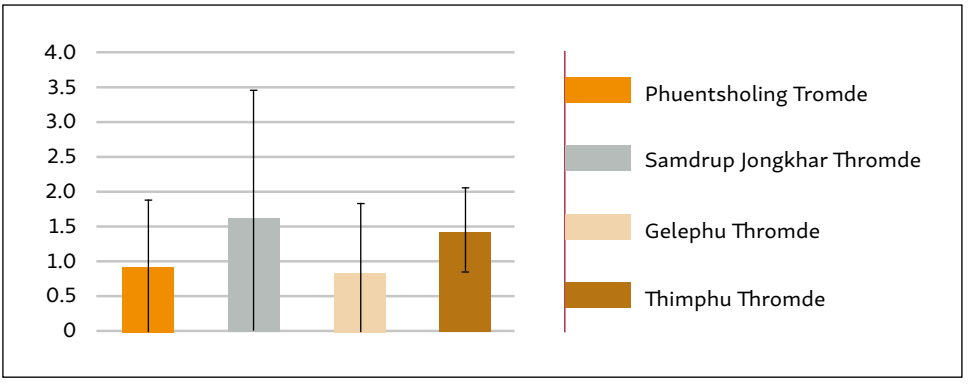
FIGURE 3.7 Percentage Contributions of Each Indicator to Dzongkhag' MPI, 2017



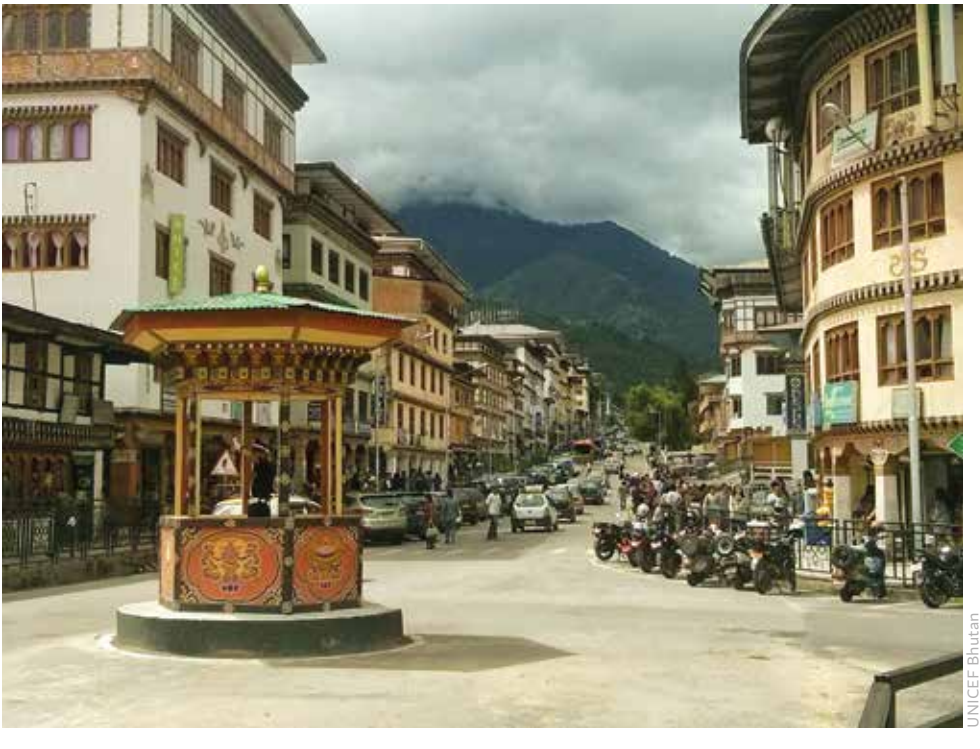
Source: Authors' calculations based on data from BLSS 2017

Finally, Figure 3.8 presents the incidence of multidimensional poverty of the four major cities. The four cities do not present significant differences in their levels of poverty, primarily because the standard errors hence confidence intervals are considerable.

FIGURE 3.8 Incidence of Poverty for Four Major Cities, 2017



Source: Authors' calculations based on data from BLSS 2017



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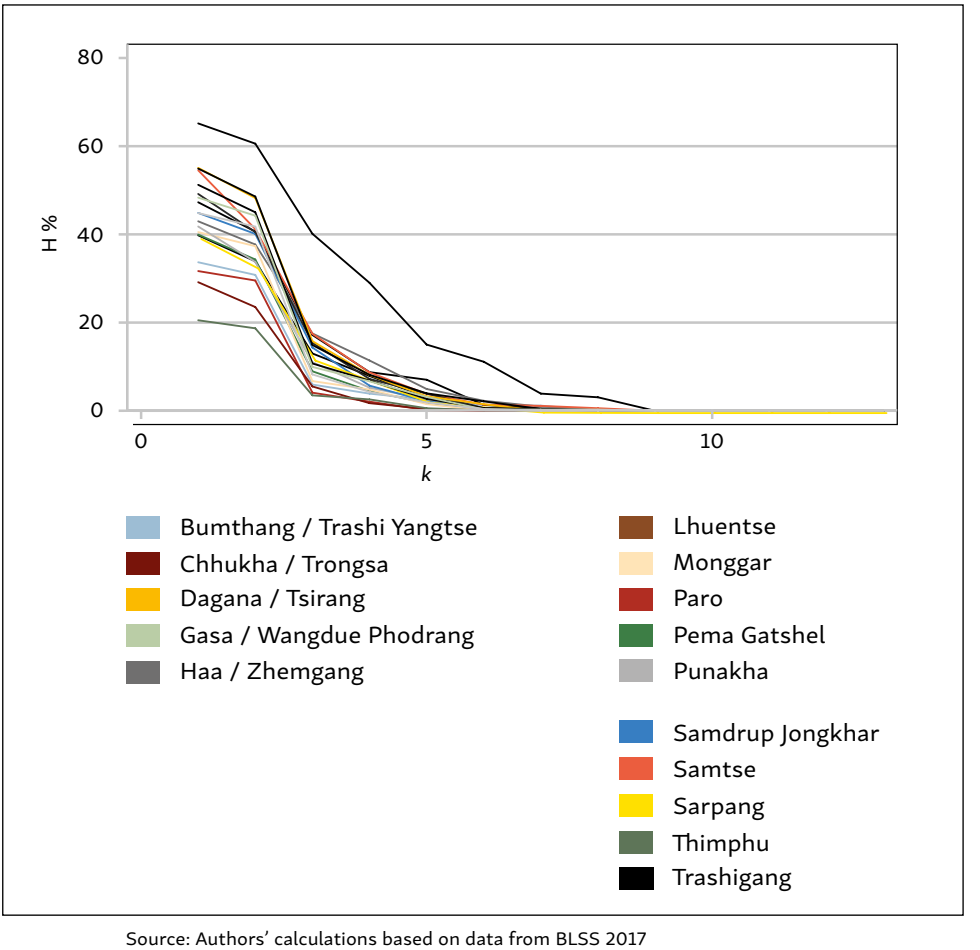
3.3 ROBUSTNESS OF MPI TO ALTERNATIVE WEIGHTS AND POVERTY CUTOFFS

Figure 3.9 plots the *Dzongkhags*' H for various levels of the poverty cutoff *k*. This figure shows that for all poverty cutoffs there is not a clear ranking in terms of poverty between *Dzongkhags*. However, Gasa always has higher multidimensional levels of poverty compared with other *Dzongkhags*.

When looking at those who are deprived in more than 46% of indicators (6/13), we find that they are distributed across 18 of the 20 *Dzongkhags* (Table 3.4). The highest incidence of multidimensional poverty with this cutoff is found in Gasa (11.1%).

FIGURE 3.9 Subnational *Dzongkhag*'s H for Different Values of the Poverty Cutoff *k*



Source: Authors' calculations based on data from BLSS 2017

TABLE 3.4 High Intensity Poverty by *Dzongkhag* (k=6), 2017

	MPI	H (%)	A (%)
Bumthang	0.007	1.3	56.3
Chhukha	0.003	0.6	54.8
Dagana	0.007	1.3	50.5
Gasa	0.060	11.1	54.1
Haa	0.012	2.3	52.4
Lhuentse	0.002	0.4	49.7
Monggar	0.000	0.1	52.4
Paro	0.000	0.0	0.0
Pema Gatshel	0.000	0.0	0.0
Punakha	0.001	0.1	51.6
Samdrup Jongkhar	0.003	0.5	53.1
Samtse	0.008	1.4	59.9
Sarpang	0.006	1.2	49.6
Thimphu	0.001	0.1	53.5
Trashigang	0.003	0.6	52.6
Trashi Yangtse	0.007	1.5	50.9
Trongsa	0.003	0.6	57.9
Tsirang	0.011	2.1	50.7
Wangdue Phodrang	0.002	0.3	64.0
Zhemgang	0.002	0.4	50.8

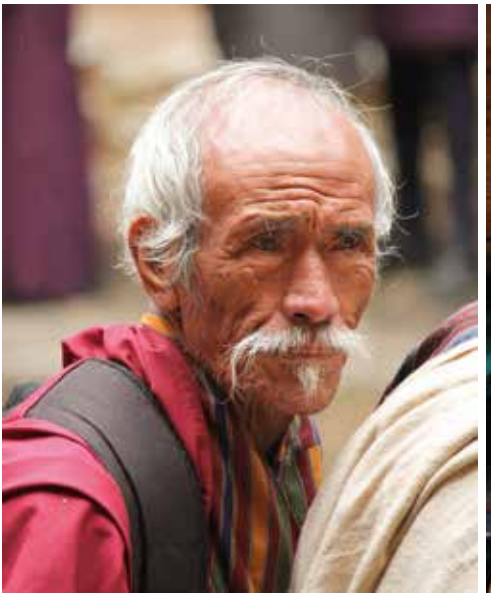
Source:Authors' calculations based on data from BLSS 2017

TABLE 3.5 Correlation among Subnational *Dzongkhag* Ranks for Different Poverty Cutoffs, 2017

		$k = 4$
$k = 2$	Spearman	0.759
	Kendall Tau-b	0.583
$k = 3$	Spearman	0.927
	Kendall Tau-b	0.808
$k = 5$	Spearman	0.937
	Kendall Tau-b	0.821
$k = 6$	Spearman	0.889
	Kendall Tau-b	0.764

Source: Authors' calculations based on data from BLSS 2017

Table 3.5 presents the Spearman and Kendall rank correlation coefficients between the regions' rankings using the selected poverty cutoff, 4, and the ranking for alternative poverty cutoffs around 4. It can be seen that the Spearman coefficient is higher than 0.90 for $k = 3$ and $k = 4$. The Kendall coefficient is around 0.9 for each of the values of $k = 3$ and $k = 4$, implying that around 90% of the comparisons are concordant in each case.



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When the rank correlation coefficients Spearman and Kendall were calculated for different combinations of weights (each dimension taking the weight of 50% and the other two 25%), the analysis revealed that for the three structures the Spearman coefficient is higher than 0.95 and the Kendal Tau-b coefficient is higher than 0.85, thus, more than 85% of the comparisons are concordant in each case (Table 3.6), establishing the robustness of the MPI to a range of plausible weights from 25% to 50% per dimension.

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TABLE 3.6 Correlation among *Dzongkhag* Ranks for Different Weight Structures, 2017

			MPI Weights 1	MPI Weights 2	MPI Weights 3
E = Education *H = Health* *LS = Living Standards*			**Equal weights: 33% each dimension**	**50% E 25% H 25% LS**	**50% E 25% H 25% LS**
MPI Weights 2	50% E 25% H 25% LS	Spearman Kendall	0.952 0.852		
MPI Weights 3	50% E 25% H 25% LS	Spearman Kendall	0.979 0.916	0.952	
MPI Weights 4	50% E 25% H 25% LS	Spearman Kendall	0.977 0.884	0.922 0.758	0.934 0.800

Source: Authors' calculations based on data from BLSS 2017

However rank correlations are not ideal for situations, such as the present, in which confidence intervals are large. The better way to evaluate is to assess pairwise comparisons using standard errors. The percentage of robust pairwise combinations by *Dzongkhag* showed that 85.3% of the pairwise *Dzongkhag* comparisons are robust to changes in the dimensions' weights from 25% to 50% per dimension. In the case of variations in the poverty cutoff, 98.4% of the pairwise *Dzongkhag* comparisons are robust to changes in k from 25% to 45%. So the structure of the Bhutan MPI is robust to a plausible range of weights and poverty cutoffs.

3.4 MULTIDIMENSIONAL POVERTY AND MONETARY POVERTY

Table 3.7 presents the magnitudes of matches and mismatches in the poverty headcount between multidimensional and monetary poverty. The incidence of multidimensional poverty and monetary poverty is significantly different and important differences are found between the poor and non-poor headcount ratio. Among the 8.2% of monetary poor, 7.2% are not multidimensionally poor. Similarly, from the 5.8% of the multidimensionally poor, 4.8% are not also monetary poor. Indeed, only 1% of the Bhutanese population are both multidimensionally poor and consumption poor at the same time. The large mismatch between the two measures illustrates the vital importance of using both measures to inform policy and planning, as they convey information about people who are poor in different ways and inform different policy interventions.

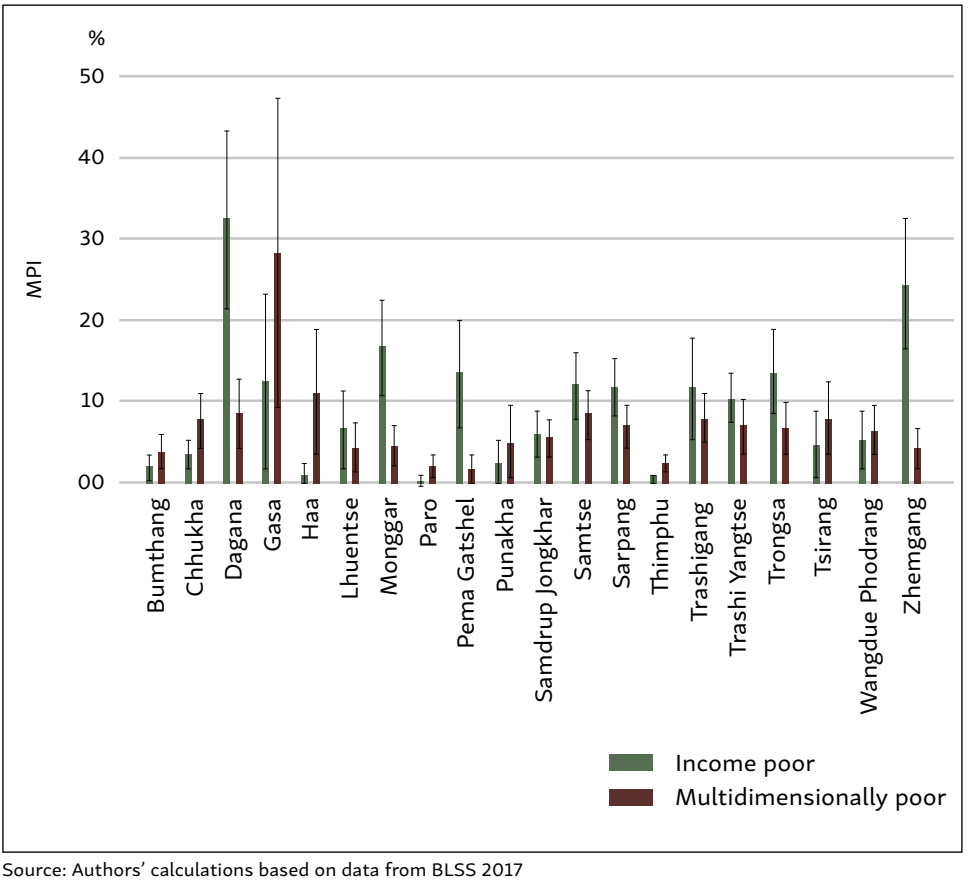
Figure 3.10 compares the rate of monetary poverty and multidimensional poverty by *Dzongkhag*. It shows that in the majority of the *Dzongkhags* the two measures do not match exactly. While the difference is especially prominent in Gasa, in Haa and Thimphu the MPI rate is statistically significantly higher than that of monetary poverty. In the case of Dagana, the monetary poverty rate is significantly higher than the MPI rate (33% versus 9%) – and significantly higher monetary rates are apparent also in Zhemgang, Monggar, and Pema Gatshel. This again demonstrates the value-added in having both measures available to policy makers for planning and allocation purposes.

TABLE 3.7 Monetary and Multidimensional Poverty: Who is Poor in Both? 2017

Monetary Poor	Multidimensionally		
	Non-poor	Poor	Total
Non-poor	87.03	4.76	91.79
Poor	7.17	1.03	8.21
Total	94.2	5.8	100

Source: Authors' calculations based on data from BLSS 2017

FIGURE 3.10 Comparison between Multidimensional Poverty and Income Poverty by *Dzongkhag*, 2017



Source: Authors' calculations based on data from BLSS 2017

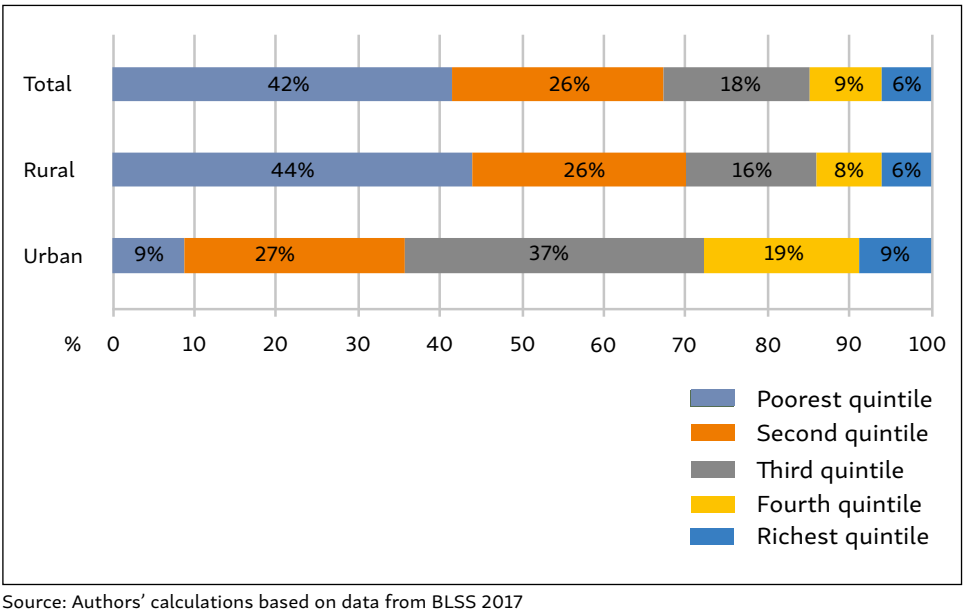
TABLE 3.8 Multidimensional Poverty by Consumption Quintile, 2017

Index	Consumption Quintile				
	Poorest	Second	Third	Fourth	Richest
MPI	0.039	0.027	0.020	0.010	0.008
Headcount ratio (H, %)	9.6	7.0	5.2	2.7	2.3
Intensity (A, %)	40.8	38.9	37.9	38.1	37.3

Source: Authors' calculations based on data from BLSS 2017

Table 3.8 and Figure 3.11 display multidimensional poverty by consumptions quintiles subnationally. The question these answer is clear: for the 5.8% of the population who are multidimensionally poor, is their consumption level among the bottom 20% of all households, as might be expected? The data show that this is not the case. Actually, only 42% of the MPI poor have consumption levels in the poorest quintile. Sixty-eight percent of multidimensionally poor people are in the bottom two consumption quintiles, but one-third of MPI poor people have higher consumption levels than might be anticipated. When comparing urban and rural areas, it is a genuine puzzle that only 9% of the urban poor are in the poorest consumption quintile, whereas 64% are in the second and third quintiles for consumption. We also notice that a small percentage of the multidimensionally poor in both rural and urban areas are in the top quintile for consumption. This may be because the short recall period of consumption data means that monetarily poor families occasionally will be identified as non-poor if in the immediately preceding week or month consumption was very high (for example, because of a wedding or family festival).

FIGURE 3.11 Distribution of Multidimensional Poverty by Income Quintile, 2017



Source: Authors' calculations based on data from BLSS 2017

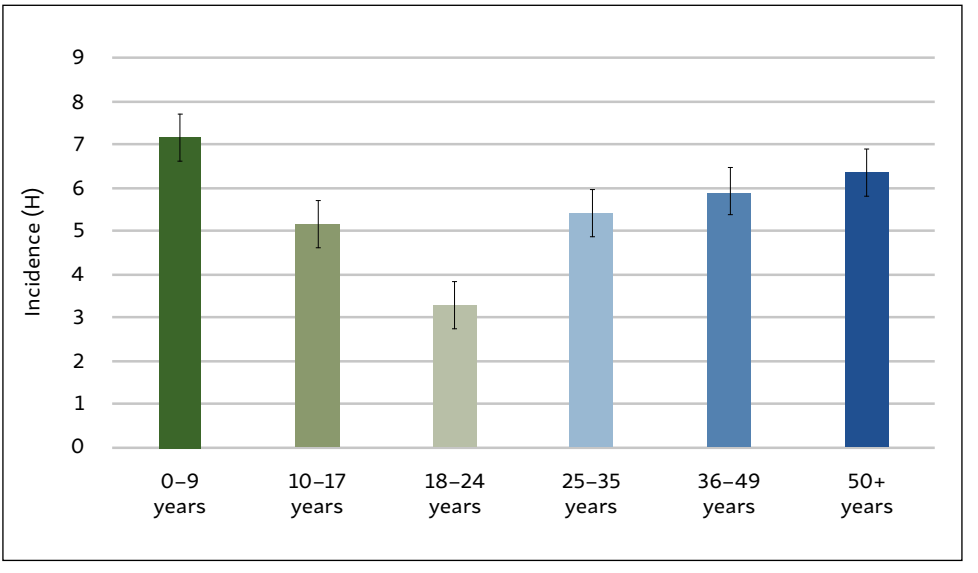
3.5. PERFORMANCE ACROSS HOUSEHOLD CHARACTERISTICS

This section examines how the incidence of multidimensional poverty varies according to household characteristics. For that purpose, we explore multidimensional poverty among different groups: age cohort, gender of the household head, level of education and literacy, and household size. At the same time, we analyse rural and urban differences across these subgroups.

Disaggregating by age reveals intergenerational disparities. According to Figure 3.12, children under the age of nine are the poorest, and 7.1% of them were poor in 2017. The incidence of poverty decreases as age increases until age 25, as can be seen in the figure. After this point, the incidence of poverty increases, with the oldest age cohort (people aged 50 years or older) showing the second highest incidence of multidimensional poverty (6.3%).[2] These findings are discussed in Chapter 5, which is dedicated to analysing MPI for different age cohorts.

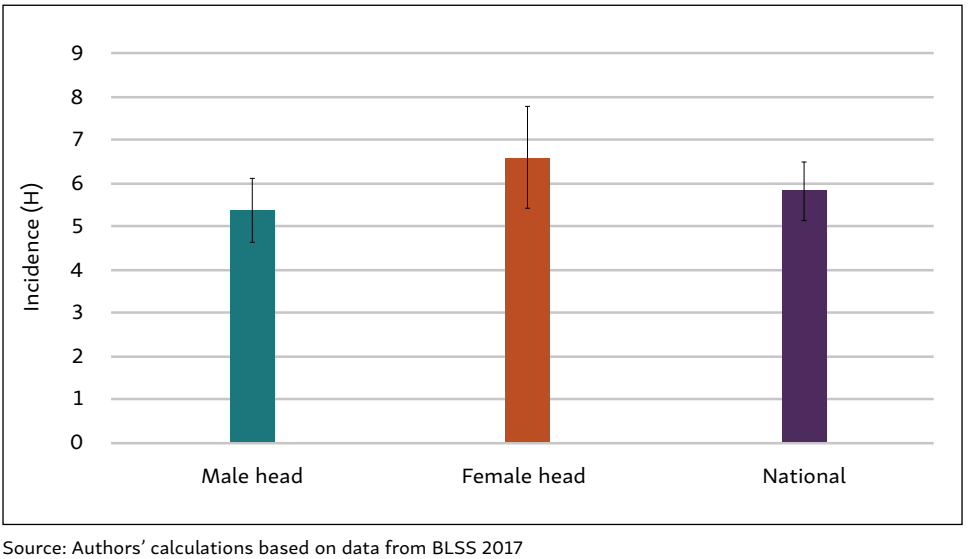
2. Children up to nine years of age represent 17.4% of the population, while the population share of the age groups 10–17, 18–24, 25–35, 36–49 and 50+ are equal to 15.5%, 11.4%, 18.9%, 16.9% and 19.8%, respectively.

FIGURE 3.12 Incidence of Multidimensional Poverty by Age Group, 2017



Source: Authors' calculations based on data from BLSS 2017

FIGURE 3.13 Incidence of Multidimensional Poverty by Household Head's Gender, 2017



Source: Authors' calculations based on data from BLSS 2017

Figure 3.13 highlights differences between female-headed household and male-headed households in terms of the incidence of multidimensional poverty.[3] The levels of incidence are higher for female-headed households, however the differences are not significant.

In addition, as shown in Table 3.9, male-headed households perform better in every censored headcount ratio, with the exceptions of cooking fuel, electricity, water, road access and housing. The largest difference is found of school attendance, with children in female-headed households being less likely to attend school.

The multidimensional poverty rate is much higher when the household head is illiterate, compared to households with a literate head of house. In the

3. In 2017, 34.9% of the population lived in a household with a female head.

TABLE 3.9 Censored Headcount Ratios by Gender of the Household Head, 2017

Indicators	Censored Headcount		Difference (p.p.)
	Female HH Head	Male HH Head	
Child Mortality	3.81	2.69	1.11
Food Security	1.94	1.45	0.49
School Attendance	2.45	1.35	1.094*
Schooling	4.81	4.14	0.67
Cooking Fuel	3.72	3.80	-0.08
Sanitation	2.08	1.59	0.49
Electricity	0.22	0.55	-0.33
Water	0.09	0.26	-0.17
Road Access	1.28	1.68	-0.40
Housing	0.70	1.27	-0.57
Assets	1.07	1.01	0.06
Land	1.79	1.37	0.42
Livestock	1.95	1.26	0.69

Source: Authors' calculations based on data from BLSS 2017

Note: * 1% level of significance

FIGURE 3.14 Incidence of Multidimensional Poverty by Literacy Status of Household Head, 2017

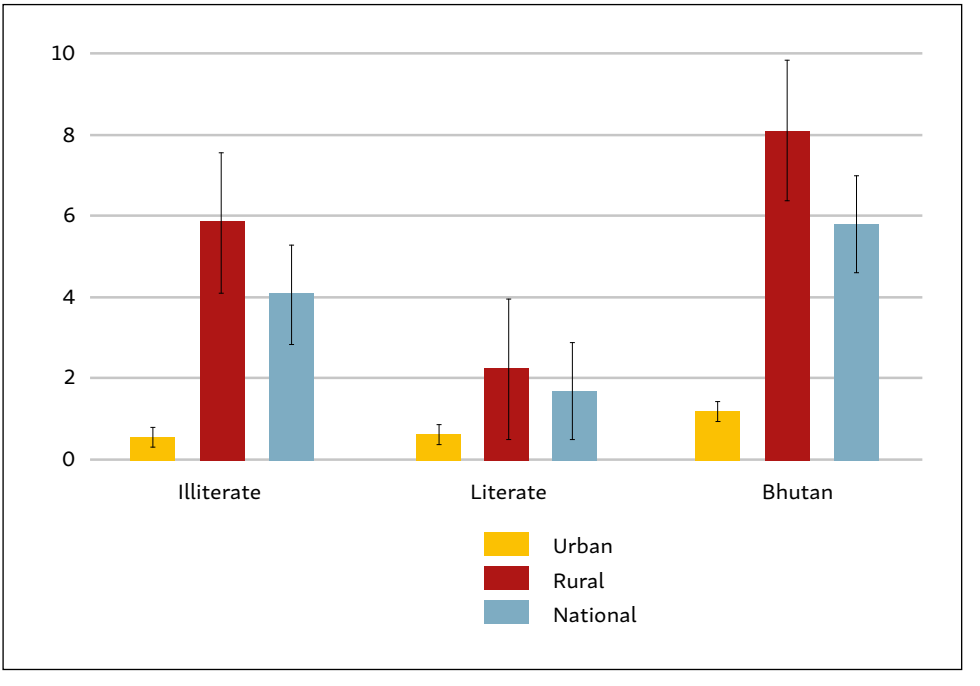
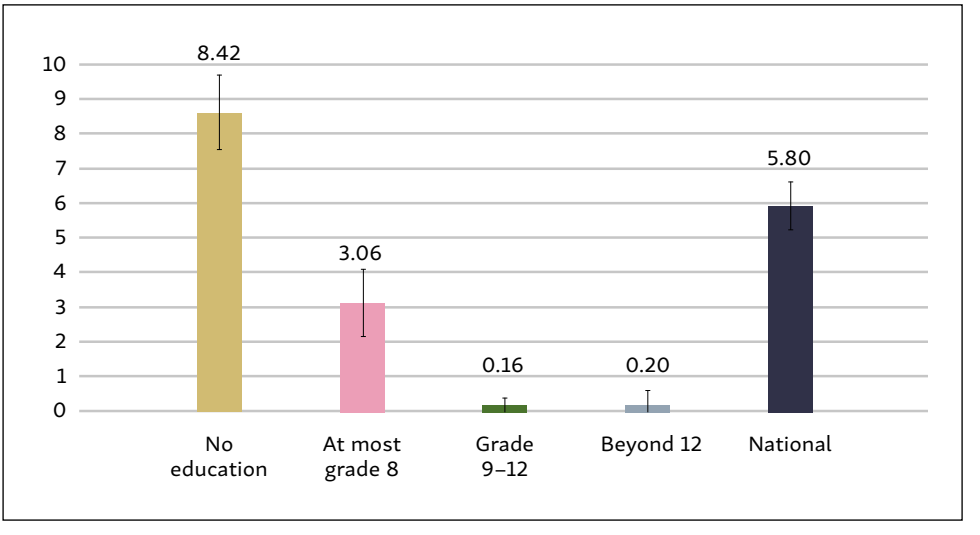


FIGURE 3.15 Incidence of Multidimensional Poverty by Household Head's Educational Attainment, 2017



Source: Authors' calculations based on data from BLSS 2017

rural areas, the chance that a person is multidimensionally poor is twice as high if the person belongs to a household whose household head is illiterate, while in urban areas, the incidence of multidimensional poverty is similar (Figure 3.14).

Figure 3.15 presents the incidence of multidimensional poverty by household head's educational attainment. Significant differences can be observed between the levels of multidimensional poverty rates for households whose head has no education compared with other households. The information presented in this analysis reveals rather dramatically that the level of education of a household's head is associated with multidimensional poverty. While this is not surprising it still merits consideration when designing policy responses.

Household size is another interesting household characteristic in the analysis of multidimensional poverty. As is well known, when monetary poverty is measured in per capita terms, poverty increases with household size. Insofar as the sample design permits exploration, no such trend is evident with the MPI, as there is no significant difference between households of different sizes.[4]

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4. Out of the total population of Bhutan, 64.8% of people live in households with up to five household members and 1.7% live in households with more than 10 members.

Dagmar Vyhnalkova | UNICEF Bhutan

IV. Multidimensional Poverty Reduction over Time

A key question is how multidimensional poverty in Bhutan has changed over time. This chapter first studies in detail the recent period 2012–2017. To look further back in time, the chapter then harmonises the 2012 and 2017 BLSS surveys with the more limited BLSS 2007 (which lacks child mortality) and analyses the pace and composition of poverty reduction across the decade. Both analyses show powerful reductions in MPI, H, and A over time. Across the decade 2007–2017, MPI was cut sharply to less than one-seventh of its starting value; the poverty rate and intensity likewise fell sharply. Thus the outline is:

4.1 Changes in Multidimensional Poverty 2012–2017;
4.2 Changes in Multidimensional Poverty 2007-2017.

4.1 CHANGES IN MULTIDIMENSIONAL POVERTY 2012–2017

This section examines the evolution of multidimensional poverty in Bhutan between the years 2012 and 2017. We calculate the MPI and its sub-indices for both periods using BLSS datasets and decompose by *Dzongkhag*. This allows us to infer trends over time in terms of poverty alleviation. In particular, we focus on regional and dimensional changes over time.

The BLSS for these waves share a common survey design and questionnaire, allowing us to create the exact same indicators for each year and to make robust comparisons across time.

It should be noted that even without adjustments, the BLSS 2012 is almost comparable to BLSS 2017. Yet assure strict comparability across time, the indicator of sanitation in BLSS 2012 was recalculated using the same

definition as in BLSS 2017.[5] This adjustment – which lowers the BLSS 2012 incidence from 12.7% to 12.4% – enables us to present changes over time rigorously for indicators having strictly comparable definitions and to do so both at the national level and at the *Dzongkhag* level. All indicator definitions, weights, and poverty cutoffs used in the 2012–2017 comparisons are the same used in the 2017 national MPI.

This section presents changes over time in the following parameters:

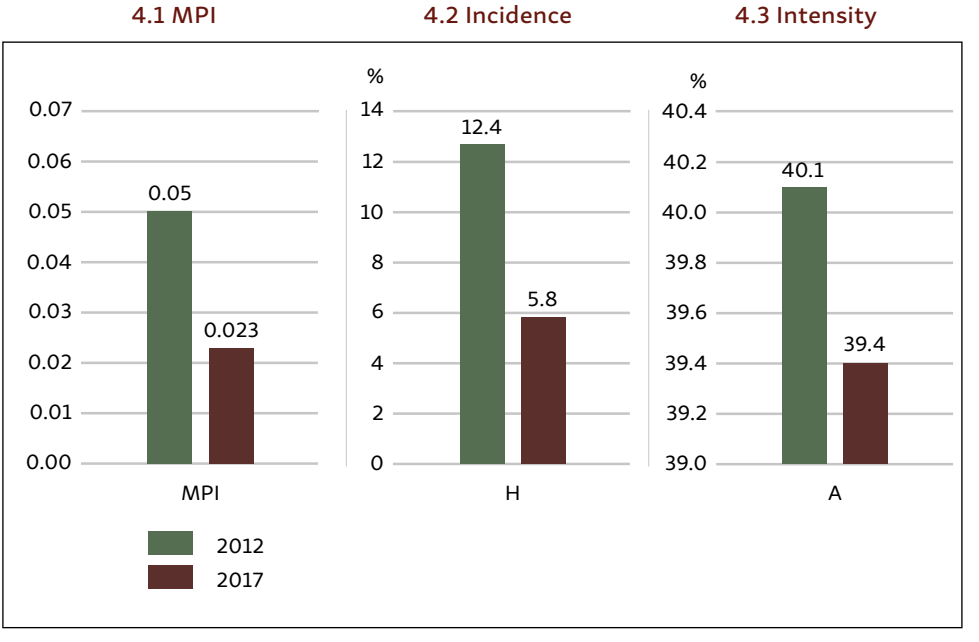
1. Multidimensional Poverty (H, A, and MPI);
2. Multidimensional Poverty with Different Values of *k*;
3. Censored and Uncensored Headcount Ratios;
4. Percentage Contribution of Each Indicator to the MPI;
5. Changes in the Levels of MPI, H, and A by *Dzongkhag*;
6. Changes in the Censored Headcounts by *Dzongkhag*.

Turning now to the three key statistics of the MPI, Figures 4.1 to 4.3 give an overview of how the incidence of poverty, intensity of poverty, and the MPI have changed over the two points in time. It is evident that multidimensional poverty dropped between 2012 and 2017. The MPI decreased from 0.050 to 0.023 and the headcount ratio (H) fell from 12.4% to 5.8%, and both reductions are statistically significant (see Table 4.1). Note that 12.4% takes into account the adjustments for comparability (the official poverty rate in 2012 is 12.7%).

It is interesting to analyse the extent to which these improvements in MPI, H, and A depend on the poverty cutoff, also known as the *k*-value. Figures 4.4 to 4.6 show the value of these three indicators for all possible values of k and for the two waves under study. As can be seen, when comparing 2012 and 2017, the curves for H and the MPI are not overlapping for k-values lower than 8, with the curves for 2017 always falling below the ones for 2012. Statistical analyses confirm significant reductions in the incidence of poverty (H) and of the overall MPI, regardless of the *k*-value chosen.

5. In 2017, a composting toilet was defined as non-deprived. This is a change from 2012 but reflects an improvement in the indicator specifications. For changes over time, both 2012 and 2017 are coded identically and a composting toilet is non-deprived.

FIGURES 4.1–4.3 Multidimensional Poverty in Bhutan, 2012–2017



Source: Authors' calculations based on data from BLSS 2017

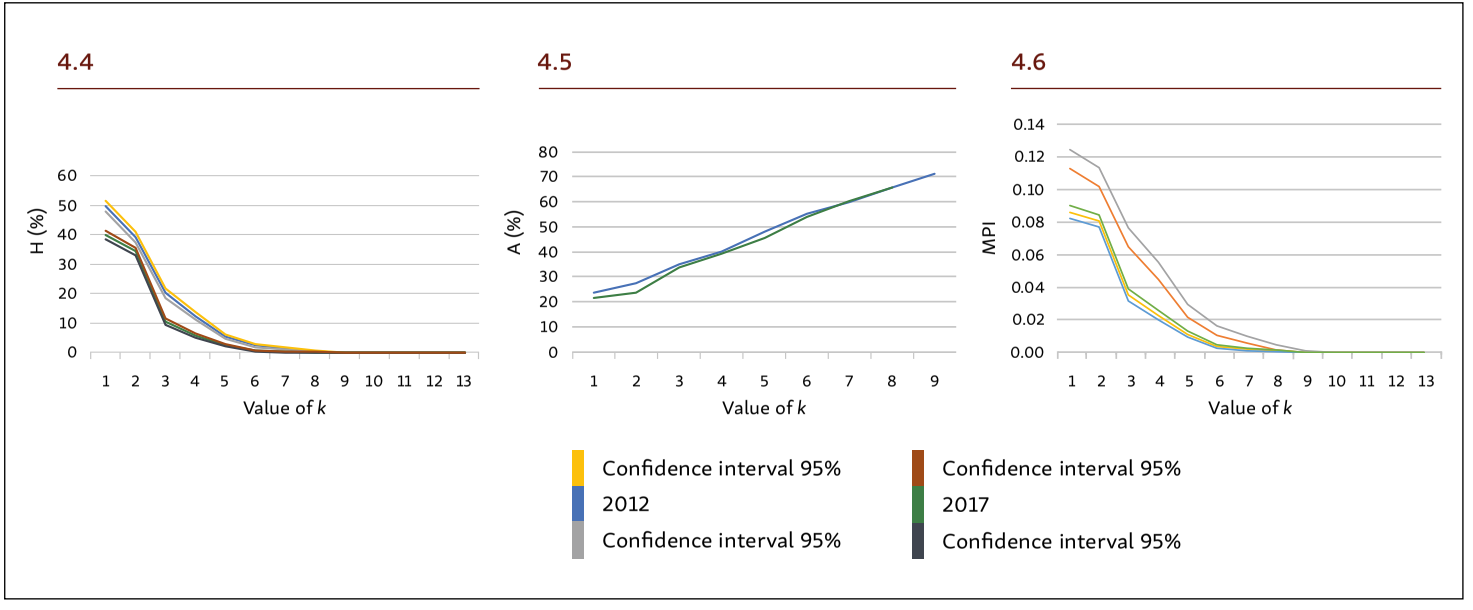
TABLE 4.1 Change in H, A and MPI between 2012 and 2017

Cutoff (k = 4)	MPI	Incidence (H)	Intencity (A)
2012	0.05	12.4%	40.1%
2017	0.02	5.8%	0.39%
Change 2012–2017	*	*	
Combined SE	0.004	0.01	0.009
Hypothesis	8.86	9.12	1.23
p-value	0.00	0.00	0.22

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

Note: * 1% level of significance, two-tailed tests

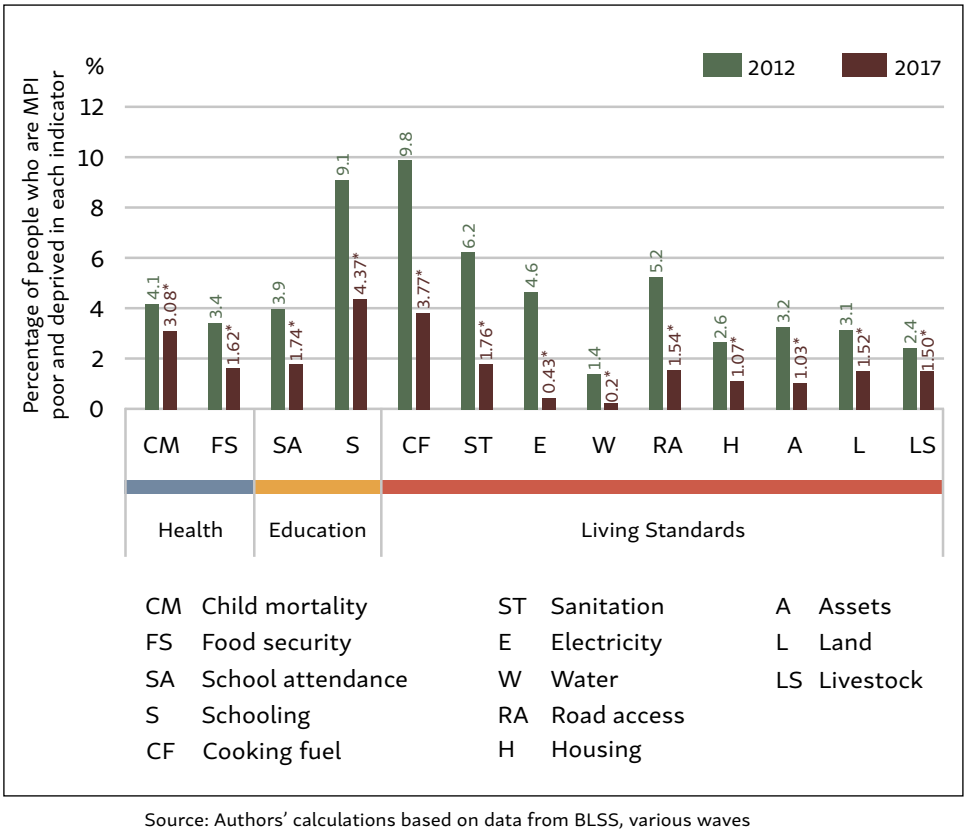
FIGURES 4.4 National Headcount Ratio (H) for Different Values of the Poverty Cutoff *k*
4.5 National Intensity of Poverty (A) for Different Values of the Poverty Cutoff *k*
4.6 MPI for Different Values of the Poverty Cutoff *k*



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

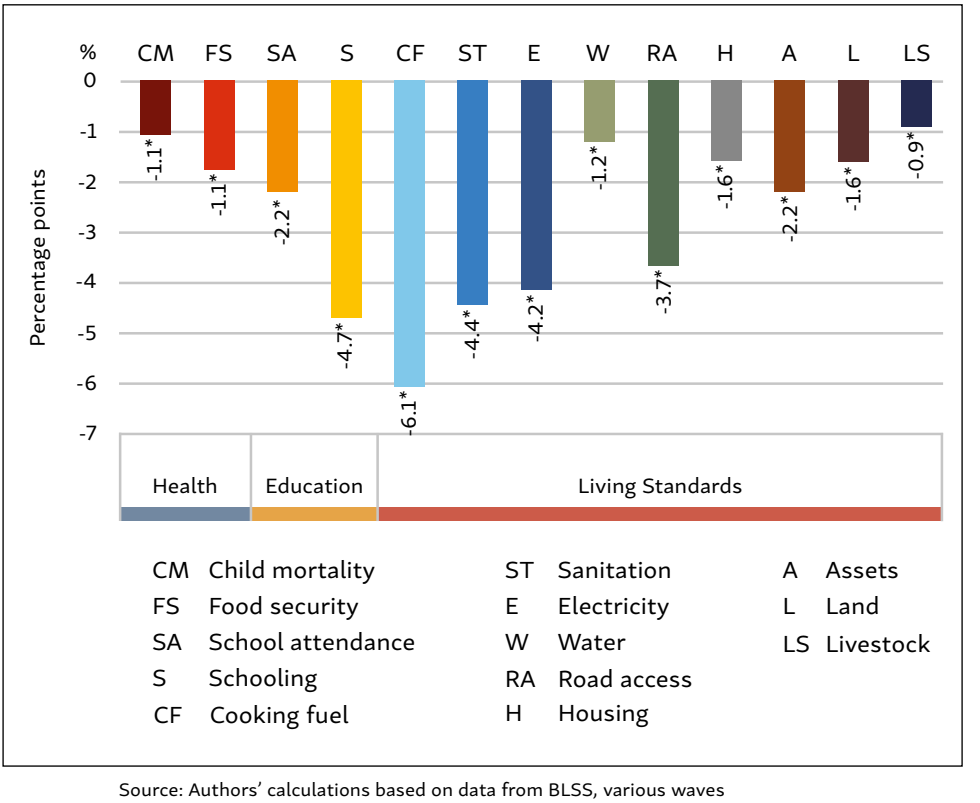
To understand how poverty has decreased – what indicators drove the reduction – we unpack the change in MPI by each of its component indicators. Figure 4.7 provides a more refined view of what drove the substantial reduction in multidimensional poverty over time. Censored headcount ratios – measuring the percentage of people who are MPI poor and deprived in a given indicator – are depicted for the two points in time. All reductions in all indicators were significant over time. Within the dimensions of education and health, for instance, all indicators show statistically significant reductions (at 1% level of significance) between 2012 and 2017. Among indicators belonging to the dimension of living standards, we see a large improvement in cooking fuel and sanitation. The censored headcount ratio for cooking fuel declined from 9.8% to 3.8%, and deprivation in sanitation dropped from 6.2% to 1.8%.

FIGURE 4.7 National Censored Headcount Ratios, 2012–2017



Source: Authors' calculations based on data from BLSS, various waves
Note: * 1% significance level, two-tailed test

FIGURE 4.8 Absolute Change in Censored Headcount Ratios between 2012 and 2017



Source: Authors' calculations based on data from BLSS, various waves
Note: * 1% significance level, two-tailed test

Figure 4.8 depicts the absolute change in the censored headcount ratios between 2012 and 2017, in percentage points. Clearly, the improvements in cooking fuel, years of schooling, and sanitation are the largest. Similarly, there are important reductions in the censored headcount ratios of other indicators such as electricity (-4.2 percentage points) and road access (-3.7 percentage points). Child mortality fell significantly, but its pace of reduction was slower than most other indicators. This is because, in the BLSS, there is no information available on *when* the child died. Thus this indicator is for that reason more of a 'stock' indicator because it may include deaths that occurred many years previously – and it is expected to change more slowly.

It is useful to analyse population-wide trends in the MPI indicators alongside the trends in deprivations of the poor.

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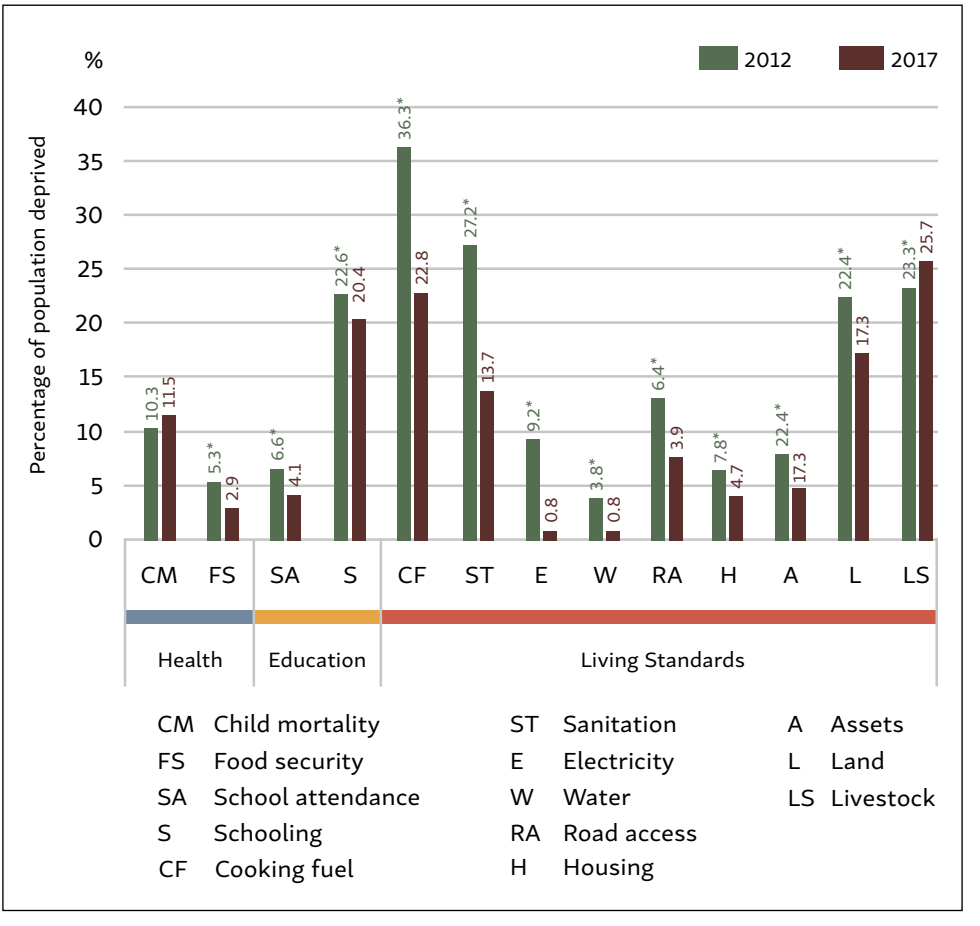
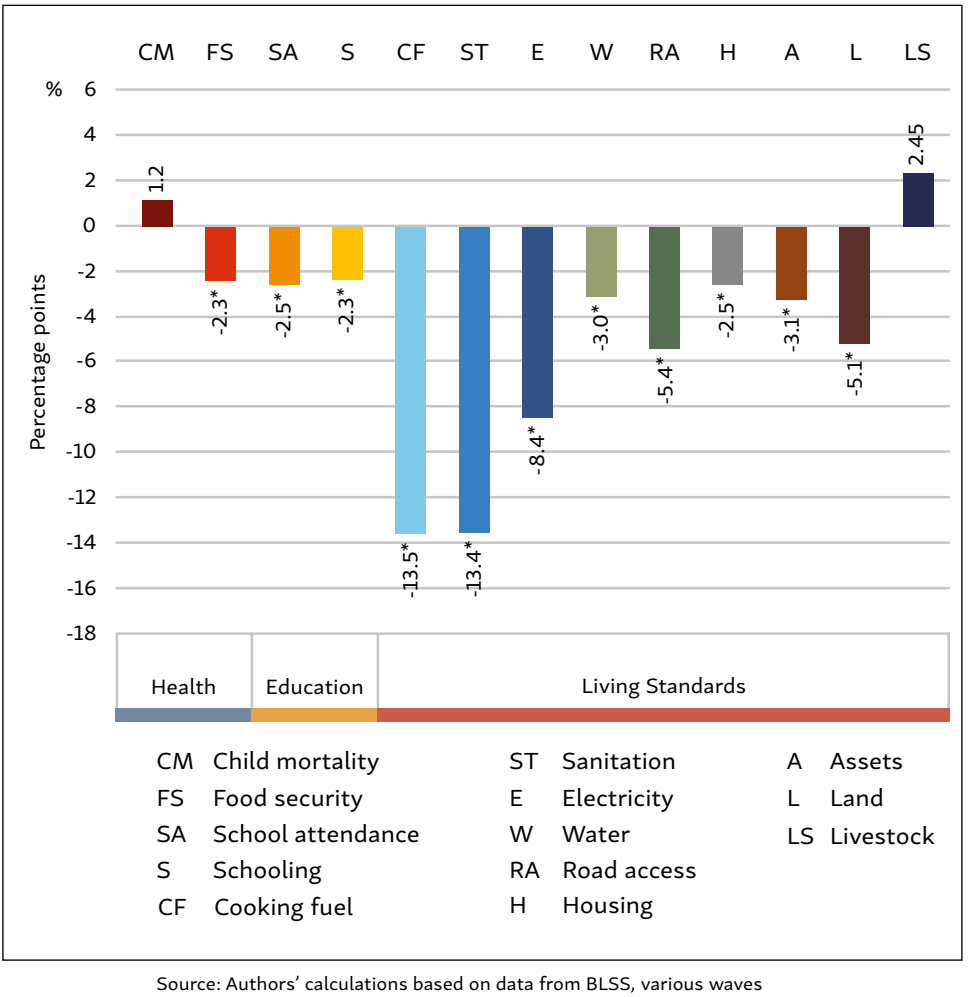
FIGURE 4.9 National Unensored Headcount Ratios, 2012–2017



Source: Authors' calculations based on data from BLSS, various waves
Note: * 1% significance level, two-tailed test

Figure 4.9 presents the proportion of people deprived in each of the 13 indicators used in the MPI, or the uncensored headcount ratios. The figure suggests that 11 of the indicators have registered improvements over time; that is, a reduction in the proportion of people deprived in them. Figure 4.10 displays the absolute change in the uncensored headcount ratios between 2012 and 2017. Sanitation and cooking fuel show the largest absolute improvements (-13.5 and -13.4 percentage points, respectively), followed by electricity (-8.4) and road access (-5.4). On the other hand, deprivations in livestock ownership worsened between 2012 and 2017 (by

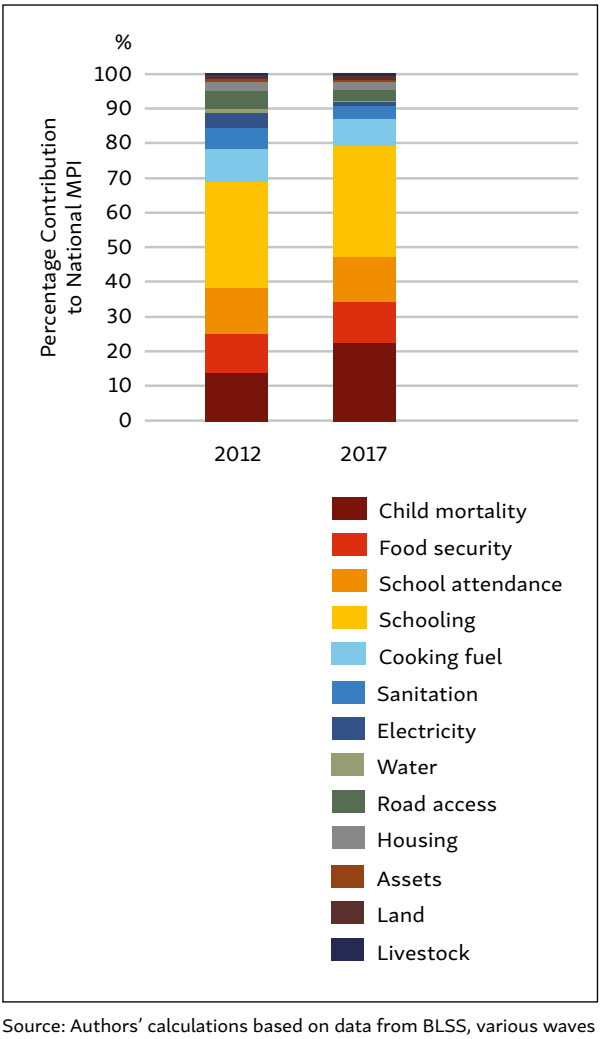
FIGURE 4.10 Absolute Change in Uncensored Headcount Ratios between 2012–2017



Source: Authors' calculations based on data from BLSS, various waves
Note: * 1% significance level, two-tailed test

+2.4 percentage points), probably due to livelihood adjustments among the non-poor in rural areas, as well as rural-urban migration. The apparent increase in child mortality among the non-poor would indeed be troubling, but it is not statistically significant. Furthermore, as mentioned above, the BLSS does not have information on when the child died, so the child mortality indicator will show slower changes as it includes some deprivations that occurred a long time ago.

FIGURE 4.11 Percentage Contribution of Each Indicator to National MPI, 2017



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

Turning now to the contribution of each of the 13 indicators of the MPI, Figure 4.11 shows each indicator's contribution to overall poverty in Bhutan for each of the two waves under study. It appears that the general composition of the MPI has changed over time due to the fast reduction in living standards indicators, and the relatively slow reduction in child mortality (due to that variable definition). In both years, years of schooling was the indi-

cator that contributed the most to poverty (30.2% and 31.9%). However, deprivations related to living standards indicators decreased sharply. Indeed, in 2017 the indicators that contribute the least to the MPI are access to a clean source of water, asset ownership, and access to electricity (each with a contribution below 1%).

In terms of dimensions, education contributes the most to overall poverty (around 40%) for both years, while health increased its contribution to overall poverty in 2017, moving from 24% to almost 35%.

Amongst the *Dzongkhags*, 16 *Dzongkhags* had statistically significant reductions in MPI. Figure 4.12 shows regional trends in absolute changes over time of multidimensional poverty. As can be seen, Monggar shows the fastest absolute reduction in the MPI between 2012 and 2017 (-0.06 points of the index), followed by Trongsa and Tsirang (-0.05 points) and Chhukha (-0.04 points). These changes are statistically significant at 1%. Very small increases in MPI were seen in Bumthang, Haa, Sarpang, and Thimphu. What merits investigation is the extent to which these increases in poverty have been driven by internal migration rather than by a worsening condition of the existing residents in those *Dzongkhags*.

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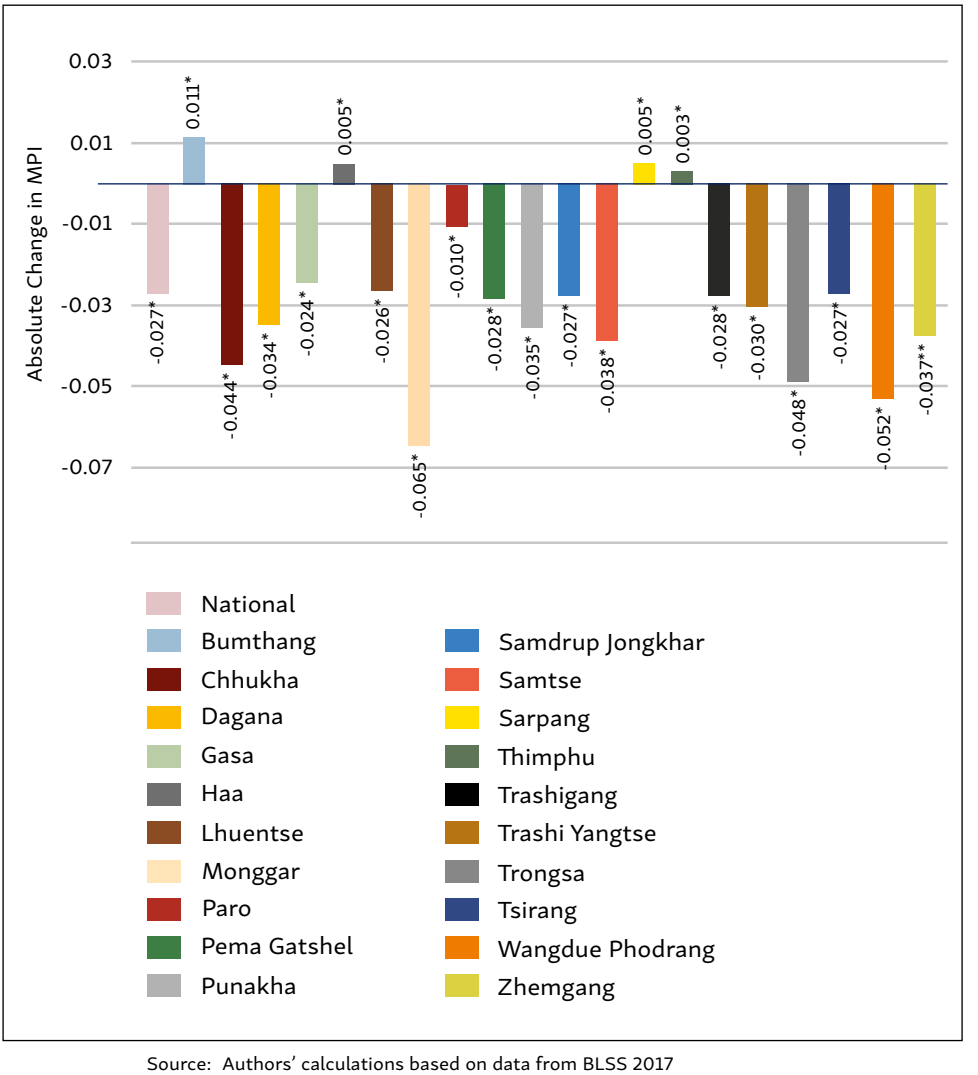
FIGURE 4.12 Absolute Change in Subnational *Dzongkhags'* MPI, 2012 to 2017

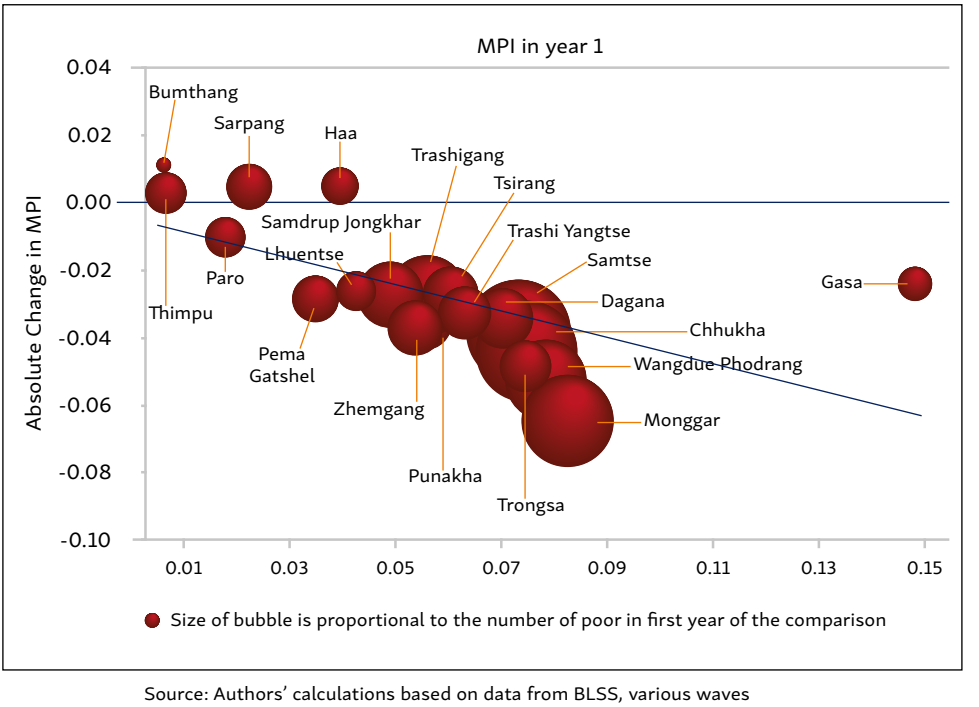


Source: Authors' calculations based on data from BLSS 2017
Note: * 1% level of significance, two-tailed test
** 5% level of significance, two-tailed test

As already mentioned, it is worth noticing again that Thimphu houses nearly 17% of the total population of Bhutan and has an incidence of multidimensional poverty of 2.6% in 2017. In contrast, Gasa is home to a little over 0.4% of the country's population, 29% of whom are poor.

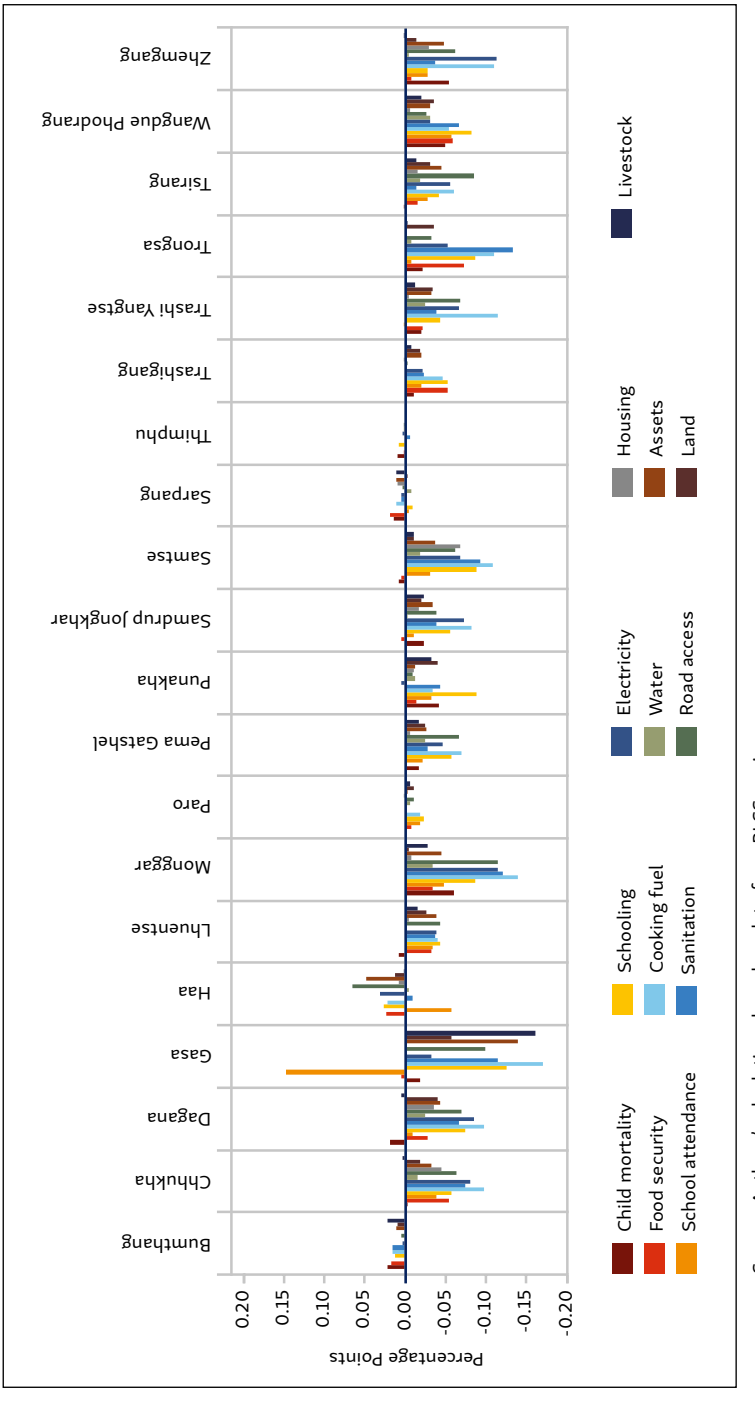
To investigate if the reduction of multidimensional poverty across *Dzongkhags* is pro-poor, or is leaving the poorest regions behind, Figure 4.13 plots the absolute change in MPI on the vertical axis against the 2012 MPI for all regions. The strong negative trend between the initial level of the MPI and the absolute change in the MPI shows a pro-poor pattern. The poorer regions have tended to reduce poverty faster than less poor *Dzongkhags*, hence, far from being left behind, they are catching up.

FIGURE 4.13 Poverty Reduction in *Dzongkhags*, 2012–2017



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

FIGURE 4.14 Absolute Change in Censored Headcount Ratios by *Dzongkhag*, 2012–2017



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

To further analyse improvements in each of the 20 *Dzongkhags* of Bhutan, Figure 4.14 highlights the changes in censored headcount ratios between 2012 and 2017. While there are clear improvements across most of the indicators in most regions, there are a few regions that have not shown reductions in most indicators. Notably, there is an increase in the censored headcount ratio for all indicators in Bumthang (except for housing). In the case of Gasa there was a reduction in most censored headcount ratios, with the exception of school attendance and food security. The largest reductions are seen in the censored headcount ratios of cooking fuel and sanitation.

4.2. CHANGES OVER TIME 2007–2017

Bhutan made lightning-quick progress in reducing MPI over a ten year period. This section compares the levels of multidimensional poverty across the three available BLSS waves (2007, 2012, and 2017) and analyses changes in the levels of MPI, H, and A, as well as each component indicator. It is important to note that the MPIs presented in this section are not the same as the official national figures. This is because the BLSS 2007 lacked the child mortality indicator and had different categories for sanitation and water source. In order to establish trends rigorously, the 2012 and 2017 surveys have been harmonised for strict comparability with the 2007 survey. Thus the point estimates in this section differ slightly from the official national figures presented earlier in this chapter. The focus of this section is the trends across the decade, which are truly astonishing.

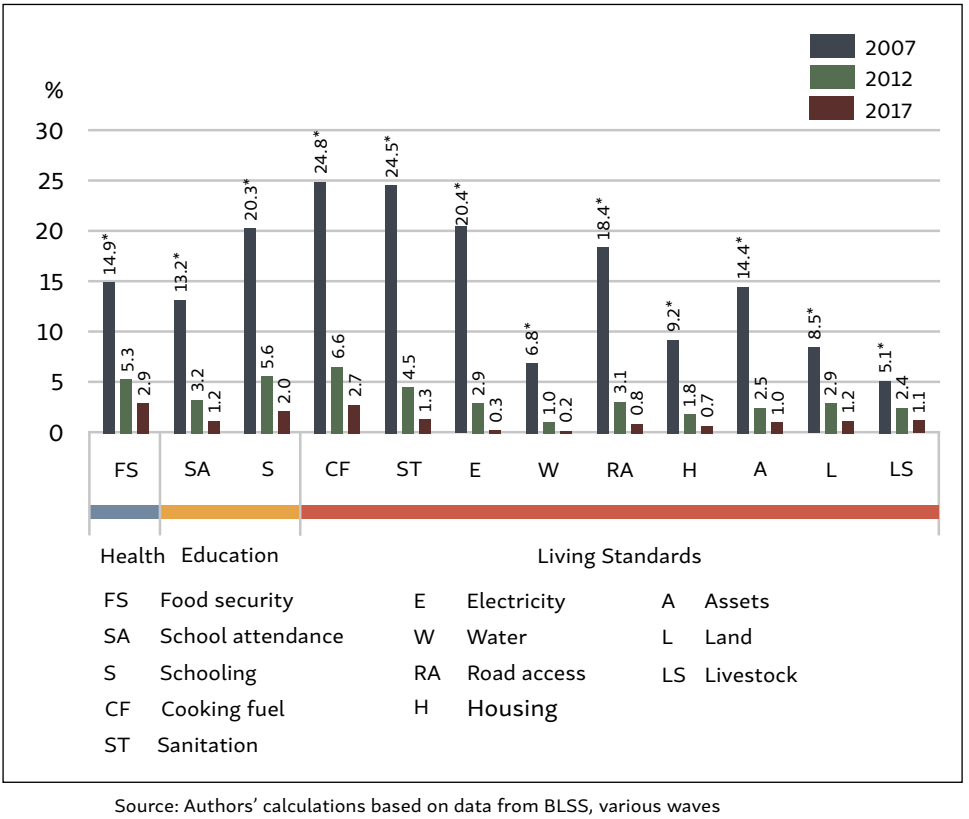
Table 4.2 shows a stunning reduction in both the MPI and the headcount ratio. The MPI fell from 0.160 to 0.019, and the poverty rate or the headcount ratio (H) fell by far more than half. Indeed it declined almost 25 percentage points. The average deprivation share of the poor (A) declined strongly as well.

TABLE 4.2 Changes in H, A and MPI between 2007, 2012 and 2017

Cutoff (*k*)	MPI	Incidence (H)	Intensity (A)
2007	0.160	29.3%	54.4%
2012	0.043	9.2%	46.5%
2017	0.019	4.2%	44.7%
Change 2007–2017	*	*	**
Hypothesis	24.6	26.0	11.8
p-value	0.00	0.00	0.00

Source: Authors' calculations based on data from BLSS, various waves
Note: * 1% significance level, two-tailed test
** 5% significance level, two-tailed test

FIGURE 4.15 Change in Censored Headcount, 2007–2012, 2017

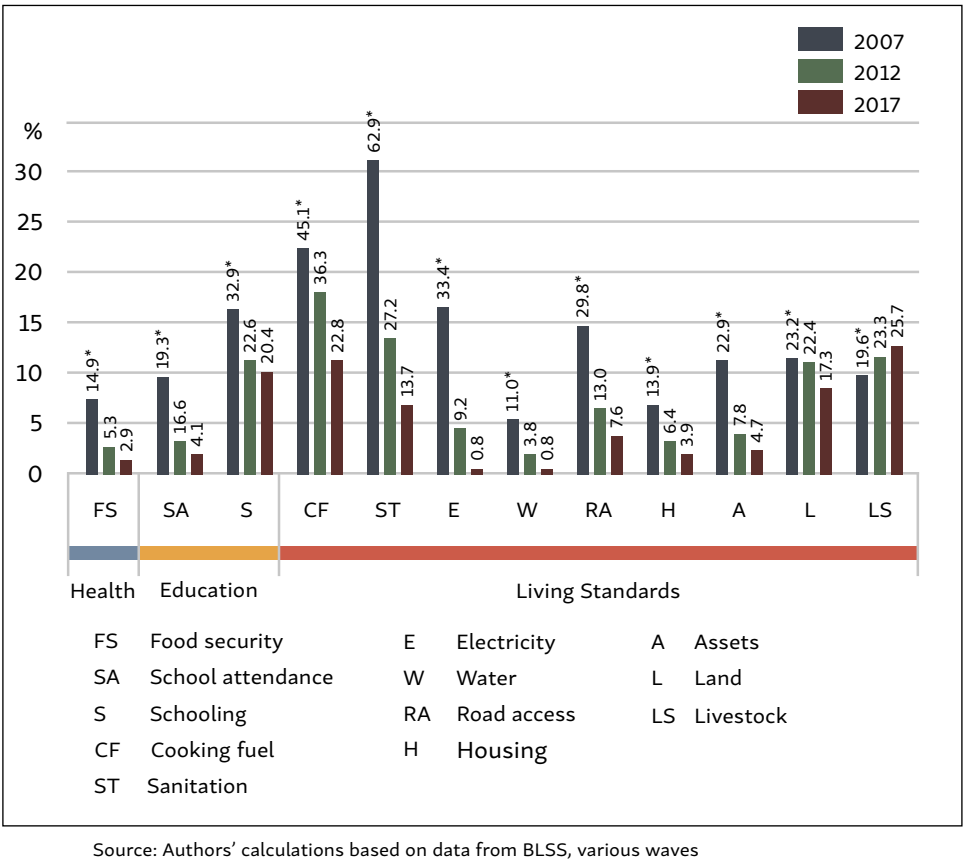


Source: Authors' calculations based on data from BLSS, various waves
Note: * 1% significance level, two-tailed test

We examine the change in the censored headcounts: the percentage of people who are both poor and deprived in each indicator. At the national level, there were statistically significant reductions in each indicator. Figure 4.15 shows that the largest absolute reductions in the censored headcount occurred in sanitation (-23.1 percentage points), cooking fuel (-22.1 percentage points), electricity (-20.1 percentage points), and schooling (-18.2 percentage points).

Figure 4.16 presents the proportion of the population deprived in each of the 12 indicators used in the 2007, 2012, and 2017 MPIs, or the uncensored headcount ratios. The figure suggests all indicators except livestock have registered significant improvements over time. The largest absolute changes are seen in the uncensored headcount ratios for sanitation, electricity, and cooking fuel, followed road access and asset ownership.

FIGURE 4.16 National Uncensored Headcount Ratios, 2007–2017



Source: Authors' calculations based on data from BLSS, various waves
Note: * 1% significance level, two-tailed test

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Ownership of livestock decreased among the non-poor between 2007 and 2012 due to changing patterns of livelihood in rural areas as well as rural-urban migration.

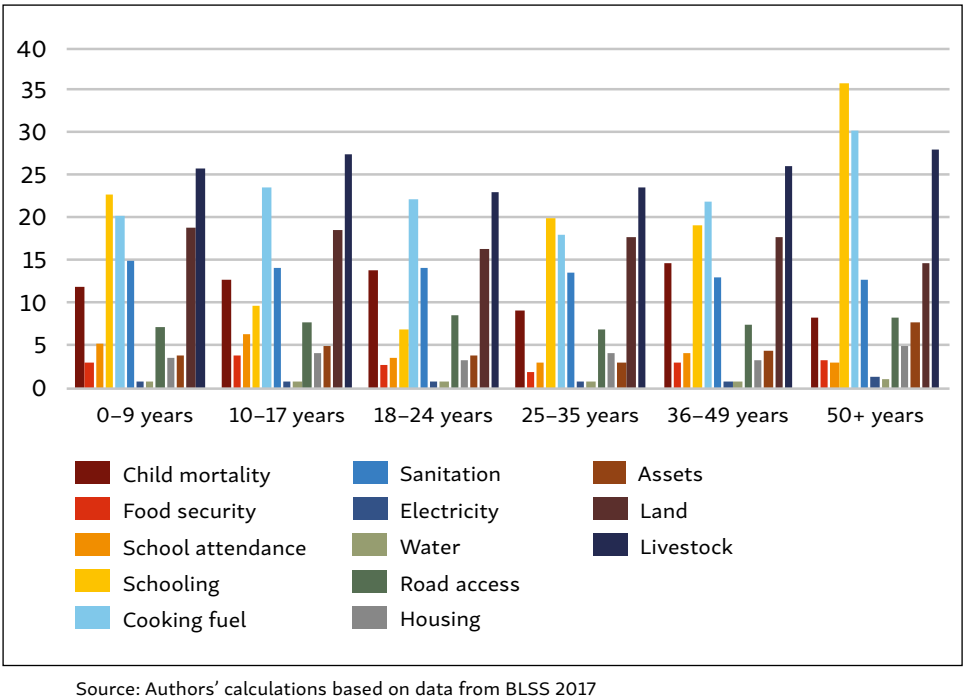
In the era of the Sustainable Development Goals, in which SDG Target 1.2 calls on all countries to reduce by at least half the proportion of men, women, and children who are multidimensionally poor by national definitions, Bhutan's accomplishment of reducing MPI and the multidimensional poverty rate by far more than half between 2007 and 2017 is especially significant. It shows that the SDG target is feasible to meet and indeed exceed within a 10-year period, whereas the 2030 agenda allows 15 years. And it shows that the MPI can be a clear tool for monitoring change and providing evidence-responsive policy adjustments that accelerate progress.

V. MPI among Children and other Age Groups

This chapter disaggregates the MPI by age cohorts. For that purpose, we compare multidimensional poverty levels across six groups: 0–9 years, 10–17 years, 18–24 years, 25–35 years, 36–49 years, and 50+ years. At the same time, we analyse rural and urban differences across these subgroups.

First, we analyse the uncensored headcount ratios by age group. As can be seen in Figure 5.1 each age cohort faces different types of deprivations. The highest deprivations for adults older than 50 are found in the years of schooling indicator (with 35.8% of the adults older than 50

FIGURE 5.1 Uncensored Headcount Ratios by Age Group, 2017



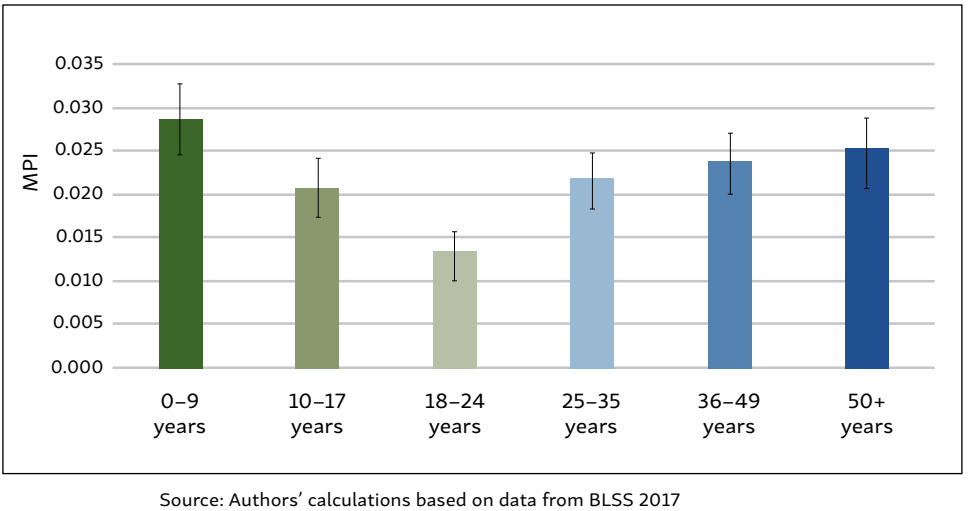
Source: Authors' calculations based on data from BLSS 2017

lacking sufficient years of schooling). For the other five age groups, livestock, cooking fuel, and land ownership are the indicators having higher uncensored headcount ratios.

As presented in chapter 3, when decompositions by age groups are considered, children below the age of nine years represent the poorest age group, with an MPI of 0.0283 in 2017. There is a decreasing trend in the MPI as age increases until age 25, as can be seen in Figure 5.2. After this point, there is an increase in MPI, with the oldest age group (individuals aged 50 and above) showing the second highest level of MPI (0.0248).

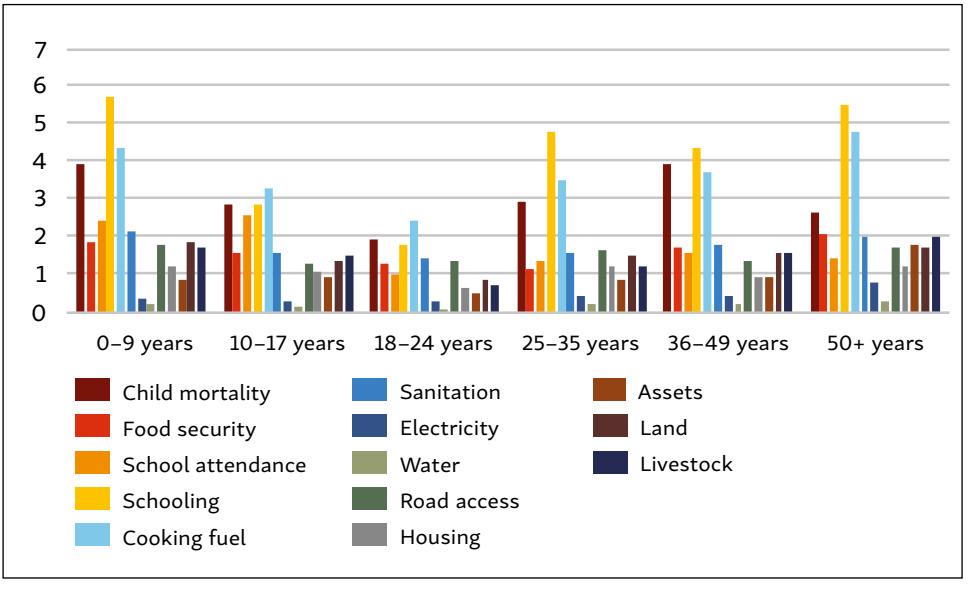
In the same context, the incidence of multidimensional poverty is higher for children under nine (7.2%), followed by adults 50 years or older (6.5%) and individuals aged 36 to 49 years (6.1%). The age group with the lowest percentage of people living in multidimensional poverty is 18 to 24 year olds (3.4%). There are no important differences in the intensity of multidimensional poverty between age groups; indeed, the six groups face an intensity of poverty of just over 39%.

FIGURE 5.2 Multidimensional Poverty by Age Group, 2017



Source: Authors' calculations based on data from BLSS 2017

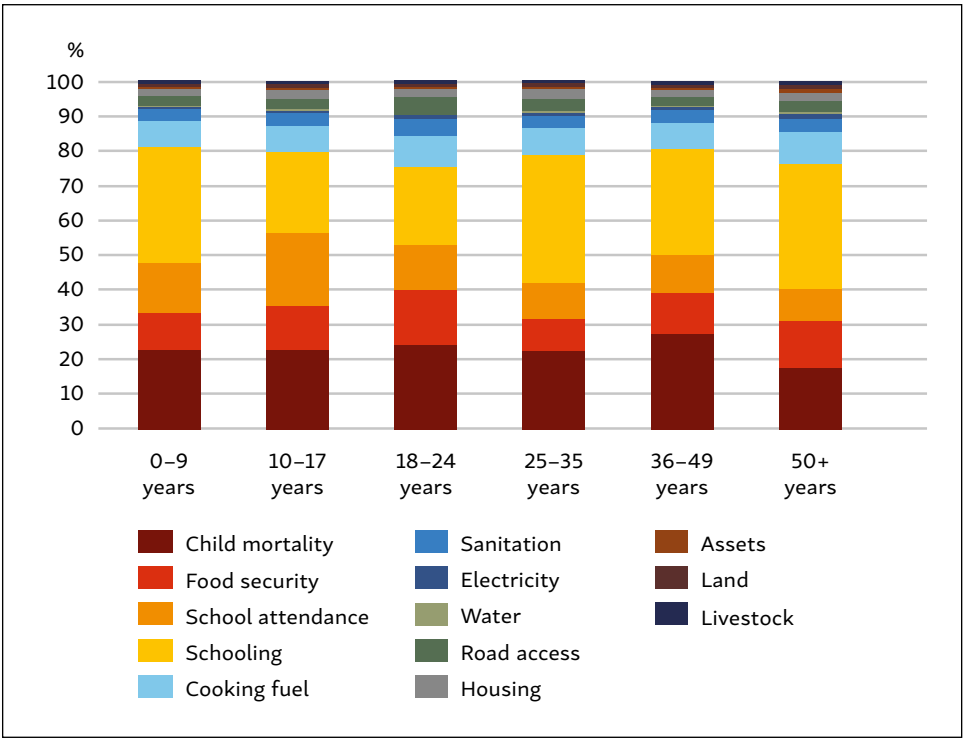
FIGURE 5.3 Censored Headcount Ratios by Age Group, 2017



Source: Authors' calculations based on data from BLSS 2017

Figure 5.3 presents the censored headcount ratios by age group. As can be seen in the figure, for children under nine and adults older than 25, schooling is the indicator with the highest censored headcount ratio (5.6% for children under nine, 4.7% for adults aged 25–35, 4.2% for adults aged 36–49, and 5.4% for adults aged 50 and above). For adults aged 36 to 49 years, child mortality has the second highest censored headcount ratio, with 3.9% of individuals deprived in this indicator and multidimensionally poor. For the other five groups, cooking fuel is the indicator with the second highest censored headcount.

FIGURE 5.4 Percentage Contributions of Each Indicator to Age Group MPI, 2017



Source: Authors' calculations based on data from BLSS 2017

Figure 5.4 illustrates the percentage contribution of each indicator to multidimensional poverty by each age group. At first glance, it is clear that the composition of multidimensional poverty is fairly similar across groups. For instance, the education dimension contributes more than 40% to overall poverty in most age groups, with the exception of the group 18–24 years, where the contribution is 35%. The health dimension contributes 30% to overall poverty in all groups. It is notable that years of schooling is the indicator with the highest contribution to the MPI for each age group.

TABLE 5.1 Censored Headcount Ratios by Age Group and Urban and Rural/ Urban Areas, 2017

	Population share	MPI	Confidence interval (95%)		H	Confidence interval (95%)		A	Confidence interval (95%)	
Rural										
0–9 years	16.5	0.041	0.035	0.048	10.3	8.8	11.7	40.3	39.2	41.41
10–17 years	15.6	0.029	0.024	0.034	7.2	6.0	8.5	40.2	38.8	41.62
18–24 years	10.7	0.019	0.015	0.024	4.9	3.8	6.1	39.3	37.7	40.99
25–35 years	16.2	0.036	0.030	0.041	9.0	7.5	10.4	39.6	38.6	40.55
36–49 years	16.8	0.034	0.028	0.039	8.5	7.2	9.8	39.6	38.8	40.47
50+ years	24.3	0.030	0.026	0.035	7.8	6.6	8.9	39.1	38.3	39.99
Urban										
0–9 years	19.3	0.007	0.005	0.009	2.0	1.3	2.6	34.8	34.0	35.6
10–17 years	15.2	0.004	0.002	0.005	1.0	0.6	1.5	34.4	33.5	35.3
18–24 years	12.8	0.003	0.001	0.005	0.8	0.3	1.3	36.9	34.8	38.9
25–35 years	24.5	0.004	0.002	0.005	1.0	0.6	1.4	35.6	34.4	36.7
36–49 years	17.1	0.005	0.003	0.006	1.3	0.8	1.8	34.7	33.7	35.6
50+ years	11.1	0.003	0.002	0.005	0.9	0.4	1.3	36.3	34.0	38.6

Source: Authors' calculations based on data from BLSS 2017

Finally, we analyse the levels of multidimensional poverty for each age group living in urban and rural areas. As is presented in Table 5.1, there are significant differences between the incidence and intensity of multidimensional poverty of people from different age groups living in rural and urban areas. In the case of urban areas, the percentage of the population older than 50 years who are multidimensionally poor is less than 1%. By contrast, people in this age group living in rural areas have an incidence of multidimensional poverty higher than 7.8%. In both areas (rural and urban), children younger than nine are the poorest, with higher levels of MPI, however this difference is not statistically significant.

SSherpa_Kuengarabten | UNICEF Bhutan

VI. Conclusion and Recommendations

This report has presented the 2017 Multidimensional Poverty Index for Bhutan and also described the composition of poverty and how it has changed from 2007 to 2017 and from 2012 to 2017.

Overall, Bhutan saw a very strong reduction in multidimensional poverty. In 2012, over 12% of Bhutanese were multidimensionally poor; in 2017, that had decreased to 5.8%. Furthermore, the reduction was pro-poor, with the poorer *Dzongkhags* reducing poverty faster in most cases. Similarly, from 2007–2017, the reduction in MPI, as assessed using a more limited variable set, was also extraordinarily fast.

For those countries who are trying to meet the Sustainable Development Goal target of halving MPI by national definitions between 2015 and 2030, Bhutan's example will be encouraging. By reducing MPI by much more than half from 2007 to 2017, Bhutan has shown that rapid change is possible. Furthermore, this progress occurred during the 10th and 11th plans, which prioritised poverty reduction. So our first recommendation is for research to document how this rapid change happened. How did the plans, the MPI; the REAP programme; Dzongkhag expenditure patterns; remittances; NGO, philanthropic, and private sector interventions; and other activities work together to create this success? This research might empower other countries to better plan how, in their own plans and policies, to end poverty in all its dimensions.

Normally, the last mile of poverty reduction is the most difficult. Getting to zero poverty means bringing services to geographically remote pockets of poverty, as in Gasa. It means addressing the special needs of vulnerable groups – such as children – and marginal groups. It means continuing the spread of services such as sanitation, roads, and

schooling. And it also means addressing new challenges such as rural-urban migration, which is particularly visible in the 2017 analysis.

The good news is that the analysis in this report suggests that further rapid progress is still feasible. The primary reason is that among the multidimensionally poor people in Bhutan, 58% of them are deprived in less than 5/13 of the weighted indicators, and 89% are deprived in less than 6/13 of the weighted indicators (Figure 3.1). So the changes required to bring 89% of MPI poor Bhutanese out of acute poverty are not too demanding. Care will still need to be invested in the small number of high-intensity poor (Table 3.4) to ensure they are not left behind.

To accelerate the reduction of MPI in the next period, the MPI should continue to be used as one input into resource allocation formulae, and monetary and multidimensional poverty measures should be analysed together to frame public policy. Furthermore, the most detailed information on the MPI that is available should be provided to *Dzongkhag* officials, perhaps in local languages, to inform policies in the next period.

Naturally, Gasa stands out as probably the poorest Dzongkhag, and one in which particular investments are merited. Furthermore, *Dzongkhag*-specific profiles vary in terms of the composition of poverty (Figure 3.7), and so poverty reduction strategies will vary by *Dzongkhag*. However as Figure 3.4 showed, Samtse, Chhukha, Trashi Yangtse, and Thimphu are home to the largest number of poor people, and together house 44% of poor persons in Bhutan. So, similarly, consideration must be given to interventions that will address the largest number of lives.

In terms of age cohorts, children aged 0–9 are the poorest age cohort in Bhutan. Special care must be taken to accelerate the reduction in children's deprivations.

Given the low current level of MPI, and the high level of political commitment, it is advisable to use the MPI to target poor households in order to eradicate acute multidimensional poverty in Bhutan.

Finally, given the salutary progress, there is also a need to design a 'moderate' MPI whose indicators reflect the higher aspirations that are now possible to consider in Bhutan. Such a moderate MPI would, in the future, enable policy makers to address deprivations in a new set of indicators that are coming to be considered as vital to human flourishing in Bhutan. It would also improve existing indicators – for example by including child mortality within the last

five years – to ensure that all indicators are equally policy responsive.

Bhutan has made tremendous progress, in accord with its national development plan, in cutting the deprivations that many suffered only a decade ago. This change shows what is possible – even in a difficult geographical environment and during a democratic transition. Bhutan's record surely will provide encouragement to other countries struggling to address the interlinked poverty-related targets of the SDGs effectively. And it is hoped that the MPI and the detailed information it provides can shape and energies policies and public actions that will, with continued effort, effectively eradicate acute multidimensional poverty in Bhutan.

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Appendix – The Multidimensional Poverty Index: Methodology and Properties

A1.1 THE MPI METHODOLOGY

Suppose at a particular point in time, there are n people in Nepal and their wellbeing is evaluated by d indicators.[6] We denote the achievement of person i in indicator j by $x_{ij} \in \mathbb{R}$ for all $i = 1,\ldots,n$ and $j = 1,\ldots,d$. The achievements of n persons in d indicators are summarized by an $n \times d$ dimensional matrix $\boldsymbol{X}$, where rows denote persons and columns denote indicators. Each indicator is assigned a weight based on the value of a deprivation relative to other deprivations. The relative weight attached to each indicator j is the same across all persons and is denoted by w_j , such that $w_j > 0$ and $\sum_{j=1}^{d} w_j = 1$.

In a single-dimensional analysis, people are identified as poor as long as they fail to meet a threshold called the 'poverty line' and non-poor, otherwise. In a multidimensional analysis based on a counting approach – as with the adjusted headcount ratio – a person is identified as poor or non-poor in two steps. In the first step, a person is identified as deprived or not in each indicator subject to a deprivation cutoff. We denote the *deprivation cutoff*

6 The meaning of the terms 'dimension' and 'indicator' are slightly different in Alkire and Foster (2014) and in Alkire and Santos (2010). In Alkire and Foster (2014), no distinction is made between these two terms. In Alkire and Santos (2010), however, the term 'dimension' refers to a pillar of wellbeing and a dimension may consist of several indicators.

for indicator j by z_j, and the deprivation cutoffs are summarized by vector $\boldsymbol{z}$. Any person i is deprived in any indicator j if $x_{ij} < z_j$ and non-deprived, otherwise. We assign a *deprivation status score* g_{ij} to each person in each dimension based on the deprivation status. If person i is deprived in indicator j, then $g_{ij}=1$; and $g_{ij}=0$, otherwise. The second step uses the weighted deprivation status scores of each person in all d indicators to identify the person as poor or not. An overall *deprivation score* $c_i \in [0,1]$ is computed for each person by summing the deprivation status scores of all d indicators, each multiplied by their corresponding weights, such that $c_i = \sum_{j=1}^{d} w_j g_{ij}$. A person is identified as poor if $c_i \geq k$, where $k \in (0,1]$, and non-poor, otherwise.[7] The deprivation scores of all n persons are summarized by vector $\boldsymbol{c}$.

After identifying the set of poor and their deprivation scores, we obtain the adjusted headcount ratio (M_0). Many countries refer to this as the MPI or Multidimensional Poverty Index.

The focus axiom requires that while measuring poverty the focus should remain only on those identified as poor.[8] This entitles us to obtain the censored deprivation score vector $c(k)$ from $\boldsymbol{c}$, such that $c_i(k)=c_i$ if $c_i \geq k$ and $c_i(k)=0$, otherwise. The M_0 is equal to the average of the censored deprivation scores:

$$M_0 = \text{MPI} = \frac{1}{n}\sum_{i=1}^{n} c_i(k).$$

A1.2 PROPERTIES OF THE MPI

We now outline some of the features of M_0 that are useful for policy analysis. The first is that M_0 can be expressed as a product of two components: the share of the population who are multidimensionally poor, or multi-dimensional headcount ratio (H), and the average of the deprivation scores among the poor only, or intensity (A). Technically,

$$M_0 = \text{MPI} = \frac{q}{n} \times \frac{1}{q}\sum_{i=1}^{n} c_i(k) = \text{H} \times \text{A};$$

7 For $k = 100\%$, the identification approach is referred to as the *intersection approach*; for $0 < k \leq \min\{w_1,\ldots,w_d\}$, it is referred to as the *union approach* (Atkinson, 2003). Alkire and Foster's dual-cutoff approach requires $0<k\leq 1$ thus it includes union, intersection, and also *intermediate* cutoffs.

8 In the multidimensional context, there are two types of focus axioms. One is a deprivation focus, which requires that any increase in already non-deprived achievements should not affect a poverty measure. The other is a poverty focus, which requires that any increase in the achievements of non-poor persons should not affect a poverty measure. See Bourguignon and Chakravarty (2003) and Alkire and Foster (2014).

where q is the number of poor.[9] This feature has an interesting policy implication for inter-temporal analysis. A certain reduction in M_0 may occur either by reducing H or by reducing A. This difference cannot be understood by merely looking at M_0. If a reduction in M_0 occurs merely as the result of a reduction in the number of people who are marginally poor, then H decreases but A may not. On the other hand, if a reduction in M_0 is the result of a reduction in the deprivation of the poorest of the poor, then A decreases but H may not.[10]

The second feature of M_0 is that if the entire population is divided into m mutually exclusive and collectively exhaustive groups, then the overall M_0 can be expressed as a weighted average of the M_0 values of m sub-groups, where the weights are the respective population shares. We denote the achievement matrix, the population, and the adjusted headcount ratio of sub-group ℓ by X^{ℓ}, n^{ℓ}, and $M_0(X^{\ell})$, respectively. Then the overall M_0 can be expressed as

$$M_0 = \text{MPI} = \sum_{\ell=1}^{m} \frac{n^{\ell}}{n} M_0(X^{\ell}).$$

This feature is also known as *sub-group decomposability* and is useful for understanding the contribution of different sub-groups to overall poverty levels.[11] Note that the contribution of a sub-group to overall poverty depends both on the poverty level of that sub-group and that sub-group's population share.

The third feature of M_0 is that it can be expressed as an average of the censored headcount ratios of indicators weighted by their relative weight. The censored headcount ratio of an indicator is the proportion of the population that is multidimensionally poor and is simultaneously deprived in that indicator.

9 This feature is analogous to that of the poverty gap ratio, which is similarly expressed as a product of the headcount ratio and the average income gap ratio among the poor.

10 Apablaza and Yalonetzky (2014) have shown that the change in M*0* can be expressed as $\Delta M_0 = \Delta H + \Delta A + \Delta H \times \Delta A$, where Δx is referred to as change in $\boldsymbol{x}$.

11 See Foster, Greer and Thorbecke (1984) for a discussion of this property.

Let us denote the censored headcount ratio of indicator j by h_j. Then M_0 can be expressed as

$$A = \frac{MPI}{H} = \sum_{j=1}^{d} w_j \frac{h_j}{H} = \sum_{j=1}^{d} w_j h_j^p.$$

Breaking down poverty in this way allows an analysis of multidimensional poverty to depict clearly how different indicators contribute to poverty and how their contributions change over time. Let us denote the contribution of indicator j to M_0 by Φ_j. Then, the contribution of indicator j to M_0 is

$$\Phi_j = w_j \frac{h_j}{MPI} = w_j \frac{h_j^p}{A}.$$

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TABLE IX Redundancy Test of Uncensored Headcount Ratios

	Child mortality	Food security	School attendance	Schooling	Cooking fuel	Sanitation	Electricity	Water	Road access	Housing	Assets	Land	Livestock
Child mortality	1.00												
Food security	0.19	1.00											
School attendance	0.14	0.08	1.00										
Schooling	0.18	0.30	0.24	1.00									
Cooking fuel	0.33	0.63	0.38	0.41	1.00								
Sanitation	0.16	0.28	0.18	0.27	0.26	1.00							
Electricity	0.10	0.10	0.08	0.52	0.99	0.29	1.00						
Water	0.14	0.08	0.12	0.35	0.50	0.32	0.05	1.00					
Road Access	0.15	0.12	0.19	0.31	0.60	0.14	0.47	0.24	1.00				
Housing	0.12	0.15	0.06	0.43	0.69	0.19	0.22	0.07	0.19	1.00			
Assets	0.13	0.22	0.10	0.46	0.76	0.20	0.60	0.13	0.20	0.17	1.00		
Land	0.19	0.28	0.24	0.23	0.26	0.22	0.36	0.16	0.22	0.21	0.27	1.00	
Livestock	0.24	0.27	0.24	0.30	0.24	0.26	0.25	0.28	0.17	0.18	0.35	0.62	1.0
Uncensored headcount ratio	0.11	0.03	0.04	0.20	0.23	0.14	0.01	0.01	0.08	0.04	0.05	0.17	0.26

Source: Authors' calculations based on data from BLSS 2017

TABLE X Redundancy Test of Censored Headcount Ratios

	Child mortality	Food security	School attendance	Schooling	Cooking fuel	Sanitation	Electricity	Water	Road Access	Housing	Assets	Land	Livestock
Child mortality	1.00												
Food security	0.34	1.00											
School attendance	0.32	0.15	1.00										
Schooling	0.68	0.54	0.56	1.00									
Cooking fuel	0.54	0.72	0.59	0.74	1.00								
Sanitation	0.42	0.32	0.28	0.72	0.74	1.00							
Electricity	0.14	0.18	0.13	0.83	1.00	0.38	1.00						
Water	0.33	0.24	0.42	0.66	0.88	0.56	0.21	1.00					
Road Access	0.34	0.17	0.31	0.74	0.92	0.38	0.55	0.59	1.00				
Housing	0.27	0.29	0.19	0.81	0.94	0.30	0.31	0.11	0.39	1.00			
Assets	0.31	0.42	0.27	0.73	0.92	0.37	0.69	0.44	0.34	0.29	1.00		
Land	0.48	0.27	0.25	0.74	0.71	0.43	0.45	0.51	0.32	0.22	0.42	1.00	
Livestock	0.53	0.33	0.30	0.76	0.57	0.37	0.21	0.29	0.13	0.16	0.39	0.48	1.00
Censored headcount ratio	0.03	0.02	0.02	0.04	0.04	0.02	0.00	0.00	0.02	0.01	0.01	0.02	0.26

Source: Authors' calculations based on data from BLSS 2017

Notes

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