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Statistical Note: Disaggregating Bhutan's MPI 2017 by Disability Status

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Abstract

Since 2010, Bhutan has used a Multidimensional Poverty Index (MPI) alongside consumption poverty to measure and fight poverty in all its forms and dimensions. Bhutan's National MPI was updated on 2012 and 2017 using the Bhutan Living Standards Survey (BLSS). In 2017, the BLSS questionnaire included questions on disability status. This statistical note shows different ways by which the MPI can be disaggregated using the available information. Each way is implemented, and the results analysed. Thus, by presenting worked out empirical examples, we hope to contribute to the evolving methodological discussions of how best to disaggregate poverty measures including the MPI by disability status. In addition, we hope to contribute to robust and detailed understanding in Bhutan of the relationship between poverty and disability status, hence to inform policies that seek to address both. However, survey data are limited, and so, very importantly, we also advise re-running these results with the 2017 census data for a more precise picture. It is hoped this note will provide some structure for a census-based analysis.

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1. Methodology

1.1 Construction of the MPI

The methodology for constructing the Bhutan MPI can be found in the Report by the National Statistics Bureau of the Royal Government of Bhutan & Oxford Poverty and Human Development Initiative (OPHI) (2017). Key steps and terms are summarized below.

Define indicators and weights: Choose a set of j indicators that comprise poverty and for which we have data on i people's achievements, where each person's achievement in that indicator is denoted x_{ij} . Each indicator is assigned a weight based on the value of a deprivation relative to other deprivations, which is denoted w_j , such that $w_j > 0$ and $\sum_{j=1}^d w_j = 1$.

Apply Deprivation Cut-offs: Who is deprived in each indicator? Next, each person is identified as deprived or not in each indicator using the *deprivation cut-off* for each indicator which is denoted z_j . A person is deprived in an indicator if $x_{ij} < z_j$ for that indicator. We assign a *deprivation status score* g_{ij} to each person in each indicator based on the deprivation status. If person i is deprived in indicator j , then $g_{ij} = 1$; and $g_{ij} = 0$, otherwise.

Create each Person's Deprivation Score: We summarise the deprivation status scores of all indicators for person i , each multiplied by their corresponding weights into a deprivation score denoted c_i where $c_i = \sum_{j=1}^d w_j g_{ij}$.

Apply Poverty Cut-off to identify who is poor: To identify who is poor, we apply a poverty cut-off (k). A person is identified as poor if $c_i \geq k$, where $k \in (0, 1]$, and non-poor, otherwise.

Compute the Headcount Ratio or Poverty Rate: The headcount ratio or percentage of people who are poor is simply q/n where q is the number of people identified as poor, and n is the total population.

Compute Intensity: To explore the breadth of poverty – how bad it is – we restrict our attention to poor people. Intensity assesses how poor they are – what their average deprivation score is. Intensity is computed as:

$$A = \frac{1}{q} \sum_{i=1}^n c_i(k)$$

Note that $c_i(k)$ denotes the censored deprivation score. In this case, if a person is not poor, their deprivation score is censored to become zero; if they are poor it remains the same value as c_i .

Compute MPI: The *MPI* or M_0 is equal to the average of the censored deprivation scores:

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

Alternative formulae for MPI: The *MPI* can equivalently be expressed as a product of the incidence and the intensity of poverty, or the multidimensional headcount ratio (H), and the average of the deprivation scores among the poor, or intensity (A):

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

We now turn to explore the composition of poverty by indicator.

Uncensored headcount ratio: First, we look at deprivations in each indicator across the population, simply by summarizing the deprivation status scores and dividing by n .

$$\text{uncensored headcount ratio} = \sum_{i=1}^n g_{ij} / n$$

Censored headcount ratio: The censored headcount ratio of indicator j , denoted h_j , is the proportion of the population that is multidimensionally poor and is simultaneously deprived in that indicator (deprivations of non-poor persons are ‘censored’ or replaced by zero. So as above we focus on deprivations of the poor and censor the others, so, $g_{ij}(k) = g_{ij}$ if $c_i \geq k$ and $g_{ij}(k) = 0$, otherwise.

$$\text{censored headcount ratio} = h_j = \left[\frac{1}{n} \sum_{i=1}^n g_{ij}(k) \right],$$

The uncensored and censored headcount ratios do not include weights. But the *MPI* is the weighted sum of the censored headcount ratios. So, it is useful to break the *MPI* down and study the weighted contribution of each indicator to poverty. This requires multiplying the censored headcount ratio by its respective weight. To obtain percentage contributions (which add up to 100% instead of to the value of *MPI*), divide the product of the censored headcount ratio and its weight by the value of *MPI*.

Percentage contribution: Let us denote the contribution of indicator j to *MPI* by ϕ_j . Then, the percentage contribution of indicator j to *MPI* is

$$\text{percentage contribution} = \phi_j = w_j \frac{h_j}{\text{MPI}}$$

1.2 Data

The Bhutan Living Standards Survey 2017 aims to collect information on socio-economic indicators in order to update the poverty profile of the country, to assess the effectiveness of the 11th Five-year Plan and to inform the next socioeconomic development plan. The 2017 BLSS covers all twenty Dzongkhags with a total sample of 11,660 households with 48,639 persons and a response rate of 98.7% (National Statistics Bureau of Bhutan, 2017).

Six questions on disability are included in the BLSS 2017. These questions follow the suggestions made by the Washington Group on Disability Statistics (WG) (Washington Group on Disability Statistics (WG), 2013) and ask about six domains (seeing, hearing, walking, remembering, self-care, and communication) and include a four points severity scale, allowing the person to identify from mild to severe difficulties (Table 1). The six questions were asked of all household members of all ages.

Table 1. Questions on Disability included in BLSS 2017

<p>Do you have difficulty seeing, even if wearing glasses?</p> <ol style="list-style-type: none"> 1. No – no difficulty 2. Yes – some difficulty 3. Yes – a lot of difficulty 4. Cannot do at all
<p>Do you have difficulty hearing, even if hearing aid?</p> <ol style="list-style-type: none"> 1. No – no difficulty 2. Yes – some difficulty 3. Yes – a lot of difficulty 4. Cannot do at all
<p>Do you have difficulty walking or climbing steps?</p> <ol style="list-style-type: none"> 1. No – no difficulty 2. Yes – some difficulty 3. Yes – a lot of difficulty 4. Cannot do at all
<p>Do you have difficulty remembering or concentrating?</p> <ol style="list-style-type: none"> 1. No – no difficulty 2. Yes – some difficulty 3. Yes – a lot of difficulty 4. Cannot do at all
<p>Do you have difficulty (with self-care such as) washing all over or dressing?</p> <ol style="list-style-type: none"> 1. No – no difficulty 2. Yes – some difficulty 3. Yes – a lot of difficulty 4. Cannot do at all

Using your usual (customary) language, do you have difficulty communicating, for example understanding or being understood?

1. No – no difficulty
2. Yes – some difficulty
3. Yes – a lot of difficulty
4. Cannot do at all

Source: BLSS 2017

1.3 Four Alternative Analyses of Disability

Four different analysis were conducted using different definitions of disability, to analyse the levels of multidimensional poverty of people with disabilities and their families. The four definitional approaches are:

1. **Individual analysis following the Washington group (WG) recommendations** to create the variable of disability (Washington Group on Disability Statistics (WG), 2017). In this analysis, if an individual reported that they lived with “a lot of difficulty” or “cannot do it at all” for at least one domain, the person was classified as “living with a disability”.
2. **Detailed Individual analysis by type and severity:** This analysis explored information from the four response categories (no difficulty, some difficulty, a lot of difficulty, or cannot do it all), and from the six domains (seeing, hearing, walking, remembering, self-care and communication). The disaggregation was done by type of impairment, and by severity of the impairment. Given the low prevalence of each difficulty in the sample, the total number of individuals reporting each of the categories is small, and the power of the sample is not enough to conduct inference analysis.
3. **Number of difficulties for person:** This analysis explored if the levels of multidimensional poverty increased depending on the number of difficulties. Given the small number of persons reporting to live with more than three difficulties, the disaggregation included four categories: no difficulty, 1 difficulty, 2 difficulties and 3 or more difficulties. Statistical inference was not possible, given the small sample size.
4. **Household level analysis by type and severity:** Because disabilities affect not only the individual, but also other household members and their role inside the household, a fourth analysis was conducted of households in which at least one-member experiences disabilities, using the same definition of disability as in point 1. In this case a person living in a household with at least one household member with a disability, was categorized as a member of a household with disabilities.

In addition, the characteristics of people with disabilities who are multidimensionally poor (using the first, WG, definition) were compared to those of people with disabilities who are not multidimensionally poor.

2. Results:

Individual analysis following the Washington group (WG) recommendations:

People with disabilities in general have significant higher levels of multidimensional poverty. The percentage of people with disabilities in Bhutan was 2.8%, which is relatively low in comparison with the international estimated of disability of 15% of the population (World Health Organization & The World Bank, 2011). The multidimensional poverty rate of this group is 11.1%, which is significantly higher than the poverty rate of people without disabilities (5.6%) in Bhutan. This clearly establishes that poverty is more prevalent among people with disabilities, although it is still encouraging that nearly 89% of people with disabilities are not MPI poor (Table 2).

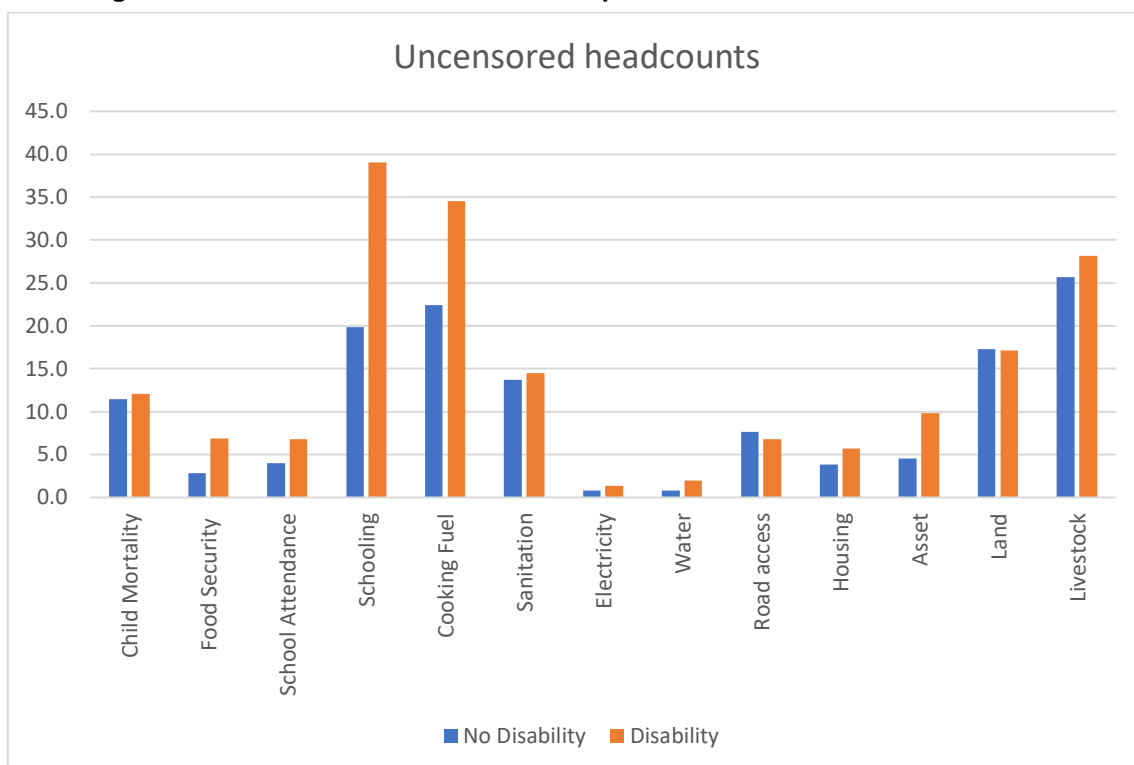
Table 2. Multidimensional Poverty for people with and without disabilities

	Disability	
	No	Yes
Share of Population	97.2	2.8
MPI	0.022	0.045
95% CI	(0.195 -0.025)	(0.034 - 0.055)
MPI rate H	5.6%	11.1%
CI	(4.98 -6.3)	(8.5- 13.6)
Intensity A	39.3%	40.3%
CI	(38.6 -40.1)	(38.4 -42.2)

Source: Authors' calculations based on data from BLSS 2017

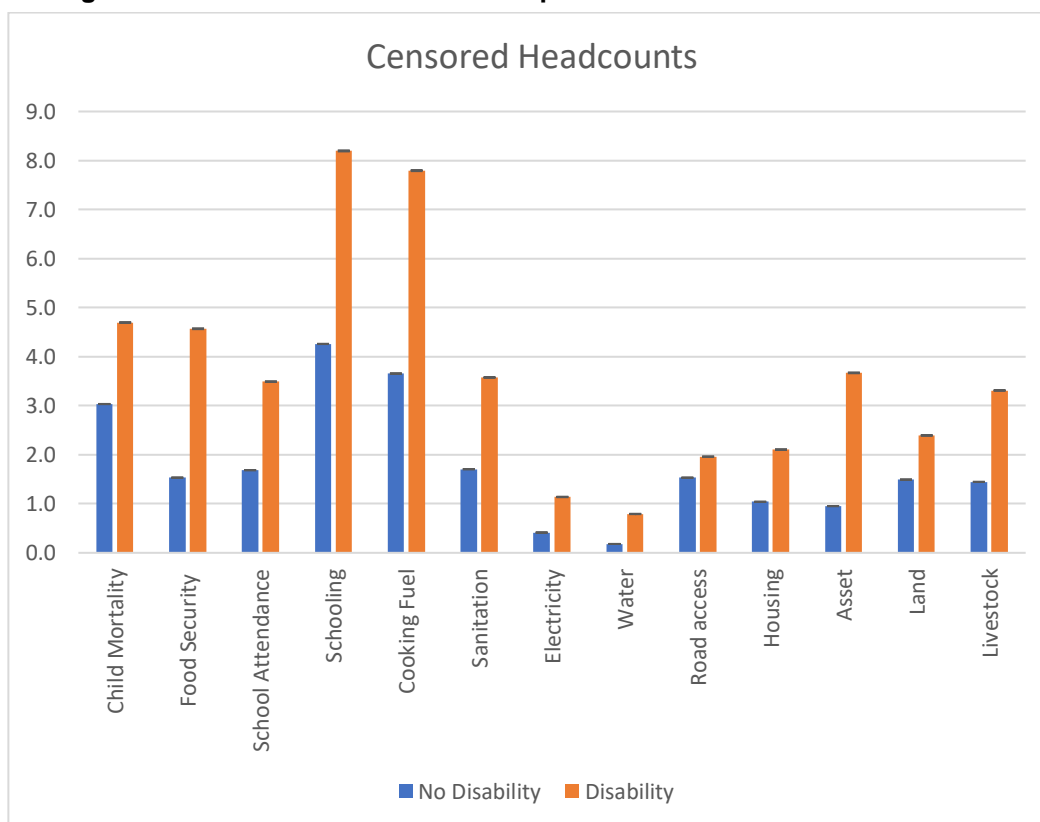
In addition, the uncensored headcount ratios are higher for people living with disabilities for all indicators except land and road access (Figure 1), and the censored headcount ratios are higher for all indicators (Figure 2). The differences are statistically significant in the indicators of child mortality, food security, school attendance, years of education, cooking fuel, sanitation, asset ownership and livestock. In the case of indicators related to education, the levels of deprivation are almost double for people with disabilities compared to people without disabilities.

Figure 1. Uncensored Headcount Ratios persons with and without disabilities



Source: Authors' calculations based on data from BLSS 2017

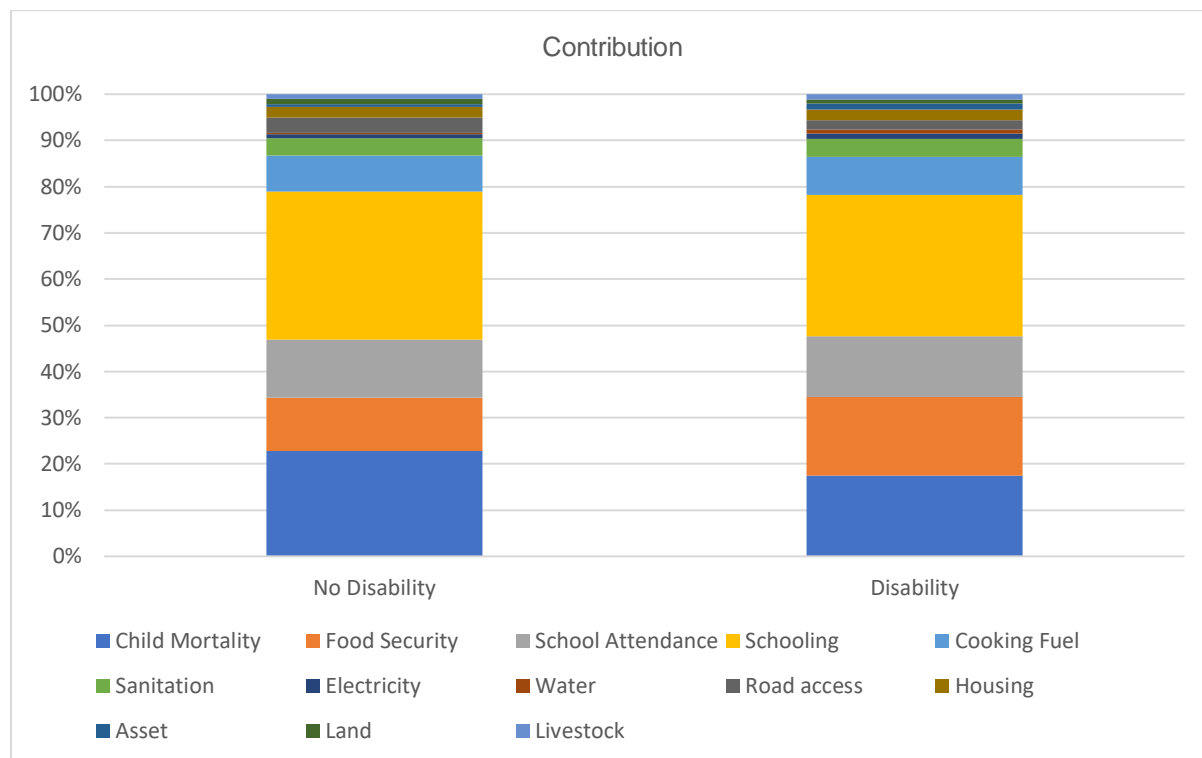
Figure 2. Censored Headcount Ratios persons with and without disabilities



Source: Authors' calculations based on data from BLSS 2017

Interestingly, the percentage contribution of each of the indicators to the MPI of people with and without disabilities followed a similar pattern, showing that poverty does not differ greatly in its composition. However, in the case of people with disabilities food security had a contribution equal to 17% compared with 12% for individuals without disability and the contribution of child mortality was lower compared to the contribution of the same indicator for people without disabilities (23% vs. 18%) (Figure 3).

Figure 3. Percentage contribution of each indicator to the MPI for people with and without disabilities



Source: Authors' calculations based on data from BLSS 2017

2.1 Characteristics of Persons with Disabilities¹

The average age of people with disabilities is 53.1 years, what is significantly different than the age of people who do not report living with disabilities (29.8 years). Disability is more prevalent in male than women (51.3% vs. 48.7%) but this result is not significant. On average, persons with severe disabilities have less than one year of education, compared to an average of 5 years of education for people without disabilities, this difference is significant at 5%. In addition, they are more likely to be the father of the head of the household or sister or brother compared to people without disabilities (16.6% vs. 2.5% and 5.9% vs. 2.6% respectively).

¹ Using the definition of disability suggested by the WG

They are significantly more likely to live in rural areas, compared to people without disabilities (15.5% vs. 34.05). 11.4% of people with disabilities live in Wangdue, 8.6% in Lhuentse and 8.0% in Thimphu. Finally, people with disabilities have significantly higher level of income poverty compared to people without disabilities (13.1% vs. 8.1%) and they are also more likely to belong to the lowest quintile of income (33.5% vs. 25.0% significant at 5%).

People with disabilities² who are multidimensionally poor are more likely to be female (53% vs. 48%), are younger than people with disabilities who are non-multidimensionally poor (51.6 v. 53.3 years). In addition, people with disabilities who are multidimensionally poor are more likely to live in rural areas (98% vs. 83%). 13% of the population with disabilities who is multidimensionally poor lives in Samtse, 12 % in Wangdue. These percentages are higher than for people without disabilities specially in the case of Samtse (13% vs. 8.3%). In addition, multidimensionally poor individuals with disability are more likely to live in the Gasa, the poorest region of the country, compared to non-multidimensionally poor individuals with disability (39.5% vs. 60.5%). In addition, of people with disabilities who are multidimensionally poor 22.5% are head of households, 14.5% are partners and 20% are sons or daughters. There are not important differences in the relationship with the head of the households between people with disabilities who are or non-multidimensionally poor. Finally, no important differences exist in the household size of people with disabilities who are or not multidimensionally poor (3.2 on average for both groups).

2.2 Detailed Individual analysis by type and severity

When analysing the levels of deprivation and multidimensional poverty of people with different difficulties and severities, the levels of poverty of people with more severe difficulties are higher than for people with mild difficulties. The differences are not significant due to the small sample size. Nevertheless, conducting analysis of the levels of multidimensional poverty of persons with disabilities is fundamental for taking informed decisions related to social programmes involving this population group and their families. Hence these results should be re-examined using census data. Future surveys including questions on disability also might consider including disability as a characteristic in the sampling frame, to guarantee that the results are representative for this population group.

When the prevalence of each of the difficulties is computed, a person reporting to have a little difficulty, a lot of difficulty or cannot do one of the activities, is classified as living with that specific

difficulty (Table 3).² The results reveal that visual difficulties are the most prevalent (6.2%), followed by walking impairments (4.7%) and hearing impairments (4.5%). The difficulty with the lowest prevalence was difficulty to communicate with others (2.4%). Given that the survey did not ask about psychosocial or cognitive difficulties, it is not possible to analyse the prevalence of those.

Table 3. Prevalence of different types of difficulties

	% of population living with...
Visual	6.2%
Hearing	4.5%
Walking	4.7%
Remembering	3.0%
Self-care	3.1%
Communication	2.4%

Source: Authors' calculations based on data from BLSS 2017

The analysis of the levels of multidimensional poverty revealed that people living with any of the six difficulties have higher levels of multidimensional poverty. More than 13% of people with severe visual limitations, or with difficulties to remember, or to communicate are multidimensionally poor. The lowest rate of multidimensional poverty is for people living with severe self-care difficulties (10.8%).

When the four categories of severity of the difficulty are considered, people with severe difficulties (cannot do it at all or a lot of difficulty) face higher levels of multidimensional poverty in most cases, with the exception of remembering and hearing difficulties. So, we see in the cases of visual impairments, the incidence of poverty 7.1% for those with some difficulty seeing, whereas among those who report non-being able to see, 16.3% are MPI poor (Table 4). In six cases, people with severe disabilities (including a lot of difficulty and cannot do it at all) have higher levels of deprivation (see Figures 4 to 9).

It is also very useful to explore whether the shape and composition of multidimensional poverty are the same for persons with different difficulty challenges. Figures 4-9 present this information for each of the categories of disability. We indeed see that the pattern of poverty varies by disability. For example, those with difficulty concentrating have very low deprivations in school attendance compared to those with difficulty in seeing. Such analysis should be re-computed using census data and used to provide efficient support to persons with disabilities who have different poverty-related deprivations.

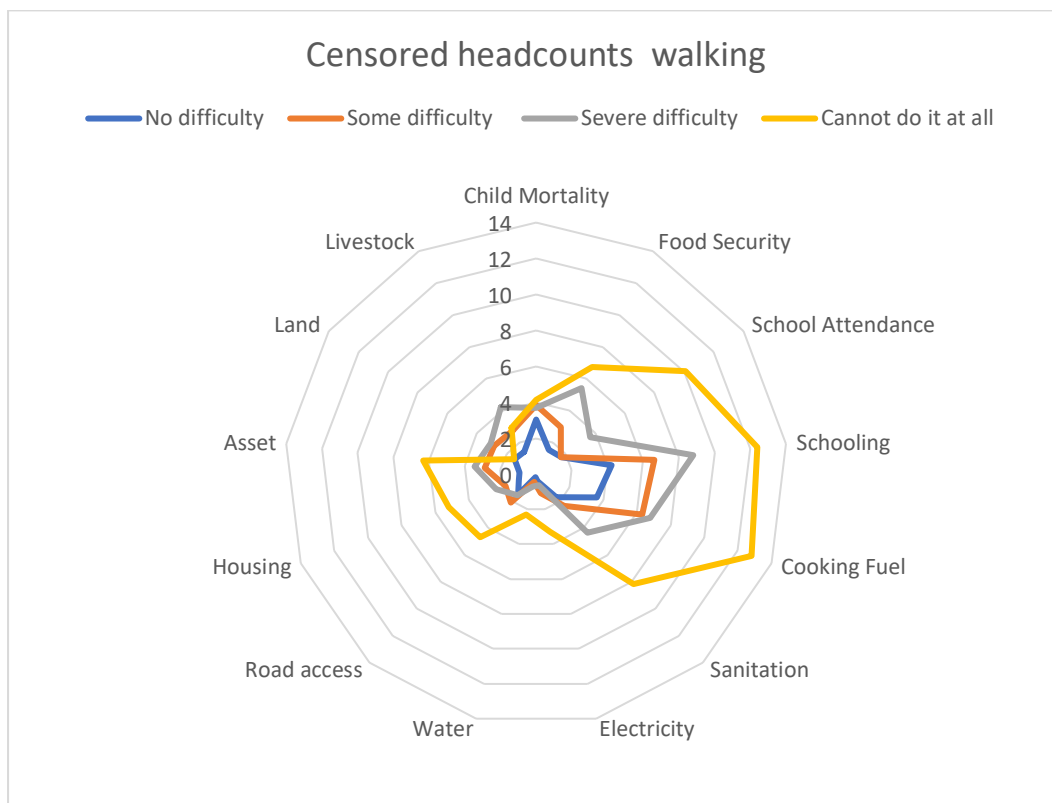
² The six domains are not exclusive, therefore people who reported to live with one difficulty can also report to live with other difficulties. Overlaps are reported in the next section.

Table 4. Multidimensional poverty of persons living with different degrees of difficulty in six domains of activity

	Share population	MPI	CI		H	CI		A	CI		
Visual	No difficulty	93.8	0.022	0.020	0.025	5.7	5.0	6.3	39.4	38.6	40.1
	Some difficulty	5.6	0.028	0.023	0.034	7.1	5.8	8.5	39.5	38.4	40.6
	A lot of difficulty	0.5	0.053	0.026	0.081	13.0	6.5	19.4	41.0	35.3	46.6
	Cannot do it at all	0.08	0.062	0.000	0.141	16.3	0.0	35.9	38.3	34.9	41.7
Hearing	No difficulty	95.5	0.022	0.019	0.025	5.6	5.0	6.3	39.4	38.6	40.1
	Some difficulty	3.5	0.033	0.026	0.041	8.6	6.7	10.4	39.1	37.7	40.5
	A lot of difficulty	0.7	0.054	0.029	0.078	12.9	7.1	18.7	41.5	38.7	44.4
	Cannot do it at all	0.3	0.042	0.014	0.070	10.6	3.7	17.6	39.4	35.2	43.6
Walking	No difficulty	95.3	0.022	0.019	0.025	5.6	5.0	6.3	39.4	38.6	40.1
	Some difficulty	3.7	0.033	0.026	0.040	8.5	6.7	10.2	39.3	38.0	40.6
	A lot of difficulty	0.76	0.045	0.028	0.063	11.4	7.1	15.8	39.8	37.0	42.6
	Cannot do it at all	0.21	0.075	0.028	0.121	17.4	7.4	27.4	42.8	36.7	49.0
Remembering	No difficulty	96.98	0.022	0.019	0.025	5.6	5.0	6.3	39.4	38.7	40.2
	Some difficulty	2.5	0.041	0.031	0.050	10.6	8.2	13.0	38.5	36.9	40.1
	A lot of difficulty	0.43	0.059	0.033	0.084	14.9	8.8	20.9	39.6	37.2	42.0
	Cannot do it at all	0.1	0.039	0.000	0.087	9.3	0.0	20.1	41.5	37.8	45.3
Self-care	No difficulty	96.9	0.022	0.020	0.025	5.6	5.0	6.3	39.4	38.6	40.1
	Some difficulty	1.94	0.040	0.028	0.053	10.2	7.3	13.2	39.5	37.9	41.0
	A lot of difficulty	0.63	0.036	0.019	0.054	9.1	4.9	13.3	39.8	36.1	43.5
	Cannot do it at all	0.55	0.051	0.027	0.075	12.8	6.8	18.8	39.8	36.1	43.4
Concentrating	No difficulty	97.6	0.022	0.020	0.025	5.7	5.0	6.4	39.4	38.6	40.1
	Some difficulty	1.8	0.034	0.023	0.045	8.4	5.8	11.1	40.1	38.3	41.9
	A lot of difficulty	0.4	0.052	0.024	0.081	13.1	6.0	20.1	40.1	37.0	43.2
	Cannot do it at all	0.25	0.056	0.016	0.096	13.4	4.3	22.5	41.9	35.2	48.6

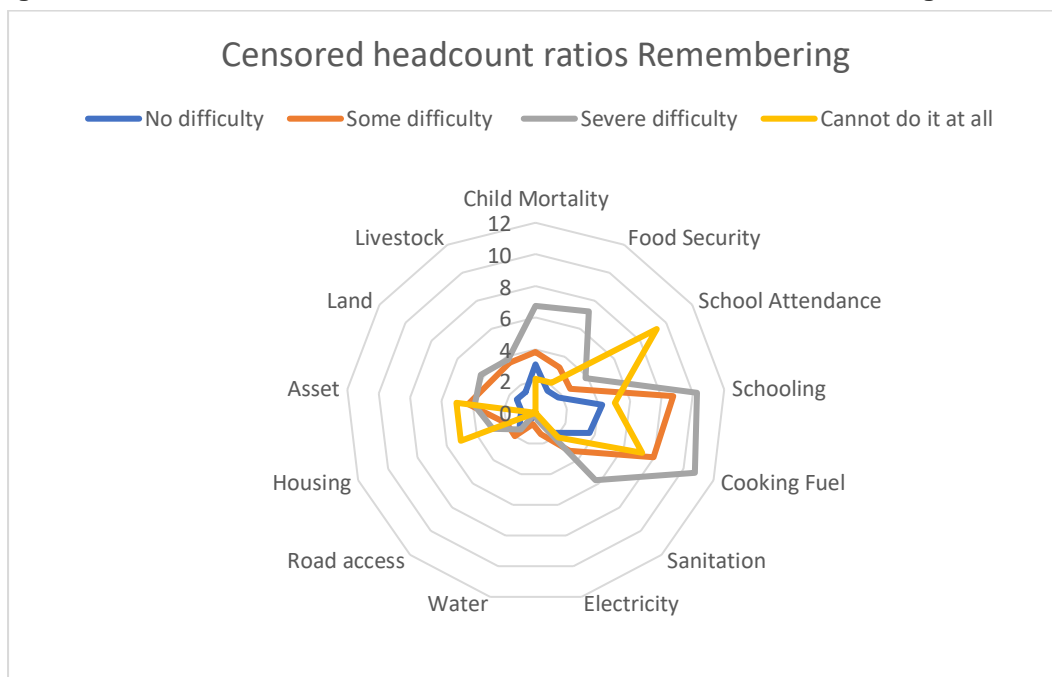
Source: Authors' calculations based on data from BLSS 2017

Figure 4. Censored headcount ratios for different severities: Walking Difficulties



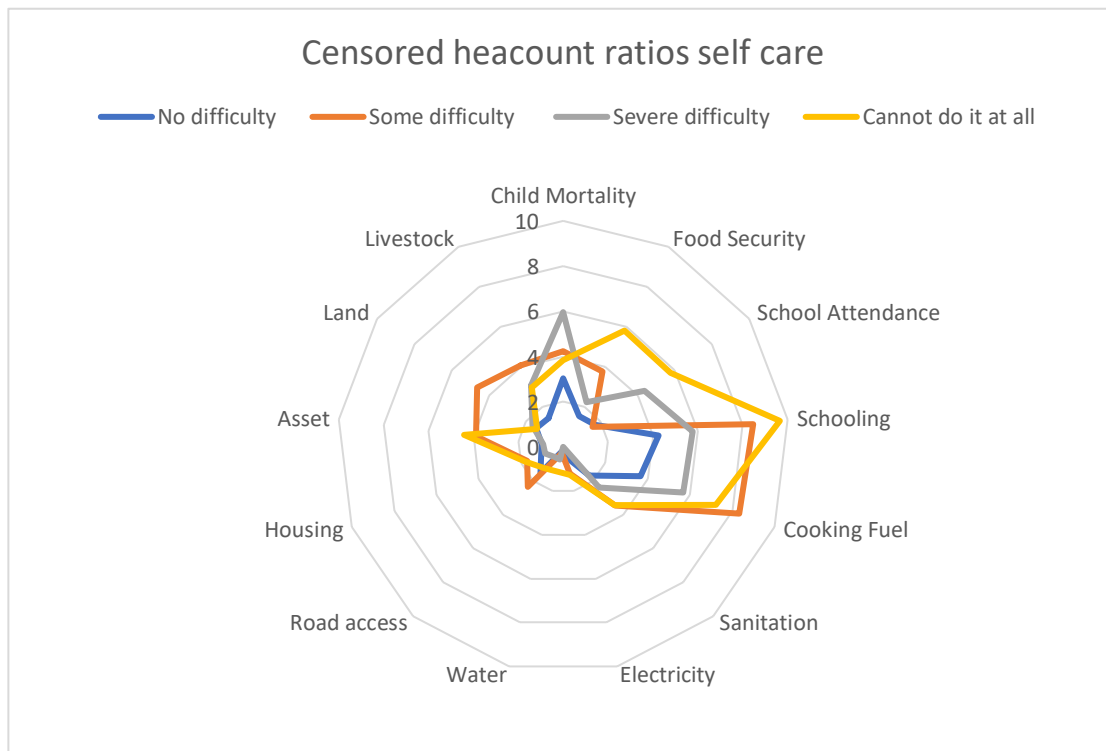
Source: Authors' calculations based on data from BLSS 2017

Figure 5. Censored headcount ratios for different severities: Remembering Difficulties



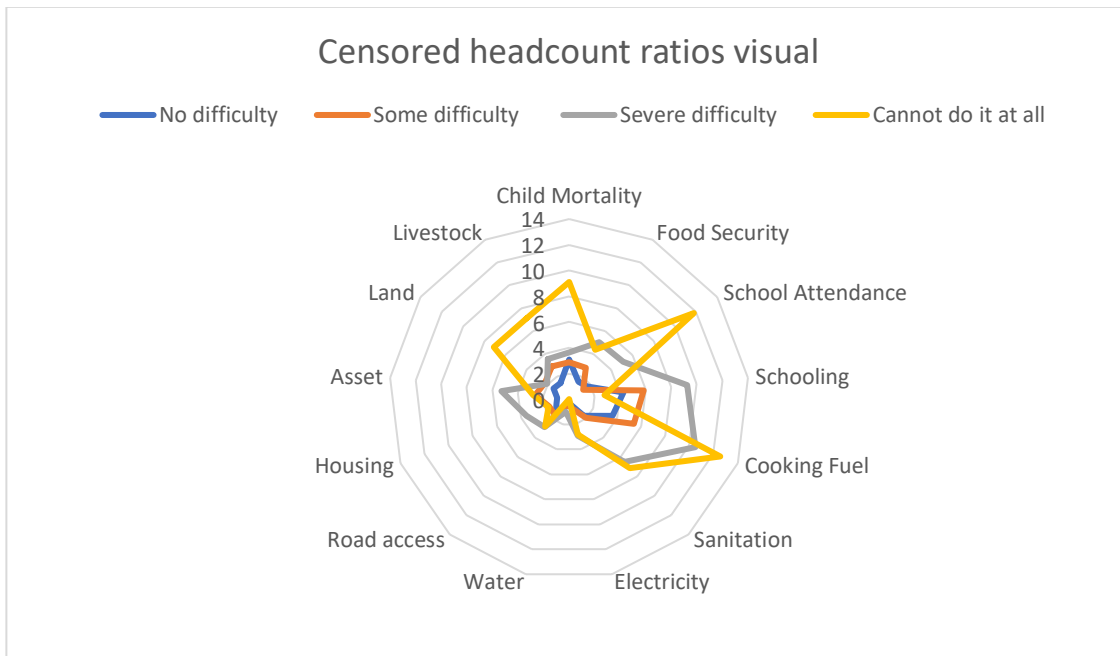
Source: Authors' calculations based on data from BLSS 2017

Figure 6. Censored headcount ratios for different severities: Difficulties with self-care



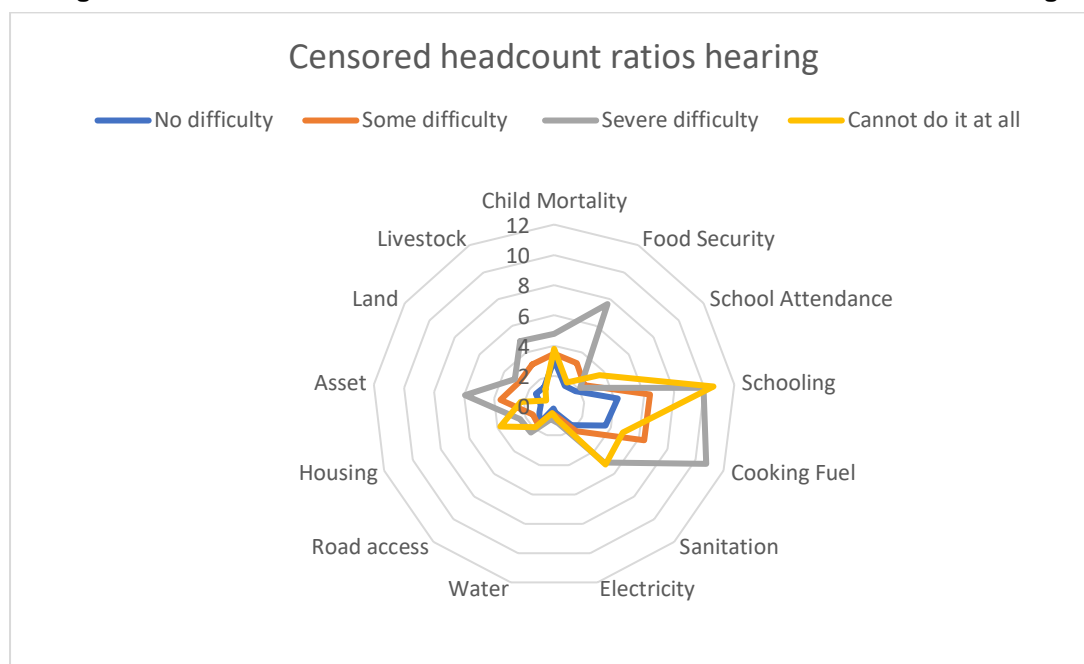
Source: Authors' calculations based on data from BLSS 2017

Figure 7. Censored headcount ratios for different severities: Difficulties seeing



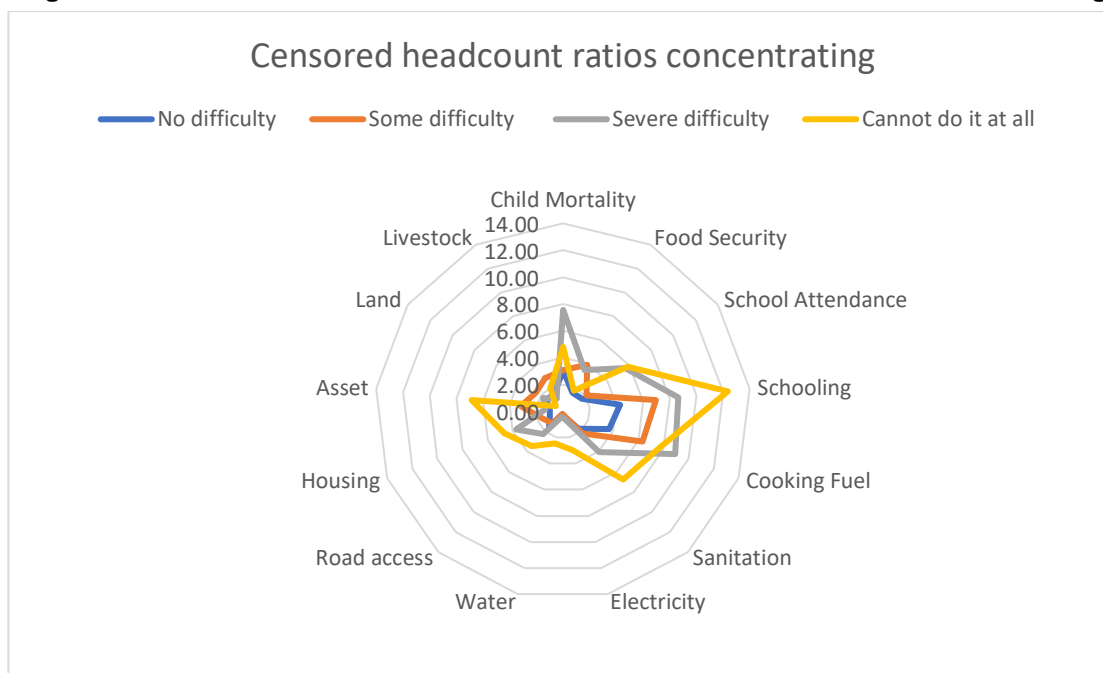
Source: Authors' calculations based on data from BLSS 2017

Figure 8. Censored headcount ratios for different severities: Difficulties hearing



Source: Authors' calculations based on data from BLSS 2017

Figure 9. Censored headcount ratios for different severities: Difficulties concentrating



Source: Authors' calculations based on data from BLSS 2017

2.3 Counting-based individual analysis to show multiple disabilities:

Given that the groups of difficulties are not exclusive, and that people can live with a combination of difficulties, it is necessary to analyse the levels of poverty and deprivation of people living with more than one difficulty. For this, we analysed the levels of multidimensional poverty of people

living with 1, 2, and 3 or more severe difficulties (following the definition of disability suggested by the WG). In Bhutan, 1.8% of the population live with one difficulty and only 0.51% have 3 or more difficulties (Table 5).

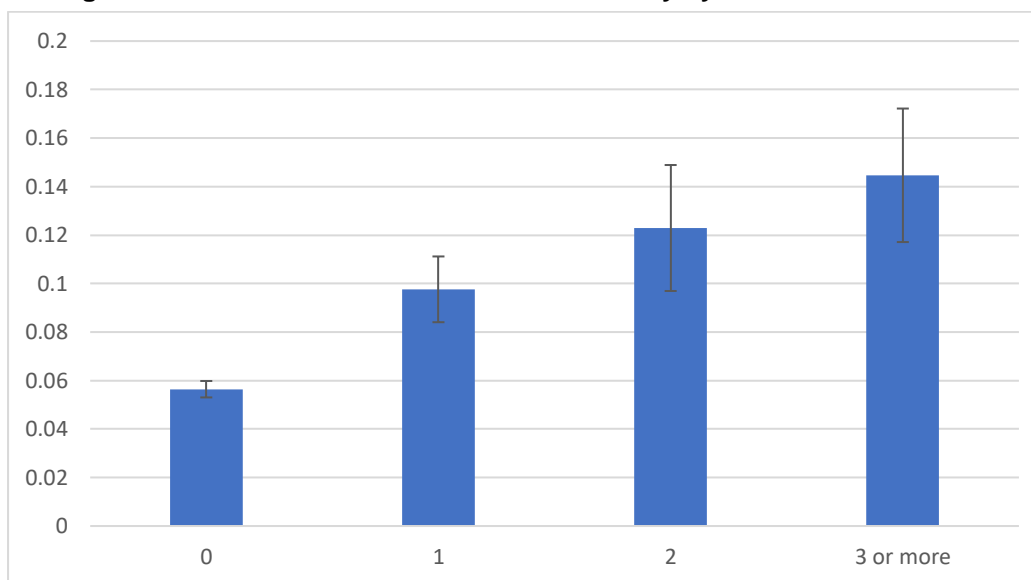
Table 5. Prevalence of disability by number of difficulties

Number of difficulties	Percentage
0	97.17
1	1.78
2	0.54
3 or more	0.51

Source: Authors' calculations based on data from BLSS 2017

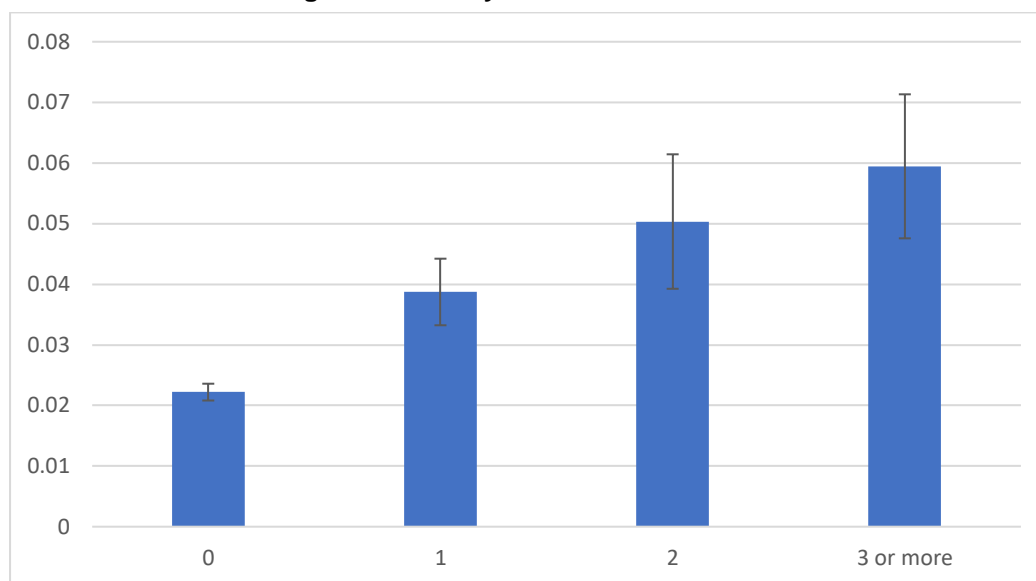
The results of the analysis reveal that there is a positive association between increases in the number of difficulties and their severity, and an increase in the level and incidence of multidimensional poverty. Indeed, the incidence of multidimensional poverty for persons living with three or more difficulties is 14.5% compared to 5.6% of those living with no difficulty (Figure 10). In addition, the MPI for people living with six difficulties is also higher than for people with a lower number of difficulties (Figure 11).

Figure 10. Incidence of Multidimensional Poverty by Number of Difficulties



Source: Authors' calculations based on data from BLSS 2017

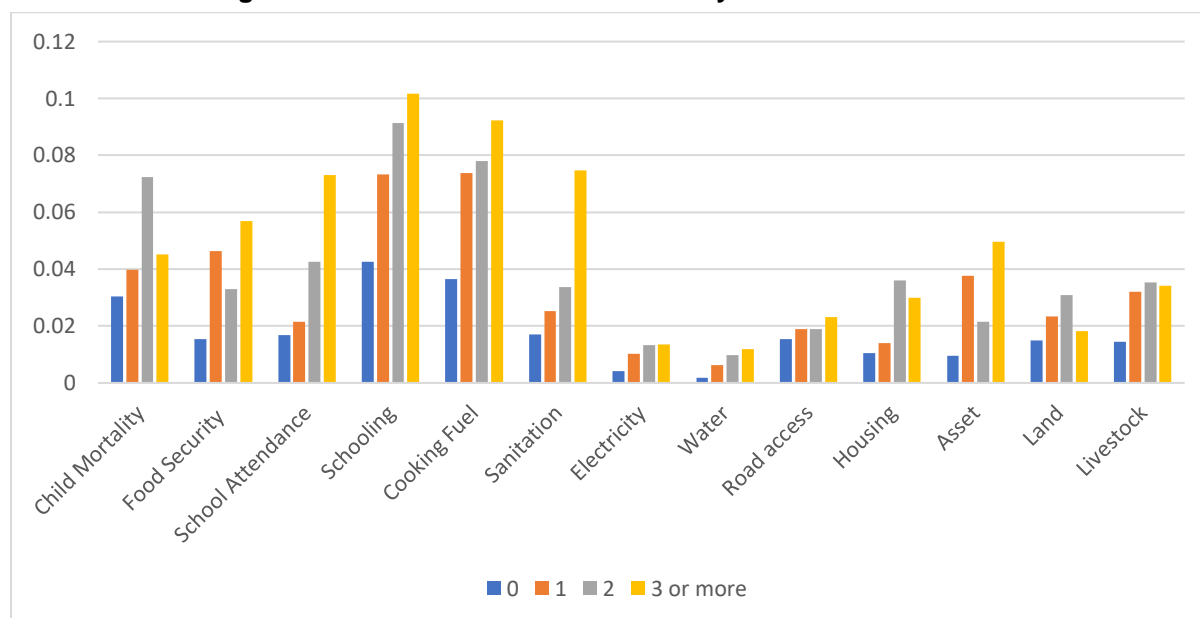
Figure 11. MPI by Number of Difficulties



Source: Authors' calculations based on data from BLSS 2017

In all cases, people living with one or more difficulties who are also multidimensionally poor have higher levels of deprivation in all the indicators, although these differences are only significant for the indicators of asset ownership and schooling. Although the sample is not representative for people with a higher number of difficulties, they often appear to have higher levels of deprivation – for example in food security, schooling, cooking fuel, assets, or sanitation (Figure 12).

Figure 12. Censored headcount ratios by number of difficulties



Source: Authors' calculations based on data from BLSS 2017

In addition, we analyse the levels of multidimensional poverty among persons with a milder level of disability also, namely all of those who reported living with: some difficulty, a lot of difficulty or cannot do it in one of the domains. 7.1% of people reported to have at least some difficulty in

one domain, 2.1% in two domains and 3.0% to live with 3 or more difficulties. The analysis reveals that 10.8% of people living with 3 or more difficulties are multidimensionally poor, compared to 5.5% for people who do not have any difficulty.

2.4 Household level analysis by type and severity

We now consider how the 2.8% of people having a disability are spread across households in the population. Fully 11.7% of people in Bhutan live in a household in which at least one member experiences a disability. Among such people living with a disability, 10.3% are multidimensional poor, a percentage that is significantly higher than the incidence of multidimensional poverty for people living in households without members with disability (5.2%). In addition, the MPI for people with disabilities and their families is statistically higher than for people living in households without members with disabilities.

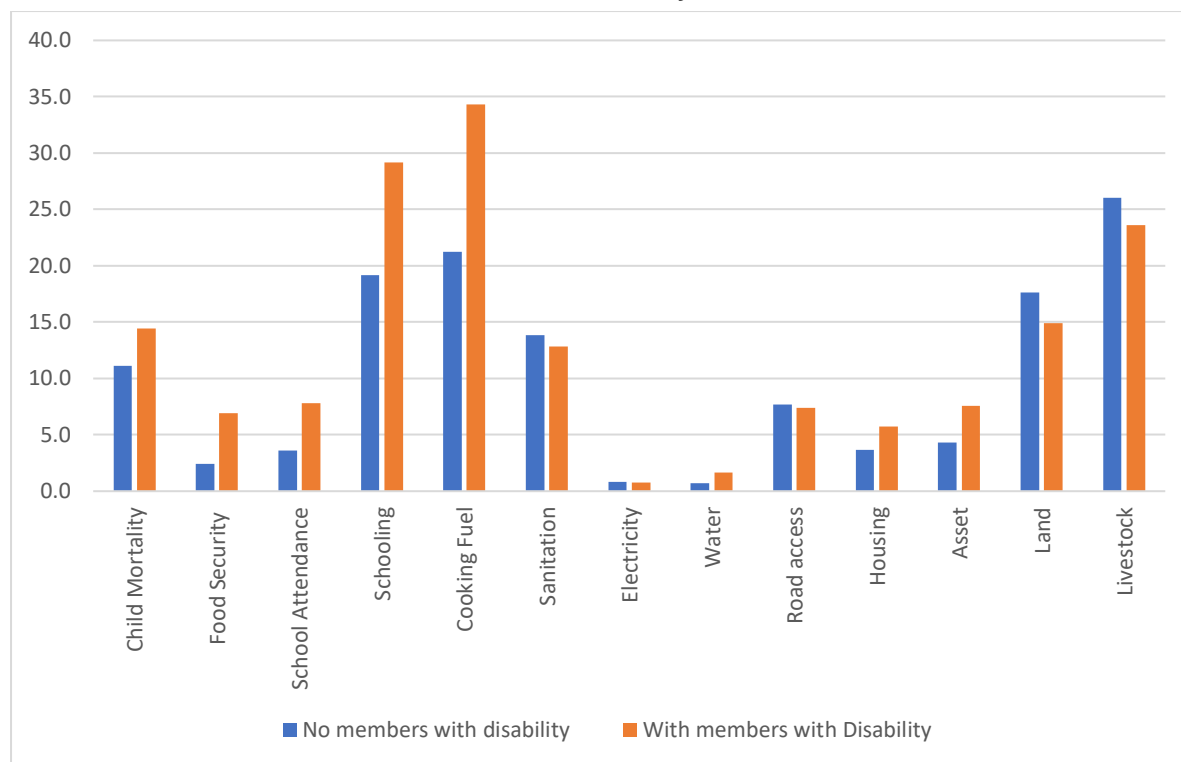
Table 6. Multidimensional Poverty for people living in households with and without members with disabilities.

	Disability	
	No	Yes
Population Share	88.3	11.7
MPI	0.020	0.042
CI	(0.018 -0.023)	(0.031 - 0.052)
Incidence	5.2%	10.3%
CI	(4.5-5.9)	(7.9- 12.7)
Intensity	39.1%	40.6%
CI	(38.3 -39.8)	(39.0 -42.2)

Source: Authors' calculations based on data from BLSS 2017

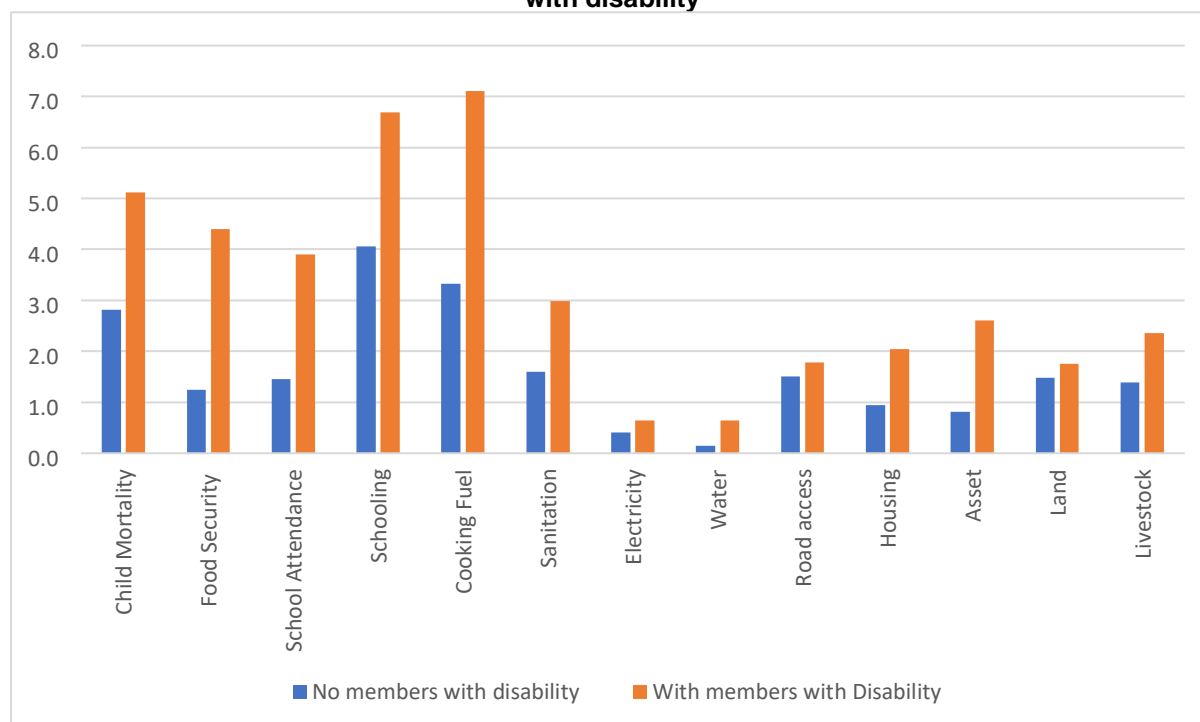
The MPI composition is similar to that one presented when the levels of disability were analysed for individuals, in that for uncensored headcount ratios access to road and land deprivations are not higher among disability-affected households, but the censored headcount ratios of each indicator appear to be higher for people living in disability-affected households.

Figure 13. Uncensored Headcounts of people living in households with and without members with disability



Source: Authors' calculations based on data from BLSS 2017

Figure 14. Censored Headcounts of people living in households with and without members with disability



Source: Authors' calculations based on data from BLSS 2017

3. Conclusions

This note has assessed the interrelationship between disability and poverty, using various different definitions. Across all analyses, we found that, people with disabilities are poorer than people without disabilities. People with severe disabilities are more likely to be multidimensionally poor, and people with a higher number of difficulties, and with difficulties that are more severe, are also more likely to have higher levels of multidimensional poverty. Furthermore, household members living with a person with disabilities are likewise more likely to be poor. There are not evident differences between individual characteristics of people with disabilities who are or not multidimensionally poor. However the area of residence and region seem to be two possible factors increasing the risk of being multidimensionally poor among people with disabilities.

Given that the findings of this statistical note have policy implications, it is advisable that future Bhutan MPI Reports include disaggregation according to whether people are living with severe disabilities according to the WG definitions, and when possible by type of impairment. Such analysis provides required evidence for policies to reduce poverty among people with disabilities and their families in Bhutan. This analysis, based on the 2017 BLSS survey, should also be implemented on the recent census to provide a much more in-depth and precise analysis of the interaction between disabilities and poverty across Bhutan.

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