



Review Article

Multidimensional poverty and disability: A case control study in India, Cameroon, and Guatemala

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ABSTRACT

Although the association between disability and multidimensional poverty has been consistently found in several studies in Low- and Middle-Income Countries. None of these studies so far has used an extended and internationally comparable questionnaire (extended Washington Group Questionnaire) and a clinical screening of disability. The purpose of this article is to calculate, compare and analyse the levels of multidimensional poverty of people with and without disabilities in Guatemala (national), in one district of Cameroon (Fundong Health District, North West Cameroon) and in one district in India (Mahbubnagar District, Telangana State). We used a case-control study approach; adults with disabilities identified in a population-based disability survey using the Washington Group Extended Questionnaire were matched to age-sex matched controls without disabilities and interviewed about their levels of access and use of different social services. Following the Alkire-Foster method, the levels of multidimensional poverty between cases and control were computed and compared. Additionally, we analysed how disability and other individual characteristics are associated with being poor in each country. The results showed that people with disabilities in all three-study settings face significantly higher levels of poverty and the intensity of their poverty is higher. In the case of Cameroon, differences in the levels of deprivation between people with and without disabilities were smaller than those observed in India and Guatemala. This might suggest that in countries with higher levels of human, economic and social development people with disabilities are being left behind by public policies aiming to reduce poverty and deprivation in basic indicators. In addition, indicators related to health contributed the most to the levels of multidimensional poverty for people with disabilities. These findings provide important evidence about the association of multidimensional poverty and disability and underline the importance of including indicators capturing individual deprivations to analyse poverty for this group.

Introduction

It is estimated that around 15% of the global population lives with any type of disability (Mitra & Sambamoorthi, 2014; World Health Organization & The World Bank, 2011) and 80% of those, live in Low and Middle Income Countries (LMICs) (World Health Organization & The World Bank, 2011). Understanding the relationship between disability and poverty has gained increasing attention in the development literature (Banks, Kuper, & Polack, 2017). The Sustainable Development

Agenda 2030 for the first time recognises people with disabilities as a vulnerable group and the importance of measuring poverty on all its dimensions. These two aspects have increased the visibility of people with disabilities in the development agenda and also have made a call to calculate and analyse the levels of multidimensional poverty of this group (Inter-Agency and Expert Group on Sustainable Development Goal Indicators, 2016). Currently, there are no official estimates of how many people with disabilities are income or multidimensionally poor globally, nor about the severity of their poverty. However, different

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studies have shown that people with disabilities have higher levels of income poverty, based on international or national income poverty lines (United Nations, 2018) and they are recognised as one of the poorest group in a society (Chronic Poverty Advisory Network, 2014; World Health Organization & The World Bank, 2011).

Disability and poverty are related in a bidirectional manner (Yeo & Moore, 2003). On the one hand, people with disabilities have a higher risk of becoming poor given their lower levels of access to health care, education, employment, and social participation. On the other hand, poor individuals are more likely to become disabled, as a result of their lack of access to preventive health care services, undernutrition and their riskier living conditions (United Nations, 2018; World Health Organization & The World Bank, 2011; Yeo & Moore, 2003).

Poverty is understood and measured from different theoretical and methodological perspectives. On one hand, it is possible to measure poverty as the lack of income or consumption that a household has (monetary or indirect measures). On the other hand, poverty is related to the lack of access to basic services and opportunities (non-monetary or direct measures) (Ringen, 1988). Under the last perspective to measure poverty (direct measures), different approaches have been proposed, including the Capability Approach. This approach aims to capture non-monetary aspects of poverty, understanding that poverty goes beyond income, and it is related to the lack of access to practical opportunities, which limits the possibilities that an individual has to live the life she or he wants and values (Sen, 2009).

Under the capability approach, disability has been identified as a situation that limits the access to practical opportunities among people with impairments (Mitra, 2006). People with disabilities are in high risk of poverty, given the difficulties to convert their income into practical opportunities and also the extra needs they face (Sen, 2009).

When talking about the relationship between disability and poverty, aspects related to the type and number of practical opportunities of people with disabilities should be considered. Evidence suggests that people with disabilities face lower opportunities to access education, health, employment and have lower levels of social and political participation (Baart & Taaka, 2018; Mactaggart et al., 2018a; Mactaggart et al., 2018b; Mitra, 2018a; Mizunoya, Mitra, & Yamasaki, 2018; Sakellariou & Rotarou, 2017; Trani, Bakhshi, Brown, Lopez, & Gall, 2018; United Nations (UN), 2018). In addition, people with disabilities and their families face extra direct (e.g. health care costs, transportation costs), indirect (e.g. no participation in the labour market of people with disabilities or their caregiver) and opportunity costs (e.g. limited labour opportunities) (Kuklys, 2005; Mitra, Palmer, Kim, Mont, & Groce, 2017) factors that increases their risk of poverty. Therefore, people with disabilities and their families have fewer tools to move out of poverty and may require more supporting strategies (e.g. social protection programmes covering for the extra costs of disability) to reach at least a minimum acceptable level of wellbeing.

Mitra (2018b) presents the *Human Development Model of Disability, Health and Wellbeing*, which considers that resources, structural factors, personal characteristics, impairments, health conditions, wellbeing and deprivations are all interlinked in bidirectional ways. Therefore, there are bidirectional links between impairments and health conditions, on the one hand, and wellbeing and deprivations on the other, and they can be jointly affected by, or affect, other outcomes such as violence or access to health care services. It also points at the importance of third factors that may lead to poverty and disability simultaneously, such as violence, low quality, and expensive health services.

Given the complexity of the different mechanisms that increase the risk of poverty and deprivation for people with disabilities, it is important that poverty measures capture deprivation in different areas of development, such as health, education and employment and provide evidence to identify policy priorities to reduce poverty and deprivation. In this context, there has been increasing recognition of the importance of assessing multidimensional poverty in the context of disability in LMICs (Mitra, 2018b, pp. 9–32; Mitra, Posarac, & Vick, 2013;

Pinilla-Roncancio, 2018; Pinilla-Roncancio & Alkire, 2017; Trani & Cannings, 2013; Trani et al, 2013, 2015, 2016; Trani & Loeb, 2012). However, comparability between studies and settings in LMICs is limited by the range of different methods used. Therefore, there is a need for comparable studies analysing the relationship between disability and multidimensional poverty in different countries, using a common definition and measure of disability, which captures a longer list of health functionings and has been validated in different context, such as the Washington Group (WG) Extended Questionnaire.

To contribute in this field, we aim to assess the levels of deprivation and multidimensional poverty of adults with and without disabilities in three different LMICs: Guatemala (national), in Cameroon (Fundong Health District, North West Cameroon) and in India (Mahbubnagar District, Telangana State), using a population-based case-control study design and the extended questionnaire of the WG. This is the first study that to our knowledge using this questionnaire to identify functional limitations, when measuring multidimensional poverty for people with disabilities, using a case-control design in different LMICs.

Methodology

Methods overview

We undertook all-age population-based surveys of disability in one district of India and Cameroon and at national level in Guatemala (Mactaggart et al, 2016, 2018a). Participants were screened for disability using both self-reported functional limitation tools and a battery of clinical impairment screening tools. A case-control study was nested within these surveys to compare people with and without disability in key life areas (e.g. health, education, work, water and sanitation). Using this information, we designed and calculated and compare the levels of multidimensional poverty for both groups using the Alkire-Foster (AF) method. While the same broad methodological approaches were used in each setting, there was some variation in terms of sampling and disability assessment between the national survey in Guatemala and the India and Cameroon studies, as described below.

Study settings

The study was conducted in Fundong Health District, North West Cameroon in 2013, Mahbubnagar District, Telangana State in India in 2014 and nationally in Guatemala in 2016. A detailed description of the process of selecting the settings is presented in Mactaggart et al. (2018a).

Survey population and sampling

In Cameroon and India, the required sample size was 4056 based on an estimated prevalence all-age disability of 4% in Cameroon and India, precision around the estimate of 20%, 95% confidence, a design effect of 1.4 and 20% non-response (disability was defined as self-reported limitations and/or presence of moderate or greater clinical impairment, epilepsy or depression). In Guatemala, the required total sample size (calculated to allow prevalence estimates at regional level) was 13,800, assuming a 6% overall disability prevalence, precision of 20%, 95% confidence, a design effect of 1.5 and 15% non-response. The prevalence of disability in Guatemala was defined based on previous studies. Specific types of difficulties were not considered when defining the sample size in any of the three countries (Mactaggart et al., 2016 for more details).

Multistage sampling was used. Probability proportionate to size sampling was used to select 51 clusters of 80 people in India and Cameroon and 280 clusters of 50 people in Guatemala. Sampling frames were the most recent census (Guatemala and Cameroon 2010; India 2011). Within clusters, we used a modified compact segment sampling: a cluster sketch map was created together with local leaders, and divided into segments of approximately 80 people (India and Cameroon) or 50

people (Guatemala). Survey teams then visited households in one randomly selected segment door-to-door (guided by a community member) until the target number of people were enumerated. In India and Cameroon, participants were invited to attend a local, central location for screening over the following two days. In Guatemala, data collection was undertaken in their homes.

Screening for disability

Participants were screened for disability using: i) self-reported functioning limitations tool and ii) clinical assessment for vision, hearing, musculoskeletal impairment and depression (in India and Cameroon). In each setting, participants were screened for self-reported functional limitations using the Washington Group Extended Set on Functioning (for Adults) and the UNICEF/Washington Group Child Functioning Module. These tools comprise questions about level of difficulty with different domains of functioning (e.g. seeing, hearing, mobility, self-care, communication, cognition, anxiety and depression), scored on a severity scale of no difficulty, some difficulty, a lot of difficulty and cannot do.

In India and Cameroon all study participants were also assessed for vision, hearing and musculoskeletal impairments, epilepsy and depression using pre-existing tools (as detailed in previous publications (Mactaggart et al., 2016)). Participants identified as having a vision, hearing or musculoskeletal impairment (henceforth MSI) were then examined by the relevant clinician in the team to determine cause and refer to appropriate services. In Guatemala, participants reporting *some* or more difficulty in one of the functional domains of the Washington Group questions were administered a clinical screen corresponding to that domain.

Defining disability

For the purposes of the case-control study, people were categorised as having a disability according to the following definitions.

Cameroon and India:

- Self-reporting: 'a lot of difficulty' or 'cannot do' in seeing, hearing, walking, understanding, being understood, remembering, concentrating, self-care, upper body strength and fine motor dexterity.
- and/or moderate or severe vision, hearing or musculoskeletal impairment or severe depression (Vision Impairment: presenting vision in better eye of $<6/18$. Hearing Impairment: Presenting average hearing threshold in better ear of $>40\text{dBA}$. Musculoskeletal Impairment: structure impairment with moderate effect on the musculoskeletal system's ability to function as a whole 25–49% or greater. Epilepsy: three or more tonic clonic seizures previously experienced. Depression: score of 20 or above on PHQ-9).

Guatemala:

- Reporting 'A lot of difficulty' or 'cannot do' in seeing, hearing, walking, understanding, being understood, remembering, concentrating, self-care, upper body strength
- and/or, reporting "a lot" of anxiety/depression daily.

Nested case-control study

All participants aged 5 years or older, who were identified as having a disability ('case') in the surveys (according to the above criteria) were invited to participate in the nested case-control study alongside an age and sex matched 'control' (participants without a disability) from within the same cluster. Age matching of controls was within ± 5 years for adults in Cameroon and India (± 10 years in Guatemala) and ± 2 years for children. In Cameroon and India, to ensure adequate sample size for the case-control study, two additional children and one additional adult with a disability were identified through community key informants (e.g. local health workers). These participants were selected from an adjacent segment in each cluster.

People with and without a disability were interviewed using a standardised questionnaire about health, education, employment, social participation, attitudes, and discrimination as well as household level living standard indicators (e.g. access to water, sanitation, and asset ownership). Proxy responders were used for children and people who were unable to respond independently.

Data analysis

The Alkire-Foster (AF) method was used to calculate the levels of multidimensional poverty. The AF method is based on a counting and axiomatic approach and extends the Foster-Greer-Thorbecke (FGT) measures. These measures identify multidimensionally poor individuals and aggregate them in a unique measure of poverty. The definition of the structure of the measure is based on different normative decisions around the purpose of the measure, the dimensions and indicators to be included, the relative importance of each of dimension and indicator and the definition of the poverty line (Alkire & Santos, 2013).

The AF method uses a dual cut-off approach. This means that each dimension has a deprivation cut-off, which identifies who is deprived or not in each indicator and a poverty cut-off that is the weighted sum of individual deprivations and identifies multidimensionally poor individuals (Alkire et al., 2015). It is important to highlight that the higher the sum of weighted deprivations, the more severe the levels of poverty. Three indicators are created using the method AF, the incidence, which is the percentage of individuals living in multidimensional poverty; the intensity that represent the average of deprivation faced by the poor and M_0 , which is the product of the incidence and the intensity.

Multidimensional poverty analysis

The purpose of the analysis of multidimensional poverty of this study is to calculate and compare the levels of multidimensional poverty among people with and without disabilities in each study setting. The measure uses the individual as the unit of identification and analysis, and it is restricted to adults aged 18 years or older in the three countries, aiming to avoid problems of comparability between the levels of education of children and the difficulties of capturing disability for children (Meltzer, 2016).

The measure includes four dimensions and 12 indicators as shown in Table 1. The dimensions are 1. Health (1 indicator), 2. Employment, education, and social protection (3 indicators); 3. Social participation (4 indicators) and 4. Living standards (4 indicators). Although the inclusion of other indicators (e.g. access to vocational education, health care expenditures or other indicators on health care, type of employment) is desirable, data limitations restricted the set of indicators included in the analysis.

Indicators in each dimension aim to capture deprivation in access to basic services and opportunities. Deprivation cut-offs are defined based on international standards (SDGs standards for access to water and sanitation) or following international approach to measure multidimensional poverty. In the case of access to health care or social benefits, deprivation cut-offs capture the lack of access to these services. For indicators related to environment or attitudes, deprivation cut-offs aim to capture facing discrimination or attitudinal barriers at least once a month. Of the 12 indicators of the measure, eight are collected and computed for each individual (access to health care, level of education, employment status, social benefits, difficulties with transportation, information, attitudes at work, and discrimination), thus these indicators capture individual deprivations. The four Living Standards indicators capture household-level deprivations (access to water, sanitation, asset ownership, and housing materials).

We used nested weights to calculate the measure, as has been used in previous studies analysing multidimensional poverty for people with disabilities (Mitra et al., 2013; Trani & Cannings, 2013; Trani et al., 2015) and has been used by most national multidimensional poverty

Table 1
Dimensions, indicators, deprivation cut-offs and weights.

Dimension	Indicator	Deprived if	Weights
Living Standards	Access to a clean source of water	The main source of water is not private pipeline or private well.	6.25%
	Access to sanitation	S/he does not have access to improved sanitation facilities, or the facilities are shared with other households.	6.25%
	Asset ownership	S/he does not own at least 2 assets (radio, tv, fridge, phone, motorbike, bicycle or computer) or does not own a car.	6.25%
	Housing materials	S/he lives in a household with the following characteristics: walls material are tiles, asbestos sheets, metal sheets, wood, unbaked bricks and thatch or the floor material is earth or other materials.	6.25%
Health	Access to health care	S/he was sick and did not seek for advice or sought advice but faced barriers (attitudinal, information, other).	25%
Employment, education and social protection	School attainment	S/he has not completed primary school.	8.33%
	Employment	S/he is not working or is working but does not receive a salary.	8.33%
	Social Benefits ^a	S/he does not receive any social benefits.	8.33%
Environment and attitudes	Transportation	S/he faced daily difficulties with transportation.	6.25%
	Access to information	S/he faced daily difficulties with information.	6.25%
	Attitudes at work or at home	S/he has faced attitudinal barriers at work or at home in a daily basis.	6.25%
	Discrimination	S/he has experience prejudice or discrimination in a daily basis.	6.25%

^a In the case of Cameroon and India, this indicator include access to social security, disability grant, pension, family allowance and other benefits. For Guatemala, the indicator considers aspects related to social security benefits, microfinance cash for work schemes, remittances, or other non-state schemes.

measures (United Nations development Programme (UNDP) & Oxford Poverty and Human Development Initiative (OPHI), 2019). This set of weights gives the same relative importance to each dimension and to each indicator inside the dimension. A person was classified as multidimensionally poor if s/he was deprived in 40% or more of the weighted sum of indicators, which is equivalent to being deprived in two or more dimensions or the weighted sum of indicators, given that each indicator has a different weight depending on the dimension they belong.

Robustness tests, changing the poverty cut-off, found that the index is robust from a poverty cut-off (*k*) equal to 20%–60%, indicating that, the selection of a poverty cut-off within this range produces robust results. In addition, robustness tests changing the weight structure showed the results were robust with different weight structures. Finally, a similar analysis was conducted using different measures of disability. In a first case using the levels of severity reported in each of the questions included in the extended Washington Group Extended Questionnaire, a three-level variable was created adding the information on the severity of functional limitation in each domain, considering that the variable takes a value of *three* when the person present severe limitation or report cannot do at least one of the activities, *two* if the person reported having

a lot of difficulty in at least one of the activities and *one* when the person reported to have some difficulty or no difficulty in all the activities. In addition, to this analysis and following Mitra (2018b, pp. 9–32) a three level measure was designed, classifying the person as no moderate/severe functional limitation, moderate functional limitation and severe functional limitation. Finally, a third robustness analysis was conducted in Cameroon and India using the results of the clinical assessment for vision, hearing, musculoskeletal impairment, and depression. In this case a person was classified as a person with disabilities if he or she were screened positive to any moderate/severe clinical impairment.

The same specification of the index is used in each study country to allow comparisons within and between countries. In addition, among people with disabilities we assess the relationship between multidimensional poverty, age and sex. We use t-tests for continuous variables to compare the results between groups.

Analysing the characteristics of multidimensionally poor individuals

Finally, a regression model for categorical data (probit model) is estimated to identify individual characteristics increasing the risk of being classified as multidimensional poor. In this model, the dependent variable is multidimensional poverty (1 = yes, 0 = no) and the independent variables are sex, age, disability status, area of residence, ethnic group (or caste) and rural/urban areas. The marginal effect on the mean are computed to analyse how the probability of being multidimensionally poor changes when the person has disability. All the results are computed using Stata 15.

Results

The total number of people with disabilities (cases) and people without disabilities (controls) aged 18 years and above varied by country; in India, there are 324 cases and 241 controls; in Cameroon there are, 206 people with disabilities and 154 controls and in Guatemala there are 707 people with disabilities and 465 controls. Table 2 presents the characteristics of participants included in the case control analysis. Cases are on average older than controls, but well matched in terms of sex.

Table 2
Characteristics of individuals included in the analysis.

		Control without disabilities	Case with disabilities
Cameroon	Total control and cases	57.3% (n = 206)	42.7% (n = 154)
	Mean Age	37.7 (1.5)	47.7 (1.4)
	% of individuals who are head of the household	35.4% (n = 73)	36.8 (n = 57)
India	Total control and cases	58.4% (n = 120)	58.3% (n = 90)
	Mean Age	57.3% (n = 324)	42.7% (n = 241)
	% of individuals who are head of the household	44.9 (0.88)	51.8 (0.86)
Guatemala	Total control and cases	42.7% (n = 138)	54.9% (n = 132)
	Mean Age	54.2% (n = 176)	53.1% (n = 128)
	% of individuals who are head of the household	60.3% (n = 707)	39.8% (n = 465)
Guatemala	Total control and cases	42.4 (0.97)	50.9 (0.86)
	Mean Age	36.1% (n = 255)	37.6% (n = 175)
	% of individuals who are head of the household	68.7% (n = 486)	66.7% (n = 310)
Guatemala	Total control and cases		
	Mean Age		
	% of individuals who are head of the household		

Deprivation among people with and without disabilities in the three countries

When the deprivations of people with and without disabilities are analysed (without considering their levels of multidimensional poverty), it is found that people with disabilities in Cameroon face the highest deprivation in housing materials, school attainment and access to social benefits. In India, the highest levels of deprivation for this group are found in access to sanitation or to a clear source of water and school attainment. Finally, in Guatemala, the highest levels of deprivation are observed in social benefits, school attainment and employment. In the three countries, differences are consistently found across these measures between cases and controls (people with and without disabilities), and people with disabilities face higher deprivations in housing materials (p-value<0.001), employment (p-value<0.001) school attainment (p-value<0.001) and access to health care (p-value<0.001) compared to people without disabilities.

Incidence, intensecity and multidimensional poverty

In the three countries, people with disabilities have significantly higher incidence of multidimensional poverty (defined as the proportion of people in the study population who experience multiple deprivations) compared with the control subjects (Table 3). The largest difference is seen in India where 41.4% of people with disabilities are multidimensionally poor compared to 13.3% controls (p-value <0.01). The intensity of poverty among those who are multidimensionally poor is also higher among people with disabilities compared to controls in each country. The largest difference is found in India, where people with disabilities experience on average 54.3% of the weighted sum of deprivations compared with people without disabilities who are multidimensionally poor, who face on average 45.7% of the weighted sum of deprivations. Cameroon has the highest overall levels of incidence, intensity and multidimensional poverty for both people with and without disabilities.

Levels of deprivations among the poor

When analysing the levels of deprivation in each of the indicators for multidimensionally poor individuals, we find that, in each country, people with disabilities face higher levels of deprivation in all indicators (except access to sanitation in Cameroon) compared to people without disabilities. However, the statistical significance of those differences varied between countries, with access to health care services being the indicator that was consistently significantly different between people with and without disabilities in each setting (p-value<0.01).

The overall highest level of multidimensional poverty is identified in Cameroon and people with disabilities face higher levels of deprivations in all dimensions, compared to controls. Comparing between countries, although levels of poverty are consistently higher among people with disabilities in each setting, the extent of this difference is larger in India compared to Cameroon and Guatemala. In the case of India, people with disabilities face higher levels of deprivation in all indicators compared to people without disabilities, these differences are all significant at p < 0.05. In Guatemala, the largest differences are seen in the indicators

related to social benefits, education, and employment, all of which are significant at p < 0.05 (Figs. 1–3).

The contribution of each indicator to the multidimensional poverty measure, called “the percentage contribution”, varied between countries. In the case of Cameroon and Guatemala, the indicator that contributes the most to the levels of multidimensional poverty is access to social benefits; followed by education and housing materials (walls and floors). In the case of India, years of schooling and access to health care services are the two indicators with the highest contribution. When the contribution of each indicator to the measure is compared between people with and without disabilities, we found that in the three countries the contribution of access to health care services to the measure was higher for people with disabilities compared to people without disabilities (Fig. 4). Therefore, a larger proportion of the levels of poverty of people with disabilities can be explained by deprivation in access to health care services.

Relationship between multidimensional poverty, age and sex among people with disabilities

We found that only in Cameroon a higher percentage of women compared to men with disabilities (82.3% vs 73.2%) are multidimensionally poor, although the difference is not significant. In India, the proportion of women and men with disabilities living in multidimensional poverty is similar (40.2% vs 42.2%). No differences between men and women with disabilities in Guatemala.

When age group are analysed, it was found that in the case of Guatemala and India a higher percentage of individuals with disabilities 60 years or older are multidimensional poor, compared to people with disabilities aged 18–59 years. However, people with disabilities aged 35–59 years old face the highest intensity of multidimensional poverty in the three countries. Indeed, people with disabilities 35–59 years living in India faced on average 56.3% of deprivations compared to 51.3% of average deprivation faced by multidimensional poor individuals with disabilities aged 18–34 years. However, neither of these results are significant at 5%.

The analysis per indicator reveal that women with disabilities face generally higher levels of deprivation than men with disabilities in Cameroon in all indicators, except for *Information Barriers, Attitudinal Barriers and Discrimination*. However, these differences are not significant. In India, women with disabilities face higher levels of deprivation in indicators such as *Access to a clean source of water, Housing materials, Education attainment, Employment, Social benefits, Attitudinal barriers and Discrimination* compared to men with disabilities, but as in the case of Cameroon, these differences were not statistically significant. In contrast in Guatemala the levels of deprivation are similar for women and men with disabilities.

Robustnessec analysis

The results of the robustness test for different disability measures reveal that people with severe functional limitations face higher levels of multidimensional poverty, compared to people with mild and moderate disabilities in Guatemala and India. In the case of Cameroon, a larger

Table 3
Incidence, Intensity and Multidimensional Poverty per disability status in each country.

	People with disabilities			People without disabilities		
	Multidimensional Poverty Adjusted Ratio (M ₀)	Incidence (H)	Intensity (A)	Multidimensional poverty Adjusted Ratio (M ₀)	Incidence (H)	Intensity (A)
Cameroon	0.42**	78.6%**	53.7%**	0.31**	61.0%	50.1%**
Guatemala	0.21**	39.5%**	52.8%	0.13**	25.5%	51.2%
India	0.23**	41.4%**	54.3%**	0.06**	13.3%	45.7%**

Incidence: Proportion of persons who are multidimensionally poor. Intensity: Average number of deprivations experienced by the poor. Multidimensional Poverty Adjusted Ratio (M₀ = H*A).

Differences between groups, t-test differences between groups **p < 0.01, *p < 0.05.

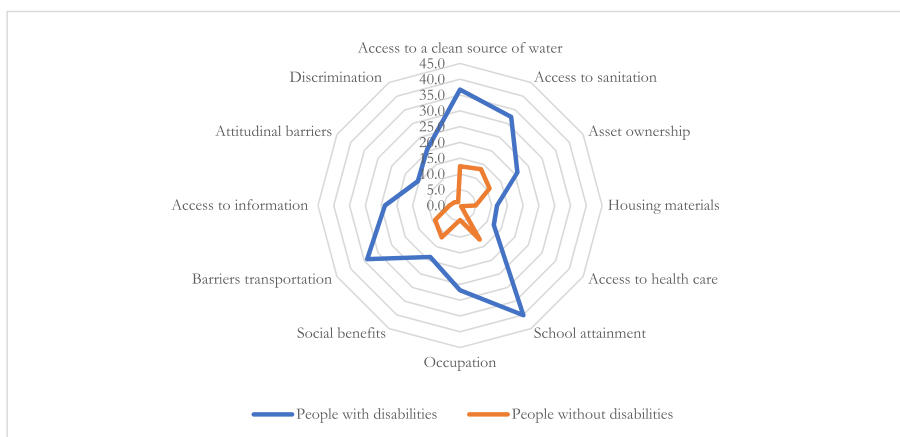


Fig. 1. Proportion of people with and without disabilities, who are multidimensionally poor experiencing deprivations in different indicators in India. Significant differences at 5%: Access to clean source of water, access to sanitation, asset ownership, housing materials, access to health care, school attainment, occupation, social benefits, barriers transportation, access to information, attitudinal barriers, discrimination.

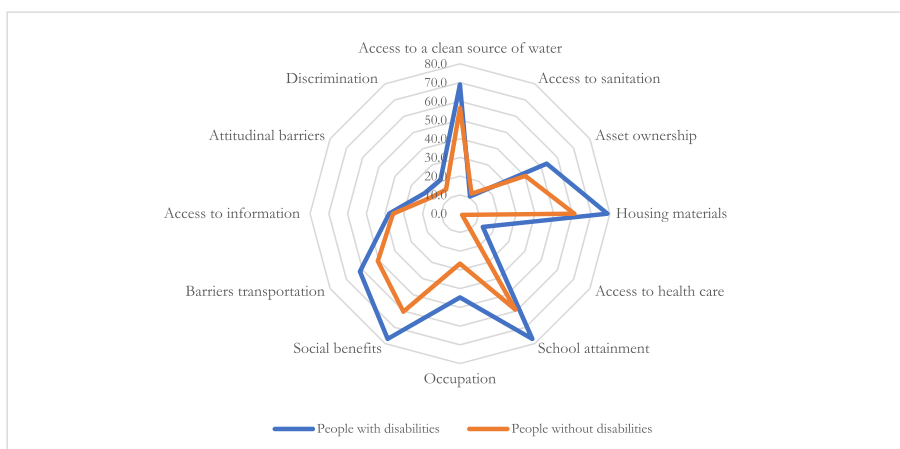


Fig. 2. Proportion of people with and without disabilities, who are multidimensionally poor experiencing deprivations in different indicators in Cameroon. Significant differences at 5%: Access to water, housing materials, access to health care, school attainment, occupation, social benefit.

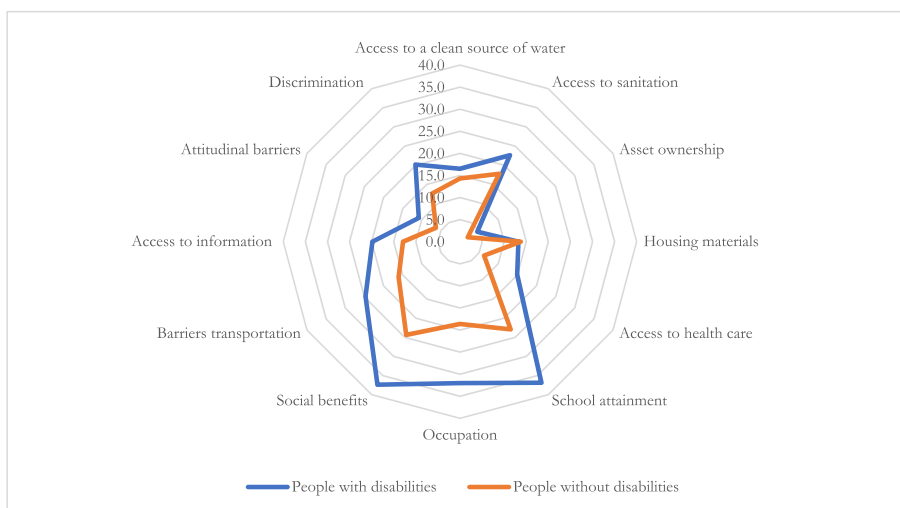


Fig. 3. Proportion of people with and without disabilities, who are multidimensionally poor experiencing deprivations in different indicators in Guatemala. Significant differences at 5%: Access to sanitation, access to health care, school attainment, occupation, social benefits, barriers transportation, access to information, attitudinal barriers and discrimination.

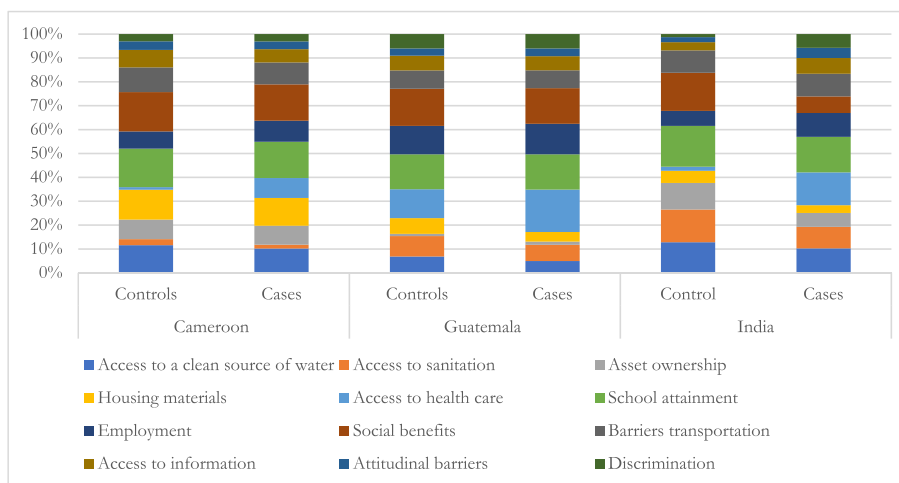


Fig. 4. Percentage contribution of each indicator to the adjusted multidimensional headcount ratio (M₀) per country.

percentage of people with moderate disabilities was multidimensionally poor compared to people with severe disabilities. In addition, the intensity of their poverty is higher compared with the both people with mild and moderate disabilities in Cameroon and Guatemala, but in India people with moderate disabilities face more severe levels of multidimensional poverty than people with mild and severe disabilities.

When the second measure of disability was used (following Mitra, 2018), the results suggest that the increase in the severity of disability is associated with higher levels of poverty in the three countries. Indeed, people with severe disabilities face higher levels of multidimensional poverty in the three countries compared with people living with mild and moderate disability, and for people with moderate disabilities their levels of incidence and intensity of poverty are higher than for people mild disabilities. Table A1 in the annex presents the results of the incidence, intensity, and adjusted headcount ratio for both robustness analysis.

It is important to highlight that in this analysis compares between groups of severity and not between cases and controls. In addition, because the data collected in the three countries is not representative for different types of impairments it is not possible to compare the levels of poverty between types of impairments and their severity. The detailed results are available upon request.

Finally, when the information on moderate/severe clinical impairment was used to identify a person with disability, the results were consistent with the main findings of the article. Indeed, in both Cameroon and India people with moderate/severe clinical impairments faced higher levels of multidimensional poverty, the intensity of their poverty was higher and faced higher deprivations in most of the indicators.

Disability as a correlate of multidimensional poverty

To analyse if disability is associated with being multidimensionally poor and can be understood as a correlate that increases the probability of being poor, we estimated a probit regression model including all cases and controls. The independent variables were related to individual characteristics such as disability, sex, age, and ethnic groups. In the three countries, being a person with disabilities significantly increases the probability of being multidimensionally poor by more than 10 percentage points (pp) compared to not being disabled (control group). For example, in Cameroon, a person living with disability has 15 pp higher probability of living in poverty than a person without disability (controls). A similar situation is observed in Guatemala, where the probability increases by 13 pp. In the case of India, living with a disability is one of the variables with the larger coefficients, increasing the

probability of being multidimensionally poor by 26 pp, more than any other individual variable included in the regression model.

Other variables that also were associated with increasing the probability of being multidimensionally poor were sex, ethnic group, and case. Indeed, in Cameroon, women have 12.5 pp higher probability of being multidimensionally poor compared with men. In India being female (14.6 pp compared to men) and belonging to any caste (>20pp depending on the caste) are independently associated with being multidimensionally poor. In Guatemala, individuals who considered themselves as Ladino or mixed ethnic group have 9 pp lower probability of being multidimensionally poor compared to belong to the Mayan ethnic group (Table 4).

Table 4 Regression analysis of multidimensional poverty per country.

	(1) India Mahbubnagar District	(2) Cameroon Fundong Health District	(3) Guatemala
Case (Person with disabilities)	0.26** (0.20-0.33)	0.15** (0.04-0.25)	0.13** (0.073-0.196)
Female	0.15** (0.06-0.23)	0.13* (-0.00 - 0.25)	0.05 (-0.033-0.126)
Age	0.01 (-0.01-0.02)	0.02** (0.00-0.03)	-0.00 (-0.011-0.006)
Age square	-0.00 (-0.00 - 0.00)	-0.00* (-0.00 - -0.00)	0.00 (-0.00 - 0.00)
Head of the household	0.08 (-0.00 - 0.00)	0.03 (-0.09-0.14)	-0.02 (-0.10-0.06)
Divorced/ Separated	-0.12 (-0.34-0.10)	-0.02 (-0.32-0.29)	-0.06 (-0.15-0.03)
Widowed	-0.21** (-0.29 - -0.13)	0.00 (-0.13-0.14)	-0.05 (-0.14-0.04)
Never married/ living together	0.22* (0.02-0.42)	0.14* (0.00-0.27)	
Ethnic group:			-0.09***
Ladino mix			(-0.15 - -0.03)
Ethnic group: Other			-0.25*
Rural			(-0.51-0.01)
			0.18***
			(0.12-0.24)
Caste: Backwards Class	0.06 (-0.05-0.16)		
Caste: Scheduled Caste	0.23** (0.13-0.34)		
Caste: Scheduled Tribe	0.27** (0.13-0.41)		
Observations	563	360	893

Confidence Intervals in brackets. **p < 0.01, *p < 0.05.

Discussion

This study computed, analysed, and compared the levels of multidimensional poverty between people with and without disabilities in Guatemala, one district of Cameroon (Fundong Health District, North West Cameroon) and in one district in India (Mahbubnagar District, Telangana State). The results found that people with disabilities faced higher levels of multidimensional poverty compared to people without disabilities in the three countries, and these disparities between groups were larger in India. The results revealed that people with disabilities face higher levels of deprivation in aspects related to access to health care, levels of education and employment compared to people of similar age and sex without disabilities in the three countries. In addition, disability was one of the most important individual characteristics associated with facing a higher probability multidimensional poverty.

As expected, a higher percentage of people with disabilities had higher levels of incidence, intensity and multidimensional poverty in the three countries. This finding was robust to different definitions of disability. Indeed, when the analysis was conducted considering the severity of the functional limitation, people with more severe limitations were poorer than other groups and faced a larger number of deprivations. This is a similar finding to the one presented by Mitra (2018b, pp. 9–32) using data from Ethiopia, Malawi and Tanzania. This finding has important policy implications, because it reveals that the severity of disability is associated with higher risk of multidimensional poverty and deprivation and implies that even the severity of disability is not as severe, people with moderate functional limitations face higher levels of deprivation and makes them more vulnerable to poverty or chronic poverty compared to people without disabilities.

Despite the inclusion of the same list of indicators in the three countries, poverty and deprivation profiles of people with disabilities were different between countries. Therefore, although people with disabilities faced higher levels of multidimensional poverty, in other words, they were poorer, they presented different needs, and policies implemented to reduce their levels of poverty must be tailored to the context and to the specific needs of people with disability in a country. In the case of Cameroon, differences in the levels of deprivation between people with and without disabilities were smaller than those observed in India and Guatemala. This might suggest that in countries with higher levels of human, economic and social development people with disabilities are being left behind by public policies aiming to reduce poverty and deprivation in basic indicators. This pattern has been observed in previous studies (Banks et al., 2017; Groce & Kett, 2013; Mitra et al., 2013; Pinilla-Roncancio & Alkire, 2017) and has been termed the 'Disability and Development Gap'.

In addition, the results of this study revealed that individual deprivations such as access to health care, employment, facing discrimination and attitudinal barriers were consistently higher for people with disabilities compared to person without disabilities in the three countries included in the analysis. This finding aligns with previous studies on multidimensional poverty and disability (Mitra, 2018a; Mitra et al., 2013; Trani et al, 2015, 2016, 2018) and present an opportunity and a challenge for policy makers to prioritize strategies to reduce deprivation in these indicators and therefore reduce poverty for this group.

Living with a disability might be considered as a factor increasing the probability of being multidimensionally poor (Pinilla-Roncancio & Silva, 2017; Trani & Cannings, 2013; Trani et al., 2013). The findings presented here revealed that people with disability in the three countries were more likely to live in multidimensional poverty compared to a person without disabilities of a similar age, sex and living in the same area. The increase in the probability was 26 pp in India and higher than 10pp in Guatemala and Cameroon. In addition, people living with more severe or complex limitations faced higher levels of multidimensional poverty, making people with severe disabilities more vulnerable to chronic poverty and probably one group that is left behind. Finally, although these differences were not significant, it is important to

highlight that our findings suggest that women with disabilities had a higher probability of living in multidimensional poverty compared to men with disabilities in Guatemala and Cameroon. This last result aligning with other literature on multidimensional poverty and disability (Trani & Cannings, 2013; Trani et al, 2013, 2015) which suggests women with disabilities might face discrimination and social barriers related both to their disability and their gender, making them more vulnerable to poverty and deprivation in basic services and opportunities.

To guarantee that social policies and poverty reduction strategies adapt and include people with disabilities, there is a need to understand what aspects create the levels of multidimensional poverty of this group. In this context, the results of the analysis of multidimensional poverty allow the understanding of how individual, household, social and community characteristics might facilitate (or limit) how efficient strategies to reduce poverty and deprivation are in different countries.

Given its multidimensional nature and human rights-based dimensions, a multidimensional poverty approach could potentially be applied in community-based rehabilitation (CBR) programs, specifically in assessing participants' poverty profiles and measuring the impact of the intervention on their profiles over time. CBR programmes can complement poverty reduction strategies and can be a powerful tool for planning and implementing specific programs to reduce poverty and deprivation for this group (Khasnabis et al., 2010).

Strengths and limitations

This is one of the first studies analysing the levels of multidimensional poverty of people with disabilities, using a case-control study design with matching methods and the Washington Group Extended Questionnaire in three different LMICs. One advantage of case-control designs is that it allows to compare individuals controlling for some individual characteristics that might be associated to poverty. Although it is not possible to define the existence of a causal relationship between disability and poverty, the results provide important and strong evidence that disability and poverty are related.

Another strength of this study is the use of a comparable data source between countries, using the questions recommended by the Washington Group, in three countries with different economic, social and political characteristics. In addition, the fact that people with disabilities were assessed with different tools to define their disability status allow us to compute different measures using other definition of disability and testing how robust our results were.

In addition, the characteristics of the data allowed the design and computation of a multidimensional poverty adjusted ratio using the individual as unit of identification. Indicators included in our analysis are mostly related to individuals' deprivations capturing perceptions of attitudes and discrimination as well as access to basic opportunities (e.g. employment, education and health).

In terms of limitations, the first is that data from India and Cameroon were only collected in one district, therefore may not be generalizable to the whole country. Also, although the matching process allowed to control for individual characteristics it was not possible to control for other factors (such as level of education, employment, relationship with the head of the household), which might influence the association observed between disability and poverty. Another disadvantage is the fact that the data was collected in different years, aspect that limits the direct comparability of the results, therefore the comparison of the results should be carefully done. Finally, it was not possible to include important dimensions and indicators such as social participation or formal employment, given data limitations or other health indicators, and given data limitations some indicators might capture different phenomena in each country (for example social benefits).

Conclusions

This study analysed the levels of multidimensional poverty of people with disabilities in India, Cameroon and Guatemala and found that this group faces higher levels of multidimensional poverty in the three countries and have higher levels of deprivation in important indicators such as access to health care, school attainment and employment. In the three countries, disability was an important factor associated with living in multidimensional poverty and the increase in the probability of poverty was larger compared to other individual characteristics. The findings of this article provide important information in the monitoring of the achievement of the Agenda 2030 for people with disabilities. It is necessary to motivate governments to disaggregate their data by disability status and to analyse the achievements of different SDG indicators for this group. Only with this information, it will be possible to

guarantee people with disabilities are not left behind from development and poverty reduction strategies.

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Declaration of competing interest

There is no conflict of interest in this research.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2020.100591>.

Annex.

Table A1
Results from robustness analysis

	India Mahbubnagar District			Cameroon Fundong Health District			Guatemala		
	Disability Score								
	Severe	Moderate	Mild	Severe	Moderate	Mild	Severe	Moderate	Mild
Incidence	40.8	33.8	22.4	77.2	80.7	60.5	43.6	35.5	25.8
Intensity	53.1	55.3	50.3	54.8	53.0	50.8	54.1	51.7	50.5
Adjusted Headcount Ratio M_0	0.217	0.187	0.113	0.417	0.428	0.307	0.236	0.184	0.130
Functional Limitations*									
	Severe	Moderate	Mild	Severe	Moderate	Mild	Severe	Moderate	Mild
Incidence	53.8	40.0	23.5	69.2	75.2	69.4	22.0	21.1	15.1
Intensity	56.2	52.8	52.2	62.0	53.7	51.2	52.5	54.1	52.5
Adjusted Headcount Ratio M_0	0.303	0.211	0.122	0.429	0.404	0.355	0.220	0.211	0.151

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