

Multidimensional Child Poverty in Pakistan: The Multiple Overlapping Deprivation Analysis (MODA) Approach

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Abstract

Child poverty is a multidimensional phenomenon that affects millions of children worldwide, particularly in developing countries like Pakistan. The problem of child poverty in Pakistan is complex and multidimensional, involving economic, social, and political factors. The purpose of this paper is to examine multidimensional child poverty in Pakistan using the Multiple Overlapping Deprivation Analysis (MODA) approach, which is an internationally recognized tool for measuring child poverty. This study relies on data from the 2017–18 Pakistan Demographic and Health Survey (PDHS), which focuses on children between the ages of 0 and 5. This study employs five dimensions that are specific to children: nutrition, health, water, sanitation, and shelter. Results show that at the cutoff ($K = 0.33$), 85 percent of children are multidimensionally poor. Whereas, 40.3% in nutrition, 21.9% in health, 16.9% in water, 23.1% in sanitation, and 44.3% in shelter are deprived. The study findings emphasize the need for increased financial support from both provincial and central governments to reduce child poverty. The primary areas of focus should include enhancing economic prospects, upgrading healthcare services, enforcing compulsory education, and implementing measures to improve nutrition to alleviate child poverty.

Keywords: Multidimensional Child Poverty. MODA approach. Demographic and Health Survey, Pakistan

Introduction

One of the most vulnerable parts of society are children because they rely on others and do not have their own financial resources. Children are the most vulnerable population everywhere in the world. It is widely recognized that growing up in poverty can have lasting effects on individuals, impacting their opportunities in adulthood and society as a whole. To ensure that everyone has a fair chance in life, it is crucial to prioritize efforts to tackle child poverty. For the first time, child poverty is explicitly mentioned in the Sustainable Development Goals (SDGs) [UNDESA, 2016], as stated in target 1.2: "By 2030, reduce by at least half the proportion of men, women, and children of all ages living in poverty in all its dimensions according to national definitions".

In particular, the goal relates to three key points: (1) Children are considered as a separate group, treated as an independent unit of analysis. (2) Recognizing poverty as a multifaceted experience requiring a strategy that extends beyond monetary poverty based on income or expenditure (3) Finally, the goal needs to be defined at the national level, taking into account the circumstances and characteristics of the country. Although standardized measures such as purchasing power parity (PPP) of US\$1.90 per day are the basis of global comparison and an effective tool for measuring progress, they can still hide national disparities. By using a country-specific definition of poverty, poverty measures can be tailored to a specific context. Particularly for the growing category of middle-income countries, country-specific definitions help to highlight country-specific disparities.

The use of multidimensional poverty highlights progress in a particular dimension and helps to identify potential tradeoffs between dimensions that are obscured by measures of monetary poverty. Furthermore, the analysis of multidimensional poverty also allows you to choose a dimension that reflects the poverty of a country, irrespective of its location or development level. Identifying children as a distinct population allows more attention to be paid to the characteristics of children with special needs. This, along with the multidimensional poverty approach, emphasizes the need to measure children poverty more

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comprehensively than current methods, which only measure the proportion of children living in low-income households (White et al. 2003).

For many years, economists have recognized the multidimensional nature of poverty. The capability approach described in Amartya Sen's seminal work (Sen, 1981, 2001, 2009) has made it increasingly clear that poverty is multifaceted and extends beyond the availability of monetary resources. In recent years, there has been a significant increase in the use and acceptance of multidimensional poverty measures, particularly in the late 1990s and early 2000s. This is evident in the works of various authors such as Tsui (2002), Bourguignon and Chakravarty (2003), Alkire and Santos (2010), and Alkire et al. (2015). The World Bank-commissioned Atkinson Commission Report fully acknowledges the importance of using multidimensional poverty measures to monitor progress towards achieving SDG 1.

Besides the explicit mention of poverty in all its dimensions in the SDGs, there are several reasons why monetary measures of child poverty can be misleading. 1) Children usually rely on household income but do not have the right to make decisions. Household resources are not always distributed in an equitable or proportionate manner (Alderman et al., 1995). 2) The purpose of income is to achieve a better quality of life, and this is particularly important for children. Children well-being is crucial, and their development is dependent on access to essential goods and services such as water, education, and healthcare. Some critical aspects of their well-being, such as protection from violence and exploitation and their participation in society, cannot be purchased on the market. Therefore, public investment is essential to providing these necessities for children. Because children have unique developmental needs, measuring poverty in monetary terms may not be sufficient. Thus, it is crucial to use multidimensional indicators to understand and address poverty effectively. The main objective of this study is to apply the Multiple Overlapping Deprivation Analysis (MODA) methodology to estimate multidimensional child poverty (MCP) in Pakistan. The specific objective is to measure multidimensional child poverty at the regional level.

The paper contributes to the existing literature on child poverty and deprivation in two significant ways. First, the paper illustrates the use of a multidimensional child poverty measure with the application of UNICEF's rights-based multiple overlapping deprivation analysis (MODA) framework to a single country case study. Second, the paper uses the Pakistan Demographic and Health Survey 2017-2018 (DHS) data to assess the multidimensional child poverty in Pakistan. This study is an effort to explore the present situation, with facts and figures, regarding child poverty and deprivation in Pakistan.

Rest of the paper is organized as follows. Section 2 briefly revises the literature on multidimensional child poverty measures. Section 3 presents the methodology and data used in the paper. Section 4 presents the estimation results. Finally, section 5 presents conclusion and policy implications.

Literature Review

Recent literature review focuses on the topic of MCP, with Amartya Sen's contribution on poverty and inequality being particularly significant. Using household data from 46 countries, Professor David Gordon and colleagues conducted the first scientific study on child poverty, specifically in developing nations, in 2000. They used the Bristol methodology for the analysis and came to the conclusion that nearly one billion children in these countries are deprived (Gordon et al., 2003).

Bastos and Machado (2009) analyzed child poverty in Portugal. Data from 5,000 children who were randomly selected from those enrolled in the third and fourth grades of primary school in public schools in the Lisbon region and subjected to survey sampling were used in this study (Lisbon City and frontier municipalities). The observations date to the years 2005 and 2006 and comprise about 15% of the total population. The study used fuzzy set theory to assess the severity of child deprivation using the four dimensions of poverty: health, education, housing, and social integration. According to the findings, the most critical dimensions of deprivation were housing and social integration, especially for children, who were in the worst conditions. According to the study's findings, social integration of ethnic minorities, school support for kids whose parents don't have a lot of education, and social protection from unemployment should all be encouraged because they seem to be major factors in children deprivation.

Roelen et al. (2010) examined poverty among children in Vietnam aged 0–15 years by utilizing seven dimensions and 12 indicators, i.e., health, housing, education, sanitation and water, leisure, child labor and inclusion, and social protection, using Alkire and Foster's identification approach. Data has been drawn from the Multiple Indicator Cluster Survey for the year 2006. Results revealed that 37% of children are poor, with water, sanitation, and recreation being the areas of deprivation that contribute the most to multidimensional poverty.

Sher et al. (2012) used the MICS dataset for the year 2007–08 to measure multidimensional child poverty in Punjab at district and division levels. The study has applied Alkire and Foster methodologies. The following indicators were used in this study: vitamin A, health access, drinking water, immunization, overcrowding, and enrollment. The divisional analysis of child poverty reveals that the Gujranwala division is the least deprived and the Rawalpindi division is the most deprived in the drinking water dimension. The results also show that overcrowding and child deprivation contribute 58.33 percent to overall multidimensional child poverty, followed by enrollment at 47.05 percent. The study recommends taking specific actions to eradicate child poverty in the most deprived districts and divisions by allocating more funds to them.

Roche (2013) examined child poverty in Bangladesh using AF methodology and data from the MICS survey 2006. Water, measles vaccination, improved sanitation, overcrowded housing, vitamin A, learning support, and salt iodization were the eight dimensions of child wellbeing used in this study. The results showed that children who lacked access to better sanitation facilities suffered a greater prevalence of deprivation in rural than urban areas.

Sandra Garca (2014) demonstrated the multidimensional child poverty (MCP) index design and development in Colombia, which can be used for evaluation and policy design. The MCAP index was used to evaluate changes in multidimensional child and adolescent poverty over the years 2008, 2010, and 2011, using data gathered from household surveys. The study has used six dimensions of poverty: nutrition, water, education, health, sanitation, information, and housing. For estimation, the study used a mixed-method approach. According to the findings, one-third of Colombian children are poor, and water and sanitation are critical dimensions for all age groups.

Qi and Wu (2015) used the China Health and Nutrition Survey (CHNS) data to examine the MCP status and its dynamic changes in China from 1989–2009. This study used the AF methodology. Nutrition, sanitation, shelter, water, education, health, and information were the seven indicators used in the study. The study's findings demonstrate that overall poverty rates decreased both nationally and across provinces between 1989 and 2009. This study investigates the regional and provincial contributions to national poverty reduction using the property of decomposition for the M_0 . The greatest reduction in child poverty rates was seen in provinces in China's middle region, and there has been a narrowing of the regional disparity in child poverty. The government should therefore implement a multidimensional poverty strategy in the future to objectively assess the degree and severity of child poverty across China, allowing for the development of more effective anti-poverty programs.

Chzhen et al. (2016) examined child poverty in the EU for children aged one to the start of compulsory schooling. Data came from the EU-SILC 2009's ad hoc material deprivation module. Nutrition, clothing, education, child development, leisure, social healthcare access, information, and housing were the eight dimensions of poverty studied. The study has applied the MODA methodology for estimations. The findings show that children who are poor in the housing dimension are often deprived in numerous other dimensions at the same time in Romania, whereas in Finland and the UK, housing deprivation is less likely to overlap with other dimensions compared to other dimensions in the measurement of poverty. Overall, poor children in Romania experience three deprivations on average, whereas those in Finland and the United Kingdom typically experience only one deprivation at a time.

Ferrone (2017) studied multidimensional deprivations among children in Bosnia and Herzegovina using data from the 2011 Extended Living Standards Measurement Survey (ELSMS). Nutrition, education, clothing, leisure, information, housing, and social participation were the dimensions used in the study. The

MODA methodology was used to estimate them. Results showed that the majority of school-age children in Bosnia and Herzegovina are poor in more than one dimension. The children from low-income families are more likely to be poor in each component separately and in a greater number of aspects together. Overall, these findings highlight the need for a comprehensive policy strategy that addresses both the supply and demand for children goods and services.

Milliano and Plavgo (2018) examined MCP in thirty sub-Saharan African countries by using MODA methodology. The study selected seven dimensions: health, information, nutrition, water, education, housing, and sanitation. The findings showed that in thirty sub-Saharan African countries, 67 percent of all children experience at least two of the five critical deprivations for child development.

Mahrt et al. (2020) investigated MCP in Mozambique by using IOF data for the years 2014–15. The study has applied Alkire and Foster methodologies. This study selected eight dimensions of poverty: nutrition, education, child labor, family, water, health, sanitation, hygiene, housing, and participation. The results of the study reveal that for children aged 0–17, the incidence of poverty in rural areas is over three times higher than in urban regions, and the four most impoverished provinces are approximately 50 times poorer than the wealthiest province.

Byegon et al. (2021) examined the prevalence of multiple child deprivation and the key factors influencing it in Kenya using survey data from DHS for the years 1993 to 2014. This study has selected seven dimensions, i.e., health, nutrition, shelter, water, education, information, and sanitation, and has used the MODA methodology for estimations. The findings show that rural children, male children, and children living in non-electricity-connected families headed by a female have a higher incidence of multidimensional deprivation than their counterparts.

David Madden (2022) investigated multidimensional poverty for three waves of an Irish cohort of children aged 9 to 17 by using the AF methodology. Data from the first three waves of the Growing Up in Ireland (GUI) 9-year-old cohort were used in this study. Poverty is measured in this study across three dimensions: health, education, and family resources. According to the findings of the study, the greatest degree of mobility is observed in terms of family resources. Children whose mothers have lower levels of education have higher mobility, with net movements into rather than out of poverty.

Itishree Pradhan and Jalandhar Pradhan (2023) used Alkire-Foster methodology and data from two rounds of the National Family Health Survey (NFHS), NFHS-4 (2015-16) and NFHS-5 (2019-21), to assess reductions in MCP in India. The four dimensions of child wellbeing used in this study were health, early childhood development, standard of living, and washing. According to the findings, the incidence of child poverty in India decreased by more than 40% between 2015-16 and 2019-21 (46.6-27.4%), while the MCPI decreased by half (24.2-12.6%). Urban areas, northern regions, Other Backward Classes (OBCs), and Hindus have experienced the greatest relative decline in MCPI. Children from rural areas, Scheduled Castes (SCs), Scheduled Tribes (STs), and Muslim families perform poorly.

Data and Methodology

The dataset used in this study is the Pakistan Demographic and Health Survey (2017-18). The Pakistan Demographic and Health Survey (PDHS) 2017-18 is a nationally representative survey conducted by the National Institute of Population Studies (NIPS) with technical assistance from the International Institute for Population Sciences (IIPS). The survey provides comprehensive information on population, health, and nutrition indicators at the national and provincial levels in Pakistan.

Empirical Methodology

This study used a methodology for multidimensional child poverty measurement proposed by (De Neubourg et al. 2012).

The UNICEF methodology of Multiple Overlapping Deprivation Analysis (MODA) is used in this study to estimate multidimensional child poverty in Pakistan. "With various dimensions and indicators, the multifaceted aspects of child poverty and deprivation are addressed comprehensively by the MODA approach" (Plavgo et al. 2013). This methodology primarily aligns with the Alkire and Foster (AF) method.

However, the MODA approach faces certain limitations driven by data availability and constraints: The primary weakness of this approach is weight. There is no scientific way to calculate the weights of each indicator and dimension. For different age groups of children, the MODA approach assigns equal weight to all indicators and dimensions. Overlapping deprivation is the second MODA methodology weakness. This is due to the lack of indicator data for all children. Some indicators apply specifically to children under the age of two, while others are used for children aged three to five. There is a gap between the age ranges covered by individual and overlapping deprivation analyses. Decomposition analysis also provides a comprehensive picture of how child poverty affects overall, multidimensional poverty. For children wellbeing analysis, UNICEF's research office reconstructed this comprehensive approach with the collaboration of the policy and strategy division. MODA is distinguished from other studies by four key features:

1. Children are the focus of analysis instead of households.
2. The study uses a life-cycle approach to measure deprivation across different age groups.
3. MODA considers multiple dimensions of well-being (health, education, nutrition, living standards, and child development) using an overlapping analysis.
4. The study has a whole-child orientation that takes into account geographical and social factors.

In this section, the study provides the step-by-step process and decision to be taken for the multidimensional deprivation.

Step 1: Select a field, dimensions, and child well-being indicators

MODA is a method based on child deprivation analysis, which means that any field, domain, or indicator of child well-being can be utilized. This study estimates multidimensional deprivation using five dimensions and eleven indicators.

Table 1. Multidimensional child poverty Dimensions, Indicators

Dimension	Indicator
Nutrition	Height for age
	Weight for age
Health	Vaccination against BCG and Polio
Water	Drinking water source
	Distance to water source
Sanitation	Type of toilet facility
Shelter	Material of floor and roof

Deprivation Thresholds

- **Nutrition:** As per the WHO criteria, a child is considered poor in the nutrition dimension when the z-scores fall below two standard deviations (SD) of the reference median.
- **Health:** According to the WHO standard, a child is said to be poor in the health dimension if they do not receive BCG and polio (types 1, 2, and 3) vaccinations according to the time specified on their child health card.
- **Water:** The water dimension considers a child to be deprived if they have to use unsafe sources of drinking water, such as an unprotected well, spring, or surface water, or if the source of drinking water is situated more than 30 minutes' walk away (round trip) according to UNICEF in 2015.
- **Sanitation:** A child is said to be poor in the sanitation dimension if s/he has access to inadequate sanitation facilities (UNICEF, 2015).
- **Shelter:** As per the criteria set by UN-HABITAT, if a child's dwelling has a floor made of sand, earth, or dung, and the roofing material is palm leaf or thatch, then the child is considered to be poor in the dimension of shelter.

Step 2: Define deprivation and specify its dimensions

Nutrition Dimension

Beyond being a fundamental human right, nutritional well-being is crucial for developing human capital. Malnutrition has a significant impact on children under five in developing nations, primarily due to insufficient access to food and poor health (Reinhard & Wijayaratne, 2002). Several indicators, including

underweight, stunting, and wasting, are used to assess malnutrition in children under the age of five (Maken & Varte, 2012). Anthropometric measures of weight for age and height for age are used in this study to assess malnutrition in children under the age of five. This study employs the stated z-scores of the WHO threshold guideline for underweight and stunting deprivation. If a child's z-scores fall below two standard deviations (SD) of the reference median, they are considered deprived in the nutrition dimension.

Health Dimension

The third significant goal of the SDGs is health, which is defined as "ensuring healthy lives and promoting well-being for people of all ages" (UNDP, 2016). To estimate the health dimension, this study uses immunisation data for BCG and polio types 1, 2, and 3. A child is said to be deprived in the health dimension if he or she has never received BCG and polio vaccinations before the age of five.

Water Dimension

Two indicators are used to measure the third dimension, which is water: 1) Drinking water source 2) the time it takes to fetch water. Children who consume water from open sources are at risk of contracting various water-borne illnesses such as cholera, dysentery, hepatitis A, polio, schistosomiasis, and typhoid. Moreover, children who must travel long distances to access water may experience adverse effects on their academic performance. According to WHO (2019), a child who uses an unprotected spring, unprotected well, or surface water as their primary source of drinking water, or if the water source is more than a 30-minute round trip walk away, is considered deprived in the water dimension.

Sanitation

One of the dimensions examined in the study was sanitation, which looked at the types of toilet facilities available in households with children. Improper storage of human waste can lead to severe illness, such as diarrhea, which can be fatal for children. Unfortunately, many underprivileged children grow up in homes that lack even the most basic forms of sanitation, leaving them with no option but to defecate in the open. This can have serious implications for the health of the community, particularly when combined with the presence of open water sources. This study identified a child as poor in the sanitation dimension if they had access to unimproved sanitation facilities.

Shelter

The fifth dimension is shelter, for which we investigated the roofing and flooring materials of households. A child's well-being is harmed when he or she lives in a poorly constructed house made of inferior materials. It may also have an impact on a child's psychological emotions when they meet with other classmates at school, lowering their self-esteem and thus their ability to maintain relations with their peers (Makhalima, 2020).

Choose a Unit of Analysis

In line with the MODA approach, this study uses children as the unit of analysis to highlight each child's specific needs. This study focuses on children under the age of five.

Define Weights

The weights allocated to each dimension represent the relative importance or value assigned to various dimensions considered in the analysis. In accordance with the MODA approach, no explicit weights have been assigned to each dimension when counting the deprivations suffered by every child, with each dimension being weighted equally. All of the indicators included for this analysis are assumed to be equally important because deprivation is defined as the non-realization of one or more of the children rights derived from the Convention on the rights of the child (CRC) and other international standards.

Define cutoffs

MODA used a dual cutoff strategy. The choice of any of these methods required the consideration of well-known information or judgment. This methodology gives results at all possible cutoff points. In this study, the union and intermediate cutoff methods were used to identify single- and multidimensional deprivation. At the single-dimension level of analysis, this study employs a union approach: a child is poor in a particular dimension if they experienced at least one form of deprivation in the relevant indicator associated with that dimension, as determined by aggregate level analysis. This study

employs an intermediate approach: if a child is poor in more than three dimensions, he or she is considered multidimensionally poor. To assess Pakistan's overall multidimensional poverty, this study proposes a soft cut-off point of $k = 0.33$ out of 5 dimensions.

Single deprivation based on indicators and dimensions.

The percentage of children who are considered to be poor in each indicator and dimension relative to the child reference population, to which each indicator and dimension refers, is known as the deprivation headcount ratio. The headcount ratio is calculated using the formula below:

$$h_{j,r} = q_{j,r}/n_r$$

$$q_{j,r} = \sum y_j$$

Where, h = headcount ratio, q = no. of poor children, n_r = total no. of children

Similar formula can be used when calculating the headcount ratio by dimension.

Step 7: Overlapping Deprivation

Deprivation overlap analysis is performed using the MODA approach (De Neubourg et al., 2012) to determine the extent to which different sectoral deprivations overlap and to identify which types of deprivation children experience simultaneously.

Step 8: Multidimensional Child Poverty at Different Cutoffs.

Multidimensional headcount deprivation counts the no. of children who are poor at each cutoff value. The following are the multidimensional deprivation measures:

1. Based on the threshold, assign each indicator a status of deprivation.
2. After deprivation is assigned to indicator, if she or he is poor in any indicator, they are also considered poor in the respective dimension.
3. In the second stage, combine all deprivation statuses from overlapping dimensions.
4. The cutoff point for multidimensional poverty in this study is $k=0.33$ i.e., if a child is poor in more than three dimensions, he or she is considered multidimensionally deprived.

This is defined as follows:

$$Y_k = 1 \text{ if } d_i > k$$

$$Y_k = 0 \text{ if } d_i < k$$

Following formula can be used for the estimation of multidimensional deprivation of child headcount

$$H = q_k/n_a$$

$$q_k = \sum y_k$$

Where, H : headcount of children who are multidimensionally poor, q_k : total no. of children who are multidimensionally poor, n_a : total no. of children, k : cutoff point

The level of deprivation among children who experience multidimensional deprivation is evaluated using the average intensity of multidimensional deprivation (A). It is the total of all current deprivations between children who have been identified as being poor, expressed as a proportion of the total of all potential deprivations between those who are poor in at least k dimensions. Finally, M_0 is the product of the multidimensional child deprivation headcount ratio and the A .

Step 9: Multidimensional poverty Decomposition by Dimensions.

Understanding the extent and impact of dimensions to multidimensional deprivation or M_0 decomposition is a critical step. To understand each dimension's contribution to M_0 , consider the following formula:

$$p_j = \sum (y_j * y_k) / n_a * d * M_0$$

Where, P_j : each dimension's contribution to the M_0 ; $\sum (y_j * y_k)$: total no. of poor children in the respective dimension as well as multidimensionally poor; n_a : total children, d : total dimensions, M_0 : Adjusted headcount ratio.

Results

This section focuses on the results of the study. First, it gives an overview of aggregate results at the country level and then discusses the aggregate results for rural and urban areas of Pakistan separately. After providing the results at the area level, this section exhibits the breakdown of multidimensional child poverty at the regional level.

Aggregate results

To better understand the scope of multidimensional deprivation among five year children in Pakistan, this section presents extensive empirical findings. The empirical findings are divided into four sections; Analysis of single deprivation, Analysis of overlapping deprivation, Analysis of multidimensional deprivation, and Dimensional decomposition.

Analysis of Single Deprivation

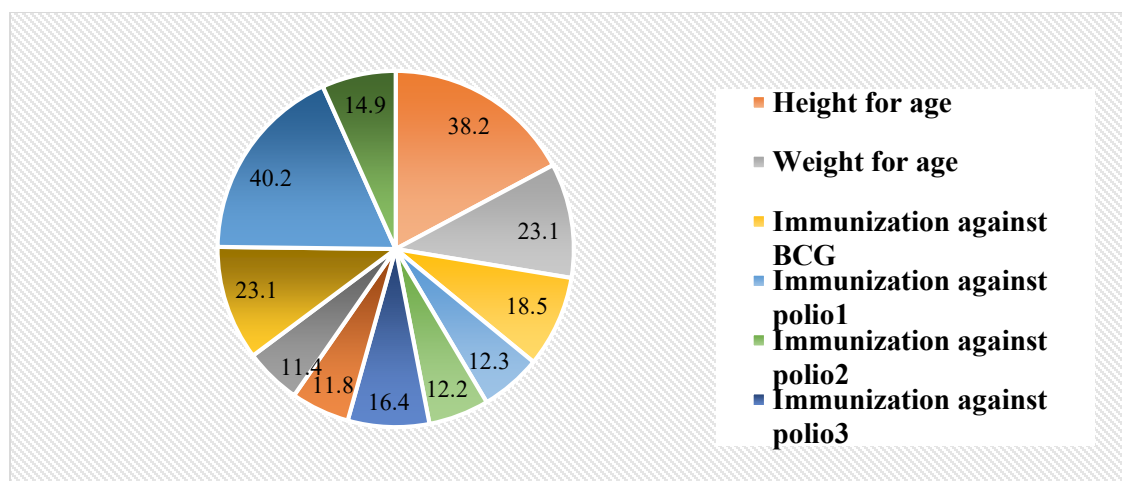
Table 2 indicates that a significant percentage of children face deprivation in various indicators. Specifically, 38.2% of children are deprived in terms of height for age, 23.1% in weight for age, 18.5% in BCG immunization, 12.3% in polio 1, 12.2% in polio 2, 16.4% in polio 3, 11.8% in access to a reliable drinking water source, 11.4% in the distance to a water source, 23.1% in toilet facilities, 40.2% in the type of flooring material, and 14.9% lack proper roofing material.

Table 2. Incidence of Deprivation by Indicator

Indicator	Deprived (%)
Height for age	38.2
Weight for age	23.1
Immunization against BCG	18.5
Immunization against polio1	12.3
Immunization against polio2	12.2
Immunization against polio3	16.4
Drinking water source	11.8
Water source distance	11.4
Type of Toilet facility	23.1
Flooring material	40.2
Roofing material	14.9

Source: Authors' calculation.

Figure 1. Percentage of Children Deprived in Incidence of Deprivation by Indicator



Source: Authors' calculation.

Deprivation Incidence by Dimension

Combining indicator-wise deprivation results in single-dimensional level analysis. A child is considered to be poor in each indicator if they are poor in any one of them. Dimensional deprivation

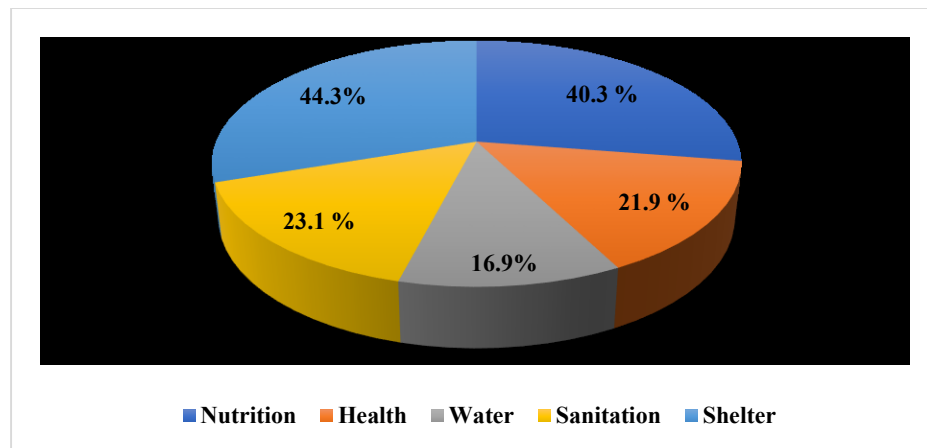
highlights Pakistan's pathetic situation overall: 40.3% of children are deprived in nutrition, 21.9% in health, 16.9% in water, 23.1% in sanitation, and 44.3% are deprived in shelter dimension (Table 3).

Table 3. Deprivation Incidence by Dimension

Dimension	Deprived (%)
Nutrition	40.3
Health	21.9
Water	16.9
Sanitation	23.1
Shelter	44.3

Source: Authors' calculation.

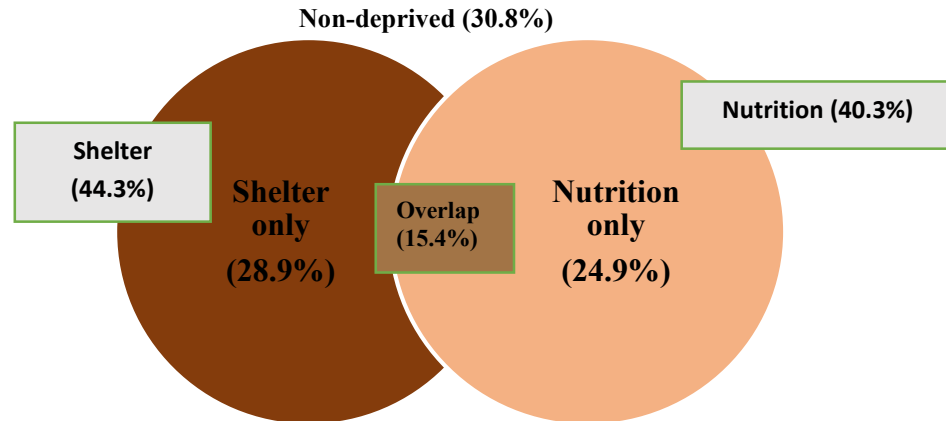
Figure 2. Percentage of Children Deprived in Deprivation Incidence by Dimension



Source: Authors' calculation.

Analysis of overlapping deprivations

Figure 3. Overlapping of Two Dimensions: 0 to 5-year age



Source: Authors' calculation.

The two-circle Venn diagram in Figure 3 shows the overlap between two dimensions that have the highest headcount: shelter (44.3%) and nutrition (40.3%). The results show that 30.8% of all the children below the age of five did not suffer from any of the two deprivations analyzed. While 40.3% of all the children under five were deficient in the nutrition dimension, 24.9% were deficient in nutrition only. This reveals that the underweight and/or stunted children were not deprived in the shelter dimension. At the same time, 15.4% of all the children below the age of five were deprived in nutrition and shelter dimensions simultaneously.

Multidimensional Deprivation Analysis

This study provided a single deprivation analysis, identifying the number of deprived children by indicator and dimension, as outlined in previous sections. The analysis of multiple deprivations offers a comprehensive understanding at each cutoff point. To assess the overall situation of multidimensional deprivation, the following three deprivation ratios are applied: the deprivation headcount ratio (H), which shows the percentage of multidimensionally deprived children; the average deprivation intensity (A), which shows the average breadth of child deprivation; and the adjusted headcount ratio (M_0), which is determined by adjusting the headcount ratio (H) for the average deprivation intensity (A).

Table 4. Multidimensional child deprivation measure estimates at different cut-offs

	k = 0.10	k = 0.33	k = 0.50	k = 0.67
H	0.96	0.85	0.68	0.43
A	0.63	0.69	0.76	0.86
M_0	0.61	0.59	0.52	0.37

Source: Authors calculation

Table 5. Headcount, Intensity of Deprivation, and Multidimensional Child Poverty by Residence at $k=0.33$

	H	(M_0)	$A=M_0/H$
Pakistan	0.85	0.59	0.69
Urban	0.94	0.69	0.80
Rural	0.78	0.50	0.64

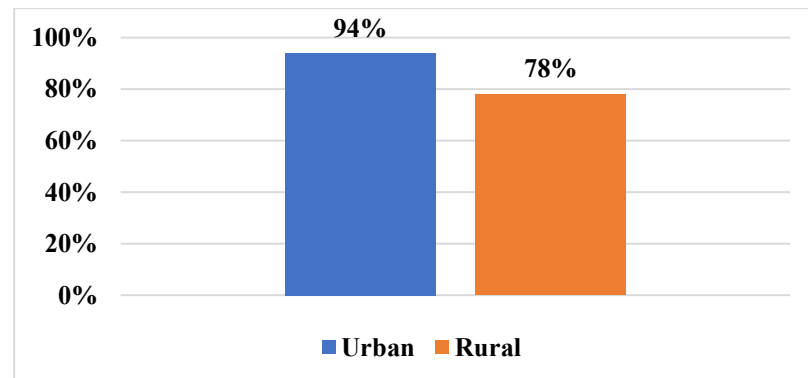
Source: Authors' calculation

It has been shown that about 59% of children are multidimensionally poor. The headcount ratio showed that 0.85 percent of people are multidimensionally poor ($k = 0.33$) in Pakistan (Table 5). The intensity of poverty (A) means that these 0.59 percent of the poor are deprived in 0.69 % of the dimensions on average. According to the results, 59 percent of the population of children is multidimensionally deprived, while the rest of the population is considered non-deprived.

The findings show that urban areas have a higher incidence and severity of poverty than rural areas. It illustrates that the headcount ratio of multidimensionally deprived children in urban Pakistan is 94%, while in rural Pakistan the percentage of poor children is 78%. Because urban children born into poor families face the economic hardships of their parents as well as the effects of poor urban living conditions and limited access to high-quality healthcare and education.

As a result of Pakistan's fast-paced urbanization, underprivileged families residing in urban areas face unfavorable living conditions, restricted access to basic services, limited job prospects, and exposure to health and environmental hazards. Various factors including slow economic growth, structural adjustment policies, rising food prices, a dearth of employment opportunities, and a housing shortage have all contributed to the surge in urban poverty (Zaidi, 2011).

Figure 4. Multidimensional Child Poverty Headcount by Place of Residence

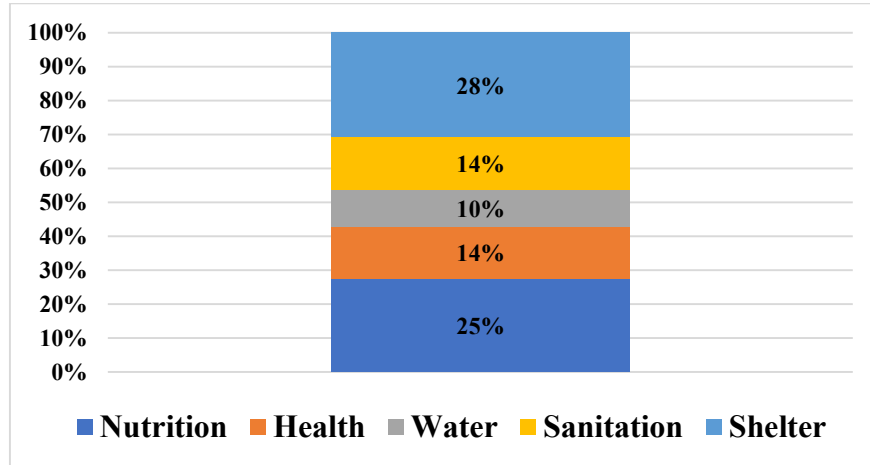


Source: Authors' calculation.

Decomposition by Dimensions

In order to comprehend the extent and impact of various dimensions on multidimensional deprivation, it is necessary to break down or decompose the data into its individual components. This section decomposes all of the dimensions when using the MODA index to show which dimensions contribute the most to child poverty.

Figure 5. Decomposition by Dimension: 0-5 years

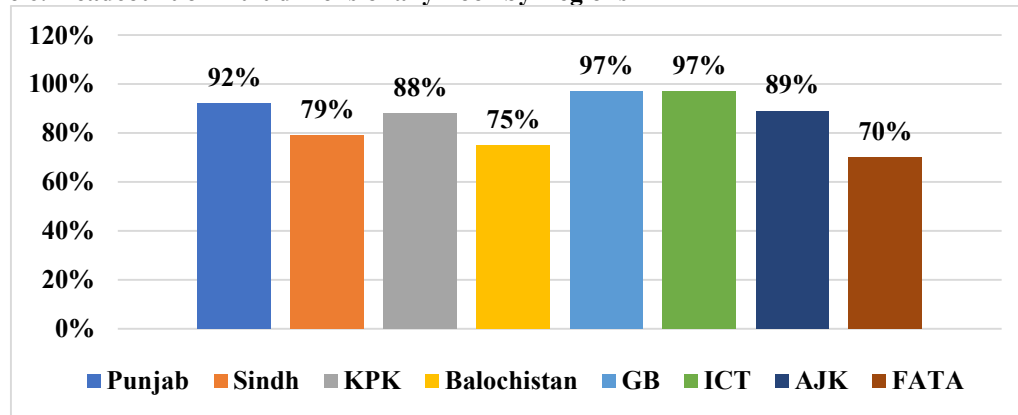


Source: Authors' calculation.

Figure 5 demonstrates the decomposition by dimensions for the younger age group. Shelter and nutrition both contributed 28% and 25%, respectively, to multidimensional deprivation. Health (14%), sanitation (14%), and water (10%) are the dimensions that have the least impact on child poverty in this age group.

Aggregate Results at Regional Level:

Figure 6. Headcount of Multidimensionally Poor by Regions



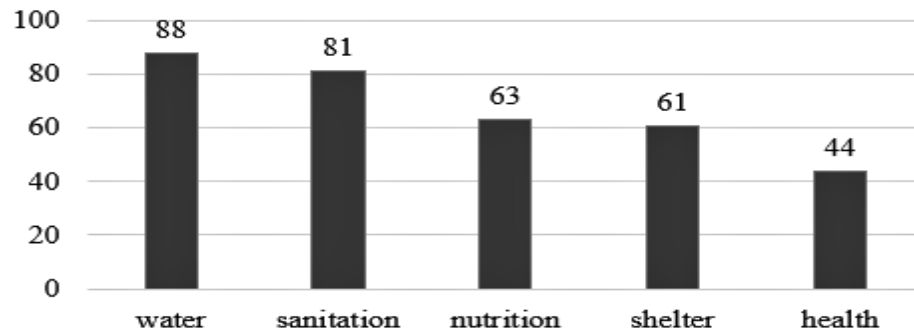
Source: Authors calculation.

Figure 6 shows the percentage of children living in multidimensional poverty in all eight regions. It can be seen in the graph that the GB and ICT region is the most deprived among all eight, with a 97% headcount of multidimensionally poor children. While the FATA region is the least deprived among the regions, with a 70% headcount of multidimensionally poor children.

Regional Level Deprivation

This section presents the results of MCP index for eight regions separately.

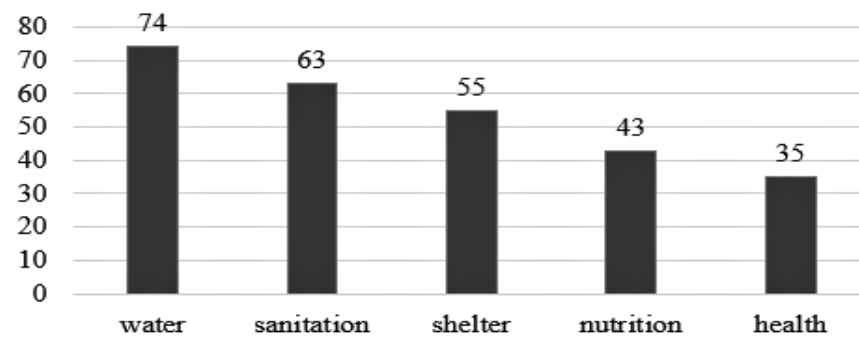
Figure 7. Percentage Deprivations of Children in Each Dimensions (Punjab)



Source: Authors calculation

Figure 7 depicts the percentage of children who are poor in each dimension separately in the Punjab region. From figure 7, it can be observed that about 88% of children are poor in the water dimension. Approximately 81% of children don't have proper hygiene facilities in the Punjab region, and 63% of children are deprived in the nutrition dimension. Figure 7 shows that approximately 61% of children are poor in the shelter dimension, while 44% of children are poor in the health dimension.

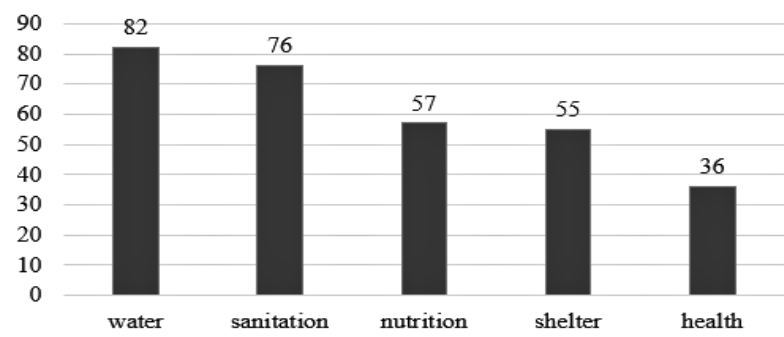
Figure 8. Percentage Deprivations of Children in Each Dimensions (Sindh)



Source: Authors calculation

Figure 8 shows the dimensional wise breakdown of poor children residing in Sindh. This figure displays that 74% children are poor in water dimension. Similarly, 63% children are deprived in the dimension of sanitation. About some 55% of children are poor in the shelter dimension. Figure 8 also shows that approximately 43% of the children are poor in the dimension of nutrition and 35% children are poor in health dimension.

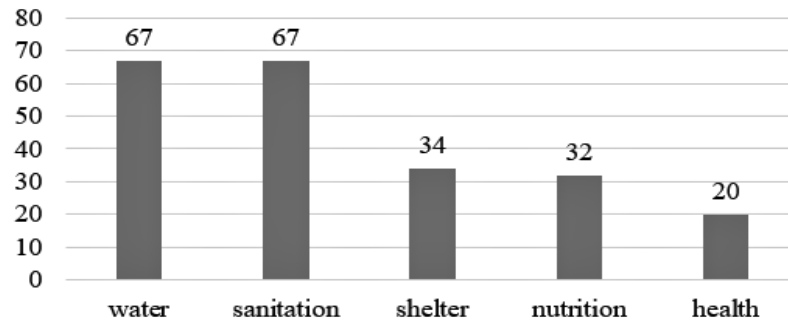
Figure 9. Percentage Deprivations of Children in Each Dimensions (KP)



Source: Authors calculation

Figure 9 shows dimensional wise deprivations of children KPK region. Figure 9 illustrates that 82% children are poor in water dimension. 76% of children face lack of basic sanitation facilities in KPK. Around 57% children are poor in the nutrition dimension. Some 55% of children are poor in shelter dimension and 36% children are poor in health dimension which means that almost 36% children, not even a single child has been immunized for the Polio and BCG.

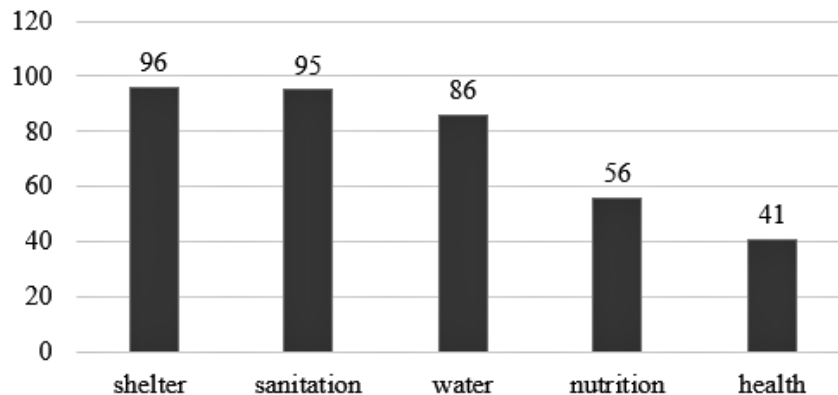
Figure 10. Percentage Deprivations of Children in Each Dimensions (Baluchistan)



Source: Authors calculation

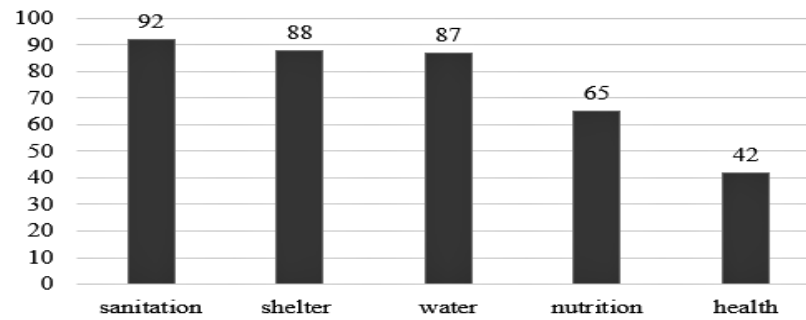
Figure 10 represents the percentage of children poor in each dimension in Baluchistan region. 67% children are poor in water and sanitation dimension, whereas, 34% children are deprived in the dimension of shelter. About 32% children deprived in the dimension of nutrition and 20% children deprived in health dimension.

Figure 11. Percentage Deprivations of Children in Each Dimensions (Gilgit Baltistan)



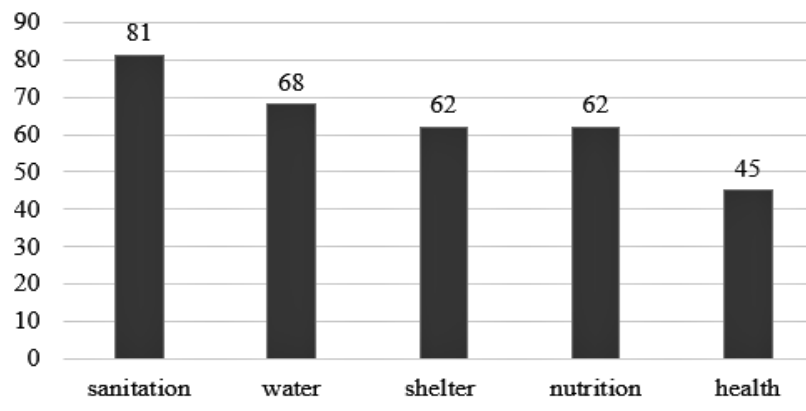
Source: Authors calculation

Figure 11 depicts the percentage of children poor in each dimension in region Gilgit-Baltistan. From the figure 11 it can be observed that about 96% of children are poor in shelter dimension. About 95% of the children don't have proper sanitation facilities in the region GB, and 86% children are deprived in water dimension. Figure 11 shows that almost 56% of the children are poor in nutrition dimension and about 41% children are poor in health dimension.

Figure 12. Percentage Deprivations of Children in Each Dimensions (Islamabad Capital Territory)

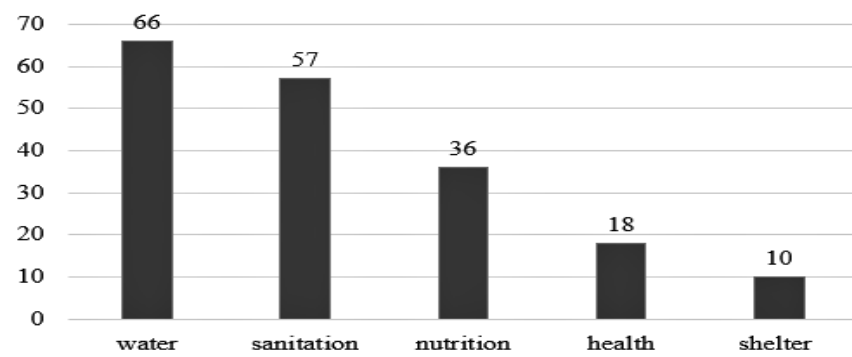
Source: Authors calculation

Figure 12 shows the dimensional wise deprivation of children living in ICT region. Figure demonstrates that 92% children are poor in sanitation dimension. Similarly, 88% children are deprived in the dimension of shelter. About some 87% of children are poor in dimension of water, 65% of the children are poor in nutrition dimension and 42% children are poor in dimension of health.

Figure 13. Percentage Deprivations of Children in Each Dimensions (Azad Jammu and Kashmir)

Source: Authors calculation

Figure 13 shows dimension wise deprivations of children in the region of AJK. This figure demonstrates that 81% children poor in sanitation dimension. 68% children in AJK are deprived in water dimension. About 62% children are deprived in the dimension of shelter. Some 62% of children are deprived in the dimension of nutrition and 45% children are poor in health dimension which means that almost 45% children, not even a single child has been immunized for the Polio and BCG.

Figure 14. Percentage Deprivations of Children in Each Dimensions (Federally Administrated Tribal Area (FATA))

Source: Authors calculation.

Figure shows the % of children deprived in each dimension separately in region FATA. Figure illustrates that 66% children are deprived in water dimension and 57% are deprived in the dimension of sanitation. Some 36% of the children deprived in the dimension of nutrition. About 18% children deprived in the dimension of health and 10% children deprived in shelter dimension.

Conclusion and Policy Recommendation

This study uses the MODA methodology to measure Multidimensional Child Poverty in Pakistan using Pakistan Demographic and Health Survey data for children aged 0–5. This study used five child-specific dimensions, namely: health, nutrition, water, shelter, and sanitation. Results show that at the cutoff ($K = 0.33$), 85 percent of children are multidimensionally deprived. Whereas 40.3% in nutrition, 21.9% in health, 16.9% in water, 23.1% in sanitation and 44.3% in shelter are deprived. There is a significant disparity between urban and rural multidimensional child deprivation, with 94% of urban children under five years old deprived, compared to 78% in rural areas. Because urban children born into poor families face the economic hardships of their parents as well as the effects of poor urban living conditions and limited access to high-quality healthcare and education. Undoubtedly, Pakistan confronts numerous challenges in its pursuit of economic development, both nationally and regionally. A significant portion of the population grapples with issues such as poverty, food insecurity, unemployment, illiteracy, healthcare concerns, inadequate access to clean drinking water, housing shortages, and inadequate sanitation facilities. The study findings underscore the necessity for increased investment in initiatives aimed at reducing child poverty. It is the collective responsibility of government agencies, policymakers, grassroots organizations, political parties, and non-profit organizations to design development policies focused on specific regions, areas, and communities. Therefore, federal and provincial governments should prioritize improving economic opportunities, healthcare, education, and nutrition to raise living standards at the regional and local levels.

References

- Amélia Bastos & Carla Machado, (2009). Child poverty: a multidimensional measurement, *International Journal of Social Economics*, Emerald Group Publishing, vol. 36(3), pages 237-251, February.
- Chzhen, Y., & Ferrone, L., (2017). Multidimensional Child Deprivation and Poverty Measurement: Case Study of Bosnia and Herzegovina, *Springer Science and Business Media Dordrecht*, 131:999–1014.
- Isaiah Kiprono Byegon, Jane Kabubo-Mariara & Anthony Wambugu. (2021). *The link between socio-economic factors and multiple child deprivations in Kenya*, *Cogent Economics & Finance*, 9:1, 1938378.
- José Roche., (2013). Monitoring Progress in Child Poverty Reduction: Methodological Insights and Illustration to the Case Study of Bangladesh, *Social Indicators Research: An International and Interdisciplinary Journal for Quality-of-Life Measurement*, Springer, vol. 112(2), pages 363-390, June.
- Marlous Milliano & Ilze Plavgo, (2018). "Analyzing Multidimensional Child Poverty in Sub Saharan Africa: Findings Using an International Comparative Approach," *Child Indicators Research*, Springer; *The International Society of Child Indicators (ISCI)*, vol. 11(3), pages 805-833, June.
- Mahrt, K., Rossi, A., Salvucci, V. et al. (2020). Multidimensional Poverty of Children in Mozambique. *Child Ind Res* 13, 1675–1700.
- Makhalima, Jabulile & Sekatane, Mmapula & Dunga, Steven. (2014). Determinants of Child Poverty in a South African Township: A Case of Boipatong Township. *Mediterranean Journal of Social Sciences*. 5. 10.5901/mjss.2014. v 5n1p235.
- Madden, D. (2022). The Dynamics of Multidimensional Poverty in a Cohort of Irish Children. *Child Ind Res* 15, 1631–1671.
- Pradhan, I., & Pradhan, J. (2023). Assessing reduction in multidimensional childhood poverty in India: a decomposition analysis. *BMC public health*, 23(1), 2024.
- Qi, Di & Wu, Yichao. (2015). A multidimensional child poverty index in China. *Children and Youth Services Review*. 57. 10.1016/j.childyouth.2015.08.011.

- Roelen, K., Gassmann, F. & de Neubourg, C. (2010). Child Poverty in Vietnam: Providing Insights Using a Country-Specific and Multidimensional Model. *Soc Indic Res* 98, 129–145.
- Sher, F., Awan, R. U., Iqbal, T., & Javed, K. (2012). Measurement of Multidimensional Child Poverty: A District Level Analysis for Punjab, Pakistan. *Business Management Dynamics*, Vol.1, No.11, pp.06-20.
- Swati Dutta, 2021. Multidimensional Deprivation among Children in India and Bangladesh, Child Indicators Research, Springer; *The International Society of Child Indicators* (ISCI), vol. 14(3), pages 917-955, June.
- Seyed Hossein Mohaqeqi Kamal, Gholamreza Ghaedamini Harouni, Mehdi Basakha & Sara Makki Alamdari (2019) Multidimensional Child Poverty Index in Iran: Distribution of Deprivation across Provinces, *Journal of Poverty*, 23:4, 353-364.
- Yekaterina Chzhen & Chris Neubourg & Ilze Plavgo & Marlous Milliano, (2016). Child Poverty in the European Union: the Multiple Overlapping Deprivation Analysis Approach (EU MODA), Child Indicators Research, Springer; *The International Society of Child Indicators* (ISCI), vol. 9(2), pages 335-356, June.