

TRENDS OF MULTIDIMENSIONAL INEQUALITY IN PAKISTAN

¹*Shahid Naeem, ²Dr. Atta Ullah Khan

¹ PhD Scholar, Department of Economics, Preston University- Islamabad Campus, Pakistan.

*Corresponding Email: shahid97@gmail.com

² Associate Professor, Department of Economics, Preston University, Islamabad Campus, Pakistan.

Email: attaullah982@yahoo.com

ARTICLE INFO	ABSTRACT
<i>Article History:</i> Received: 17 Aug 2019 Revised: 05 Oct 2019 Accepted: 21 Dec 2020 Available Online: 05 Jun 2020 <i>Keywords:</i> Multidimensional Inequality in Pakistan <i>JEL Classification:</i> D63, I14, I24	The devastating dynamics of multidimensional inequality has always been a debatable issue over the history of developing globe. This paper develops an index of multidimensional inequality (MDI) using the same dimensions and weights that has been used by Government of Pakistan over a ten-year period using Pakistan Social and Living-standard Measurement (PSLM) survey data for 2004-05 and 2014-15. The analysis show that along with overall decreased MDI in Pakistan, the direction of change remains different for urban and rural areas. The overall reduction in MDI is larger in urban areas compared to a little deterioration in the rural areas of the country. The analysis also show that MDI decreased in Punjab, Sindh and Khyber Pakhtunkhwa provinces while it deteriorated in Balochistan. An examination of the dimensions show that lack of education contributes more in the level of inequality, followed by access to health services. Education level of the head of household, level of income and family size were found to be strongly associated with factors contributing to the status of a household in terms of its contribution to MDI.

© 2020 The authors, under a Creative Commons Attribution-Non-Commercial 4.0

1. INTRODUCTION

There is ample evidence that the inequality has not improved significantly despite considerable decrease in poverty in most countries during the last 25 years. Income inequality is typically higher in developing and emerging economies than in advanced economies. In major emerging economies, income inequality has increased over the past three decades. The picture is mixed in case of the developing world¹. This does not really match with the basic objective of economic development viz. improving the living standards of the common people to imply that fruits of development are not equitably shared amongst the populations. This indicates that growth and income distribution jointly determine the impact on the living standards, which warrants an examination of inequality in a society.

1.1 Background of the Study

Economists have believed for a long-time in the existence of an inverse U-shaped relationship between inequality and growth, whereby high levels of inequality tend to be associated with increases in growth in the initial stages of development (Kuznets, 1955; Adelman and Morris, 1973). However, recent empirical research does not support this hypothesis. The study of inequality has largely taken place within single dimensions such as income, health and education, reflecting that the experts predominately concentrate on a particular discipline and field of study at one time. Majority of the discourse on inequality has focused on income inequality, and hence our knowledge of income inequality has advanced considerably over the last few decades. There is enough evidence that increasing inequality (within and across countries) has started to harm the very fabric of societies. A consensus is emerging across a number of high-profile specialized organizations and experts that more needs to be done to halt this trend of increasing disparities. This requires ensuring that the benefits of growth are shared more equitably and that solutions are found to limit any harmful impact (see, for example, Stiglitz, 2012; Piketty 2014; Atkinson, 2015).

There is a growing recognition that inequality and poverty are better understood in the multidimensional spectrum; thereby giving the deeper and wider view of the situation. Although an income poverty line remains a useful and consistent way of identifying individuals faced with risk of poverty, only income measure is not sufficient to pick

¹ <https://www.weforum.org/agenda/2018/11/is-income-inequality-rising-around-the-world>

up how individuals' deprivation varies across key aspects of their lives. This has led to the development of multidimensional poverty measures, such as the Global Multidimensional Poverty Index (Alkire and Foster, 2011), and material deprivation measures (for example, the EU's measure which picks up the inability to afford some items considered by most people to be desirable or even necessary to lead an adequate life), to complement income-only measures.

Just like poverty, inequality exists in various other forms apart from just income and consumption metrics. Likewise, the UNDP's human development report looks at inequality of opportunities that lead to inequality of capabilities (UNDP, 2019). Access to education, health facilities etc. are also important determinants of inequality (Haq, 1976). Therefore, researchers opine that inequality is also a multidimensional phenomenon just like poverty. It is, therefore, essential to analyze inequality based on other dimensions of well-being as well, e.g. education, health, living standard, nutrition, etc. This paper develops a multidimensional index of inequality on similar lines as the Foster & Alkire multidimensional poverty index (MPI) for the overall assessment of inequality in Pakistan. The analysis also looks at the change in multidimensional inequality over the period 2004-05 to 2014-15. In addition, decomposition analysis is also carried out to get insights into major drivers of multidimensional inequality in the country over the two points in time.

1.2 Research objectives

The research is carried out based on the following objectives:

- To develop a measure to assess multidimensional inequality on similar lines as the Foster & Alkire multidimensional poverty index (MPI).
- Assessment of inequality in Pakistan, and changes over the period 2004-05 to 2014-15.
- Decomposition analysis to get insights into major drivers of multidimensional inequality in the country over the two points in time.

1.3 Statement of the problem

A number of studies claim that multidimensional poverty in Pakistan has reduced over time. There is need to see if this change in multidimensional poverty is accompanied with a reduction in multidimensional inequality or not; and what are the drivers of the change in the multidimensional inequality in Pakistan.

2. REVIEW OF LITERATURE

2.1 Inequality

There exists a large body of empirical research examining inequality in the context of both developed and developing countries. However, studies examining inequality in a multidimensional setting are more limited, with some of the more recent ones making use of the approach of the multidimensional poverty measurement. Income is not sufficient to evaluate welfare, there are some other attributes of well-being, e.g. education, health etc. (Sen, 1987). According to Sen (1973) inequality measures can be classified into two broad types, the objective and the normative. Whereas objective measures of inequality e.g. variation in housing quality (e.g. overcrowding and housing quality index) look at the physical aspects of inequality, the normative measures of inequality consider inequality by viewing its effect on social welfare function. In this approach the measurement of inequality involves normative perspective e.g. ethics, welfare or utility levels. The social welfare functions are employed to estimate inequality. For univariate distributions, Kolm (1977) originated the normative approach while Atkinson (1970) introduced the general procedure for construction of an inequality index based on a social evaluation. A social evaluation is concerned with the ranking of alternative distributions according to their social desirability. In normative approach, inequality measures are based on social welfare functions.

2.2 Multidimensional Inequality

Kolm (1977) and Bourguignon et al., (1982) wrote the seminal articles on multidimensional inequality by exploring the theoretical foundations of multidimensional inequality. These two studies developed 'dominance criteria for ranking multivariate distributions'. It is the normative approach that gives the partial orderings to the possible distributions of attributes. However, an inequality index completely orders all distributions (Weymark, 2003). The two stage approach for the measurement of multidimensional inequality was suggested by Maasoumi (1986). The first stage is concerned with the association of well-being level to the bundle of goods of each individual. In second stage, the uni-dimensional inequality measure is applied to the obtained vector of individual well-being levels. The two-stage approach is most widely used in the estimation of multidimensional inequality (Becker, 1957).

However, the difficulties in the interpretation of coefficients obtained during this methodology make the use of the index very limited. Similarly, Tsui (1995) also proposed a multidimensional inequality index, which is criticized

because its parameters are not interpretable. Bourguignon and Chakravarty (1999) proposed a multidimensional inequality index which provides a direct relationship with social evaluation functions. The index is based on an individual cardinal function that represents the embedded ordinal preferences. Gajdos and Weymark index (Gajdos and Weymark, 2005) computes the Gini social evaluation function at the first stage while in the second stage the generalized mean across dimensions is computed. Decancq and Lugo (2008) came up with Decancq index, which starts with finding generalized mean across dimensions, and computing social evaluation function in the second stage.

Labar (2011) measured multidimensional inequality in China using the three dimensions of education, health and wages. Study used China Health and Nutritional Survey (CHNS) for eight provinces of China for the years 1991, 1993, 1997 and 2000. Employing multidimensional Gini and Atkinson indices, the study concluded that inequalities in wages have increased in China after a decrease between 1993 and 1997. Inequalities in education have gradually fallen while they increased in health between 1997 and 2000. Araar (2009) scrutinized multidimensional inequality in Cameroon using the household survey for 2001 comprising of 11,000 households. The study employed Multiple Correspondence Analysis (MCA) and proposed a new index where social evaluation function of welfare depends on unidimensional and multidimensional forms of inequality. The study selected three dimensions; health, housing and education. Results of the study showed that multidimensional inequality is higher in rural areas. Moreover, housing dimension has highest contribution in inequality followed by education and health.

Rohde and Guest (2013) attempted to analyze inequality in health, education and income in the United States of America using Maasoumi index. The study used the Panel Income Dynamics data for US from 1990 to 2007. The study showed that in US uni-dimensional and multidimensional inequality increased during the period 1990 to 2007. Bidyadhar and Mohanty (2015) attempted to analyse multidimensional poverty in India. His study used Indian Human Development Survey (2004-05) to study inequality across the dimensions of household environment, employment, health, knowledge and income. Applying Alkire-Foster methodology, this study concluded that at least half of the population in India is multi-dimensionally deprived. Moreover, consumption expenditure has highest contribution in MPI in India. Saboor et al., (2015) studied prevalence of multidimensional deprivation in 26 regions of the four provinces of Pakistan. The study used HIES and PSLM data sets for 1998-99, 2001-02, 2004-05 and 2007-08. The study included health, education and housing facilities dimensions to apply Alkire-Foster methodology in order to analyze the deprivation at household level. The results of the study revealed that multidimensional poverty is lower in urban areas as compared to rural areas. Kohat, Bahawalpur, Hazara, Faisalabad, Sibbi and Malakand showed substantial decline in poverty from 1998-99 to 2007-08. Zhob showed highest level of MPI (50%) and Karachi showed the least MPI.

3. RESEARCH METHODOLOGY

The Human Development Index (HDI) is an index of life expectancy, education, and per capita income indicators. The index is used to rank countries in accordance with their level of human development in terms of a composite rank calculated based on their achievement in terms of life expectancy, education and per capita income. Higher HDI score corresponds with higher lifespan, higher level of education level, and higher gross national income (in terms of PPP per capita). UNDP's composite Human Development Index (2010) measures average achievement in a country in three selected dimensions of human development based on national indices. The tool has enough flexibility and can be used to measure multidimensional poverty (UNDP 2010).

3.1 Data Source

Pakistan Bureau of Statistics carries out the Pakistan Social and Living-standard Measurement (PSLM) Survey every alternate year to provide information necessary to compute social and economic indicators at national, provincial, and district levels as well as for rural and urban regions. This study will employ micro data of 2004-05, and 2014-15 rounds of PSLM Survey. The PSLM sample for 2004-05 comprised of 65,693 households, with 43,279 (65.9%) rural and 22,414 (34.1%) urban households. On the other hand, the total PSLM sample for the year 2014-15 round comprised of 78,622 households, with 49,555 (63%) of them from rural areas and the remaining 29,063 (36.9%) from the urban areas of Pakistan.

4. DATA ANALYSIS

This section provides a detailed account of the trends in the multidimensional inequality (MDI) and poverty (MPI) for Pakistan using data from the 2004-05 and 2014-15 PSLM surveys. We begin with Pakistan's National MDI and MPI results followed by a discussion on the composition of inequality and poverty along the three main dimensions. The last part of this Section presents an analysis of the MDI and MPI across different household characteristics.

4.1 Multidimensional poverty and inequality at national level

Table 1 shows MDI for the base period of 2004-05 as well as for the end period of 2014-15. The analysis of the MDI show that in 2004-05, the average inequality in the three dimensions of education, health and living standards at the national level was 18.6 percent. The regional breakup of this inequality measure shows that average MDI was slightly higher in the rural areas of the country in the baseline period at 14.4 percent in comparison to 12.2 percent in the urban areas. The trends in MDI over the ten-year period 2004-15 show that inequality declined, with the MDI in 2014-15 at 16.4 percent. The regional analysis indicates that in comparison to 2004-05, MDI in rural areas increased to 16.3 percent in 2014-15, whereas in urban areas, it declined with the MDI in 2014-15 falling to 7.5 percent from its initial level of 12.2 percent in 2004-05. Similar declining trend has been shown (Sial, et. al. 2015) while analyzing consumption expenditure using Gini index and multidimensional inequality during 2005-06 and 2010-11. In order to put the trends in multidimensional inequality into proper context, a comparison with trends in multidimensional poverty over the same period is also carried out. The figures reveal that at the national level, the MPI also declined during this ten-year period, from 28.1 percent in 2004-05 to 19.6 percent in 2014-15. Similarly, the urban/ rural disaggregation shows that MPI decreased both in the rural and urban areas of the country, from 37.2 percent in 2004-05 to 27.6 percent in 2014-15 in rural areas, while it fell significantly in urban areas from 10.4 percent in 2004-05 to just 5.9 percent in 2014-15.

Table 1. Multidimensional poverty and inequality at national level

Region	2004-05					2014-15				
	Pop%	MPI	H	A	MDI	Pop%	MPI	H	A	MDI
National	100	0.281	54.0	51.9	0.186	100.0	0.196	38.8	50.4	0.164
Rural	67.4	0.372	70.3	52.9	0.144	63.03	0.276	53.8	51.4	0.163
Urban	32.6	0.104	22.6	46.0	0.122	33.97	0.059	13.3	43.9	0.075

4.2 Multidimensional poverty and inequality at province level

Table 2 shows the MDI along with MPI for the base period of 2004-05 as well as for the end period of 2014-15 in respect of the four provinces. The analysis indicates that in 2004-05, the average inequality in the three dimensions of education, health and living standards in Punjab provinces was 16.8 percent, compared to 22.3 percent in Sindh 17.1 percent in Khyber Pakhtunkhwa and 14.7 percent in Balochistan. The regional breakup of this inequality measure in the provinces shows that average MDI was higher in the rural areas of Punjab and Khyber Pakhtunkhwa (at 13.9 percent and 14.5 percent, respectively) compared to the urban areas of these provinces in the base year. On the other hand, MDI in Sindh and Balochistan was higher in the urban areas (at 13.8 percent and 12.5 percent, respectively) compared to the rural areas of these provinces in 2004-05.

The trends in MDI over the ten-year period 2004-15 show that inequality declined in Punjab, Sindh and KP while it increased slightly in Balochistan over the same period. The analysis of MDI by region in the provinces indicates that in comparison to 2004-05, MDI in rural areas of all provinces increased in 2014-15, whereas, it declined in urban areas of Punjab, Sindh and KP and increased in the urban areas of Balochistan over the period under review. Thus, in case of Balochistan, MDI has witnessed an increase in both urban and rural areas over the ten-year period. The table also shows that MDI was the highest in Sindh province in both the years i.e. 2004-05 (at 22.3 percent) and 2014-15 (at 19.9 percent) when compared with the other provinces. The MDI was the lowest in the base year in Balochistan province (at 14.7 percent) while in the year 2014-15, it was lowest in Punjab (at 13.5 percent).

In order to put the trends in multidimensional inequality into proper context, a comparison with trends in MPI over the same period is also carried out. The figures reveal that at the provincial level, the MPI also declined during this ten-year period in all four provinces, from 25.1 percent in 2004-05 to 15.6 percent in 2014-15 in Punjab, from 29.2 percent to 22 percent in Sindh, from 34.7 percent to 25.5 percent in Khyber Pakhtunkhwa and from 46.4 percent in 2004-05 to 40.8 percent in 2014-15 in Balochistan province. The urban/ rural disaggregation of the incidence of MPI shows that MPI has decreased in the rural areas of all the four provinces. MPI has also witnessed a decline in the urban areas of Punjab, Sindh and KP provinces while it increased slightly from 21.6 percent in urban areas of Balochistan province in 2004-05 to 22.1 percent in 2014-15, similar to the trends depicted in MDI for this province.

Table 2. Multidimensional poverty and inequality at province level

Province/ Region	2004-05					2014-15				
	Pop %	MPI	H	A	MDI	Pop %	MPI	H	A	MDI
Punjab	58.5	0.251	49.9	50.4	0.168	57.0	0.156	32.4	48.1	0.135
Rural	40.8	0.325	63.6	51.2	0.139	37.9	0.210	43.0	48.9	0.142
Urban	17.7	0.086	19.2	44.9	0.107	19.1	0.048	11.3	42.3	0.064
Sindh	24.6	0.292	54.3	53.9	0.223	26.7	0.220	41.7	52.8	0.199
Rural	12.5	0.493	88.0	56.1	0.110	12.2	0.415	76.4	54.4	0.142
Urban	12.1	0.119	25.2	47.2	0.138	14.5	0.056	12.5	44.9	0.077
KP	12.8	0.347	65.6	52.9	0.171	12.0	0.255	50.5	50.6	0.154
Rural	10.7	0.390	73.1	53.4	0.145	9.78	0.295	57.7	51.1	0.151
Urban	2.1	0.133	28.6	46.5	0.135	2.2	0.081	18.8	42.9	0.078
Balochistan	4.0	0.464	82.4	56.2	0.147	4.2	0.408	73.9	55.3	0.159
Rural	3.3	0.530	92.0	57.6	0.103	3.1	0.478	84.2	56.8	0.135
Urban	0.7	0.216	46.8	46.3	0.125	1.1	0.221	46.4	47.7	0.120

In order to get a better understanding of the role of the three dimensions in driving inequality at the national level, the overall MDI has been broken into separate MDI for education, health and living standards, for both the years under review. The results shown in table 3 indicate that education had the highest level of inequality amongst the three domains both 2004-04 and 2014-15. The MDI for education stood at 0.462 in the baseline period of 2004-05, which fell to 0.435 in 2014-15. Following education, health was observed to have the highest level of inequality at the national level. The MDI for health was 0.328 in 2004-05, which declined marginally to 0.317 by 2014-15. The MDI for living standard was lowest across the three dimensions and also witnessed the highest fall during this period, falling from 0.236 in 2004-05 to 0.135 in 2014-15. When examined from the perspective of multidimensional poverty, the findings with respect to the role of the three dimensions are seen to be somewhat similar. MPI for Education is seen to be the highest in both the years. Following this, in the baseline period (2004-05) was the dimension of living standard, although in 2014-15, health is in second place followed by living standards. Moreover, similar to the finding for multidimensional inequality, the highest fall amongst the three dimensions for MPI has also been witnessed in the living standards dimension, which declined from 0.317 in 2004-05 to 0.182 in 2014-15.

Table 3. Multidimensional poverty and inequality in three main dimensions

	2004-05			2014-15		
	Education	Health	Living Standard	Education	Health	Living Standard
MPI	0.391	0.269	0.317	0.317	0.224	0.182
H	61.4	49.0	56.9	51.9	39.0	37.1
A	63.6	55.0	55.7	61.0	57.5	48.9
MDI	0.462	0.328	0.236	0.435	0.317	0.135

The analysis of the multidimensional inequality index by the three main dimensions across the urban and rural areas of the country reveals some interesting findings (in table 4). In case of urban areas, the earlier results seen at the national level above seem to hold, with dispersion in educational outcomes being the main contributor to urban inequality in both the years reviewed, although this inequality is seen to fall during this period. This is followed by health and living standards dimensions, with inequality in both falling during the period under consideration. Coming to the rural areas which are home to the major share of the national population during the period examined, it is observed that while inequality in the education dimension is the highest among the three, the dispersion in educational indicators actually increased during 2004-05 and 2014-15, from 0.426 to 0.439. Similarly, in case of health and living standard, a similar trend is seen, i.e., the MDI for health went up slightly from 0.339 in 2004-05 to 0.349 in 2014-15; while that for living standards also increased marginally from 0.156 to 0.161 during the corresponding period. The above analysis by region (rural/ urban) indicate that the fall in inequality in all the three main dimensions in the urban areas of Pakistan was larger than the slight deterioration in the indices of three dimensions in the rural areas. Thus, the fall in inequality in urban areas offsets the deterioration in the rural areas. This is despite that fact that the rural areas constitute the majority of the country's population over this period. This also serves to highlight that reduction in inequality in the rural areas should be the main policy priority in order to reduce the absolute level of inequality in the country.

Table 4. Multidimensional poverty and inequality in three main dimensions at regional level

2004-05	Education	Health	Living Standard	Education	Health	Living Standard
	Urban (32.6%)			Rural (67.4%)		
MPI	0.226	0.180	0.079	0.476	0.316	0.440
H	37.8	34.1	17.7	73.6	56.7	77.2
A	59.8	52.7	44.6	64.6	55.7	57.1
MDI	0.374	0.258	0.113	0.426	0.339	0.156
2014-15	Urban (36.97%)			Rural (63.03%)		
MPI	0.170	0.063	0.086	0.403	0.318	0.238
H	30.2	12.7	19.7	64.7	54.3	47.4
A	56.2	49.3	43.6	62.3	58.6	50.3
MDI	0.290	0.119	0.065	0.439	0.349	0.161

4.3 Multidimensional poverty and inequality and household characteristics

In this section, study analyze the relationship of inequality and poverty with different household characteristics such as income, family size and education of head of household for both the years under review, i.e. 2004-05 and 2014-15. To establish the relationship between inequality and different household characteristics, we have divided the reported income variable² in quintiles, and estimated the multidimensional poverty and inequality for each quintile separately. Table 5 showing the trends in multidimensional inequality and poverty indicates that both inequality and poverty fall across successive income quintiles at the national level in both the years under reference. In 2004-05, MDI was 15.8 percent for the lowest income quintile and falls consistently to reach at 12.7 percent for the highest quintile. Similar trends are seen to hold as well across the rural and urban areas of the country, although the level of MDI and MPI are higher in the rural areas each corresponding quintile. The data also shows that for 2014-15, MDI was 17.8 percent for the lowest income quintile and falls consistently to reach at 8.4 percent for the highest quintile. Similar trends are seen to hold as well across the rural and urban areas of the country, although the level of MDI and MPI are higher in the rural areas for each corresponding quintile. The comparison of the multidimensional inequality for each quintile for both the years show that inequality has decreased for all quintiles in 2014-15 except for the first and second quintiles at the national level. In case of urban areas, MDI is seen to have declined across all income quintiles, during the ten-year period. However, in case of rural areas, the analysis indicates that inequality has increased for households in all income quintiles except for the 5th quintile.

Table 5: Multidimensional poverty and inequality and the income quintiles

2004-05					
Income Quintiles	1	2	3	4	5
National					
MPI	0.426	0.376	0.290	0.204	0.103
MDI	0.158	0.154	0.151	0.146	0.127
Urban					
MPI	0.248	0.208	0.133	0.079	0.028
MDI	0.158	0.139	0.114	0.093	0.061
Rural					
MPI	0.459	0.427	0.366	0.297	0.220
MDI	0.140	0.132	0.123	0.124	0.123
2014-15					
National					
MPI	0.345	0.274	0.193	0.126	0.060
MDI	0.178	0.157	0.143	0.116	0.084
Urban					
MPI	0.178	0.121	0.064	0.034	0.010
MDI	0.120	0.092	0.073	0.053	0.032
Rural					
MPI	0.381	0.336	0.268	0.201	0.131
MDI	0.172	0.150	0.142	0.126	0.115

² Income variable is household per capita income and is constructed using section E of the PSLM. For construction we have used question 8, 9, 10, 15 and 17 for years 2010-11, 2012-13 and 2014-15. Whereas for remaining years, we have used questions 13, 14 and 16. Finally while making quintiles we also have applied weights assigned to each household.

The analysis of MDI and MPI with respect to family size is presented in table 6. The figures show that both inequality and poverty increase with family size during both the years under review at the national level. In 2004-05, MDI for household with a size of less than 4 members was 14.7 percent, which increased to 19.2 percent for household with size between 4-6 members, while inequality was observed to be highest for households with more than 8 members at 20.2 percent. A similar trend is observed across both the urban and rural areas of the country, although the MDI in the rural areas is higher for each successive category of household size, except the base category of less than 4 members, where MDI is equal for both urban and rural areas. In 2014-15, a similar trend in MDI and MPI is observed, although the magnitude of MDI and MPI is lower across each corresponding family size category. This indicates that both inequality and poverty has declined for all households during the period examined. However, the regional breakup shows that during 2004-05 to 2014-15, the MDI for each household size category increased for rural households, while it fell for the urban households.

Table 6. Multidimensional poverty and inequality and the family size³

Family size	≤ 4	4 < x ≤ 6	6 < x ≤ 8	8+
2004-05				
National				
MPI	0.267	0.265	0.286	0.311
MDI	0.147	0.192	0.198	0.202
Urban				
MPI	0.085	0.090	0.109	0.140
MDI	0.101	0.114	0.128	0.141
Rural				
MPI	0.355	0.367	0.377	0.392
MDI	0.101	0.146	0.158	0.170
2014-15				
National				
MPI	0.159	0.180	0.221	0.251
MDI	0.127	0.160	0.181	0.190
Urban				
MPI	0.038	0.056	0.069	0.096
MDI	0.059	0.071	0.082	0.100
Rural				
MPI	0.243	0.267	0.294	0.314
MDI	0.120	0.164	0.180	0.188

The relationship between multidimensional inequality, poverty and education level of the head of household presented in table 7 shows some interesting results. In the baseline period of 2004-05, inequality is seen to be highest for households where head has primary level education. For education level above primary, i.e. matric and higher education, the MDI is seen to fall with each successive level as education and is lowest for households whose head has higher education.

The analysis of multidimensional inequality and education across the urban and rural areas of the country, shows that in case of urban areas, it is seen to be falling with each successively higher levels of education of the household head during both the years reviewed. Moreover, the comparison between 2004-05 and 2014-15 indicates that inequality has fallen markedly during this period for urban households in each category of the household head's educational attainment. Coming to the rural areas, the figures indicate that in the baseline period of 2004-05, multidimensional inequality was lowest for households whose head was illiterate, while it was similar for all the three remaining education groups of the household head at 0.134. In 2014-15, inequality was seen to be highest for households with head having primary level of education at 0.145, followed by those whose head was illiterate. For households with head having matriculation and higher education, the level of MDI was successively lower at 0.137 and 0.125, respectively. The comparison between 2004-05 and 2014-15 shows that in rural areas, inequality increased for all educational categories of the household head, with the exception of higher education.

³ We have divided the household size in four groups in such a way that the groups are almost equal in size, by applying weights are 28%, 32%, 22% and 18% respectively in year 2014-15.

Table 7. Multidimensional Poverty and Inequality and the education level⁴ of head of household

Head education	Illiterate	2004-05 Primary	Metric	Higher
National				
MPI	0.391	0.296	0.162	0.077
MDI	0.143	0.160	0.147	0.117
Urban				
MPI	0.207	0.134	0.054	0.020
MDI	0.127	0.118	0.081	0.054
Rural				
MPI	0.442	0.369	0.245	0.192
MDI	0.121	0.133	0.134	0.134
2014-15				
National				
MPI	0.310	0.203	0.100	0.049
MDI	0.149	0.146	0.112	0.077
Urban				
MPI	0.137	0.079	0.027	0.009
MDI	0.093	0.083	0.047	0.026
Rural				
MPI	0.362	0.260	0.162	0.122
MDI	0.141	0.145	0.137	0.125

5. MODEL SPECIFICATION

In the first step, the identified indicators are calculated for each household and for each measure of welfare. These measures are clubbed in three dimensions – education, health and living standard. We assigned 0 or 1 to each household based on its welfare status in respect of each dimension. In the second step, the indicator of the selected dimensions is calculated at household level. Arithmetic mean (simple or weighted) is used to aggregate the indices for each indicator at household level, separately for each dimension. This allows us to analyze the status of multidimensional poverty or deprivation for each region, province as well as at the national level. In the third step, a cumulative index is calculated for each household to reflect an aggregate value in respect of the selected indicators for each household. Household specific combined index H^h will be computed as follows:

$$H^h = \sum w_i M_s^h \quad \forall h = 1, 2, \dots, k$$

Where w_i denote the weights assigned to each indicator and M_s^h represents household (h) index for each dimension s .

This study will use the indicators, cut-offs and weights that have been used by the Government (GOP, 2016) in calculating multi-dimensional poverty (MPI) in Pakistan so that the situation of multidimensional inequality can be assessed on the same parameters on which the Government has assessed multidimensional poverty. The dimensions, indicators, deprivation cut-offs and the weights assigned to each of the selected indicators for estimation of multidimensional inequality and poverty are illustrated in Appendix. To calculate multidimensional inequality (MDI), after finding ranks of the households, we calculate positive multiple of variance applied on H^h as a measure of multidimensional inequality. Since we are interested in exploring between-group disparity in poverty, which may range between zero and one, the maximum value that variance can take is 0.25 and so we opt for using $\alpha = 4$, and thus calculate multidimensional inequality using the following formula:

$$I(H) = \frac{4}{n} \sum_{i=1}^n [H_i - \mu(H)]^2$$

⁴ Education level is divided in four groups. Illiterate is the one have not passed even single grade. Under primary are the people who have passed grades 1 to 5 but not higher. Metric group contains people who have passed grades between 6 to 10, and finally higher means more than 10. Distribution of variable is 41%, 16%, 28% and 15% respectively after assigning the due weight to each household.

6. RESULTS AND DISCUSSIONS

The analysis shows that multidimensional inequality in Pakistan has decreased during the period 2004 to 2015 with a similar trend being observed in urban areas of Pakistan. However, an increase has been observed in the rural areas, which appears to be contrary to a priori expectations. Provincial analysis shows that multidimensional inequality declined in Punjab, Sindh and Khyber Pakhtunkhwa, while it increased in case of Balochistan province. The analysis of multidimensional inequality by region within the provinces indicate that MDI in case of rural areas increased in all provinces over the period under review. However, in case of urban areas, it declined in Punjab, Sindh and Khyber Pakhtunkhwa, while it increased in the urban areas of Balochistan over the period under review. A province level comparison of the trends of multidimensional inequality with the trends in multidimensional poverty over the period under review reveal that at the provincial level, multidimensional poverty declined during the ten-year period in all four provinces as well as in the urban and rural areas, with the exception of urban areas of Balochistan province. Within the three dimensions, education is found to have the highest level of inequality at the national level, followed by access to health services and living standard. Review of correlation between multidimensional inequality and household characteristics shows that the education level of the head of household, higher income level of household and smaller family size are associated with level of multidimensional inequality.

6.1 Policy recommendations

Expanding equitable access to education in particular in the rural areas should be the main priority in order to reduce the multidimensional inequality in the country. A higher share of the government's budgetary allocations should be targeted towards improving service delivery in education and health in the rural areas to narrow down the dispersion in these areas. In view of limited fiscal space, the provincial governments cannot invest huge amount of resources in developing physical infrastructure and employing large number of service providers for improving service delivery in education and health. Therefore, access to education and health can be considerably enhanced by employing IT based education and tele-medicine mechanisms, in particular in areas with lower population density as well as in the far-flung areas of all four provinces. Moreover, efforts to improve service delivery in education and health need to be targeted towards socially excluded households or those who cannot send children to school due to economic pressure. Gradually shifting the present unconditional cash transfer programmes towards conditional cash transfer programmes can help in this regard. Access to cheap micro-finance can play an important role in improving the living standards in particular in low income population. Thus, community-based streams of various schemes need to be launched all over the country. The efficiency of such initiatives can increase manifold if education is made skill based as well as contextualized. Thus, education and skills pertaining to agriculture and allied sectors would be more attractive for the parents and students in the rural areas.

REFERENCES

- Adelman I. & C.T. Morris. (1973). Economic growth and social equity in developing countries, *Stanford University Press*.
- Alkire, S. & Foster, J. (2011). Understandings and misunderstandings of multidimensional poverty measurement, *The Journal of Economic Inequality* 9(2), 289-314.
- Araar, A. (2009). The Hybrid Multidimensional Index of Inequality. *Poverty and Economic Policy Research, Working Paper*, 9-45.
- Atkinson, A.B. (1970). On the measurement of inequality. *Journal of Economic Theory*, 244-263.
- Atkinson, A.B. (2015). Inequality: What can we do? *Harvard University Press*, London.
- Becker, G. (1957). *The Economics of discrimination*. University of Chicago.
- Bidyadhar, D., & Mohanty, S. K. (2015). Regional estimates of multidimensional poverty in India. *Economics*, Kiel Institute for the World Economy, 9(36) 1-35.
- Bourguignon et.al. (1982). The comparison of multidimensioned distributions of economic status, *The Review of Economic Studies*, 49(2), 183-201.
- Bourguignon, F., & Chakravarty, S. R. (1999). A family of multidimensional poverty measures. *Advances in Econometrics, Income Distribution and Scientific Methodology*, 331-344.
- Decancq, K., & Lugo, M. A. (2008). Measuring Inequality of Wellbeing: A Proposal based on a Multidimensional Gini Index.
- Gajdos, T., & Weymark, J. A. (2005). Multidimensional generalized Gini indices. *Economic Theory*, 26(3), 471-496.
- Haq, M. u. (1976). *The Poverty Curtain*. New York: Columbia University Press.
- Kolm, S. C. (1977). Multidimensional egalitarianisms. *The Quarterly Journal of Economics*, 91(1), 1-13.
- Kuznets, S. (1955). Economic Growth and Inequality. *An Economic Review* 45, 1-28

- Labar, K. (2011). *Multidimensional Inequalities in China*. Centre of Studies and Research on International Development, University of Auvergne, France.
- Maasoumi, A. (1986). The Measurement and Decomposition of Multidimensional Inequality, *Econometrica*, 54(4), 991-98.
- Piketty, E. S. (2014). Inequality in Long Run 344(6186), 838-843.
- Rohde, N., & Guest, R. (2013). Multidimensional Racial Inequality in the United States. *Social Indicators Research*, 113, 591-605.
- Saboor, A., Khan, A., Hussain, A., Ali, I., & Mahmood, K. (2015). Multidimensional Poverty in Pakistan: Regional Variations and Temporal Shifts. *The Quarterly Review of Economics and Finance*, 56, 57-67.
- Sen, A. (1973). On Economic Inequality. *New York: Norton*.
- Sen, A. (1987). A standard of living, Lecture II, Lives and Capabilities in Hawthorn.
- Sial, M.H., Noreen, A., Awan R.U. (2015). Measuring Multidimensional Poverty and Inequality in Pakistan, *The Pakistan Development Review*, 54(4), 685-696.
- Stiglitz, J. E. (2012). The price of inequality: How today's divided society endangers our future, W.W. Norton Co., USA.
- Tsui, K. Y. (1995). Multidimensional Generalizations of the Relative and Absolute Inequality Indices: The Atkinson-Kolm-Sen Approach. *Journal of Economic Theory*, 67(1), 251-265.
- UNDP. (2019). Human Development Report, Beyond income, Beyond Averages, Beyond Today: Inequalities in Human Development in the 21st Century, USA, 31-35.
- Weymark, J. A. (2003). *The Normative Approach to the Measurement of Multidimensional Inequality*. Nashville: Department of Economics, Vanderbilt University.

Appendix

Dimensions, Indicators, Deprivation Cut-offs and Weights of the selected indicators

Dimension	Indicator	Deprivation Cut-off	Weights
Education	Years of schooling	Deprived if no man OR no woman in the household above 10 years of age has completed 5 years of schooling	1/6 = 16.67%
	Child school attendance	Deprived if any school-aged child is not attending school (between 6 and 11 years of age)	1/8 = 12.5%
	School quality	Deprived if any child is not going to school because of quality issues (not enough teachers, schools are far away, too costly, no male/female teacher, substandard schools), or is attending school but remains dissatisfied with service	1/24 = 4.17%
Health	Access to health facilities/clinics/Basic Health Units (BHU)	Deprived if health facilities are not used at all, or are only used once in a while, because of access constraints (too far away, too costly, unsuitable, lack of tools/staff, not enough facilities)	1/6 = 16.67%
	Immunization	Deprived if any child under the age of 5 is not fully immunized according to the vaccinations calendar (thousands with no children under 5 are considered non-deprived)	1/18 = 5.56%
	Ante-natal care	Deprived if any woman in the household who has given both in the last 3 years did not receive ante natal check-ups (households with no woman who has given birth are considered non-deprived)	1/18 = 5.56%
	Assisted delivery	Deprived if any woman in the household has given birth in the last 3 years attended by untrained personnel (family member, friend, traditional birth attendant, etc.) or in an inappropriate facility (home, other) (households with no woman who has given birth are considered non deprived)	1/18 = 5.56%
Standard of living	Water	Deprived if the household has no access to an improved source of water according to MDG standards, considering distance (less than a 30 minutes return trip): tap water, hand pump, motor pump, protected well, mineral water	1/21 = 4.76%
	Sanitation	Deprived if the household has no access to adequate sanitation according to MDG standards: flush system (sewerage, septic tank and drain), privy seat	1/21 = 4.76%
	Walls	Deprived if the household has unimproved walls (mud, uncooked/ mud bricks, wood/bamboo, other)	1/42 = 2.38%
	Overcrowding	Deprived if the household is overcrowded (4 or more people per room)	1/42 = 2.38%
	Electricity	Deprived if the household has no access to electricity	1/21 = 4.76%
	Cooking fuel	Deprived if the household uses solid cooking fuels for cooking (wood, dung cakes, crop residue, coal/ charcoal, other)	1/21 = 4.76%
	Assets	Deprived if the household does not have more than two small assets (radio, TV, iron, fan, sewing machine, video cassette player, chair, watch, air cooler, bicycle) OR no large asset (refrigerator, air conditioner, tractor, computer, motorcycle) AND has no car.	1/21 = 4.76%
	Land and livestock (only for rural areas)	Deprived if the household is deprived in land AND deprived in livestock, i.e. a) Deprived in land: the household has less than 2.25 acres of non-irrigated land AND less than 1.125 acres of irrigated land b) Deprived in livestock: the household has less than 2 cattle, fewer than 3 sheep/goats, fewer than 5 chickens AND no animal for transportation (urban households are considered non-deprived)	1/21 = 4.76%