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BEYOND NUMBERS: A COMPREHENSIVE STUDY OF THE SEVERITY AND VULNERABILITY OF MULTIDIMENSIONAL POVERTY ACROSS GENDER, RELIGION AND CASTE IN NUH DISTRICT, HARYANA

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Abstract

To achieve the target of 'Developed India at 2047' and the holistic aim of Sustainable Development Goals (SDGs) i.e., 'to leave nobody behind'; the investigation of multidimensional poverty (including severity and vulnerability criteria) at sub national and sub state level of India, has its significance as it explores the right directions and areas to be focused by the policy makers. As is known the state of poverty jeopardizes physical and cognitive performance of the country people which in turn deceases productivity and growth of the economy. In this context, the present study aims to have primary data-based picture of multidimensional deprivation across different groups and gender-based inequality in the Nuh district of Haryana. The Nuh district of Haryana has got success to reduce the number of multidimensional deprived households during the period from 2015-16 to 2019-21. The reduction in the number of global MPI based deprived households ensures the success of government policies to reduce poverty in the most deprived district of Haryana. However, in terms of Multidimensional severity and Multidimensional vulnerability, the female headed households in the Nuh district of Haryana have been found more deprived than male headed households. The larger proportion of families belong to scheduled caste, backward class and Muslim religion has been found deprived than other castes and religions. Therefore, the present study explores the vital areas considering Multidimensional severity and Multidimensional vulnerability where the policy makers can endeavor to reduce deprivations and deficiencies of these groups rather than to provide benefits of any kind uniformly to all.

Keywords: Multidimensional Poverty, Inequality, Gender, Health, Education, Severity, Vulnerability

JEL Codes: I32, D63, J16, I14, I24

1. Introduction

To attain inclusiveness objective of Sustainable Development Goals (SDGs) by focusing on equality of opportunity, equality of outcomes, no discrimination before the law, policies and programme, participation in social and cultural practices and inclusive socioeconomic development **(UNDP-SDGs, 2017)**. In line to this, the present study endeavors to get primary data base picture of the deprivation of different groups and gender-based inequality in the Nuh district of Haryana during 2015-16 to 2019-21 using data from the national family health survey IV and V (NFHS-4 & NFHS-5). There is high inequality among the districts in terms of performance of socioeconomic indicators in Haryana. The GSDP varies substantially across the districts in Haryana. The extent of Multidimensional poverty has been extremely high in Nuh and low in Panchkula (GOI,

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2021). Nuh stands low in terms of performance of different socioeconomic indicators among different districts of Haryana. It has deprived households more than states having highest MPI based households Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh, Chhattisgarh and Jharkhand. However, Nuh is most deprived district of Haryana. The conditions of households headed by female are very worst in Nuh district. On the basis of Global MPI, Multidimensional severity and Multidimensional venerability criteria, female head of households are more deprived than male headed households in both rural and urban area of Nuh district of Haryana. Similarly, in terms of quality-of-life indicators of female headed households, there is huge difference between Nuh and Haryana. The scenario of female headed households in the Nuh district may be comprehended as extracted picture from global scenario of the same. Globally, one in six multidimensional poor people live in female-headed households. In 14 countries, home to 1.8 billion people, female-headed households have, on average, a larger MPI value than male-headed households. To further explore gender relationships, the global MPI is dis-aggregated by the gender of the household head for 108 countries with available information. The incidence of multidimensional poverty is positively correlated with the rate of intimate partner violence against women and girls. Women and girls living in multidimensional poor households are at higher risk of violence because they often face uncertain living conditions and have less financial independence 40 and bargaining power 41 within the household. In some countries traveling long distances to fetch water and food or to go to school or work puts women a risk of sexual and physical violence.42 The incidence of multidimensional poverty in male-headed households has a high positive and statistically significant correlation (0.622) with the proportion of ever-partnered women and girls subject to physical and/or sexual violence by a current or former intimate partner in the 12 months prior to the survey. This finding also holds among female headed households. **(UNDP, MPI-2021).** In addition to this, Poverty statistics of India also underlies the fact that the incidence of poverty and deprivation is very high among the households belonging to Scheduled Castes (SCs), Scheduled Tribes (STs), and Other Backward Castes (OBCs) **(GoI, 2011)**. **Alkire et al. (2021)** in their study also observed that in India, STs and SCs tend to be poorer than other social groups even if they have the same levels of education, and they face discrimination. Nuh district in this regard experiencing the similar scenario as most of scheduled caste and backward class families along with Muslim families are deprived than other caste and other religions respectively. The next sections the study are devoted to explore the investigation for the same.

2. Data Sources & Research Methodology

The study is based on unit level data of National Family Health Survey-IV and Family Health Survey-V since the study requires the data on the same indicators on which the data is collected by National family Health Survey.

Techniques of Analysis

To analyze the gender specific Multidimensional Poverty in Nuh district of Haryana study uses the methodology given by Alkire and Foster, (2007). This methodology consists of two steps. In the first step, study identifies that who is multidimensionally poor and in the second step, the study measures of poverty in Nuh district of Haryana.

2.1. Identification of Poverty

In the first step, dimensions, indicators, and cut-offs were chosen as identification of poor households.

2.1.1. Dimensions and indicators of the Multidimensional Poverty

To measure the multidimensional poverty, three dimensions were taken: Education, Health and Standard of Living [Alkire & Foster (2007), Alkire & Santosh (2010), Alkire (2011), Sharma and Chakravarty, (2015)].

The first dimension of education was represented by two indicators of years of schooling and school attendance; the dimension of health was represented by one indicator, i.e., nutrition; and the third dimension of standard of living comprised of indicators concerning electricity, drinking water, sanitation, flooring, cooking fuel and assets.

2.1.2. Cut-off Indicators

A household *i*is considered deprived if its achievement in that indicator *i x* is below the cut-off z_i, that is, if $x_i<z_i$.

2.1.2.1. Education Level

To understand the **Education Level** two indicators were used i.e. years of schooling of household members; and school attendance of children. According to multidimensional poverty index, allthehousehold membersare considered as non-deprived if at least one person has completed eight years of schooling Similarly, all the household members are considered as deprived if any of the school going age children has notattended eight years of schooling (grade 1 to 8). If, not even a single member has attended school for eight years, the household's current and future knowledge and abilities are reduced [Alkire & Foster (2007), Alkire & Santosh (2010), Alkire (2011) Sharma, and Chakravarty, (2015), Sharma and Batra (2021)].

2.1.2.2. Health

The second dimension is Health**.** The study used nutrition as a health indicator. A household is identified as deprived in nutrition, if anyone in the household is malnourished. Malnourishment in adults was measured with BMI and in children on the basis of Z score. In MPI, all household members are considered to be deprived in nutrition if *at least one* undernourished person is observed in the household. Adults are considered malnourished on the basis of BMI and children are considered malnourished on the basis of Z score.

2.1.2.2.1. Z-Score

Z-Score was used as a measure of **malnutrition** (health status) of children under five years. Children are the victim of malnutrition if their Z score value is higher than the percentage of the median. It is a more statistically uniform approach to define malnutrition (Yang and Onis 2008; and WHO, 2006).

$$\boldsymbol{Z\ Score} = \frac{Measured\ Value - Median\ of\ Refrence\ Population}{Standard\ Deviation\ of\ Reference\ Population}$$

$$Percentage\ of\ the\ Median = \frac{Measured\ Weight\ of\ Childern}{Meadian\ weight\ of\ the\ Reference\ Population}\ X\ 100$$

To calculate the malnutrition status of children, the Anthro Software developed by Department of Nutrition, World Health Organization, Geneva (Switzerland)was used and to define nutritional status based on Anthropometric[i] indices, the cut-off values were used.

Table 1: Classification of Malnutrition for Weight for Height, Height for Age, and Weight for Age based on Z- Scores

Classification	Z Score Value
Adequate Malnutrition	-2 < Z Score < +2
Moderate Malnutrition	-3 < Z Score < -2
Severe Malnutrition	Z Score < -3

Source: World Health Organization. (2006).

Here, the weight for height index was used to measure wasting or acute malnutrition; height for age was used to measure stunting or chronic malnutrition, and weight for age was used to measure the underweight. According to WHO, the value above +2 Z score in weight for height shows that the child is overweight. On the other hand, below -2 Z score weight for age shows that the child is under-weight.

Table 2: Classification of Malnutrition for Weight for Height, Height for Age, and Weight for Age based Percentage of Median.

Classification	Weight for Height (In percent)	Height for Age (In percent)	Weight for Age (In percent)
Adequate	90-120	95-110	-
Middle	80-89	90-94	-
Moderate	70-79	85-89	60-80
Severe	<70	< 85	< 60

Source: World Health Organization. (2006).

2.1.2.2.2. Body Mass Index (BMI)

The most useful measure of **malnutrition** in adults is the body mass index (BMI). BMI is the measurement for human shape based on individual weight and height. It is defined as the individual's body mass (kg.) divided by the square of their height (World Health Organization. (2006).

$$\boldsymbol{Body\ Mass\ Index} = \frac{Mass\ (kg.)}{\text{Height}^2\ (m^2)}$$

Table 3: Classification of Adult Malnutrition based on Body Mass Index

Classification	Cut off point based on BMI
Under-Weight	From less than 18.5
Normal	From 18.5 to 25
Over-weight	From above 25

Source: World Health Organization. (2006).

BMI less than 18.5 considers an individual as underweight and indicate malnutrition, an eating disorder or other health problems while BMI greater than 25 considers an individual as overweight and BMI of 18.5 to 25 indicates optimal weight (Alkire and Foster (2007; and 2011).

2.1.2.3. Standard of Living

The MPI considers Standard of Living indicators individually. The present measurement used six indicators, which, in combination, possibly represent acute poverty. It included three standard indicators that are related

to health as well as to standard of living, particularly in terms of clean drinking water, improved sanitation and use of clean cooking fuel. It also included two other provisions, that is, electricity and flooring material.
A household is considered to have access to clean drinking water if the water source is any of the following types: piped water, public tap, borehole or pump, and it is within a distance of 30 minutes' roundtrip walk. If it fails to satisfy these conditions, it is considered as deprived in access to water facility.
A household is considered to have access to improved sanitation if it has some type of flush toilet or latrine, or ventilated improved pit or compost toilet not being shared by members other than the family itself. If the household does not satisfy these conditions, it is considered as deprived in sanitation facility. A household is also considered to be deprived if it does not have any access to electricity, bathroom, flooring material of dirt, sand or dung and also if the household does not have bathroom facility and has only one room house.
A household is considered deprived in cooking fuel if it cooks with dung, wood etc. If a household does not own more than two of such provisions as radio, TV, telephone, bike, motorbike or refrigerator, and does not own a car or tractor it is considered as deprived (Alkire & Foster, 2007); Alkire & Santosh, 2010; Alkire, 2011; and Sharma and Chakravarty, 2015).

2.2. Techniques of Analysis used to measure MPI

Multidimensional Poverty Index measures poverty in d dimensions across a population of n Households of Nuh district of Haryana. Let $y_i=[y_{ij}]$ denote the *n* x*d* matrix of achievements for *i* households across *j* dimensions. To identify who is poor among the population, a two-step procedure is applied using two different kinds of cut offs. Firstly, identify all households who are deprived in any dimension. Let $z_j>0$ *be* the poverty line (or deprivation cut-off) in dimension *j*, and *z* be the vector of poverty lines for each of the dimensions of multidimensional poverty. Define a matrix of deprivations $g^0 = [g_{ij}^0]$ whose typical element $g_{ij}^0$is defined by $g_{ij}^0= W_j$ when $y_{ij} <z$, and $g_{ij}^0=0$ when $y_{ij} \geq z$. That is, the ij^{th}entry of the matrix is equivalent to the dimensional weight $w_j$when person *i* is deprived in dimension *j*, and is zero when the person is not deprived.
The deprivation score of each household is calculated by taking a weighted sum of the number of deprivations, so that the deprivation score for each household lies between 0 and 1. Formally:

$$C_i = w_1I_1 + W_2I_2 +\ldots..+ W_dI_d$$

where $i= I$ if the household is deprived in indicator *i* and $i= 0$ otherwise, and *i w* is the weight[ii]attached to indicator *i* with $\sum^{d}_{i=1}W = 1$.
In this way, one is considered poor if the deprivation score is equal or greater than the poverty cut-off. Secondly, identify who is to be considered multidimensional poor. Formally, someone is poor if $C_i \geq k$ ($C_i \geq$ kthen C_i (k_i) = C_i , but if $c_i< k$, then Ci(k_i) =0. is the Ci(k_i) deprivation score of the poor)**.**

2.2.1. Multidimensional Poverty Index (MPI)

The MPI = $u(g^0(k))$, or the mean of the censored deprivation matrix. *MPI* can also be expressed as the product of two intuitive measures: the (multidimensional) headcount ratio (*H*) and the average deprivation share among the poor (*A*). *H* is simply the proportion of people that are poor. That is, *H =q/n* where *q* is the number of poor households; it represents the *incidence* of multidimensional poverty. To understand *A*, first notice that $c_i (k)/ dq$ indicates the fraction of weighted indicators in which the poor person *i* is deprived. The average of that fraction among those who are poor (*q*) is precisely *A*, where its expression is given by$A = \sum_{i=1}^{n} C(k)/dq$. A represents the *intensity* of multidimensional poverty.

2.2.2. Decomposing by indicators

Another key feature of the MPI is that, once the poor have been identified (in other words, once the MPI has been computed), one can decompose the MPI into its component-censored indicators.

The censored headcount ratio is obtained, by simply adding up the number of people who are poor and deprived in that indicator and dividing by the total population. Once all the censored headcount ratios have been computed, it can be verified, do a weighted sum of the censored headcount ratios, to obtain the MPI.
In a formula, this can be verified as follows:
$MPI = W_1CH_1 + W_2CH_2 + \ldots.. + W_9CH_9$
Here, $w_1$is the weight of indicator 1 and $CH_I$is the censored headcount ratio of indicator 1, and so on for the other nine indicators, with$\sum_{i=1}^{d} Wi = 1$
Contribution of Indicator *i* to MPI= $\frac{WiCHi}{MPI} * 100$
Whenever the contribution to poverty of a certain indicator widely exceeds its weight, it suggests that there is a relative high deprivation in this indicator in the country. The poor are more deprived in this indicator than in others. Clearly, the sum of the contributions of all indicators needs to be 100 per cent.

2.3. Inequality Measurement

The present study uses a counting approach suggested by Seth and Alkire (2014) to assess the inequality in Nuh district. The study attempts to explore the inequality in gender. In this section, a sample of n = 200 households is taken and their wellbeing is assessed by a fixed set of d = 9 indicators. Seth and Alkire (2014) explore the decomposition formulation of the inequality measure[iii].
Seth and Alkire (2014) explore the decomposition formulation of the inequality measure[iv]. To recall, the censored deprivation score vector c has $m \geq 2$ mutually exclusive and collectively exhaustive population subgroups, where the population share of subgroup ℓ to total population is denoted by $v^{\ell}$and the share of poor in subgroup ℓ to total poor population by θ^{ℓ}. An immediate inequality decomposition that can be made is breaking down the overall inequality among the poor into a within-group and a between-group component. The following function decomposes the overall inequality among the poor, whose deprivation scores are summarized by vector a:

$$V(a) = (\sum_{l=1}^{m})\theta^{\ell} V(a^{\ell}) + V(\overline{\mu a}; \overline{q}) \qquad \ldots\ldots\ldots\ldots\ldots\ldots (4.2.3.1)$$

Total Within-group Between-group

Thus, the term $V(a)$ captures inequality among the poor. The first component in (4.2.3.1) captures the total within-group inequality among the poor; whereas, the second component captures the total between-group inequality or inequality across subgroup intensities. The between-group term is $(\overline{\mu a}; \overline{q}) = V(\mu a^1 1q^1, \ldots, \mu a^m 1q^m)$ and $1q^{\ell}$ is the q^{ℓ}-dimensional vector of ones for all $\ell = 1, \ldots, m$, which can be expressed as:

$$V(\overline{\mu a}; \overline{q}) = 4 \sum_{l=1}^{m} (\theta^{\ell}) [\mu(a^{\ell}) - \mu(a)]^2 \qquad \ldots\ldots\ldots\ldots\ldots\ldots (4.2.3.2)$$

One way of incorporating the total within-group inequality among the poor and disparity across subgroup poverty is through applying the inequality measure to the censored deprivation score vector c. In fact, all counting poverty measures are based on the entire deprivation score vector c. The adjusted headcount ratio poverty measure proposed by Alkire and Foster (2011) is obtained by taking an average across all elements of this vector. The inequality-adjusted poverty measures are also based on the deprivation score vector c (Chakravarty and D'Ambrosio, 2009).

The inequality measure V applied on the entire censored deprivation score vector c can also be decomposed into a within-group and a between-group component as:

$$(c) = \sum_{l=1}^{m}[v^{\ell}V\ (c^{\ell}) + V(\overline{\mu c}\ ;\ \overline{n})\ ] \qquad \ldots\ldots\ldots\ldots\ldots\ldots(4.2.3.3)$$

The function $V\ (c)$ captures inequality in deprivation scores across the society, but assuming that the nonpoor are assigned a deprivation score equal to zero. The first term on the right-hand side of equation (4.2.3.3) is the population-weighted inequality across the deprivation scores within subgroups and the second term captures inequality in averages of all deprivation scores across m subgroups. Note that $V\ (\overline{\mu c}\ ;\ \overline{n})\ = V(\mu\ (c^1)\ 1n^1, \ldots, \mu\ (c^m)1n^m\ )$ and $1n^{\ell}$ is the n^{ℓ} dimensional vector of ones for all $\ell = 1, \ldots, m$, where $\mu(c^{\ell})$ is the adjusted headcount ratio poverty measure of subgroup ℓ and so the second term captures disparity in poverty across subgroups. As in (4.2), the between-group term can be expressed as:

$$\overline{(\mu c}\ ;\ \overline{n}) = 4\ \sum_{l=1}^{m}(v^{\ell}\mu(\ c^{\ell}) - \mu\ (c)^2\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4.2.3.4)$$

The ℓ^{th} within-group inequality component $V(c^{\ell})$ captures inequality across all elements in $c^{\ell}$and so it does not capture inequality only across the poor, which is important in order to understand whether a poverty alleviation policy has been equitable across the poor. To reflect inequality across the poor, the population within each subgroup can be divided into two further subgroups: the poor and the non-poor. The deprivation scores of all the poor in subgroup ℓ are summarized by a^{ℓ}. Note that the average deprivation score among the poor, $\mu(a^{\ell})$, is referred to as the intensity of poverty by Alkire and Foster (2011). The average deprivation score among the non-poor, however, is zero by the poverty focus property and hence, the term $V(c^{\ell})$ for each subgroup ℓ is further decomposed as:

$$V\ (c^{\ell}) = \left|\frac{q\ell}{Va\ell}\ V\ (a\ell)\right| + [\ \ (\mu(\ a^{\ell})\ ,\ 0)] = [H^{\ell}V\ (a^{\ell}) + V\ (\mu\ (a^{\ell})\ ,\ 0)] \quad \ldots\ldots\ldots\ldots(4.2.3.5)$$

The first term on the right-hand side of (4.2.3.5) is the within-group inequality among the poor, which in this case is the headcount ratio or the share of the population poor in that subgroup (H^{ℓ}) times its within-group inequality among the poor ($V(a^{\ell})$). Replacing the expression of $V(c^{\ell})$ from (4.2.3.5) in (4.2.3.3), we obtain:

$$V(\ c) = H + \sum_{l=1}^{M}[\theta^{\ell}V\ (a^{\ell}) + V\ (\overline{\mu c}\ ;\ \overline{n})\ \ + \sum_{l=1}^{m}(v^{\ell}V\mu\ (a^{\ell})\ ,\ 0] \quad \ldots\ldots\ldots\ (4.2.3.6)$$

Thus, the inequality measure (c) , which measures inequality in deprivation scores across the society, can be broken down into three components. The first is the *total within-group inequality amongthe poor* $\sum_{l=1}^{M}[\theta^{\ell}V\ (a^{\ell})$ *times the share of the poor in the society* (H). The second component captures *inequality or disparity between the subgroups' adjusted headcount ratios* $V\ (\overline{\mu c}\ ;\ \overline{n})$ as defined in (4.2.3.4). The third component represents the population-weighted average *inequality between the poor and the non-poor* in population subgroups, where $v^{\ell}V\mu\ (a^{\ell})$, 0 captures inequality between the average deprivation-score among the poor and the average deprivation-score among the non-poor, which is zero (Seth and Alkire, 2014; Sharma and Batra, 2021). The next section of the paper includes the discussion of results related to poverty extent, vulnerability, severity and gender, region wise and caste wise poverty.

3. Results and Discussion

3.1 Extent of Poverty in Nuh District of Haryana

Table 4: Incidence, Intensity and Multidimensional Poverty in Nuh

	Acute Poverty						Vulnerability						Severity					
	2015-16			2019-21			2015-16			2019-21			2015-16			2019-21		
	H	A	MPI	H	A	MPI	H	A	MPI	H	A	MPI	H	A	MPI	H	A	MPI
MHH	0.574	0.498	0.286	0.415	0.455	0.189	0.796	0.428	0.341	0.668	0.376	0.251	0.212	0.656	0.139	0.099	0.616	0.061
FHH	0.64	0.492	0.315	0.453	0.461	0.209	0.776	0.451	0.35	0.708	0.384	0.272	0.192	0.656	0.126	0.145	0.614	0.089
Nuh	0.589	0.497	0.293	0.419	0.455	0.191	0.795	0.43	0.342	0.673	0.376	0.253	0.211	0.654	0.138	0.104	0.615	0.064

Source: Calculation based on the unit level data of NFHS-4 & NFHS-5

"MHH= Male Headed Household, FHH= Female Headed Household; H= Incidence of Poverty or Multidimensional Head Count Index, A= Intensity of Poverty MPI= Multidimensional Poverty Index".

Table 3.1 exhibits the status of deprived families in Nuh district of Haryana using the different poverty cut-off criteria. The total 41.9 percent families in the Nuh district are multidimensional poor as per global MPI criterion. In addition to this, on the basis of vulnerability criterion i.e., families deprived in twenty percent indicators, 67.3 percent families were found as deprived. Furthermore, 10.4 percent families were found in the category of deprived in fifty percent indicators i.e., they are considered in severe condition. On the other hand, the female headed families in Nuh district of Haryana were found more severe, venerable and multidimensional poor than male headed families.

3.2 Difference based on Sex of head of Households

In can be observed from the table 3.1 that during the 2015-16 to 2019-21 the 17 percent families were successfully got rid from acute poverty based on Global MPI based criterion. On the basis of severity criterion again Nuh district performed well as it had achieved 10 percent reduction in families of having severe status. During the 2015-16 to 2019-21, there is reduction in the number of MPI based deprived female headed families in Nuh district of Haryana. However, the female headed families were found more severe than male headed families during the same period i.e., the reduction in severity of female headed families is not sufficient which further makes it a great matter of concern for the policy makers. Also, MPI based poverty having great extent with 43.7 percent in rural area of Nuh district of Haryana in comparison to urban area of Nuh with 25.8 percent.

3.3 Gender wise disparities across rural and urban areas

The male headed families in rural area of Nuh district are more deprived (MPI Criterion) with 43.1 percent than urban area male headed families with 27.1 percent in the 2019-21. Moreover, in the rural area of Nuh district of Haryana female headed families are three times more deprived than male headed families in the same period in terms of global MPI criterion. The male headed households in urban area are more deprived than female headed households in urban area of Nuh district of Haryana. However, this picture is reverse in the rural area of Nuh district of Haryana. The same type of results found on the basis of severity and vulnerability criterion.

3.4 Progress in Nuh District

In the Nuh district of Haryana, the MPI based head count poverty has declined 22 percent in the urban area during 2015-16 to 2019-21. It has declined 20 percent in rural area of Nuh district of Haryana. Although, female headed households are more deprived than male headed households in rural area of Nuh district of Haryana but the performance of female headed households in the reduction of MPI based poverty during 2015-

16 to 2019-21 has been found better than male headed households in the rural area. In contrast to this, the male headed households are more deprived than female headed households in urban area of Nuh district of Haryana. However, in terms of multidimensional severity and vulnerability indices female headed households were found performing less than male headed households during 2015-16 to 2019-21. In addition to this, the overall severity of Poverty has also declined to seven times in urban area of Nuh district of Haryana during 2015-16 to 2019-21. It has declined more than half in rural area during the same period i.e., fifty percent households in rural area has escaped from poverty from 2015-16 to 2019-21. Overall, on the basis of global MPI, Multidimensional severity and vulnerability female were found more deprived than male headed households which generates the ground for the study of sub groups poverty status within both groups. The next section is concerned with the discussion for the same.

Table 5 : Poverty by Gender, Caste and Community

		2015-16			2019-21		
		H	**A**	**MPI**	**H**	**A**	**MPI**
Male Headed Household	**SC**	0.620	0.498	0.309	0.328	0.433	0.142
	BC	0.604	0.503	0.304	0.456	0.458	0.209
	GEN	0.40	0.465	0.186	0.347	0.464	0.161
	Hindu	0.227	0.441	0.100	0.185	0.427	0.079
	Muslim	0.664	0.503	0.334	0.483	0.458	0.221
Female Headed Household	**SC**	0.681	0.439	0.299	0.313	0.473	0.148
	BC	0.710	0.508	0.361	0.487	0.462	0.225
	GEN	0.256	0.395	0.101	0.354	0.435	0.154
	Hindu	0.224	0.429	0.096	0.157	0.497	0.078
	Muslim	0.718	0.496	0.356	0.545	0.457	0.249
Total	**SC**	0.625	0.493	0.308	0.326	0.439	0.143
	BC	0.610	0.503	0.307	0.460	0.459	0.211
	GEN	0.393	0.461	0.181	0.347	0.464	0.161
	Hindu	0.227	0.441	0.100	0.182	0.434	0.079
	Muslim	0.667	0.502	0.335	0.490	0.457	0.224

Source: Calculation based on the unit level data of NFHS-4 & NFHS-5

The table 5 reveals that forty six percent households are deprived as per MPI criterion they belong to Backward category, thirty two percent belong to scheduled category and thirty four percent are related to other categories. It implies households belong to Backward category in Nuh district of Haryana are most deprived. It can be observed that female headed households related to Backward class are more deprived than female headed households of Scheduled and other class categories with forty eight percent number.

The progress picture of caste and gender based poverty reduction during the period from 2015-16 to 2019-21. It can be seen from the table that thirty one percent households belong to SC category have come out from deprivation status which is more than BC and other category households. Similarly, thirty seven percent female headed households belong to SC category have come out from the deprivation trap during the same period which is more than male headed households and female headed households of both categories i.e., BC and other categories. However, the ten percent families belong to other caste that means other than SC and BC category have fallen into the deprivation trap in the same duration.

3.5 Religion based poverty and Progress

Table 5 also throws light on religion-based poverty in the Nuh district of Haryana. It can be observed from table that Muslim households are more deprived than the Hindu household with forty nine percent and eighteen percent respectively. In addition to this female headed households belong to Muslim religion are more deprived than female headed households of Hindu religion. However, during the 2015-16 to 2019-21 seventeen percent Muslim households have come out of deprivation which is more than Hindu households poverty reduction with only four percent. Moreover, female and male headed Muslim households have

performed better than male and female headed households related to Hindu religion with the reduction of eighteen and seventeen percent reduction in poverty.

Table: 6 Percentage of Households Deprived in Each Indicators in Nuh District of Haryana

Area			Child Mortality	Nutrition	Years of Schooling	School Attendance	Electricity	Drinking Water	Sanitation	Flooring	Cooking Fuel	Assets
NFHS-4	Rural	Male Headed Household	9.68	61.27	33.57	26.07	10.44	24.33	48.34	70.3	89.02	24.54
		Female Headed Household	6.71	62.41	22.48	39.93	16.44	17.11	62.41	72.48	84.89	38.59
		Total	9.49	61.34	32.85	26.98	10.83	23.86	49.26	70.44	88.75	25.46
	Urban	Male Headed Household	7.75	61.84	22.85	24.73	2.93	8.38	43.18	63/10	61.42	17.19
		Female Headed Household	0	0	50	20	20	20	50	70	70	20
		Total	7.59	60.57	23.4	24.64	3.28	8.62	43.32	63.24	61.6	17.24
	Nuh	Male Headed Household	9.49	61.33	32.49	25.94	9.68	22.72	47.82	69.57	86.23	23.8
		Female Headed Household	6.49	60.39	23.37	39.28	16.55	17.2	62.01	72.4	84.41	37.98
		Total	9.3	61.27	31.93	26.75	10.1	22.39	48.69	69.75	86.12	24.67
NFHS-5	Rural	Male Headed Household	4.06	44.81	33.98	23.92	1.59	16.14	30.07	47.61	83.19	18.79
		Female Headed Household	2.15	45.9	25	40.3	4.09	24.78	25.86	50.21	84.05	34.69
		Total	3.86	44.92	33.04	25.63	1.85	17.05	29.63	47.88	83.28	20.46
	Urban	Male Headed Household	3.11	41.55	23.78	12.44	0	10	23.33	26.22	43.33	11.11
		Female Headed Household	0	8.69	10.87	13.04	0	8.69	21.73	36.95	52.17	13.04
		Total	2.81	38.43	22.53	12.67	0	9.85	23.13	27.16	44.06	11.46
	Nuh	Male Headed Household	3.966	44.482	32.94	22.75	1.42	15.22	29.39	45.43	79.13	18.01
		Female Headed Household	1.96	42.59	23.72	37.84	3.72	23.33	25.49	49.2	81.17	32.745
		Total	3.75	44.27	31.98	24.33	1.66	16.32	28.98	45.79	79.32	19.55

Source: Calculation based on the unit level data of NFHS-4 & NFHS-5

3.6 Deprived in each indicator (Why they are deprived?)

Table 6 gives the answer of cause of poverty question in terms of deprivation in ten indicators based on three dimensions i.e., health, education and standard of living. It can be seen that seventy nine percent households are deprived in cooking fuel followed by forty five percent and forty four percent households deprived in flooring and nutrition. It implies that most of the households in Nuh district of Haryana are poor due to deprivation of cooking fuel, flooring (pucca house) and nutrition. However, in terms of Child Mortality and electricity only five percent households are deprived.

The table also gives the progress picture of households in terms of each indicator during 2015-16 to 2019-21. It can be observed that more than forty percent households have come out of the deprivation of flooring followed by twenty percent and seventeen percent households have come out of the deprivation of sanitation and nutrition.

Gender based deprivation in each indicator

Table 6 also gives the picture of gender-based deprivation in each indicator. It can be observed that female headed households in Nuh district of Haryana are more deprived in flooring and cooking fuel followed by children school attendance and assets indicators with the fifteen and fourteen percent than male headed households in the Nuh district of Haryana. On the other hand, in terms of sanitation, years of schooling and nutrition male headed households are more deprived than female headed households in the Nuh district of Haryana with four percent, fifteen percent and two percent respectively. During 2015-16 to 2019-21 female headed households have performed well in terms of thirty six percent reduction in families not having adequate sanitation. In terms of flooring male families have performed better than female headed households during the same duration.

Proportional Contribution of each indicator of Poverty

The Table **I-IV** in appendix reveals the proportional contribution of each indicator in the poverty index of Nuh district of Haryana. It can be observed from the table that proportional contribution of nutrition has deceased from twenty six percent to twenty four percent during 2015-16 to 2019-21 and during the same duration proportional contribution of years of schooling has decreased with minor extent from twenty two percent to seventeen percent. Overall, it has been extracted that the proportional contribution of health and standard of living indicators in poverty index has declined in comparison to education indicators during the 2015-16 to 2019-21.

Table 7: Results of Logit Regression

Parameter	β's	β's Value	Odd Ratio (Logit^{-1} of β's)	Std. error	z	P>z
Intercept	β_0	-0.909	0.402	0.086	-10.560	0.000
Gender (F)	β_1	-0.219	0.802	0.095	-2.300	0.022
Religion (Muslim)	β_2	0.718	2.052	0.079	9.040	0.000
Caste (SC)	β_3	0.364	1.439	0.101	3.610	0.000
Caste (BC)	β_4	-0.112	0.893	0.066	-1.690	0.092
Age (Young age)F	β_5	0.476	1.610	0.057	8.330	0.000
Area (Urban)	β_6	-0.172	0.841	0.102	-1.680	0.093
LR test: χ^2 (01)=192.45 (p <0.005)						

Source: Calculation based on the unit level data of NFHS-4 & NFHS-5

β0 = -0.90918 is interpreted as the log-odds that ρ=1 when Xij=0 and u=0, and is referred to as the overall intercept. The probability of β0 is estimated by Logit-1, that means the probability of multidimensional poverty incidence for Rural, Older age male headed household of general category and Hindu religion is 40 percent. If we hold u=0, Female=1, the probability of poverty for a female-headed household with the same circumstances would be 32 percent which eight percent less than their male counterpart. Furthermore, the probability of poverty incidence for a rural, Muslim, female-headed household with the similar above-mentioned factors is 66 percent, while the probability of poverty incidence for the rural, Muslim, female-headed household is approximately 95 percent. While the above-mentioned factors are significant, no significance is perceived for a head of household who belongs to backward class and urban area.

Concluding Remarks

In conclusion, the Nuh district of Haryana has got success to reduce the number of deprived people based on global MPI criterion during the period of both NFHS-IV and NFHS-V. The reduction in the number of MPI criterion based deprived people triumphs the government policies success. However, in terms of global MPI, multidimensional severity and Multidimensional vulnerability, the female headed households in the Nuh district of Haryana have been found more deprived than male headed households. This has provided the scope for policy makers. The policy makers in this regard should focus on the female headed households rather than to providing benefits of any kind uniformly to all. The female headed households should be given more weightage and reservation in all the schemes of benefits. The higher tier government should engage local government to employ resources in proper manner through proper monitoring in this regard. There should be special budgetary provision for the benefits of female headed households. The government should also focus on providing more economic and social infrastructure facilities in the Nuh district of Haryana as public investment in infrastructure generates positive spillover effects which further results in economic and social progress. There should be diversity in the government policy focused on poverty reduction of scheduled, backward class and Muslim families of Nuh district of Haryana as they have been found more deprived than others. Therefore, all the policies of government in line to sustainable development goals (SDGs) should inbuilt diversity to achieve the target of developed India @ 2047.

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Appendix I

TABLE 1 Proportional contributions of each Dimension to Multidimensional Poverty Index by Gender (NFHS-4)

	Rural			Urban			Nuh		
Indicators	Male Headed Household	Female Headed Household	Total	Male Headed Household	Female Headed Household	Total	Male Headed Household	Female Headed Household	Total
Child Mortality	0.053	0.035	0.051	0.053	0	0.053	0.053	0.034	0.051
Nutrition	0.265	0.256	0.264	0.296	0	0.293	0.268	0.254	0.261
Years of Schooling	0.177	0.117	0.173	0.146	0	0.144	0.174	0.115	0.170
School Attendance	0.142	0.204	0.147	0.170	0.335	0.172	0.145	0.205	0.149
Electricity	0.018	0.027	0.019	0.007	0.111	0.008	0.017	0.028	0.018
Drinking Water	0.034	0.21	0.033	0.015	0.111	0.016	0.032	0.022	0.031
Sanitation	0.072	0.085	0.073	0.071	0.111	0.072	0.072	0.085	0.073
Flooring	0.091	0.090	0.091	0.106	0.111	0.106	0.092	0.090	0.092
Cooking Fuel	0.107	0.106	0.107	0.101	0.111	0.101	0.107	0.106	0.107
Assets	0.041	0.060	0.042	0.035	0.111	0.036	0.040	0.061	0.041

Source: Field level data

TABLE II: Proportional contributions of each Dimension to Multidimensional Poverty Index by Gender

	Rural			Urban			Nuh		
Indicators	Male Headed Household	Female Headed Household	Total	Male Headed Household	Female Headed Household	Total	Male Headed Household	Female Headed Household	Total
Child Mortality	0.024	0.016	0.023	0.032	0	0.031	0.024	0.016	0.023
Nutrition	0.246	0.245	0.246	0.285	0	0.275	0.249	0.240	0.248
Years of Schooling	0.230	0.152	0.221	0.291	0	0.281	0.234	0.149	0.225
School Attendance	0.183	0.233	0.189	0.158	0.50	0.171	0.181	0.239	0.188
Electricity	0.004	0.010	0.005	0.000	0	0	0.004	0.010	0.004
Drinking Water	0.027	0.039	0.028	0.006	0	0.006	0.026	0.038	0.027
Sanitation	0.058	0.047	0.056	0.041	0.166	0.039	0.057	0.046	0.055
Flooring	0.079	0.083	0.080	0.072	0.166	0.076	0.079	0.084	0.079
Cooking Fuel	0.113	0.114	0.114	0.084	0.166	0.087	0.112	0.115	0.112
Assets	0.035	0.061	0.038	0.030	0.166	0.035	0.035	0.063	0.038

Source: Field level data

TABLE III: Proportional contributions of each Dimension to Multidimensional Poverty Index by Gender NFHS-4

	Rural			Urban			Nuh		
Indicators	**Male Headed Household**	**Female Headed Household**	**Total**	**Male Headed Household**	**Female Headed Household**	**Total**	**Male Headed Household**	**Female Headed Household**	**Total**
Health	0.318	0.291	0.316	0.349	0	0.346	0.320	0.288	0.318
Education	0.319	0.320	0.319	0.316	0.355	0.316	0.319	0.321	0.319
Standard of Living	0.363	0.389	0.365	0.335	0.665	0.338	0.361	0.392	0.363

Source: Field level data

TABLE IV: Proportional contributions of each Dimension to Multidimensional Poverty Index by Gender

	Rural			Urban			Nuh		
Indicators	Male Headed Household	Female Headed Household	Total	Male Headed Household	Female Headed Household	Total	Male Headed Household	Female Headed Household	Total
Health	0.271	0.261	0.269	0.317	0	0.305	0.273	0.256	0.271
Education	0.413	0.385	0.410	0.450	0.502	0.451	0.416	0.388	0.413
Standard of Living	0.316	0.354	0.321	0.234	0.498	0.244	0.311	0.357	0.316

Source: Field level data

[i] Anthropometry is the measurement of population of the human body.

[ii] In MPI, the three dimensions are equally weighted, so that each of them receives a 1/3 weight (the indicator *i* weight is expressed as w_i, with $\sum^{d}_{i=1} W=1$).

[iii] Seth and Alkire (2014) the decomposition results focusing on the censored deprivation score vector to show their relevance to a dual cutoff approach to poverty measurement and the study explore the inequality decomposition across these two groups.

[iv] Seth and Alkire (2014) the decomposition results focusing on the censored deprivation score vector to show their relevance to a dual cutoff approach to poverty measurement and the study explore the inequality decomposition across these two groups.