



Fuzzy Multidimensional Poverty in Nagaland: A District wise Study

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Abstract

Poverty remains an important area of research in South Asia. In India, even after almost seventy-five years of independence the dimension wise distribution of poverty is very much shocking. Especially for the case of Northeast Indian States, poverty and inequality vary a lot. This indicates exclusion of this region from rest of the India. The cultural aspect and the isolated features in Northeast India are quite responsible. Measuring poverty in multi-dimension wise is to give the overall or macro view of the situation, but the use of fuzzy logic enhances the capacity of usual multidimensional measurement for micro view. Present study analyses the poverty and inequality among the districts of Nagaland in different aspects of life. The purpose of the study is to give a microscopic view of poverty in Nagaland. Across the dimensions, the unequal distribution of deprivations causes many anomalies in the State. The empirical findings critically analyse the different contributing factors.

Keywords

Poverty, Unidimensional, Multidimensional Poverty Index, Fuzzy Sets, Nagaland, Deprivation, Northeast India, Women, Youth.

JEL Codes

D63, E24, I14, I32, I24.

Introduction

Poverty has been in existence in South Asian countries for a long time with higher intensity. As India is one of the important countries in South Asia, there is no difference in India regarding poverty and inequality. The impact of poverty can be seen in different parts of India but with different intensities and causes. Northeast India has received comparatively less attention than the rest. The two very general causes are geographical and cultural for the isolation of this region. In the present study, we would like to focus on Nagaland as it is an important state in Northeast India. Recent data and reports have been showing different tendencies.

Nagaland is a landlocked state in Northeast India. On 1st December 1963, it became the 16th State of India. Nagaland is a Himalayan Mountain State. The terrain is hilly and landslides are very regular, hence the transport costs are very high in the region. This results in a high cost of living in the state. As per Census 2011, there are roughly 16 major tribes in the 11 different districts of Nagaland, also these major tribes are subdivided into many clans. Though Indian English is the official language of the State, the major languages spoken are approximately 24. Unlike the other states, Nagaland has granted autonomy in most areas. This isolated feature has abled to protect of tribal tradition and culture in the region.

The government's role has not been very supportive in Northeast India, which led to critical social issues and conflicts in the region (Bhattacharya, 2011). Though Nagaland got its statehood in the early sixties, the process of development was unable to take place properly due to many rebellious activities. Year after year many separatist groups were formed and dissolved mainly for the demand for "Greater Nagaland". During this period peace and harmony in the region have been hampered a lot. Most young people keep fighting for the separatist groups without knowing the proper cause (Tariq, 2011).

Nagaland is one of the smallest states in India, where 49.23 percent of the total population is in the workforce, and out of which 56.71 percent are in agriculture & allied services, 12.85 percent were in the household industry and 38.95 percent were in other works (Nagaland, 2011). Agriculture & related activities are the main occupations in the rural areas of Nagaland. Traditional Jhum practice, for cultivation, suffers from inadequate irrigation, rough weather, and soil management. The poor level of infrastructure in the region hinders the mobility of foods. Most of the tribal people in rural areas are mainly dependent on agriculture but the government's extension machinery has been facing challenges in intervening due to the customary laws and administrative practices of the tribes. Unlike most of the other small states of India, Northeast states are very

weak in the industrial sector. According to the Small States Profile Ranking in India: 2009, Delhi was at the top and Meghalaya was at the bottom (10th). Nagaland's position was 7th (from top) (Bhattacharya, 2011).

Education is the backbone of any society. Educated youth can lead society with their vision and mission for further betterment. As per the report of MHRD (2016-17), the primary dropout rates, Arunachal Pradesh (23.25 %) having the highest in India (6.35 %), and Nagaland (20.95 %) holds the very second position followed by Meghalaya (17.69 %). For the case of upper primary dropout rates, Nagaland (18.28 %) holds first place in the region followed by Meghalaya (17.59 %). Nagaland (31.28 %) again holds the highest position in the region for the dropout rates at the secondary level followed by Mizoram (30.67 %). Although the literacy rate in Nagaland is quite impressive, youth have been facing tremendous difficulties to find a proper jobs. Due to weak industrialization and infrastructure, most of the educated population was unwillingly forced to depend on agriculture and allied activities (Kikhi, 2006). There will be a two-fold situation, unemployed intelligent people may become dangerously violent and that will be a significant waste for the country to have idle educated people (Puttaswamiah, 1977). This two-fold situation is happening in Nagaland. Various public media (mainly in Northeast India) has been reporting different social unrests related to the youth. Many antisocial and violent events took place in the region (Nagaland), where the presence of the youth was prominent (Nongkynrih, 2009). Lack of industrialization, infrastructure, and the very isolated & excluded feature of the state of Nagaland, paved the way for unemployment and social unrest. Which causes poverty. The 5.77 percent of poor people in India resided in the Northeast region, whereas this entire region accounted for only 3.58 percent of the total Indian population (Ray & De, 2005). As per the NITI-Aayog's Report of the Task Force on Elimination of Poverty- Nagaland, the poverty line defined in 2011-12, there were approximately 2.8 lakh poor persons (14 percent of the State's population), in rural areas, 6.1 percent in urban areas, 32.1 percent of the State's population were below the poverty line. Overall 92.69 percent of deprivation in Standard of Living, 20.26 percent of deprivation in Health, and 34.55 percent in Education in Nagaland (Jamir & Ezung, 2017). Nagaland ranked 5th among the eight Northeast States in India regarding the share of BPL population but surprisingly it got 3rd rank regarding multidimensional poverty (Bagli, 2017). As per 61st round, NSS (2004-05) data Nagaland (9.71 %) ranked 1st in rural areas and also in urban areas for headcount ratio among the Northeast States, but later Nagaland's (19.9 % in rural & 16.5 % in urban) rank came down to 4th place as per 68th round NSS-2011-12 data (Khan & Padhi, 2017). Nagaland also has a long tradition of deprivation and vulnerability like insurgency and ethnic conflict.

Poverty measures and different approaches

The poverty measurements have been focusing mainly on income and non-income approaches. The dollar-a-day international poverty line was introduced by the World Development Report (1990). The income-focused approach identifies poverty by specifying a cut-off 'Poverty-Line', defined as the level of income below which people are diagnosed as poor. The income approach is one-dimensional, so it is easy to calculate and interpret but very difficult to analyze. As per Sen, poverty is not having a lack of money, it's way bigger than this. Poverty is multidimensional deprivation an individual suffers. So, considering only one dimension (income or expenditure) may lead to manifold confusion. To address this issue a new multidimensional measurement of human deprivation was introduced by the Human Development Report (1996) as the Capability Poverty Measure (CPM), which was not income focused. For better understanding, both the approaches (income & non-income) were incorporated to form the Human Development Index (HDI) by UNDP. The measurement of poverty has two distinct but interrelated exercises, viz; (1) identification of the poor, and (2) aggregation of the statistics regarding the identified poor to derive an overall index of poverty (Sen, 1981). To complement the HDI, Human Poverty Index (HPI) was 1st introduced in the Human Deprivation Report (1997). HPI had two parts HPI-1 for developing countries (low-income) and HPI-2 for a group of selected high-income countries for identifying regional disparities. In 2010, it was replaced by the Multidimensional Poverty Index (MPI). As per the traditional approach to poverty measurement, partitioning the population into the simple dichotomy of 'the poor' versus the 'non-poor' is an oversimplification. Poverty is not a simple attribute that characterizes an individual in terms of its presence or absence rather the relative hardship or well-being of a person is a matter of degree (Cheli & Lemmi, 1995). The Unidimensional (income) poverty index cannot capture all the essence of poverty or deprivation as poverty has many dimensions like well-being, employment, nutrition, health, education, etc. whereas the MPI will do better in the understanding the root causes of poverty & policy measures to curb the issue (Banerjee, Chaudhuri, Montier, & Roy, 2014). Poverty not only causes difficulties in doing livelihood practices but in many cases, it can disable people from making proper cognitive actions. People behave in a less capable way under poverty which surely helps to sustain poverty (Mani, Mullanathan, & Zhao, 2013).

It has been recognized that the multidimensional approach toward poverty is sufficiently good over the unidimensional approach, but the identification of the poor remained a problem to be solved (Cheli & Lemmi,

1995). Poverty is a collective situation in society but in reality, somehow it is related to individual behavior with a lot of ambiguity to address. We need a more sophisticated method for dealing with the uncertainty problem of poverty (Betti, Cheli, Lemmi, & Verma, 2008). Zadeh introduced the fuzzy set theory to incorporate the degree of uncertainty of the members of a set by distinguishing their crispness and fuzziness (Zadeh, 1965). Fuzzy logic mainly deals with ambiguity and vagueness. Cerioli and Zani (1990) were the first to use Fuzzy logic in the measurement of poverty. Poverty qualifies for the fuzzy logic as its intrinsic character is very much vague and unclear (Betti & Verma, 2007). We simply cannot declare that a person is certainly poor, if we do so then there comes an important question is it possible to make that individual non-poor by giving a few rupees? There is no simple answer to this question due to its vagueness (Qizilbash, 2006). We need detailed information for identifying poor households and their intensity but, it is very much impossible to gather specified information regarding income and consumption of basic needs, so, the fuzzy character is intrinsically present in the information (Chakravarty, 2011).

Need for the Study and objectives

We have already discussed the situation in Northeast India in different aspects and especially in Nagaland regarding insurgency and conflicts, livelihood, women participation, youth, and poverty as per various articles and reports published by different researchers and organizations. Not much holistic and in-depth study has been done in this region (Nagaland) so far. All the studies discussed earlier, have not considered the use of fuzzy logic for detailed district-wise analysis in Nagaland. The majority of the studies discussed above were done mainly by using different rounds of NSS (National Statistical Survey) data. We have mentioned the cause and significance of the use of fuzzy logic in the measurement of poverty analysis suggested by the researchers.

Our basic objectives are to analyze the existing deprivation in the districts of Nagaland using fuzzy logic and to see the dimension-wise response of the indicators as well as the sub-indicators for the period 2015-16. By this, we want to see the impact of exclusion on Women's participation, educational attainment, social justice, and problems of youth, sustaining the poverty in the region.

Materials and Methods

For the present study, we used mainly the unit-level household data from the National Family Health Survey 2015-16 (NFHS-4) also, we have used other data from sources available for the study like the Census 2011 of

India report, NITI-Aaygo's Report of the Task Force on Elimination of Poverty- Nagaland, National Family Health Survey 2015-16 (NFHS-4) report on Nagaland, etc.

In the present study for calculation of the Multidimensional Poverty Index, we used mainly the Alkire-Foster methodology (Alkire & Foster, 2011). To incorporate the Fuzzy logic in the calculation of Multidimensional Poverty, we used the methodology used by Das (Das & Pal, 2019) previously developed by Costa, Degum & Costa, and Costa & Angelis (Costa, 2002) (Dagum & Costa, 2004) (Costa & Angelis, 2008). Now the existing methodology of Alkire and Foster (2011) is to be blended with the Fuzzy logic for measuring Fuzzy Multidimensional & Unidimensional Poverty.

Here n is the cardinal number of the crisp set A . A is a representative sample of the population.

The m -order vector of attributes X considers attributes for various dimensions of poverty. Subset B (of A) is a set of poor households. The degree of the membership to the set B of the i^{th} household represented by the poverty ratio of the i^{th} household. B contains any household (a_i) must have some degree of membership according to the attributes vector or in other words if any household does not possess at least any of the attributes of X .

The membership function to the fuzzy set B can be defined as

$$\mu_B(X_j(a_i)) = x_{ij}, 0 \leq x_{ij} \leq 1$$

In particular, $x_{ij} = 1$ if and only if the i^{th} household doesn't possess the j^{th} attribute; $x_{ij} = 0$ if and only if the i^{th} household possesses the j^{th} attribute; $0 < x_{ij} < 1$ if and only if the i^{th} household possesses the j^{th} attribute with some intensity, which belongs to the open interval $(0,1)$.

The poverty ratio or the degree of membership of the i^{th} household to the fuzzy set B can be defined as the weighted average of x_{ij}

$$\mu_B(a_i) = \frac{\sum_{j=1}^m x_{ij} W_j}{\sum_{j=1}^m W_j}$$

Here W_j , attached weight to the j^{th} attribute. $\mu_B(a_i)$ measures the degree of poverty (relative deprivation) of the i^{th} household. The weight W_j captures the intensity of the vulnerability of X_j . Its nature is an inverse type.

Cerioli & Zani (1990) suggested a form for W_j

$$W_j = \log \left[\frac{n}{\sum_{i=1}^n x_{ij} n_i} \right] \geq 0$$

Here n_i , the weight attached to the i^{th} sample observation.

So, the poverty ratio of the population μ_B be

$$\mu_B = \frac{\sum_{i=1}^n \mu_B(a_i) n_i}{\sum_{i=1}^n n_i}$$

The above formula can be considered as a weighted average of the poverty ratio of the i^{th} household.

The Unidimensional poverty ratio for the j^{th} indicator is the weighted average for x_{ij} with the considered weight n_i be

$$\mu_B(X_j) = \frac{\sum_{i=1}^n x_{ij} n_i}{\sum_{i=1}^n n_i}$$

In the present study, we divided the m-order vector attributes X into three main dimensions as suggested by Alkire and Foster (2011) for a multidimensional approach, which are Health, Education, and Standard of Living.

More specific breakdowns and indicator-wise classification of crisp and fuzzy can be seen in Table 01.

Using the Fuzzy logic, we changed the character of the indicators from crisp to fuzzy. In Table-01 we showed the distinction between crisp indicators with or without deprived conditions (either 1 or 0) and newly constructed Fuzzy indicators with their membership values belongs to an open interval (0,1). That means the Fuzzy indicators can assume any values between 0 to 1 under different intensities of deprivation.

According to the Alkire-Foster methodology, we need to calculate the Multidimensional Headcount ratio (H)

$$H = \frac{q}{n}$$

Here q is the number of households that are multidimensionally poor and n is the total number of households in the population (Alkire & Foster, 2011).

Average intensity (A)

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

Here $C_i(k)$ is the censored deprivation score of the i^{th} household. $C_i(k)$ is defined as

$$C_i = W_1 I_1 + W_2 I_2 + W_3 I_3 + \dots + W_j I_j + \dots + W_m I_m$$

Here $I_j = 1$ if the i^{th} household is deprived in the indicator j and $I_j = 0$ if the household is surely not deprived in the indicator j . We may consider any household as poor if $C_i \geq k$, where k is the poverty cutoff and the value of k suggested by Alkire-Foster was to be considered any household lacking in at least one of the dimensions mentioned. That means we may consider a household poor if that particular household is deprived in at least one of the given dimensions (Health, Education, and Standard of living) (Alkire & Foster, 2011).

Table-01
Indicators wise Membership values

STANDARD OF LIVING			
<i>Crisp Indicators</i>	<i>Fuzzy Indicators</i>	<i>Fuzzy Deprivation Membership Values (Poverty Ratio)</i>	
Assets	Rural/Urban	Radio	0.00462962962963
		Cycle	0.00462962962963
		Sewing Machine	0.00462962962963
		Watch	0.00462962962963
		Fan	0.00462962962963
		Chair	0.00462962962963
		Own this house	0.00462962962963
		Cot/Bed	0.00462962962963
	Urban	TV	0.00154320987654
		Refrigerator	0.00154320987654
		Bike	0.00154320987654
		Car	0.00154320987654
		Water pump	0.00154320987654
		Telephone/Mobile	0.00154320987654
	Rural	Agricultural land	0.00154320987654
		Animal drawn cart	0.00154320987654
		Irrigated land	0.00154320987654
		Live stock	0.00154320987654
Thresher		0.00154320987654	
Tractor		0.00154320987654	
Housing	Floor material	0.01851851851852	
	Wall material	0.01851851851852	
	Roof material	0.01851851851852	
Drinking Water	Source of water	0.02469135802141	
		0.01234567901231	
	Time	0.01851851851852	
Electricity		0.05555555555556	
Sanitation	Toilet facility	0.01851851851852	
		0.00925925925925	
	Shared toilet	0.02777777777777	
Cooking (fuel & place)	Type of fuel	0.03703703703703	
	No Separate kitchen	0.01851851851851	
EDUCATION			
School Attendance	Member attended school 2015-16	0.11111111111111	
	Educational level 2015-16	0.05555555555556	

Years of Schooling	Highest educational level	0.05555555555556	
	Highest years of schooling	0.11111111111111	
HEALTH			
Child Mortality	Age at death (≤ 5)	0.16666666666666	
Nutrition	Child	Severe	0.0370370370377
		Moderate	0.0185185185182
	Women	Severe	0.0370370370371
		Moderate	0.0185185185182
	Men	Severe	0.0370370370374
		Moderate	0.0185185185182

Source: Author's calculation from Alkire-Foster (2011) & Costa (2002).

Multiplying both headcount ratio and average intensity, we get the Multidimensional Poverty Index ($MPI=H \times A$), but as we are combining Alkire and Foster's (2011) methodology with Fuzzy logic, we simply denote the Fuzzy Multidimensional Poverty index by MPI^* .

Results & Discussion

We have used the Fuzzy Multidimensional Poverty Index (MPI^*) and the Fuzzy Unidimensional Poverty Ratio for our calculation. We have discussed the different membership values for different indicators as well as for different sub-indicators (Table-01). We have calculated the Headcount ratio, Average intensity, and Fuzzy Multidimensional Poverty Index (MPI^* -overall) for different districts of Nagaland (Table-02). We also calculated different Headcount ratio, Average intensity, and MPI^* for male and female household headship (Table-02a & Table-2b). We used the Fuzzy Unidimensional Poverty Ratio for the different indicators and sub-indicators for critical analysis (Table-03, Table-04 & Table-05).

The top three districts having the highest Headcount ratio are Mon, Tuensang & Longleng. Whereas the top three districts having the lowest Headcount Ratio are Mokokchung, Kohima & Zunheboto (Table-02). According to the Headcount Ratio of the Nagaland, roughly 44 percent of households out of the entire population are deprived at least in one dimension out of the three mentioned in Table-01 (Standard of Living, Education, and Health). The district Mon has roughly 71 percent of households whereas the district Mokokchung has roughly 23 percent of households under Multidimensional poverty. This shows severe inequality among the districts regarding the Multidimensional Headcount Ratio. The top three districts having the highest Average Intensity are Mon, Longleng, and Kiphire. Whereas the districts having the lowest Average Intensity are Mokokchung, Wokha, and Kohima.

Table-02**District wise distribution of overall Fuzzy Multidimensional Poverty Index (MPI*)**

DISTRICTS	HEADCOUNT RATIO (H)	AVERAGE INTENSITY (A)	MPI* (Overall)
Dimapur	0.378742046521	0.396077659123	0.150011263198
Kiphire	0.502751854511	0.424820590076	0.213579339495
Kohima	0.289984029204	0.394239874078	0.114323267158
Longleng	0.542428861789	0.429800441023	0.233136164021
Mokokchung	0.232323232323	0.374082906011	0.086908149881
Mon	0.708511001194	0.448013527160	0.317422512677
Peren	0.530070611152	0.415102980473	0.220033890550
Phek	0.449853504620	0.418489823460	0.188259113731
Tuensang	0.614160700080	0.422130802257	0.259256149039
Wokha	0.352523098792	0.392740735313	0.138450181034
Zunheboto	0.344854268765	0.411570561800	0.141931865135
<i>Nagaland</i>	0.444011162653	0.416605776879	0.184977615360

Source: Author's calculation from NFHS-4 (2015-16) unit level household data.

In the district Mon, an average deprived household experiences 45 percent of deprivation. Whereas in the district Mokokchung an average deprived household experiences 37 percent of deprivation. Which shows lesser inequality among the districts regarding Average Intensity.

Table-02a**District-wise distribution of Fuzzy Multidimensional Poverty Index of households with Male headship**

DISTRICTS	HEADCOUNT RATIO (H)	AVERAGE INTENSITY(A)	MPI* (Male Household Head)
Dimapur	0.396681749623	0.396899106452	0.157442631971
Kiphire	0.512072434608	0.426446667118	0.218371583061
Kohima	0.311183584726	0.394097082538	0.122636542874
Longleng	0.540533333333	0.430097628126	0.232482104590
Mokokchung	0.232821341956	0.373781354007	0.087024276438
Mon	0.704968383017	0.449434028214	0.316836780143
Peren	0.559160839161	0.415345393052	0.232244878521
Phek	0.461538461538	0.420538692054	0.194094780948
Tuensang	0.629965947787	0.423660187860	0.266891491784
Wokha	0.377403846154	0.391558790813	0.147775771004
Zunheboto	0.364655172414	0.411194951270	0.149944365851
<i>Nagaland</i>	0.462611479534	0.417817986671	0.193287396990

Source: Author's calculation from NFHS-4 (2015-16) unit level household data.

The impact of the Headcount ratio and Average intensity together can be seen in the Fuzzy Multidimensional Poverty Index or MPI*. The top three districts having the highest MPI* are Mon, Tuensang, and Longleng and the top three districts having the lowest MPI* are Mokokchung, Kohima, and Wokha. The visible inequality in MPI* among the districts is mainly due to the headcount ratio rather than the average intensity. That means the distribution of deprived households is pretty much uneven but they are experiencing deprivation quite similar in manner. That surely indicates an unbalanced development process has been going on in the state.

Table-02b

District-wise distribution of Fuzzy Multidimensional Poverty Index of households with Female headship

DISTRICTS	HEADCOUNT RATIO (H)	AVERAGE INTENSITY (A)	MPI* (Female Household Head)
Dimapur	0.291232372777	0.390619790134	0.1137611288334
Kiphire	0.320197044335	0.373886853804	0.119717465504
Kohima	0.179104477612	0.395537463865	0.070842530841
Longleng	0.580645161290	0.424222679382	0.246322846093
Mokokchung	0.228187919463	0.376637228872	0.085944065649
Mon	0.768292682927	0.426018308462	0.327306749184
Peren	0.334586466165	0.412380605498	0.137976969509
Phek	0.348583877996	0.394979056344	0.137683331187
Tuensang	0.388663967611	0.386763760195	0.150321137566
Wokha	0.157232704403	0.415009700078	0.065253097496
Zunheboto	0.171284634761	0.418580117132	0.071696342481
<i>Nagaland</i>	0.295038295038	0.401382693067	0.118423265420

Source: Author's calculation from NFHS-4 (2015-16) unit level household data.

The headcount ratio for Nagaland is surprisingly low in female household headship. Approximately there are 46 percent of households live under multidimensional poverty under male headship, whereas only 29 percent of households under female headship. More or less all districts have a low headcount ratio for the case female headship, except the districts Mon and Longleng (Table-02a & Table-02b).

To see the deprivation more clearly indicator-wise breakdown is necessary. The district Mon (77.61%, 91.09% & 14.47%) ranks top regarding assets, housing, and electricity respectively whereas regarding drinking water, sanitation, and cooking Peren (72.71%), Tuensang (41.46%), and Longleng (95.93%) respectively rank top as per the proportion of deprived households (Table-03). The district Mokokchung (19.18% & 11.63%) ranks last regarding assets and sanitation respectively, whereas Kohima (44.35% & 0.55%) ranks last in housing and electricity respectively as per deprived proportion (Table-05). For drinking water and cooking Tuensang

(38.18%) and Dimapur (43.38%) respectively rank last as per the proportion of the deprived households (Table-03). This result shows there exists severe inequality in assets, housing, drinking water, and cooking among the districts. Whereas for sanitation and electricity the distribution of the deprivation the inequality is low, though there exists a higher degree of deprivation. Among all the districts Mon (45.21%) had the highest and Mokokchung (16.33%) had the lowest proportion of deprivation for the case of school attendance. Whereas the deprivation in years of schooling among all the districts is very high but the inequality was low (Table-04). Child mortality is low in all the districts with almost negligible inequality. Though the district Phek ranks top and Dimapur ranks as per child mortality. For the indicator of nutrition, males are less deprived than children and females. The district Mon (21.26% & 13.80%) score highest in the deprivation of child and female nutrition respectively and for male's health Peren is top of the list (Table-05).

Figure-01
District-wise Administrative Map of Nagaland



Source: Department of Land Resources Govt. of Nagaland.

Figure-02
Spatial Distribution of MPI* for the Districts of Nagaland in 2015-16



Multidimensional Poverty Index

Source: Authors calculation

Figure-03

Spatial Distribution of MHCR for the Districts of Nagaland 2015-16



Multidimensional Headcount Ratio

Source: Authors calculation

Figure-04

Spatial Distribution of MAI of the Districts of Nagaland in 2015-16



Multidimensional Average Intensity of Deprivation

Source: Authors calculation

Figure-02, 03 & 04 are the graphical representations of the MPI* (overall), Multidimensional Headcount ratio & the Multidimensional Average Intensity for all the districts of Nagaland during 2015-16. It can be seen from the above figures the distribution of multidimensional poverty is quite a at par with the headcount ratio instead of average intensity. Multidimensional poverty was high in the districts which share an international border. This may be due to the result of insurgency in the state. Comparatively the western districts are less poor than their counterparts on the eastern side. At the same time, the northern districts are also experiencing high multidimensional poverty than the districts in the south. (Das & Pal, 2019)

Table-03

District-wise distribution of Fuzzy Unidimensional Poverty Ratio for specific indicators under Standard of Living

DISTRICTS	STANDARD OF LIVING					
	ASSETS	HOUSING	DRINKING WATER	SANITATION	ELECTRICITY	COOKING
Dimapur	0.223388888889	0.525555555556	0.537222222222	0.378333333333	0.018333333333	0.433888888889
Kiphire	0.639125151883	0.718104495747	0.601458080194	0.289185905225	0.018226002430	0.900364520049
Kohima	0.276572064552	0.443516972732	0.603784084585	0.373400111297	0.005564830273	0.538119087368
Longleng	0.701694915254	0.793220338983	0.923163841808	0.389830508475	0.022598870056	0.959322033898
Mokokchung	0.191831683168	0.549504950495	0.440594059406	0.116336633663	0.006188118812	0.626237623762
Mon	0.776169265033	0.910913140312	0.557906458797	0.239420935412	0.144766146993	0.952115812918
Peren	0.576484018265	0.764840182648	0.727168949772	0.385844748858	0.031963470320	0.856164383562
Phek	0.616812227074	0.888646288210	0.525109170306	0.246724890830	0.014192139738	0.89956331877
Tuensang	0.601049868766	0.692913385827	0.381889763780	0.414698162730	0.028871391076	0.914698162730
Wokha	0.405000000000	0.455000000000	0.721250000000	0.305000000000	0.027500000000	0.722500000000
Zunheboto	0.535377358491	0.774764150943	0.716981132075	0.271226415094	0.005896226415	0.867924528302
Nagaland	0.464193347008	0.653794702577	0.607776687773	0.320877552840	0.027022206368	0.738785338446

Source: Author's calculation from NFHS-4 (2015-16) unit level household data.

Table-04

District-wise distribution of Fuzzy Unidimensional Poverty Ratio for specific indicators under Education

DISTRICTS	EDUCATION	
	SCHOOL ATTENDANCE	YEARS OF SCHOOLING
Dimapur	0.335000000000	0.850000000000
Kiphire	0.370595382746	0.833535844471
Kohima	0.229271007234	0.845854201447
Longleng	0.319774011299	0.862146892655
Mokokchung	0.163366336634	0.824257425743
Mon	0.452115812918	0.831848552339
Peren	0.371004566210	0.831050228311
Phek	0.306768558952	0.823144104803
Tuensang	0.410761154856	0.841207349081
Wokha	0.232500000000	0.826250000000
Zunheboto	0.247641509434	0.859669811321
<i>Nagaland</i>	0.308213680549	0.840542227771

Source: Author's calculation from NFHS-4 (2015-16) unit level household data.

Table-05

District-wise distribution of Fuzzy Unidimensional Poverty Ratio for specific indicators under Health

DISTRICTS	HEALTH			
	CHILD MORTALITY	NUTRITION		
		CHILD	FEMALE	MALE
Dimapur	0.000666666667	0.092222222222	0.131111111111	0.018888888888
Kiphire	0.023086269745	0.174969623329	0.106925880923	0.017010935601
Kohima	0.004451864218	0.089037284363	0.092932665554	0.012242626600
Longleng	0.010169491525	0.127683615819	0.111864404780	0.014689265537
Mokokchung	0.001237623762	0.038366336634	0.103960396040	0.011138613861
Mon	0.015590200445	0.212694877506	0.138084632517	0.012249443207
Peren	0.012557077626	0.141552511416	0.060502283105	0.013698630137
Phek	0.019650655022	0.115720524017	0.073144104803	0.008733624454
Tuensang	0.018372703412	0.196850393701	0.093175853018	0.010498687664
Wokha	0.011250000000	0.077500000000	0.088750000000	0.005000000000
Zunheboto	0.002358490566	0.101415094340	0.086084905660	0.009433962264
<i>Nagaland</i>	0.010434317310	0.118879871578	0.101043431731	0.012753054490

Source: Author's calculation from NFHS-4 (2015-16) unit level household data.

The findings from this study show that severe inequality is present in the headcount ratio (MPI* overall). More severe inequality in the headcount ratio for MPI* (male household head) than MPI* (female household head). Less inequality in average intensity for all the cases. As Fuzzy Multidimensional Poverty Index is the manifestation of headcount ratio and average intensity together, the headcount ratio dominates the MPI* (for all cases). For the Standard of living dimension Assets ranks first, then Drinking water, Cooking, Housing, Sanitation, and Electricity comes last regarding the degree of inequality in the proportion of deprived households in the districts. For the Education dimension, School attendance has more degree of inequality than Years of schooling. Similarly, in the Health dimension Child's nutrition ranks 1st then Female nutrition, Child mortality, and Male nutrition comes last. The distribution of deprivation varies a lot among the districts in almost every indicator.

As per the report on Multidimensional Poverty Index in India published by NITI AAYOG, 2021, the headcount ratio of Nagaland was 25.23% whereas Bihar was at the top with 54.91% and Kerala was at the bottom with 0.71%. This fact signifies that Nagaland was having moderately high poverty among the other States of India, which also reflects the exclusion. That report further confirms the findings of the study with the fact that Mon (MPI-0.224) was the most deprived district and Mokokchung (MPI-0.033) was the least deprived among other all the districts of Nagaland (NITI_Aayog, 2021).

According to the NFHS-4 Report on Nagaland (2017), the percentage of household headship was very much unequal in the state even after a long period of independence. Overall 84.20 percent of households come under male headship whereas only 15.80 percent of households are under female headship. Generally, it can be said that lesser household data may statistically show lesser variability. This somehow defines the comparatively low poverty under female household headship than males in the result of the present study. This result also signifies women were unable to get social rights that were quite exclusive from the rest of India.

One of the shocking results of the present study tells about educational status in the state. Roughly 84 percent of households have at least one person (age 14 or above) not completed minimum years of schooling, though the school attendance is pretty much low than years of

schooling. This result statistically shows the situation of youth is a matter of concern. Many young students face problems from their families as parents often ask them to quit their studies and start traditional farming or crafting work in the village. Because if they complete their studies, they may not be that much interested in doing traditional work (Nongkynrih, 2009). The increasing rate of unemployment due to weak industrialization influences the dropout rate in Nagaland. Most of the students are convinced to join the separatist group. Which may cause the dropout rates to be high (Kikhi, 2006) (Tariq, 2011) (Amer, 2017)

The present study shows the deprivation and vulnerability of women in Nagaland. The impact of this social and economic exclusion has been tremendously painful. There were roughly 1800-3500 sex workers in Dimapur, the commercial capital of Nagaland. The spread of HIV among the sex workers has been increasing and this resulted in the state, holding the top 2nd place regarding HIV prevalence state in India. The cause of joining the profession is mainly due to chronic poverty, death of parents, family rejection, etc., (Devine, Bowen, Dzuvichu, Rungsung, & Kermode, 2010). The socio-cultural and economical status of women was very much vulnerable, evidenced by too early sexual debut, low or no educational attainment, unemployment, abuse of conservative male parents, and drug use. They have been trying to overcome the socio-economic disadvantages by engaging themselves in sex work, which is pretty much a destructive situation in any society (Bowen, et al., 2011).

The present study shows the problem of severe inequality and poverty in different districts of Nagaland, which are the reflection of unemployed educated youth. The industrial sector in the region has been struggling, causing widespread unemployment. There are many challenges associated with Micro and Small enterprises. Keeping the fact that after more than seventy years of Independence this sector suffers from a lack of modern technology, skilled labour, inadequate bank credit, and insufficient marketing networks (Jamir I. , 2014). As many researchers have pointed out that poverty is the manifestation of diversified actions from the social and economic perspectives. The problem of multidimensional poverty, women's deprivation, regional insurgency, and unemployed educated youth are very much cyclically

affecting each other. Especially in Nagaland, the customary laws for social norms and attitudes are influencing the entrepreneurial mindset of educated youth (Solo & Nagi, 2017).

After repeated efforts by the government of India in Nagaland as well as other parts of Northeast India, things are changing slowly but miles to go. The major things to be taken care of are women's participation in society, better employment opportunity for the educated youth, and infrastructure development in the region. Further research is needed for a better understanding and analysing the deprivation & exclusion situation in Nagaland.

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