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Rural Households' Multidimensional Poverty and Its Determinants in Konso Woreda, SNNP Region, Ethiopia

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Abstract

Eradicating poverty in all its forms is one of global society's sustainable development goals. This requires creative and rigorous efforts to measure and reduce multidimensional poverty in a way that ensures no one is left behind. Despite a couple of efforts made to measure multidimensional aspects of welfare at the national level, limited studies have been done in rural parts of the country, where most poverty researches focused in unidimensional poverty. Hence, this study quantified the extent and examined the determinants of rural household multidimensional poverty status using the Alkire-Foster method and the ordered logistic regression model, respectively. Cross-sectional data set was collected from 397 randomly selected households using structured questionnaire. Living standards indicators contribute the most to multidimensional poverty, while empowerment contributes the least. The study revealed that multidimensional poverty headcount, intensity, and the index were found to be 80.35 percent, 55.97 percent, and 44.8 percent, respectively. Among the sampled households, 2.2 percent of households were non-poor, 17.8 percent were vulnerable, 52.6 percent were moderately poor, and 27.4 percent were severely poor. According to the ordered logit model, the probability of a household being in multidimensional poverty was determined negatively by sex(male), expenditure, family size, land size, and employment level, while age and distance to the nearest health center are positively influencing it. Hence, promoting family planning, diversifying income sources and *viable labor-intensive rural employment opportunities, provision of improved energy sources, electricity, clean water, and a road network would reduce a multifaceted rural poverty.*

Keywords*: Deprivation Score; Konso; Multidimensional Poverty Index; Ordered Logit Model*

Introduction

Poverty eradication in all of its manifestations is one of the objectives of the Sustainable Development Goals (UN, 2015). Because of this, the world's governments have promised unprecedented support to end poverty. Poverty has traditionally been defined in terms of income, and people are classified as poor if they are unable to earn enough money to meet their food or basic needs (Alkire and Fang, 2019). In recent years, there has been growing agreement on the inadequacy of income poverty measurements (Sen 1992). In 2010, UNDP and the Oxford Poverty and Human Development Initiative (OPHI) launched the global multidimensional poverty index. As aspects of deprivation, the G-MPI encompasses health, education, and living standards. When the total deprivation score exceeds 0.33 (Alkire and Foster, 2011), the family is deemed to be in multidimensional poverty. While 1.34 billion people (23.3%) live in multidimensional poverty, 83% of multidimensionally poor people live in Sub-Saharan Africa and South Asia, and 342 million people (56%) in Sub-Saharan Africa live in extreme poverty (OPHI, 2018).

Multidimensional poverty is widespread in Ethiopia, particularly in rural Ethiopia (Tigre, 2018). According to the OPHI (2018) report, 86 million Ethiopians lived in multidimensional poverty, making Ethiopia the third-poorest nation in the world behind Nigeria (97 million) and India (364 million). Multidimensional poverty has been decreasing moderately over time, but Ethiopia still has a larger proportion of its population living in poverty (Tigre, 2018). Even though multidimensional poverty is still at a high percentage, the proportion of financially poor people has decreased. The World Bank, using data from the 2016 Ethiopian Demographic Household Survey, estimates that 24% of Ethiopians are financially poor, a considerable decrease from the 29.6% reported by NPL for the years 2010–2011 (World Bank, 2019).

Poverty in Ethiopia is a key development issue that has given rise to a variety of socio-economic issues that endanger the society's survival and stability. As a result, the government of Ethiopia is making significant investments to combat poverty and advance social development, following its overall development policy objectives. The second Growth and Transformation Plan (GTP II), for example, mainstreams the SDGs and aims to reduce national poverty to 16.7% by 2020 (MoFED, 2016). Despite progress, Ethiopia still has issues with investment in health, lack of safety for women and girls,

education, and access to clean water, all of which contribute to the country's relatively low sanitation and attended birth rates (World Bank, 2019).

The multidimensional poverty index (MPI) for the SNNP region was 0.574 according to OPHI (2017), which used data from the 2011 Ethiopia Demographic and Health Survey. The same survey states that 89.7% of the population is multidimensionally poor, 6.1% of the population is vulnerable to poverty, and 73.2% of the population is living in extreme poverty. In Konso, because of recurrent droughts, increased population, decreasing land for farming and grazing, and lack of access to clean water, a massive number of people live in poverty.

As per a critical review in a review of the poverty literature, the majority of research done in Ethiopia followed a one-dimensional approach (Borko, 2017; Teka et al., 2019; Biyena & Beyene, 2019; and Mekore & Yaekob, 2018). Some studies on multidimensional poverty (e.g., Ambel et al., 2015; Bersisa & Heshmati, 2016; Heshmati & Yoon, 2018; Tigre, 2018; and Desawi, 2019) were limited to the non-customized global dimensions (health, education, and standard of living dimensions) and ten indicators. Also, they are highly generic and ignore differences within the country's regions (rural and urban) and ethnic groups. Since more than 80% of Ethiopia's population lives in rural areas, eradicating poverty in its all forms requires area-specific indicators and cut-offs that are crucial to identifying multidimensionally poor people and understanding the complex nature of rural society. The Alkire–Foster methodology is very exposed to being customized to encounter the specific rural context of the area to be studied (Burchi et al., 2018). In addition to the G-MPI indicators, this study includes locally important indicators such as land, stored crops, and livestock ownership that have not been considered by previous studies. The other gap in previous poverty research is the use of binary models assuming poverty status is binary (poor-non-poor). However, the poor is not equally poor (moderately poor-extremely poor) and the non-poor too (non-poor-vulnerable). Therefore, the present study tries to fill this gap using the Alkire-Foster method and the ordered logistic regression model to quantify the extent of poverty and examine the determinants of rural multidimensional poverty, respectively in Konso woreda, SNNP region.

Materials and Method

Description of the Study Area

The study was done in Konso, which is in the Southern Nations Nationalities and People Region (SNNPR) in the Great Rift Valley, at latitudes of 5° 20' north and 37° 20' east, elevation of 1540 meters (5,052 feet), 310°C winds at 6 km/h, 27% humidity, and distances from Addis Ababa and Hawassa towns of respectively 595 and 360 km. The Oromia area borders Konso on the south, Alie Woreda on the west, Derashe Woreda on the north, Amaro Woreda on the northeast, and Buriji Woreda on the east. The average annual temperature is 23 °C; the average annual rainfall is 802 mm; spring (*Belg*) is the main rainy and main crop production season; livelihoods depend on livestock and sorghum as the staple cereal. In 2018, the total population was estimated to be around 325,975, with the male population estimated to be around 156,901 and the female population estimated to be 169,074. The population is the projected number from the previous census in 2007 and is used by the administration of the area.

Data source and Method of Data Collection

The study relied on primary data gathered through an interview-administered questionnaire. The questionnaire is designed in such a way that it provides statistical information on multidimensional poverty dimensions and indicators, household demographic composition, and socio-economic variables. For this, the unit of observation is the household (defined as a group of people eating and living together for more than six months of the year).

Sampling Technique and Sample Size

Konso woreda was purposively chosen because the area is where the bulk of people experience extreme poverty and where the effective SafeNet program is also being implemented (PSNP). There are 42 kebeles in Konso, and more than 80% of them are semi-arid (Kolla). Two-stage sampling procedures were used in this investigation to get the necessary primary data. From a total of 42 Kebeles in Konso, five Kebeles were chosen at random for the first stage. These kebeles are Debena, Gera, Dera, Fasha, and Borkora. As the study population was finite and known, sample households were calculated by Yamane's (1967) formula from 52687 Konso households.

$$\mathbf{n}= \frac{\mathbf{N}}{\mathbf{1+N(e)2}} = \frac{\mathbf{52687}}{\mathbf{1+52687(0.05)2}} \mathbf{= 397}$$

Where n is the sample size, N is the total number of households in Konso Woreda, and e is the error term counted (5%). In the second stage, household sampling frames were obtained from each kebele's administrative office, and 397 households were selected by using a systematic random sample technique followed by a proportionate to size technique to select sample households.

Method of Data Analysis

Alkire Foster Methodology

In this study, the multidimensional poverty index (MPI) measure developed by Alkire and Foster (2011) was used. This technique was modified to better reflect local circumstances, demands, and data availability. Five dimensions and 16 indicators are employed instead of the global MPI's three dimensions and ten indicators. Due to the simplicity of the index for policy interpretation (Atkinson et al., 2002), each of the study's five dimensions is given a 1/5 weight, following the conventional MPI structure of equal-nested weights. Additionally, each dimension's indicators are equally weighted.

Here we note the indicator i weight as Wi, with $\sum_{i=0}^{d} Wi = 1$---------- (1) Then, based on their deprivations in the component indicators, each person is given a deprivation score by adding up their deprivations in a weighted manner, resulting in a value that ranges from 0 to 1.

Formally, $C_i=W_1I_1+W_2I_2+-------+W_dI_d$---------- (2)

Where $I_i=1$ if the person is deprived in indicator *i* and $I_i=0$ otherwise and W_i the weight attached to indicator i with $\sum_{i=0}^{d} Wi = 1$

In this way, someone is considered poor if her deprivation score is equal to or greater than the poverty cut-off. Formally, someone is poor if $C_i \geq K$ (Alkire & Foster, 2011). Since there are 16 indicators included in this study, the poverty cut-off is set at about one-third (33.32%) of them (Alkire & Fang, 2019). A person is termed multidimensionally poor if they are lacking in (k=5) weighted indicators (33.32% of dimensions). Additionally, one can classify someone as severely poor if they are denied access to more than 50% of the indicator (k=8), and the percentage of households that are vulnerable

to poverty is represented by the 20–33.32% weighted deprivations they suffer. Mathematically the MPI combines two aspects of poverty.

1) **Incidence (H):** The percentage of poor people, or the head count.

$$\text{H} = \frac{q}{n} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (\mathbf{3})$$

Here q is the number of people who are multidimensionally poor and n is the total population.

2) **The intensity of people's poverty (A):** The average percentage of dimensions in which poor people are deprived.

$$\text{A} = \frac{\sum_{i=1}^{n} \text{Ci(K)}}{q} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Where $C_i(K)$ is the censored deprivation score of individual *i* and *q* is the number of multidimensionally poor people.

The MPI is the product of both: MPI = H × A…………………………………. (5)

Table 1. Summary of dimension, indicators, cutoff, and weight

Dimension of poverty	**Indicators**	**Household is deprived if...**	**Weight**
Health (1/5)	Child mortality	Any child has died in the family five-year preceding survey	1/10
	Adult illness	The illness of adult members during the four weeks before the survey	1/10
Education (1/5)	Year of schooling	Number of household member aged 13 years or older have completed six years of schooling	1/15
	Complete years of schooling of household head	If the household head has not eight years of schooling	1/15
	School dropout	If any school-attending children have dropped out of their school for at least more than a year	1/15
Living standard (1/5)	Sanitation	The sanitation facility is not improved	1/25

Dimension of poverty	**Indicators**	**Household is deprived if...**	**Weight**
	Cooking fuel	Cooks with dung, agricultural crop, shrubs, wood, charcoal, or coal	1/25
	Drinking water	Does not have access to improved drinking water	1/25
	Electricity	No electricity	1/25
	Housing	Inadequate housing	1/25
Asset endowment and Income (1/5)	Crop stored	Having no stored crop	1/20
	Land owned	Own land less than average 0.83 hectares	1/20
	Income	Income below area poverty line z	1/20
	Livestock owned	Own livestock below the average of 2.92 tropical livestock unit	1/20
Empowerment (1/5)	Schooling for girls or boys	Educating boy is more important than girl	1/10
	Women's right to decide	If women have no right to decide on the incomes	1/10

Source: Customized from OPHI, 2018

Econometric Model Specification

To analyze the relationship between multidimensional poverty and its determinant, this study employed an ordered logit model. The ordered logit model is also known as the proportional odds model which means the categories of the outcome variable are in order. The continuous latent variable Y^*(multidimensional poverty) has various threshold points (cut point). These cut points (threshold) are represented by κ which is the deprivation cut-off. Further, suppose that while we can only observe the categories of response

$$Y=\begin{cases}0 & if\ Y*< k1\\ 1 & if\ k1 < Y* \leq k2\\ 2 & if\ k2 < Y* \leq k3\\ . & \\ . & \\ N & if\ kN < Y*\end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where, parameters k1 is 20%, k2 is 33.32%, and k3 is 50% are the externally imposed end points of the observable categories. Then the ordered logit technique used the observations on Y, which are a form of censored data on Y*, to fit the parameter vector β.

In the population, the continuous latent variable Y^* is equal to

$$Y* = \sum_{k=1}^{k} \beta_k X_{ki} + \epsilon_i = Z_i = \epsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The Ks βs and M-1 Ks are parameters that need to be estimated by using maximum likelihood estimation.

Table 2. Summary of Variables definition, Measurement, and Hypothesized sign

Variable Code	**Definition and measurement**	**Hypothesized sign**
Age (years)	Continuous	-
Sex	1 if male and 0 otherwise	-
Education (years).	Continuous	-
Family size	Continuous	+
Expenditure (birr)	Continuous	-
Dependency ratio	Continuous	+
Marital status	1 if marred and 0 otherwise	-
Land size (hectares)	Continuous	-
Livestock (TLU)	Continuous	-
Employment	1 if employed and 0 otherwise	-
Total income (birr)	Continuous	-
Distance to the nearest health center (minute)	Continuous	+
Distance to the nearest road (minute)	Continuous	+
Access to electricity	1 if access to electricity and 0 otherwise	-
Having bank account	1 if has bank account and 0 otherwise	-
Access to credit	1 if access to credit and 0 otherwise	-

Result and Discussion

Descriptive Statistics

Deprivations and MPI estimation

The study used five dimensions and sixteen indicators for the estimation. The figure 1 presents multi-dimensionally poor households' deprivation in different indicators. For policy implications to identify the indicators in which many households are poor, the estimation of censored headcount (the percentage of people who are MPI poor and are deprived in each indicator) is essential (Alkire & Foster, 2011). The percentage of the population living in families that are both deprived by that indicator and multidimensionally poor is shown in Figure 1 below. It was revealed that, in addition to being multi-dimensionally poor, 97.5 percent, 93.4 percent, 79.87 percent, and 70.75 percent of the population are also without access to electricity, housing, cooking fuel, or a full year of education for the family head. The proportions of the population that are multi-dimensionally poor and who lack access to education for girls vs. boys, respectively, were 7.23% and 9.1%. In terms of dimension, most of the households are deprived of indicators of living standards while having fewer indicators of empowerment.

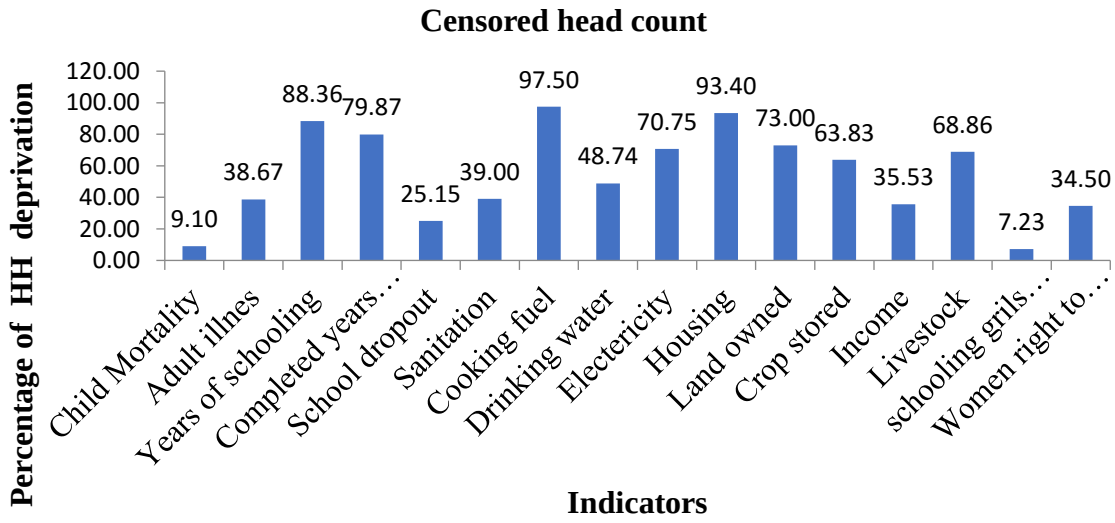

Figure 1. Censored headcount (%)

Multidimensional Poverty Index

The study calculates the multidimensional headcount ratio (H), the intensity of poverty (A), and the adjusted multidimensional headcount ratio (MPI) for cutoffs based on the overall deprivation score. Table 3 displays the estimation's findings.

Table 3. MPI Estimation

Poverty cutoff at k=number of deprived indicators	Incidence H	Intensity A	MPI (H*A)
K=5 (Ci=0.33)	80.35	55.97	0.448

Source: Own computation, based on household survey data, 2019

Table 3 showed that 80.35 percent of the population in the research area was multidimensionally poor. The MPI was found to be 0.448, indicating that poor people in the Konso Woreda experience roughly 44.8% of the deprivations that would be experienced if everyone were deprived in all indicators. The average intensity of deprivation, which measures the share of deprivation each poor person experiences on average, is 55.97 percent.

The Konso MPI of 0.448 is lower than the national MPI of 0.49 and the regional MPI of 0.574 as determined by the globally comparable MPI. Comparable MPI measurements conducted internationally by UNDP (2018) revealed higher MPI estimates than those determined in this country-specific investigation. Whether a household possesses a TV, phone, bike, motorbike, refrigerator, or vehicle or not is one of the assets utilized in the MPI estimation by UNDP (2018), which is less likely to identify non-poor people for rural economies. In contrast, area-specific indicators are employed in this study to quantify household wealth in rural economy. These assets include grain storage, animal ownership, household income, and land ownership. Therefore, it is crucial for policy intervention to have area-specific indicators and cutoffs to identify the exact pocket of poverty and eradicate it across all dimensions.

Households were found to be divided into four categories based on the Alkire and Foster measurement of multidimensional poverty: non-poor (below a 20 weighted deprivation score), vulnerable (20-33.32% weighted deprivation score), moderately poor (33.32–50% weighted deprivation score), and severely poor (above a 50% weighted deprivation score) (Alkire & Fang, 2019). Out of those 80% of multidimensionally impoverished households, 52.64% were determined to be moderately poor, and

27.45% were severely poor. Moreover, 17.8% of the households in the 20% of multidimensionally non-poor households were identified as being vulnerable. The figure below demonstrates that the majority of the respondents were from moderately multidimensionally poor households, followed by severely multidimensionally poor households.

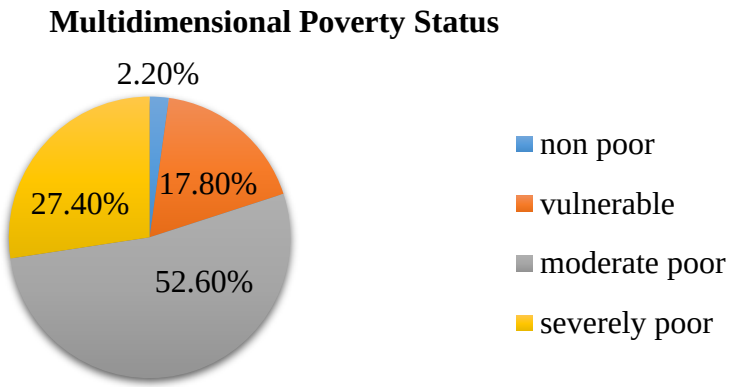

Figure 2:Multidimensional Poverty Status

Source: Own computation, based on household survey data, 2019

Ordered Logit Regression Result on the Determinants of Multidimensional Poverty

According to the study result, multidimensional poverty and household head age are positively correlated (table 4). Bing aged raises the risk of being severely multidimensionally poor. Maintaining other things constant, when age increase by one year, the probability of being in severe multidimensional poverty will increase by 0.59 percent. The strong correlation between severe poverty and household status suggests that multidimensional poverty rises with age. Indeed, older people are more likely to have health problems and are less likely to participate in the labor force. As a result, elderly people have lower labor productivity and efficiency than the young. As a result, poverty will worsen in old age for household heads. The study's findings support those of Amao et al. (2017), Michael et al. (2019), and Chen (2019) et al., who conducted a study on the determinants of multidimensional poverty and found that the age of the household head is positively and significantly associated with multidimensional poverty.

The gender of the household head is negatively and significantly associated with rural multidimensional deprivation of households, as shown in Table 4. Being in a household with a male

head of household reduces your chances of being severely multidimensionally impoverished. Keeping other factors constant, being a male-headed household reduces the likelihood of being in severe multidimensional poverty by 21 percent compared to a female-headed household. This result shows that men and women in the research area do not have equal access to economic and social resources. This outcome supports the findings of Michael et al. (2019), according to which the likelihood of being poor increases with being a female-headed household (rather than a male headed household).

Table 4: Marginal effects of Ordered Logit

Variables	ME for non-poor hh	ME for vulnerable hh	ME for moderate poor hh	ME for severely poor hh
Age of hh head	-0.0004**	-0.00041***	-0.0014*	0.0059***
Sex of hh head	0.0086**	0.096***	0.1*	-0.21**
Expenditure per adult equivalent	7.36e-06**	0.000075***	0.000025*	-0.0001***
Family size in the adult equivalent	0.00168*	0.017**	0.0058	-0.025**
Education level	-0.000164	0.00167	-0.0058	0.0024
Dependency ratio	0.0022	0.023	0.0078	-0.033
Marital status	-0.00027	-0.0027	-0.00087	0.0039
Land size	0.0046*	0.047**	0.158	-0.067**
TLU	0.00085	0.0087	0.0029	-0.0125
Employment level	0.0235	0.19**	-0.0375	-0.18***
Monthly income	-4.63e-07	-4.72e-06	-1.59e-06	6.78e-06
Distance near the health center	-0.000091	-0.00093*	-0.0003	0.0013*
Distance near road	-0.000067	-0.00068	-0.00028	0.00098
Access to electricity	0.005	0.49	0.01	-0.064
Bank account	0.00117	0.0118	0.0035	-0.0166
Access to credit	-0.0029	-0.299	-0.01	0.43

Source: Own computation, based on household survey data, 2019

****, ** & * implies level of Significance at 1%, 5% and 10%, respectively.*

Family size is significantly and negatively correlated with multidimensional poverty status. This negative relationship between households being in the severely poor category and their size implies that multidimensional poverty decreases as family size increases. Keeping other factors constant, when family size in adult equivalent increase by one, the probability of being in severe multidimensional poverty will reduce by 2.5 percent. One possible reason for this is that most people in study area are

engaged in traditional agriculture. Traditional agriculture is, by its nature, labor intensive. Hence, all working-age (even underage) rural household family members engage in family farm activities in one way or another. Therefore, households with more family members who are actively involved in family farm activities can manage their family farms easily, and the more economically active household members in a family, the less likely the family is to fall into poverty. This outcome supports the conclusions of Amao et al. (2017), Heshmati & Yoon (2018), Michael et al. (2019), and Chen (2019) et al., who conducted a study on the determinants of multidimensional poverty and found that household size is negatively and significantly associated with multidimensional poverty. Spending per adult equivalent has a negative impact on the probability of households' multidimensional poverty status in the study area and is statistically significant at the 1% probability level. This indicates that households with high expenditures per adult equivalent are more likely to diversify their sources of income and are less likely to be impoverished.

The study area's households' multidimensional poverty condition is negatively impacted by the size of the farmland, which is significant at the 5% probability level. Other things remaining constant, when farm size increase by one hectare, the probability of being in severe multidimensional poverty will decrease by 6.7 percent. Because rural people's lives and livelihoods are inextricably linked to agricultural activities, access to land is seen as the fundamental cause of rural multidimensional deprivation. A household with extensive tracts of cultivated land is more likely to generate more food and is less likely to live in poverty. This result is in agreement with the study conducted by Amao et al. (2017), Adepoju (2018), Michael et al. (2019), and Chen (2019) et al., who found that household head farm size helps households reduce multidimensional rural poverty.

Employment status has a detrimental impact on the likelihood of households in the study area experiencing multidimensional poverty. This suggests that working outside the farm boosts farmers' spending on fundamental requirements such as food, education, and health care, as well as wealth accumulation. Keeping other things constant, when household employed on off-farm activates, the probability of being in severe multidimensional poverty will decrease by 18 percent. The findings are consistent with the findings of Adeoye et al. (2019), who suggest that non-farm wage income and non-farm self-employment have a negative relationship with multidimensional poverty.

Distance from a health center has a positive and significant impact on the study area's multidimensional poverty status at a 10% probability level. The risk of a household being classified as multidimensionally nonpoor diminishes with increased distance from a health center but also increases the likelihood of being classified as somewhat severely multidimensionally poor. Maintaining other things constant, when distance from a health center increase by one minute, the probability of being in severe multidimensional poverty will increase by 0.13 percent. Households living in rural, remote areas without any access to roads face problems when they need emergency health care services, which increase rural household deprivation. The study finding conforms to Roy et al.'s (2019), who conducted a study on the socio-economic determinants of multidimensional poverty in rural areas and found that distance from a health center is positively and significantly associated with multidimensional poverty.

Conclusion and Recommendation

The study was conducted in Konso Woreda, a SNNP regional state. The main goal of this study was to quantify and identify rural household multidimensional poverty and its contributing factors, respectively, in the study area. The study concludes that this cross-sectional analysis demonstrated that multidimensional poverty measures identified the research area's highest incidence of poverty. This was evident in the calculated MPI indices, and the result revealed that the multidimensional poverty rate is 80.35 percent of the population, while the average intensity of deprivation and MPI were found to be 55.97 percent and 44.8 percent, respectively. The study also concluded that the indicators of a high standard of living linked to government services have a greater impact on rural multidimensional poverty in the study area. Besides, fuel for cooking, housing, and electricity are the primary contributors to rural poverty from the perspective of the living standard dimension.

The ordered logistic regression results provide a significant identification of the factors that contribute to multidimensional poverty in the studied area. However, being the male household head, family size in adult equivalent, expenditure per adult equivalent, land size, and employment level were statistically significant and had a strong negative effect on multidimensional poverty, while age and *distance to the nearest health center had a positive effect* on multidimensional poverty in the study area. Hence, promoting family planning, improving access to clean fuels, electricity, clean water, inexpensive and improved housing, toilet systems, agricultural land, viable labor-intensive rural employment

opportunities, education, and infrastructures like roads and transport services would reduce rural multidimensional poverty in the study area.

Conflict of Interest

We declared that we have no conflict of interest.

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