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EFFECTS OF ILL-HEALTH COST ON MULTIDIMENSIONAL POVERTY: EVIDENCE FROM RURAL HOUSEHOLDS IN NIGERIA

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ABSTRACT

Good health is important in the economy of any nation especially in the fight against poverty, poor health affects productivity and income of the workers and this will further deepen the incidence of poverty and ill-health. This study examined the linkage between ill-health cost and multidimensional poverty of rural households in Ogun state, Nigeria. Multistage sampling was used to select 240 households for the study. Data collected were analysed with descriptive statistics, economic cost of illness, multidimensional poverty index and logistic regression model. The result revealed that majority (95%) of the households experienced malaria infestation, time cost of illness contributed most (92.6%) to the total economic cost. Result revealed that 69% of households are multidimensionally poor. Furthermore, marital status ($p<0.01$), off-farm income ($p<0.01$), financial cost ($p<0.01$), days forgone production ($p<0.1$), time cost ($p<0.01$) and area cultivated ($p<0.1$) positively, and significantly influence multidimensional poverty status while household size ($p<0.01$), cooperative membership ($p<0.05$), public health care services ($p<0.1$) and health extension contact ($p<0.01$) have negative, and significant effect. The study concluded that increase in out of pocket expenditure as a result of ill-health cost increases poverty status, availability and access to public health facilities reduces poverty status, it was therefore recommended that public health facilities should be located nearer to the people with minimum social stratification that might discourage poor masses from its usage, essential drugs should be provided at subsidized rates as this will go a long way in reducing financial cost thereby reducing poverty status.

Keywords: Illness; Multidimensional Poverty; Deprivation

JEL: I32; D01

INTRODUCTION

Agriculture is an indispensable sector in Nigerian economy because it remains the only local source of food and natural fibre in spite of the dominance of petroleum, agriculture still plays vital roles in Nigerians economy, it contributed 23 percent to Nigeria's Gross Domestic Products (GDP) in 2017 (CBN, 2018). The sector provides employment for over 70% of Nigeria labour force, however, in spite of contribution of agriculture to national development; the sector has not received the appropriate public and institutional attention and had failed to contribute significantly to poverty alleviation. Poverty is dominant in rural Nigeria as a result of limited social services and infrastructural facilities (IFAD, 2012). OPHI (2017) reported that incidence of poverty in rural Nigeria rose from 68.4% in 2008 to 70% in 2017.

The Nigeria agricultural sector was dominated by subsistence farmers that were exposed to different health challenges which directly or indirectly affect their level of production as well as their living standards. Nigerian subsistence farmers spend as much as 13% of total household expenditure on treatment of malaria alone (Ajani and Ugwu, 2008). This gives enough evidence that the cost of combating diseases and health problem by farmers is quite huge. Large out of pocket health expenditure as a result of ill-health can have a major

impact on financial status of rural households and can push them to poverty. They are likely to reduce their expenditure on basic items or sell off their productive assets in order to cope with health costs. However, developing countries which Nigeria is inclusive need good health and productive agriculture to fight against poverty; poor health affects the productivity and income of the workers and this will further deepen the incidence of poverty and ill-health (IFPRI, 2007). Although there are growing literatures on effect of ill-health on poverty status of farmers, previous studies failed to adopt a holistic approach to the problem of farmers' health and poverty in rural communities, previous studies used uni-dimensional poverty measures such as income and expenditure, this studies differs from other studies as it employs a multidimensional poverty measures that complements money-based measures by considering multiple deprivations and their overlap, as it is related to Sen's conception of capabilities. The study also identifies illness suffered by the households and estimate cost incurred as a result of ill-health.

DATA AND METHODS

The study was carried out in Ogun State Nigeria. Multistage sampling procedure was used for the study; the first stage was a random selection of four (4) Local

Government Areas (LGAs) out of the twenty (20) Local Government Areas (LGAs) in the state, the second stage was a random selection of three (3) villages from the selected LGAs, the last stage was a purposive selection of twenty (20) households from the selected villages making two hundred and forty (240) respondents, however, during data clean up only 225 questionnaire were fit for analysis representing 94% of the total responses.

Cost of illness

This study adopted and modified Cost of Illness (COI) procedure used by **Sauerborn et al., (1996)** and **Akinbode et al., (2011)** with the inclusion of preventive cost, COI was used to capture the economic cost of ill-health, it is as specified in the Eq. (1-3).

Financial Cost

$$F_c = \sum_{j=0}^n (F_d + F_m + F_t + F_{su}) \quad (1)$$

Time cost of illness

$$T_c = \sum_{j=0}^n [(T_{si} * a_{si} * w) + (T_{ci} * a_{ci} * w)] \quad (2)$$

$$\text{Economic cost} = \sum_{j=0}^n (F_c + T_c) \quad (3)$$

The preventive cost P_c was added to the cost and it was specified as the Eq. (4).

$$\text{Economic cost} = \sum_{j=0}^n (F_c + T_c + P_c) \quad (4)$$

Where:

F_d financial cost of drugs, herbs, etc. (₦);
 F_m financial cost of medical consultancy (₦);
 F_t financial cost of travel (₦);
 F_{su} financial cost of subsistence (feeding) (₦);
 T_c total time cost (number of days forgone production);
 T_{si} time cost of sick person (number of days forgone production);
 a age coefficients (number);
 s sick individual (number);
 w daily wage rate (₦);
 T_{ci} time cost of caregiver (s) (number of days forgone production);
 c caregiver (number);
 F_c total financial cost of health care.

To estimate the number of days of forgone production activities required in estimating the time cost of illness, following **Akinbode et al., (2011)** the man days was estimated using the average male adult work for about 8 hours a day. Thus, the actual total hours devoted to farm work was converted to male adult equivalent by multiplying those of male by 1 and those of female by 0.75 and those of children by 0.5, an assumption that average working condition prevail.

The age coefficient “a” represents productivity coefficient and this takes on the following values following **Sauerborn et al., (1996)** and **WB (1993)**:

Age < 17years = 0.5

18-40years=1

41-55years=0.75

56-65years = 0.67 and

>65years = 0.5.

Multidimensional Poverty Index

The Multidimensional Poverty Index (MPI) complements money-based measures by considering multiple deprivations and their overlap. Adopting from the MPI of **Alkire et al., (2011)** and **Aboaba et al., (2019)**, two dimensions and seven indicators were added to the 3 dimensions and 10 indicators of the MPI in other to better capture the multidimensional poverty in the study area, these additional dimensions are infrastructure and social capital while the indicators include transportation facilities, hospital, market, roads, group and networks, information and communication, empowerment and political actions, the maximum score is 100% or 1 with each dimension (Education, Health, Standard of Living, Infrastructure and Social capital) are equally weighted. A household was considered multi-dimensionally poor if the total deprivation is equal to or greater than 20% or 0.2

Multidimensional Poverty Indices

Following **Alkire et al. (2011)**, the multidimensional poverty index was expressed as the Eq. (5).

$$MPI = H * A \quad (5)$$

Where:

H the multidimensional headcount ratio which is the proportion of people who are poor, the multidimensional head count ratio (H) is expressed as the Eq. (6).

$$H = \frac{q}{n} \quad (6)$$

Where:

q the number of people who are multi-dimensionally poor and n is the total population.

A the intensity (or breadth) of poverty which is the average deprivation score of the multi-dimensionally poor people and can be expressed as the Eq. (7).

$$A = \frac{\sum_{i=1}^n c_i(k)}{q} \quad (7)$$

Where:

$c_i(k)$ the censored deprivation score of individual i and q a number of people who are multi-dimensionally poor.

Logistic Regression Analysis

Logistic regression analysis was used to estimates the effect of burden of disease on multidimensional poverty status of the households, the model was specified as the Eq. (8).

$$Y_i = \ln\left(\frac{p}{1-p}\right) = \alpha_0 + \sum_{i=1}^{16} \alpha_i Z + e_i \quad (8)$$

Where:

Z independent variables specified in the Table 1.

Y_i the multidimensional poverty status (1= multidimensionally poor, 0=otherwise);

α_0 intercept;

$\alpha_1 - \alpha_{16}$ parameters to be estimated;

e_t error term or disturbance term.

RESULTS AND DISCUSSION

Socioeconomic characteristics

The results (Tab. 2) revealed that the mean age of the household heads was 54 years; this implies that most of the household heads were old, non-energetic and not within their productive age, this may have a positive influence on their poverty status. Larger proportion of the household heads were male. This implies that there were more male than their female counterparts. This can be attributed to the fact that farming is tedious and requires a lot of energy which most female might not be able to provide. The average size of the household is approximately 6 persons; this implies that most of the households have a fairly large household size which they

might employ on their farms. More than half of the household heads were married. The implication is that most of the household heads have implanted sense of responsibility as marital status prompts commitment to business because of the family needs that must be met. On the average, the household heads spent 6 years in school. This implies, that most of the household heads had basic education and this might influence their adoption of innovative practices which will improve their poverty status. Lower percent and half of the household heads were members of cooperative society and farmer's organization respectively. The mean farming experience was approximately 26 years. This implies that most of the household heads had enough experience about farming and this may influence their productivity and poverty status. Most of the household heads were smallholders with average farm size of 2.8 hectares. This result revealed that most of the farmers were smallholders and this may have a positive influence on household poverty status.

Table 1: Definition and measurement of variables

Variable	Definition	Measurement	Expected sign
Z ₁	age of household heads	(years)	+
Z ₂	sex of household heads	(Dummy, 1=male, 0=female)	-
Z ₃	household size	(number of persons)	+
Z ₄	marital status of household heads	(Dummy, 1=married, 0=otherwise)	+
Z ₅	off-farm income	(naira)	-
Z ₆	level of education of household heads	(years)	-
Z ₇	cooperative membership	(Dummy, 1=member, 0=otherwise)	-
Z ₈	farmers organization	(Dummy, 1=member, 0=otherwise)	-
Z ₉	farming experience of household heads	(years)	-
Z ₁₀	preventive cost	(naira)	±
Z ₁₁	financial cost	(naira)	+
Z ₁₂	days forgone production	(days)	+
Z ₁₃	time cost	(naira)	+
Z ₁₄	area cultivated	(hectare)	-
Z ₁₅	availability of public health care	(Dummy, 1=available, 0=otherwise)	-
Z ₁₆	contact with health extension	(Dummy, 1=had contact, 0=otherwise)	-

Source: Authors review of literatures

Table 2: Descriptive Statistics of the Sample data

Variable	Mean	Standard Deviation
Age	54.3	14.1
Sex ⁺	0.7	0.4
Household size	5.9	2.4
Marital status ⁺	0.6	0.5
Level of education	5.5	4.9
Cooperative membership ⁺	0.2	0.4
Farmers association ⁺	0.5	0.5
Farming experience	26.4	14.9
Area cultivated	2.8	2.8

Note: ⁺ In case of dummy variables, proportions were used instead of means.

Source: Field survey data analysis, 2018

Illness Experienced by the Households

For the period of 6 months (Table 3), back pain illness was suffered by almost all of the rural households, high proportion of the households experienced fever, malaria infestation was suffered by almost all of the rural households. Less than half of the households suffered guinea worm, almost half suffered typhoid infestation, a quarter of the households suffered measles, more than half of the households experienced rheumatism. More than a quarter of the households suffered tuberculosis infestation while proportion of the households suffered waist pain. This implies that majority of the households suffered malaria, followed by back pain, waist pain, fever, rheumatism, typhoid, guinea worm, tuberculosis and measles respectively.

Table 3: Illness Experienced by the Households

Variable	Frequency (Episodes)	Percentage	Rank
Perceived illness			
Back pain	210	93	2 nd
Fever	195	87	4 th
Malaria	213	95	1 st
Guinea worm	82	36	7 th
Typhoid	103	46	6 th
Measles	56	25	9 th
Rheumatism	118	52	5 th
Tuberculosis	66	29	8 th
Waist pain	200	89	3 rd

Source: Field survey data analysis, 2018

Economic Cost of Illness

On the average, the economic cost of illness for the period under consideration (six months) (Table 4) was ₦158,073.72. The total financial cost was ₦11,116.92, the total time cost was ₦146,305.70 and the total preventive cost was ₦651.70. The total financial cost contributed 7.03% to the total economic cost, cost of drugs and herbs contributed 74.24% to the total financial cost and 5.22% to the total economic cost, cost of medical consultancy contributed 12.40% to the financial cost and 0.87% to the total economic cost, cost of sustenance (feeding)

contributed 6.76% to the financial cost and 0.48% to the economic cost while cost of travelling contributed 6.59% to the financial cost and 0.46% to the economic cost. The total time cost contributed 92.56% to the total economic cost and the time cost of sick person contributed 59.11% to the time cost and 54.71% to the economic cost, time cost of care giver contributed 40.89% to the total time cost and 37.84% to the total economic cost, preventive cost contributed 0.41% to the total economic cost. This implies that cost of drugs and herbs contributed most to the total financial cost and time cost of sick person contributed most to the total time cost, the total time cost contributed most to the total economic cost followed by financial cost and preventive cost respectively. This result is in consonance with the findings of Adekunle *et al.*, (2016) that found out that time cost contributed most (64.08%) to the economic cost of illness, followed by financial cost (28.30%) and preventive cost (7.62%) respectively. The results also support the findings of Akinbode *et al.*, (2011) that found out that time cost of illness was a major contributor to the economic cost of illness.

Deprivation Experienced by the Rural Households

Almost all of the households were not deprived adequate nutrition, larger proportion did not experienced child mortality, high proportion have access to basic education, high proportion completed basic education, high proportion were not connected to national electricity grid, more than half were deprived clean water, more than half were deprived adequate sanitation, high proportion were deprived clean cooking fuel, half were deprived clean floor of home, high proportion did not own productive and households assets, more than half did not have hospital available within 2 km of their homes, more than half did not have neighbourhood markets to display their goods, more than half were deprived good transport facilities, high proportion did not received support from non-family members in times of hardship, high proportion were being excluded from social and cultural activities while more than half did not control over decisions affecting their lives (Table 5).

Table 4: Estimates of Cost of Illness

Variable	Amount (₦)	% Cost	% Total Cost
Financial Cost			
i. Cost of drugs and herbs	8,253.48	74.24	5.22
ii. Cost of medical consultancy	1,378.82	12.40	0.87
iii. Cost of feeding	751.64	6.76	0.48
iv. Cost of travelling	732.97	6.59	0.46
1. Total Financial Cost	11,116.92	100.00	7.03
Time Cost			
i. Time cost of sick person	86,486.03	59.11	54.71
ii. Time cost of care giver	59,819.67	40.89	37.84
2. Total Time Cost	146,305.70	100.00	92.56
Preventive Cost			
3. Total Preventive Cost	651.10	100.00	0.41
4. Total Economic Cost	158,073.72		100.00

Source: Field survey data analysis, 2018

Table 5: Deprivation Faced by the Households

Dimension	Frequency	Percentage
Nutrition		
Not Deprived	212	94.22
Deprived	13	5.78
Child mortality		
Not Deprived	197	87.56
Deprived	28	12.44
Access to basic education		
Not Deprived	202	89.78
Deprived	23	10.22
Completion of basic education		
Not Deprived	183	81.33
Deprived	42	18.67
Connected to national electricity		
Deprived	165	73.33
Not Deprived	60	26.67
Clean drinking water		
Deprived	129	57.33
Not Deprived	96	42.67
Adequate sanitation		
Deprived	124	55.11
Not Deprived	101	44.89
Clean cooking fuel		
Not Deprived	72	32.00
Deprived	153	68.00
Clean floor of home		
Not Deprived	112	49.78
Deprived	113	50.22
Ownership of assets		
Deprived	161	71.56
Not Deprived	64	28.44
Availability of hospital within 2Km		
Deprived	130	57.78
Not Deprived	95	42.22
Availability of neighbourhood market		
Deprived	132	58.67
good road network	93	41.33
Good transport facilities		
Deprived	121	53.78
Not Deprived	104	46.22
Support in times of hardship from non-family members		
Deprived	142	63.11
Not Deprived	83	36.89
Exclusion from social and cultural activities		
Deprived	165	73.33
Not Deprived	60	26.67
Control of decision affecting life		
Deprived	125	55.56
Not Deprived	100	44.44

Source: Field survey data analysis, 2018

Poverty Status of Rural Households

The results presented in Table 5 revealed, that the multidimensional head count ratio was 0.69 which implies that 69% of the rural households are multidimensionally poor. That is 69% of people are in households with a malnourished person, no clean water, no electricity, no good health care services, no education, a dirt floor, unimproved sanitation, inadequate infrastructures, etc. The result is in line with the findings of **Amao et al.,**

(2017) that found out that the multidimensional headcount ratio in south-western Nigeria was 67.4%, the intensity of poverty among the rural households in the study area was 0.41. This implies that on average the rural poor households were deprived 41% of the weighted indicators, that is they are deprived 41% of clean water, electricity, education, health services, improved sanitation. The result is similar to the finding of **OPHI (2017)** that found out that the intensity of poverty in Ogun state was 42.5%. The

multidimensional poverty index was 0.28, this implies that the rural households are deprived in 28% of the total deprivations they could experience overall. These findings differ from that of **OPHI (2017)** and **Amao et al., (2017)** that found out that the multidimensional poverty status of Ogun state and south-western Nigeria are 11.2% and 31.8% respectively.

Table 6: Multidimensional Poverty Indices of Rural Households

Variable	Value
Multidimensional Headcount Ratio (H)	0.69
Intensity of Poverty (A)	0.41
Multidimensional Poverty Index (MPI)	0.28

Source: Field survey data analysis, 2018

Effect of Ill-health Cost on Multidimensional Poverty Status

The diagnostic test (Table 7) revealed the overall fit of the model at 1% ($p < 0.01$) level of significance, the Pseudo R squared showed that 91.9% variation in multidimensional poverty status was jointly explained by the explanatory variables. This shows that the model has a very high explanatory power. The marginal effects of household size revealed that if the size of the household increases by 1% the multidimensional poverty status of the rural households will reduce by 1.4%, this result contradicts the findings of **Awan and Iqbal (2010)** and **Adekoya (2014)** that reported a positive relationship between household size and probability of being poor, this was because most of the household members are matured enough to be

working thereby contributing to the household income. The marginal effects of marital status showed that the poverty status of married household's increases by 12.6% compared to their counterparts. This is so because most of the married households have more of their household members to be children who are unproductive and yet take a big proportion of household income in terms of school fees, medical bills, food and clothing, this result corroborates the finding of **Adekoya (2014)**. The marginal effects of off-farm income revealed that increase in off-farm income increases the likelihood of being poor; this was because the level of livelihood diversification among the households is low thereby resulting to low income. The coefficient of cooperative membership revealed that the poverty status of rural household heads that belonged to cooperative society is likely to reduce by 5.6% compared to their counterparts. The marginal effects of financial cost revealed that increase in financial cost would increase the probability of being poor by 0.5%. This implies that increase in financial cost (drugs and herbs, consultancy, feeding and travelling) increase the poverty level of the rural households, this is so because large out of pocket expenditure on (drugs and herbs, consultancy, feeding and travelling) is catastrophic to the wellbeing of the household as they are likely to reduce their expenditure on basic items such as food or sell off their productive assets in order to cope with health costs thereby pushing them into poverty. This results corroborates the findings of **Oparinde et al., (2018)**.

Table 7: Logit Regression Estimate of Effect of Ill-health Cost on Multidimensional Poverty Status

Variable	Coefficient	Standard Error	t-value	P-value	Marginal Effects (dy/dx)
Age	0.130	0.081	1.600	0.109	0.002
Sex	-4.243	2.738	-1.550	0.121	-0.070
Household size	-0.828*	0.439	-1.890	0.059	-0.014
Marital status	7.642***	2.340	3.270	0.001	0.126
Off-farm income	0.000***	0.000	5.740	0.000	0.000
Level of education	-0.047	0.095	-0.500	0.619	-0.001
Cooperative membership	-3.391**	1.599	-2.120	0.034	-0.056
Farmers association	0.375	0.993	0.380	0.706	0.006
Farming experience	-0.077	0.055	-1.400	0.161	-0.001
Preventive cost	-0.002	0.003	-0.740	0.461	0.000
Financial cost	0.003***	0.001	3.570	0.000	0.005
Days forgone production	0.109**	0.045	2.430	0.015	0.002
Time cost	0.000***	0.000	-2.680	0.007	0.002
Area cultivated	0.419*	0.236	1.780	0.076	0.007
Public healthcare services	-9.303**	4.641	-2.000	0.045	-0.154
Health extension contact	-6.453***	1.690	-3.820	0.000	-0.107
Constant	-10.454*	5.897	-1.770	0.076	
<i>Diagnostic test</i>					
Wald $\chi^2(16)$	60.53***				
Prob > χ^2	0.000***				
Pseudo R ²	0.919				
Log likelihood	-11.857				
Number of Observation	225				

Note: ***, **, * Significant at 1, 5 and 10%

Source: Field survey data analysis, 2018

The marginal effects of the forgone production days revealed that if the number of forgone production days as a result of ill-health increases by 1%, the poverty status of the rural household will increase by 0.2%. This is so because ill-health reduces the healthy time of the households thereby reducing their level of production and income which will invariably push them into poverty. The marginal effects of time cost showed that increase in time cost of the sick individual and care giver would increase the probability of being poor by 0.1%. This implies that increase in time cost increases the probability of being poor. This is so because the number of forgone production days would increase as a result of ill health thereby reducing their efficiency and income and further deepening the incidence of poverty and ill health (IFPRI, 2007). This result corroborates the findings of Adebayo *et al.*, (2012) and Oparinde *et al.*, (2018). Similarly, Rhaji and Rhaji (2008) reported that health related indices had negative relationship with revenue generation and productivity among sampled household farmers.

The coefficient of area of farmland cultivated revealed that if the area cultivated increases by 1% there is likelihood that the poverty status of the poverty status of the household will increase by 0.7%. This may be because larger farm size prevents the farming households from diversifying into off-farm and non-farm activities thereby limiting the amount of income generated which will invariably affect their standard of living. The marginal effects of health care provider revealed that availability of government clinic would reduce the likelihood of being poor by 15.4%. This implies that the poverty status of rice farming households that have access to government clinics is likely to decrease compared with their counterparts that have no access to government clinics. This is so because households that have access to government clinics are likely to receive health care services at a cheaper cost (financial cost). This would increase their healthy time which would invariably translate to increase income and productivity, thereby stamping out poverty. The marginal effects of health extension worker revealed, that the poverty status of households that have contact with health extension worker, is likely to reduce by 10.7% compared to their counterparts that did not have contact with health extension worker.

CONCLUSION AND RECOMMENDATION

The study examined the linkages between ill-health cost and multidimensional poverty status of rural households. The result revealed that majority of the households suffered malaria illness followed by back pain, waist pain, fever, rheumatism, typhoid, guinea worm, tuberculosis and measles respectively. Time cost of illness contributed most to the total economic cost followed by financial cost and preventive cost respectively. It was revealed that higher proportion of people are in households with a malnourished person, no clean water, no electricity, no good health care services, no education, a dirt floor, unimproved sanitation, inadequate infrastructures, etc. it was further revealed that marital status ($p < 0.01$), off-farm income ($p < 0.01$), financial cost ($p < 0.01$), days forgone

production ($p < 0.1$), time cost ($p < 0.01$) and area cultivated ($p < 0.1$) positively, and significantly influence multidimensional poverty status, while household size ($p < 0.01$), cooperative membership ($p < 0.05$), public health care services ($p < 0.1$) and health extension contact ($p < 0.01$) have negative, and significant effect. The study concluded that increase in out of pocket expenditure as a result of ill-health cost increases poverty status, availability and access to public health facilities, reduces poverty status.

It was therefore recommended, that public health facilities should be located nearer to the people with minimum social stratification that might discourage poor masses from its usage. Essential drugs should be provided to the rural households at subsidized rates, as this will go a long way in reducing their financial cost, thereby reducing their poverty status.

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