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The nexus between poverty and socio-economic characteristics of the household and household head: Evidence from Sierra Leone

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ABSTRACT

Household poverty is widespread in Sierra Leone, affecting about 6 out of every 10 persons, which calls for urgent policy action. This study used the 2018 Sierra Leone Integrated Household Survey (2018 SLIHS) and a logistic model to analyze the influence of socio-economic characteristics of the household and household head on poverty. The analysis has shown that living in rural areas, having no formal education, or being unemployed, significantly increases the probability of a household being in extreme poverty. Other factors contributing to household extreme poverty status were: have a large household size with many children below 10 years, being separated from a spouse (widowed or divorced), being disabled, and working in the agriculture sector. On the other hand, the characteristics that decrease the probability of a household being poor include being a female household head, having at least secondary school education (notably tertiary education), residing in urban areas or cities, working in the services sector, and being single or married. Therefore, enhancing service delivery through a viable decentralization process, and supporting easily accessible quality education programmes, especially tertiary education, are critical for meaningful poverty reduction across all sections of the population.

Keywords: Poverty, household, socio-economic characteristics, logistics model.

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INTRODUCTION

Poverty remains an existential threat to the wellbeing and survival of many populations around the world, especially in Africa, where it is endemic in many ways. Stopping its contagion, therefore, has always been an urgent matter for policy-makers around the world. For this reason, the fight to eradicate poverty and inequality is at the center of the United Nations Sustainable Development Goals (SDGs). 'Ending poverty in all its forms is the first of the 17 goals of the 2030 Agenda, designed to galvanize governments and non-state actors to tackle headlong this societal problem. The World Bank (2007) Report and the Beegle et al. (2016) World Bank Commissioned Report, have both demonstrated that it is possible to win this fight when all hands are put on deck around a single course as it was under the Millennium Development Goals (MDGs). The Beegle et al. (2016) World Bank Commissioned Report, for example, showed that global effort under the MDGs succeeded in reducing the proportion of people living on less than $1.90 a day in Africa from 57 percent in 1990 to 43 percent in 2012, and that life expectancy at birth rose by 6.2 years, while the prevalence of chronic malnutrition among children under five fell by 6 percentage points, over the same period.

Sierra Leone has made some progress in the fight to eradicate poverty following the end of the civil war in 2002 by substantially reducing the poverty headcount over the years from 80 percent of the population in 1990 to 66.4 percent in 2003, and 52.9 percent in 2011 (World Bank, 2013). Notwithstanding, the country has been wallowing near the bottom of the UNDP Human Development Index (HDI) since 1990 when the measure was first introduced; and the 2018 HDI Report, ranked Sierra Leone 184 out of 189 countries. At 59 years of independence, the health indicators such as life

expectancy at birth of 46 years, Infant Mortality Rate (IMR) of 75 per 1000 live births; Under Five Mortality Rate of 122 per 1000 live births, and Maternal Mortality Ratio of 717 per 100000 livebirth (Statistics Sierra Leone, 2020), although declining from the 2013 figures, are among the worst in the sub-region. Furthermore, the latest poverty figures have shown a reversal of the progress made in the fight, as the poverty headcount ratio slightly increased to 57 percent in 2018 from 52.9 percent in 2011 (Statistics Sierra Leone, 2019). The exploitation of the many mineral deposits and more than 30 years of implementing structural adjustment programs (SAPs) of the International Monetary Fund (IMF) have not provided a solid foundation for sustained poverty reduction across the country (IMF, 2014).

The current situation of poverty is in contrast to that of the 1960s where the country once enjoyed a relatively high living standard; buoyant economic growth and low unemployment (Davies, 2000). Double-digit inflation and a high unemployment rate of about 12 percent (Statistics Sierra Leone, 2019) characterized the country's development and economic policy framework. The National Development Plan (2019-2023) launched in 2019 as the country's medium-term socio-economic development roadmap placed even more emphasis on these issues and was viewed as a policy blueprint for eradicating poverty and reducing inequality in Sierra Leone by 2023. This current plan is the fourth Poverty Reduction Strategy Paper (PRSP) Sierra Leone prepared and implemented. Each one of these strategies is designed to sustain macroeconomic stability, improve public service delivery, and improve human capital development. The other pillars include improving public financial management, diversify the economy; build and expand infrastructures such as road networks, electricity, water supply systems, and communication network; facilitate the full potential for creating jobs, reducing poverty and vulnerability; and promote good governance and participatory democracy (Government of Sierra Leone, 2019).

Ironically, Sierra Leone is not poor at all. It is resource-rich, endowed with a broad range of natural resources, including large deposits of diamonds, gold, bauxite, rutile, iron ore, and fertile land for agriculture and valued marine resources. In fact, with an annual GDP growth rate of about 20.1 percent recorded in 2013, the country was classified as one of the fastest-growing economies in Africa (IMF, 2014). Such growth came about on the backdrop of new iron ore mining in the Tonkolili District. Nonetheless, the poverty headcount in 2018 was estimated as 6 out of every 10 persons living in poor households across the country. The rural areas are the worst hit, experiencing the brunt of it.

This irony of economic growth and poverty existing side-by-side can best be described as 'grow-verty, which seems to be the case also for many other resource-rich countries in Africa. This underscores the fact that economic growth does not automatically translate into better poverty reduction outcomes (Olofin et al., 2015). This 'grow-verty' paradox, however, lends credence to the need for reinvigorated effort to investigate the determinants of poverty in Sierra Leone looking at it from a micro perspective. Such a call is even more expedient amid the 'war' President Maada Bio's administration has declared against poverty, lawlessness, and corruption throughout the country.

This study, therefore, aims to answer the following research questions:

1. Why is it that despite the many minerals and natural resource endowments Sierra Leone has, more than half of the population still lives in poverty?
2. What causes households to be poor even in the face of the accelerated economic growth in the country?

While it is true that at least 4 poverty profiles have been prepared by the World Bank and Statistics Sierra Leone since 2001, only Fagernäs and Wallace's (2007) study has attempted to study the determinants of poverty beyond the profiles and the asset studies conducted in Sierra Leone. The UNDP (2019) published Multidimensional Poverty Index (MPI) Report for Sierra Leone also did not provide the inferential causes of poverty across groups and locations of the population. There is no known study conducted in Sierra Leone which has considered the level of disaggregation of the variables considered in this study as well as the methodology adopted. This underscores the point that there is an information gap regarding the determinants of poverty in Sierra Leone

Therefore, this study is a single attempt to analyze and focus attention on the poverty and vulnerability of households in the country. It uses a Logistics Regression model to conduct the analysis, with a particular focus on the education, gender, and other socio-economic characteristics of the household head. The aim is to identify the causes of extreme poverty in households by using a binary logistic model. This study attempts to establish whether there is a causal relationship between household poverty and socio-economic characteristics of the household and the household head in Sierra Leone. In such a framework, the binary variable (extreme poverty) takes the value of one of the households is extremely poor and zero if the household is not extremely poor.

LITERATURE REVIEW

Poverty and income inequality have been identified as major limitations to economic growth and development (Awotide et al., 2015), which in turn is affecting the ability of individuals, households, and communities to meet their basic needs. It is clear from the empirical literature that

there is no consensus pinpointing the general determinants of poverty; in other words, the studies are inconclusive or even controversial regarding the likely causes of household poverty. Notwithstanding, understanding the causes and consequences of poverty will enable policymakers to design policies and interventions that target the poor and hence be able to alleviate their sufferings (Dudek and Lisicka, 2013). The World Bank Institute (2005) has provided five reasons why we much study or measure poverty in general, which are:

1. To 'keep the poor on the agenda' of policy-makers-out of sight, out of mind kind of situation; which means poverty studies are a vehicle to keep the poor on the political and economic agenda of governments and development partners at both national and international level;
2. To 'target interventions, domestically and worldwide, and this point emphasizes proper targeting of interventions aimed at alleviating poverty; knowing where the poor are and why they are poor and help with proper targeting of interventions;
3. To 'monitor and evaluate projects and policy interventions meant to help the poor, and this underscores the need to be able to predict the effects of and then evaluate, policies and programs designed to help the poor;
4. To 'enable the assessment of household access to public services and programme support such as social safety net (SSN) programs'; understanding of the impacts of programmes and interventions on the poor and communities is critical; and
5. To 'evaluate the effectiveness of institutions whose goal is to help the poor; the emphasis is on 'measuring governments' effectiveness or success' in fighting poverty, and this needs a good deal of information and data on poverty.

The literature has generally grouped the non-monetary causes of poverty into two broad categories: the socio-economic characteristics of the head of household and the characteristics of the household itself. The socio-economic characteristics of household heads examined here include educational level, gender, age, marital status, disability status, and employment status. A study of these characteristics is important because they have an important bearing on the living conditions of household members, household size, and child upbringing, the consumption of goods and services, and the residence of the household. Gender has been identified in the literature as one of the key factors that determine access to the position of household leadership, especially in societies where men are overwhelmingly present in positions of leadership and decision making, culturally and otherwise. Men are often considered as household heads, irrespective of their ages or economic status, or ability to make decisions on behalf of all members of the household.

The education level of the household head, for example, have been singled out as one of the most important variables to explain the incidence of extreme poverty in most developing countries (Achia et al., 2010; Fagernäs and Wallace, 2007; Razak et al., 2014; Akerele and Adewuyi, 2011; Mok et al., 2007; Shete, 2010; Edoumiekumo et al., 2013; Adekoya, 2014). These studies generally concluded that the educational level of the head of the household has a positive impact on the poverty status of the household as a whole. Ibrahim and Umar (2008) and Tshediso (2012) used logistic regression methods to investigate the impact of education on the poverty status of female-headed households in South African, and collaborated on the finding that education of the household head indeed lowers the chances of a household being poor.

Also, O'Hare (2014) in his study of UK poverty discovered that demographic characteristics such as age, gender, marital status, educational level, and employment status of the head of household have a direct relationship to the poverty level of the household in the UK. The study also concluded that female-headed households have a higher chance of being poor due to the low level of education and lack of better job opportunities

However, some researchers (World Bank, 2018; Aritomi et al., 2008) have questioned the gender of the head of household as a determinant of household poverty. This is because household headship analysis usually does not provide reasons why females are heading households. In many cases, for example, female headship seems to have been brought upon them unprepared, created by the absence of a husband due to death, migration, and divorce. In addition, cultural norms and traditions in many countries ensure that males remain household heads no matter their economic status (World Bank, 2018; Aritomi et al., 2008). Consequently, female headship is a small proportion of households globally, mostly less than a quarter of household heads in any given country. Such female-headed households have been largely considered vulnerable and at risk of poverty by the academic and policy-making bodies (Aritomi et al., 2008).

Studies such as Shete (2010), Edoumiekumo et al. (2013), Dartanto and Nurkholis (2013) have included dependency ratios in their analysis, and have found out that higher dependency ratio significantly and positively increase the probability of households plunging into poverty. Other studies such as Akerele and Adewuyi (2011), Litchfield and McGregor (2008) and Lekobane and Seleka (2017) have concluded that a higher dependency ratio worsens household poverty and welfare. This means that the impact of the dependency ratio on poverty is not conclusive, which is not unique to dependency ratios, but cut across other determinants

such as household size and level of education of the household size.

Residence of the household has been identified as a major cause of household poverty in the literature. Studies such as Adekoya (2014), Mok et al. (2007), Saboor (2004), Habyarimana et al. (2015), Fields et al. (2003) and Mduduzi and Talent (2017) have shown concluded that households in the rural areas were poorer than those in the urban areas, which means that poverty was higher in rural areas when compared to urban areas.

The household size has been identified in the literature as a key factor negatively affecting the poverty and welfare status of a household across countries. Many other studies (such as Fagernäs and Wallace, 2007; Lanjouw and Ravallion, 1995; Sekhampu, 2013; and Lekobane and Seleka, 2017) have concluded that the larger the household size the higher the probability of the household falling into or remaining in poverty since there are more 'mouths' to feed with inadequate resources and take care of the other basic needs of the household. However, Usman (2009) argued that the household size alone is not a major cause of poverty but rather the number of income earners in the household that should be considered as a cause. A larger household with more income earners will not necessarily be poor given the fact that more resources are earned to support the welfare of the household compared to a smaller household size with (say) no income earners due to sickness or other cultural restrictions and barriers. The study, therefore, concluded that women were more vulnerable in Pakistan due to social norms barriers and lack of productive assets and opportunities in society such as access to education, and health care, etc. In other words, women are helpless and contribute far less to the income of the households due to barriers that made them non-income earners compared to the men.

Labour constraints have also been identified as a cause of poverty through farm productivity. Njoka and Kamau (2006) and Belshaw and Coyle (2001) have all agreed that agricultural productivity is affected by labor constraints and the lack of skilled workers, which intern affected production and incomes of farmers, who are usually subsistence poor farmers. Households headed by persons with disabilities are therefore more at risk of being poor than able-bodied headed households

METHODOLOGY

This study uses household survey data of the 2018 Sierra Leone Integrated Household Survey (SLIHS) obtained from Statistics Sierra Leone to study the causes of household poverty in Sierra Leone. Studies conducted elsewhere, which also used household survey data, include Fagernäs and Wallace (2007), Dudek and Lisicka (2013), Achia et al. (2010), Khudri and Chowdhury (2013), Edoumiekumo et al. (2013), and Cheema and Sial (2012). These studies used household data to assess the causes of household poverty and wellbeing and have in various ways identified factors including widowhood, disability, illiteracy, aging, household size, education, dependency, residence, and low income or wages of the female workers, which are the factors believed to have a relative effect on the poverty status of the households in those countries. Household surveys are an important source of socio-economic data, providing indicators to inform and monitor household expenditure patterns, poverty, and wellbeing. Demographic and Health Surveys (DHS), Household Budget Surveys (HBS), Multi-Indicators Cluster Surveys (MICS) are datasets commonly used in such analysis.

The 2018 SLIHS was a nationally representative sample survey with a target of 6,840 households nationwide. The survey collected detailed household income and expenditures, demographic, social, and economic data of all persons in the household. The processed data were obtained from Statistics Sierra Leone, cleaned up, and merged to produce a single data file for analysis at the household level with identified poor households.

The Model

This study aims to explain the association between poverty and some household head and household characteristics such as educational level, gender, marital status, employment status and age of the household head, household size, and residence. The purpose is to establish the causality of poverty measured by extreme poverty score and the socio-economic characteristics shown in Figure 1.

This conceptual framework underscores the fact that poverty is influenced by both socio-economic characteristics of the head of household and the household. In this regard, the study used a logistic transformation to establish this relationship. The logistic regression model adopted by this study, states that the dependent variable, which is extreme poverty, has the value of one of the households is extremely poor and zero if the household is not poor. Such an approach has been widely used in the literature by researchers such as Achia et al. (2010), Dudek and Lisicka (2013), Apata et al. (2010), McKenzie (2005), Serumaga-Zake and Naude (2002), Mok et al. (2007), Akerele and Adewuyi (2011), Edoumiekumo et al. (2013), Biyase and Zwane (2017), Adekoya (2014), Garza-Rodriguez et al. (2015), Sinnathurai and Brezinova (2011), Ibrahim and Umar (2008) and Tshediso (2012).

In such a case of binary variables, the ordinary least square (OLS) technique cannot be used to estimate the analysis

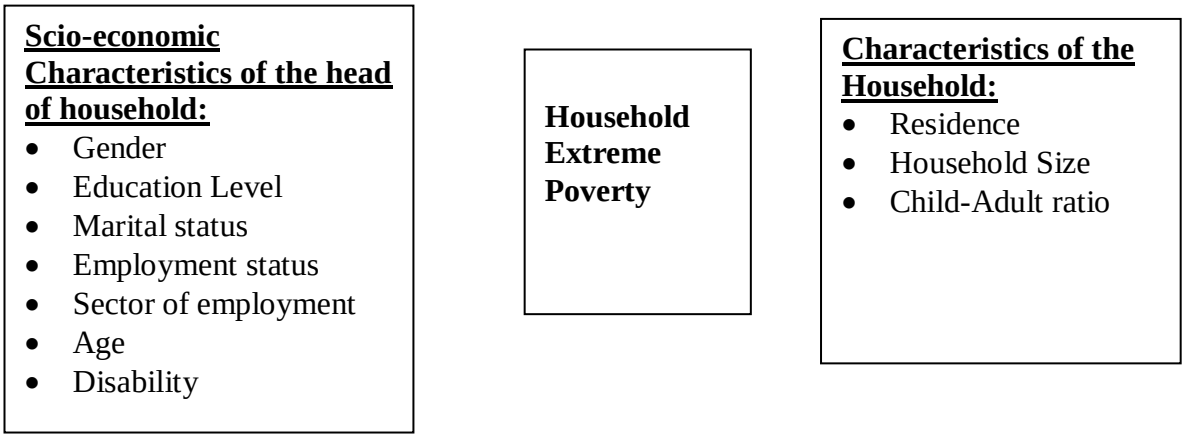

Figure 1. Conceptual framework of the cause of poverty.

of parameters; thus, the maximum likelihood method is used for estimation.

The general logistics equation consideration is specified as follows:

Let Y be the binary outcome variable indicating a household be extremely poor by the World Bank poverty measurement with (0, 1) and P be the probability of Y (a household being extremely poor) to be 1, P=P(Y=1). Let X1, X2⋯, Xk be a set of predictor variables (household and head of household characteristics). Then the logistic regression of Y on X1, ⋯, Xk estimates parameter values for β0, β1,⋯, βk via maximum likelihood method of the following equation using natural logarithms, can be written as:

$$(P=1)=\ln\left(\frac{p}{1-p}\right)=\beta_0+\beta_1x_1+\ldots+\beta_kx_k \quad ---------(eq...1)$$

Taking the exponent and multiplicative inverse of both sides, we have:

$$\frac{1}{p}=1+\frac{1}{\exp(\beta_0+\beta_1x_1+\ldots+\beta_kx_k)} \quad -----(eq...2)$$

Taking common denominator:

$$\frac{1}{p}=\frac{\exp(\beta_0+\beta_1x_1+\ldots+\beta_kx_k)+1}{\exp(\beta_0+\beta_1x_1+\ldots+\beta_kx_k)}$$

Finally, take the multiplicative inverse again and using matrix notation, we have:

$$(P=1)=\frac{\exp(\chi\beta)}{1+\exp(\chi\beta)} \quad ---------(eq...3)$$

Where, P is the probability of a household being extremely poor represented by (P=1), which is the binary dependent variable; and the explanatory or independent variables are represented by x's, such that:

$$X=\begin{bmatrix}1\\X_1\\X_2\\.\\.\\.\\X_n\end{bmatrix} \text{ and } \beta=\begin{bmatrix}\beta_0\\\beta_1\\\beta_2\\.\\.\\.\\\beta_n\end{bmatrix}$$

X is a vector representing the characteristics of households in the country; whereas $\underline{\beta}$ is a vector of parameters measuring the relative contribution of each of the household characteristics to the probability of the household being poor as defined in monetary per adult equivalent with 2700 calories as the yardstick for Sierra Leone.

This means that:

$$P(pov = 1) = \frac{exp(X\beta)}{1 + \exp(X\beta)} = \frac{exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_n X_n)}{1 + exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_n X_n)} \text{ ----------(eq. 4)}$$

Equation (eq. 4) was estimated by the maximum likelihood method. This procedure does not require assumptions of normality or homoskedasticity of errors in predictor variables. The expanded logit is specified as:

$$Logit(poor\_ext = 1) = \beta_0 + \beta_1 hhhsex\_f + \beta_2 resid + \beta_3 hhms1 + \beta_4 hhms2 + \beta_5 hhms3 + \beta_6 hedu1 + ... +$$
$$\beta_7 hedu2 + \beta_8 hedu3 + \beta_9 hedu4 + \beta_{10} hedu5 + \beta_{11} emp + \beta_{11} hhemp\_sec1 + \beta_{12} hhemp\_sec2 + ... +$$
$$\beta_{13} hhemp\_sec3 + \beta_{14} hhhdis + \beta_{15} hhsize + \beta_{16} hssq + \beta_{17} ca\_ratio + \beta_{18} hhhage + \beta_{19} hhhagesq - - - (eq....5)$$

This model estimates the probability that a household with given characteristics is extremely poor. This model (eq. 5), therefore, predicts the probability that a household is extremely poor under the given circumstances or factors discussed above using the STATA version 14 software.

RESULTS AND DISCUSSION

General model significance

The Pseudo R-squared statistic presents a complex interpretation as a measure of good-fit for logistics regression models unlike in the case of the Ordinary Least Square (OLS) regression models and could be discarded entirely as a measure (Hosmer and Lemeshow, 2000). Nevertheless, the Pseudo R-squared of 0.174 shown in Table 1 means that there is some good-fit association between the dependent variable (extreme poverty) and the explanatory variables; which means that variations in the probability that a household is extremely poor (poor_ext) are explained by variations in the explanatory variables.

In addition, the Wald Chi-Squared (×2) Test is used to test for the overall significance of the explanatory variables in the specified model. The results indicate that our model passes the test for overall significance since the Wald ×2(16) has a value of 509.37 (p=0.01) which is significant at the 1 percent level and also greater than the critical value of 26.296 at the 95 percent confidence level. This means that the explanatory variables are jointly significant in determining the variations in the dependent variable-extreme poverty of households (poor-ext). Therefore, the results in Table 1 shows that all the household and household head characteristics included in the model are jointly significant in explaining the probability of a household being extremely poor in the country; and that, there is no evidence to suggest that the model suffers from any gross model specification deficiencies issues.

Also, to forestall the biases that could result from multicollinearity (explanatory variables being highly correlated with each other), which is common among logit/probit models due to the plausibility of a dummy variable trap, the number of dummy variables was limited in the model. For example, housing conditions, source of water for drinking, and main source of electricity for lighting were dropped from the final model.

These variables, although they impact poverty they are more likely a consequence of poverty than a cause and are much more appropriately used in asset model studies than in a logistics model.

Most of the explanatory variables are statistically significant at a 5 percent level and with the expected signs, which suggests that the model is a 'good-fit'.

Furthermore, the constant of this model is the expected value of the log-odds of extreme poverty when all of the predictor or explanatory variables equal zero. Although a zero value of the constant is not realistic, it is equally difficult to interpret its coefficient.

The influence of the socio-economic characteristics of the head of household on poverty

Gender of the head of household

Even though the gender of the head of household is originally a statistical variable used to avoid duplication during data collection, it has been extensively used in household poverty analysis. The results shown in Table 1 show that the gender of the head of household has a negative coefficient of -0.196887, which indicates that female (the reference category of the gender variable) headed households are less likely to be extremely poor

Table 1. Results of the Maximum likelihood Logistic Regression Model Estimation of the causes of poverty in Sierra Leone.

Log pseudolikelihood = -352933.44	
Number of obs = 6,541	Prob > chi2 = 0.00
Wald chi2(16) = 509.37	Pseudo R2 = 0.174

Extreme poverty	Coef.	Robust Std. Err.	z	P>z	[95% Conf.	Interval]	Odds Ratio
Sex of household head (hhhsex_f)	-0.1969	0.1478	-1.33	0.183	-0.4866	0.0928	0.8213
household residence (resid)	1.4397	0.1660	8.67	0	1.1142	1.7651	4.2193
Household Head Marital Status-married (hhms1)	1.4317	0.7248	1.98	0.048	0.0111	2.8523	4.1858
Household Head Marital Status-separated (hhms2)	1.6148	0.7430	2.17	0.03	0.1587	3.0710	5.0271
Household Head Marital Status-never married (hhms3)	0	(omitted)					1
Household head educational level-no education (hedu1)	1.4328	0.3669659	3.9	0.000	0.7135	2.152014	4.1903
Household head educational level-primary education (hedu2)	1.4127	0.3823389	3.69	0.000	0.6633	2.162093	4.1071
Household head educational level-secondary education (hedu3)	1.2827	0.3773	3.4	0.001	0.5432	2.0222	3.6064
Household head educational level-Tec/Voc education (hedu4)	0	(omitted)					1.000
Household head educational level-university education (hedu5)	0	(omitted)					1.000
Household Head employment status (emp)	-0.0761	0.1051	-0.72	0.469	-0.2822	0.1298	0.9267
Household Head sector of employment-Agriculture (hhemp_sec1)	0.6936	0.14712	4.71	0	0.4053	0.9819	2.0009
Household Head sector of employment-Industrial (hhemp_sec2)	0.3134	0.2259	1.39	0.165	-0.1293	0.7562	1.3681
Household Head sector of employment-services (hhemp_sec3)	0	(omitted)					1.000
Household Head disability status (hhhdis)	0.3867	0.1564	2.47	0.013	0.0802	0.6933	1.4722
Household size (hhsize)	0.5753	0.0609	9.45	0	0.4559	0.6946	1.7776
Square of household size (hssq)	-0.0184	0.0033	-5.55	0	-0.0249	-0.0119	0.9817
Child-Adult Ratio (ca_ratio)	-0.2646	0.3156	-0.84	0.402	-0.8831	0.3539	0.7675
Age of Household Head (hhhage)	0.0209	0.0207	1.01	0.312	-0.0196	0.0615	1.0211
Square of age of Household Head (hhhagesq)	-0.0002	0.0002	-0.94	0.347	-0.0006	0.0002	0.9998
Intercept (_cons)	-9.8244	0.9327	-10.53	0	-11.6525	-7.9964	0.0001

Source: 2018 SLIHS Data; STATA version 14.

compared with male-headed households. The odds of 0.82 shows that a female-headed household being extremely poor is 0.82 times lower than for male-headed households. This suggests that artificially changing the household headship from male to female will reduce the chances of the household being extremely poor by 0.82 times. This finding is similar to the one obtained by Razak et al. (2014) in their study in Malaysia, who found out that other determinants held constant, a male-headed household was 1.17 times more likely to be poor compared to a female. On the other hand, this finding is contrary to the one obtained by Olofin et al. (2015) for Nigeria; Mduduzi and Talent (2017) for South Africa; and Kona et al. (2018) for Bangladesh; who separately found out that male-headed households were less likely to be poor than female-headed households in those countries.

However, the results show that the influence of the gender of the household head on poverty is insignificant, which means that there is no significant difference in the likelihood of a male and a female-headed household being extremely

poor in Sierra Leone. In other words, targeting gender alone as a basis for poverty alleviation interventions will not yield a significant dividend on household poverty across the country. It is not clear why female-headed households were less likely to be poor than male-headed counterparts. However, the World Bank (2013) Poverty Report for Sierra Leone alluded to the fact that female-headed households were less poor probably because female heads were involved in small business activities, which could have served them as both a vehicle for savings and investment.

Educational level of the household head

There were five categories of the educational level of the head of household such as no education, primary, secondary, technical/vocational, and university education. The results shown in Table 1 show that the model estimation used TEC/VOC and University education as bases for comparison, the face the data shows that all households headed by university graduates were above the extreme poverty level. The results show that coefficients of no education (1.4328), primary education (1.4127), and secondary education (1.2827) were positive and significant at the 5 percent level. This means that all things being equal, households headed by persons with no education, primary or secondary level education were more likely to be extremely poor than those households headed by persons with TEC/VOC or university education. In addition, the odds of being extremely poor for households headed by persons with no education, primary education, and secondary education are respectively 4.19 times, 4.11 times, and 3.61 times higher than those for those households headed by persons with TEC/VOC or university education. This means that odds for no education and primary education are almost the same, which indicates that persons who attain a primary level of education face almost the same constraints regarding access to basic amenities including job opportunities. Also, the odds ratios indicate that acquiring TEC/VOC or university education by a household head with previously no education or primary education will reduce the chances of their households being extremely poor by four times. However, this is a long-term effort of eliminating extreme poverty given the gestation period of formal education in the country.

These findings are similar to the one obtained by Razak et al. (2014) in Malaysia, by Apata et al. (2010) in Nigeria, Garza-Rodriguez, et al. (2015) in Mexico, Dudek and Lisicka (2013) in Poland, Eirini and Panos (2011), Achia et al. (2010) in Kenya, and the Sinnathurai and Brezinova (2011) in Sri Lankan, and other studies such as Bigsten et al. (2003) and Widyanti et al. (2009), concluded that the incidence of poverty declines as the level of education of the head of household increases. Ibrahim and Umar, 2008 added that the incidence of poverty in the household would decrease as more household members become educated or literate. Also, Biyase and Zwane (2017) found out that the highest level of education of the family member was positively significant and that increasing the education level would increase the probability of being non-poor by an increase of 0.034% in South Africa. In addition, the World Bank (2018) confirmed that household poverty rates decline sharply as the education level of the head of household increases; and heads of households with tertiary education are unlikely to be poor in Sub-Saharan Africa (SSA). However, Tshediso (2012) found out that in South Africa the education level of the head of household is insignificant in explaining the poverty of female-headed households in that country; which seems to be a less common finding across countries and over time.

Nevertheless, this finding remarkably underscores the important role of education in poverty alleviation across countries of the world, and it suggests that helping a man with no education to acquire tertiary education will automatically put him above the poverty line. The finding supports the government's flagship Free and Quality Education (FQE) Program launched in September 2018 for basic and senior secondary school education as a strategic way of addressing institutional poverty in the country; hence urged the government to continue such a well-placed program. However, the finding shows that the impact of education on extreme poverty in Sierra Leone will only be felt if individuals who would be heads of household were educated to at least TEC/VOC level or of course acquire university education. Primary and secondary school level of education scores is not significantly different from individuals with no education, which underscore the value of post-secondary school education in the fight against poverty (all things being equal). In a country where job opportunities are scarce, both the non-educated and those with primary or secondary school education face almost the same binding constraints to find and retain a paid job.

Household head marital status

The marital status of the head of the household was a category variable with three options: married, separated, and never married. The model used 'never married' as the base or reference for comparison with a coefficient of 0 and odds ratio of 1, holding all other variables constant. In this regard, the results in Table 1 show that the coefficient of the married head of household (1.4317) is positive and significant at the 5 percent level. It means that households headed by married persons are significantly more likely to be extremely poor than single-person headed households (all things being equal). The odds of extreme poverty of a household headed by married persons are 4.19 times higher than households

headed by never-married persons. Also, the positive and significant coefficient of a household headed by separated persons (1.6149) means that such households are more likely to be poor than households headed by never-married persons. Also, the odds ratio score shows that households headed by separated persons are 5.03 times more likely to be extremely poor than those households headed by never-married persons.

This finding is in agreement with the one found by Albert and Collado (2004) in their determinant of poverty studies in the Philippines, which was that married-headed households tend to be poorer than single or never married persons. In addition, the finding is in line with the finding obtained by Razak et al. (2014) for Malaysia that households headed by separated (which includes divorced, widowed, and live separated) were more likely to be poor compared to single headed-households, and two times more likely compared to married headed households.

This suggests that separation although it brings freedom from the spouse's control, it in most cases comes at a price of loss of income and status, which renders one vulnerable to poverty.

Household head employment status

The results in Table 1 show that the employment status of the head of household has a negative coefficient of -0.0761, which means households headed by economically active persons are less likely to be extremely poor than households headed by non-economically active persons. This means that with a job, one has income to spend on food and other items; while the heads without a job, their income will be irregular by all standards, and hence their spending on necessities will be unstable. The odds of extreme poverty for households headed by economically active persons is 0.93 times lower than those headed by persons with no employment. This finding collaborates with the one obtained by Kona et al. (2018) that increasing the working opportunities for women by one unit the probability of being non-poor will increase by 0.62 percent in Bangladesh; and similarly, the probability of being poor for a household whose head is employed is lower compared to those whose heads were unemployed in South Africa (Mduduzi and Talent, 2017). However, the coefficient is insignificant at the 0.05 significant level and the odds are less than 1, which means that the employment status of the head of household has no significant influence on poverty among households in the country.

Sector of employment of the head of household

The importance of the sector of employment lies in the level of formality and access to income and other facilities in that sector. The three general sectors of economic activities defined for this analysis are agriculture, industrial, and services. The model used the services sector as the basis for comparison with a coefficient of 0 and odds ratio of 1 as shown in the result Table 1. The result shows that the coefficient for agriculture is positive and significant at the 0.05 significance level, which means that those households headed by persons working in agriculture are more likely to be extremely poor than those working in services. The low level of reward from agriculture could be responsible for this as although agriculture provides food for the household yet the income generated is not enough to enable the household to buy other necessities for the household. So the odds of being poor are 2 times higher for those households headed by persons in agriculture than those in services. On the other hand, the coefficient for industrial is positive by insignificant at the 0.05 significance level; meaning that although those households headed by persons working in the industrial sector are more likely to be extremely poor, yet the difference is not significant; and the odds shows that such industrial households are 37 percent more likely to be in extreme poverty than those in services. The results show that services seem to provide more financial rewards than industry and agriculture, which support the fight against extreme poverty in the country.

This result on the type or sector of work of the head of household concerning poverty is similar to the findings of Dawood et al. (2008) in Pakistan who found evidence in their respective research studies that the poverty status of the household was strongly associated with household's engagement in agricultural activity; that is, those households whose heads are engaged in agriculture have a higher probability of being poor than those engaged in other sectors. Similarly, Garza-Rodriguez et al. (2015) also found similar evidence that being an agricultural and other low paid jobs was positively connected with the probability of being poor; while Sinnathurai and Brezinova (2011) noted that agricultural employment has a negative but insignificant effect on poverty incidence in Sri Lanka; and this finding was corroborated by Ojimba (2012) who found that poverty incidence spreads more with agricultural employment. In a similar study among farming households in the Nasarawa State of Nigeria, Ibrahim and Umar (2008) found that poverty incidence reduces with the number of household head income sources and with the number of household members employed outside agriculture.

This finding underscores the need for productivity stimulating investment in the agricultural sector (Dawood et al., 2008), to enhance the performance of the sector in terms of both output and incomes accruing to farmers and producers.

Disability of the head of household

Disability constrained the labor of individuals and household heads at all levels of training, which could limit the type of job and hence the level of income that individuals get as a reward. The coefficient of disability (0.3867) is positive and significant at the 0.05 significance level, which means that households headed by disabled persons are significantly more likely to be extremely poor than those headed by non-disabled persons. The extreme poverty odds of 1.4723 shows that a household headed by a disabled person has a 47 percent chance of being poor when compared with the one headed by a non-disabled person (all things being equal). This means that disability is a significant contributor to household poverty in the country, as disability constraints labor endowment of individuals and hence has virtually the same impact on individuals and households and unemployment. It appears that there are so far limited research studies undertaken to assess the relationship between poverty and disability, especially in developing countries; although disability and poverty are closely linked together. However, Carmen and Proctor (2014) in their study of poverty in the USA found out a similar situation that in 2014 disabled persons had a higher incidence of poverty than able persons given that overall poverty rate was 15 percent, while the poverty rates for the disabled persons were 29 percent, and that of the not disabled persons was 12 percent.

In a country like Sierra Leone where employment opportunities are few, the disabled face many constraints include employment discrimination, loss of independence, unequal access to education, and health care services. Hence the disabled people are caught in a poverty trap that made them depend on social support and the goodwill of society and faces extra costs of meeting the basic welfare needs of the households. In a country where social benefit schemes are hardly available, the provision of a social safety net (SSN) to this group of households will go a long way to alleviating their plight and hence meeting the leave no one behind the goal of the SDGs by 2030. The SSN should be able to reduce households' vulnerability to shocks and disasters, increasing food security and nutrition of such disabled persons headed households while creating productive assets for them.

Age of the head of household

Age is a demographic variable usually linked to schooling, employment, and status, especially in traditional societies. The results shown in Table 1 show that the age of the head of household has a positive coefficient (0.0209), indicating that a one-year increase in the age of the head of household will increase the odds of being extremely poor by 0.02, although such an impact is not statistically significant. Kona et al. (2018) found similar evidence in Bangladesh that as the age of the household head increased the probability of being non-poor will decrease 0.11%.

Similarly, The World Bank Report (2018) found out generally in SSA countries, poverty decreases with age, although it decreases at different ages for women and men; and that at ages 25-34, women were 2 percentage points poorer than men. On the other hand, Farooq et al. (2013) concluded that the age of the household head is not a significant determinant of household poverty given the fact that there could be other income earners in the household apart from the household head; and as a result, the age of the household head does not matter at all in such a circumstance.

However, the age square variable has a negative coefficient (-0.0002), which means that there is a quadratic maximum turning point in the age of the head of household beyond which the probability of a household being extremely poor decreases with the increase in the age of the household head. The odds of extreme poverty will increase by 1.02 times when the age of the household head increases by one unit; and that this increase will continue as the age of the household head is increased up to 57 years, beyond which the chances of the household being extremely poor will begin to decline with each additional year of the household head. The possible explanation for this maximum turning point at 57 years could be that beyond 57 years, experience gained in doing work or business could earn the higher position and more resources which could be used to support the wellbeing of the household.

Household characteristics

Household residence

The residence of the household, which is the geographical location of the household was found to have a positive and significant coefficient of 1.4397, which means that a household in the rural areas is significantly more likely to be poor than a household residing in the urban areas. The Stats SL/World Bank (2019) 2018 SLIHS Report confirmed that extreme poverty was almost 5 times lower in the urban areas than in the rural areas. This finding is similar to the one obtained by Adekoya (2014) in Ogun State (Nigeria); Mok et al. (2007) for Malaysia, Saboor (2004) for Ethiopia, and Habyarimana et al. (2015); Fields et al. (2003), Dudek and Lisicka (2013) in Poland, and Mduduzi and Talent (2017) who found out in their respective studies that the incidence of poverty was higher in rural areas when compared to urban areas.

The odds of a household in rural areas being in extreme poverty are 4.22 times (or 322%) higher than those in urban areas. This means that relocating from

urban areas to rural areas will increase the chances of the household being extremely poor by more than 4 times. This suggests that the location of the household is a major factor in determining the extreme poverty situation of households. The rural-urban divide with the urban areas enjoying a good number of facilities and amenities, which are absent from the rural areas, is widening the gap in household poverty and increasing the misery of the rural poor.

Household size

Household size reflects the composition of the household under one head. The results shown in Table 1 shows that household size has a positive and significant coefficient (0.5753), indicating that the larger the household size, the more likely the household will fall into extreme poverty. However, the household size square variable has a negative coefficient (-0.01843), which means that the probability of a household falling into extreme poverty increases with the increase in the household size up to a point beyond which any increase in the household size will lead to a decline in the extreme poverty in the household. The odds of extreme poverty will increase by 1.78 times when the household sizes by one unit; and that this increase will continue as the household size is increased up to 15 household members, beyond which the chances of the household being extremely poor will begin to decline with each additional household member. The possible explanation for this maximum turning point at 15 members could be that beyond 15 members, each additional household member would contribute more to the general wellbeing of every member through skills and labor for employment. In agriculture, for example, the more workers one has in the household the bigger the farmland and the greater the harvest.

This finding is collaborated by studies conducted by Researchers such as Ibrahim and Umar (2008), Garza-Rodriguez et al. (2015), Afera (2015), and Mduduzi and Talent (2017), which separately found evidence that the incidence of house poverty increased with household size. However, Razak et al. (2014) found a contrary situation in their study in Malaysia that every additional member in the family results in the odds of being poor decreased by 10.3%, with everything else held constant. The reason for this is that new members could also have included income earners of the household.

Child-adult ratio (ca_ratio)

The Child-Adult Ratio has a negative but insignificant coefficient (-0.2646), meaning that as the number of children increases relative to the number of adults in the household, the chances of a household being extremely poor also increase. Of course, raising children below 10 years comes with huge costs nowadays, which could be a heavy burden on household expenditures and hence welfare. It means that households with more children below 10 years old face higher risks of being extremely poor than those households with more adults 10 years and over. Adult members tend to contribute more to the household welfare than children. This result is similar to the one obtained in South Africa by Mduduzi and Talent (2017), who suggested that the dependency ratio increased the likelihood of a household being poor.

In a country where fertility levels continue to remain high and relatively stable with estimates of total fertility rate (TFR) decreasing slightly from 6.5 in 1974 to 6.3 in 1985, 6.1 in 2004, and 5.2 in 2015 (Togoh et al., 2017) birth controls would be an effective means of poverty alleviation and eradication.

CONCLUSION AND RECOMMENDATIONS

The study used a logistic model to estimate the influence of socio-economic characteristics of the household and head on extreme poverty. The analysis has shown that the characteristics that increase the odds or probability of being extremely poor include living in rural areas and having no formal education. Other characteristics included having no job, a large household size (with many children below 10 old), being separated from a spouse (widowed or divorced), being disabled, and working in the agriculture sector. On the other hand, the characteristics that decrease the probability of a household being poor include the sex of the head of household, have at least secondary school education (notably tertiary education), residing in urban areas or cities, working in the services sector, and being single or married. The binary logistics has enabled us to understand the factors determining poverty and the identification of vulnerable groups of households at the micro-level of the household. In reality, the poor are a reflection of the communities in which they live and their lives are to a large extent conditioned by the societies they are part of the economic and political economy of their countries. Hence, the elimination of poverty must be seen in the context of the overall development of the societies in which it is found, which in turn requires a thorough understanding of the causes of poverty.

Therefore, we can conclude that although Sierra Leone has seen many years of economic growth, yet poverty has abounded alongside due to the following factors:

1. Lack of services such as electricity, pipe-borne water, health care, and job facilities, especially in the rural areas where 60 percent of the population lives is a major cause of household poverty. Poor road networks, and lack of access to income-generating activities beyond working on the farm, have kept households in rural communities

below the poverty lines.
2. The lack of formal education is a major cause of poverty; and that acquiring post-secondary school education is a pathway out of poverty.
3. The social status of the head of household such as separation (either due to divorce, death of a spouse, or other causes) is a significant cause of household poverty, possibly resulting from the loss of income and assets.
4. As expected, unemployment is a major cause of household poverty in Sierra Leone; however, the study also found evidence poverty status of the household was strongly associated with the household's engagement in agricultural activity.
5. That larger household size caused poverty in the household, and that households with more children below 10 years old face higher risks of being extremely poor than those households with more adults 10 years and over as such household members contribute a lot to household welfare.

RECOMMENDATION

This paper makes the following recommendations for policy action:

1. The study has underscored the important role of rural development and commercialization of agriculture as strategic poverty alleviation efforts to reduce the vulnerability of rural households and those headed by widowed, divorced, or speared females. This paper, therefore, recommends the scaling up of rural development programs geared towards improving service delivery as well as improving agricultural productivity to boost rural household's incomes and purchasing power.
2. The study has shown that education is an important vehicle for poverty alleviation. However, post-secondary school education is critical for household poverty eradication. Therefore, this paper recommends that alongside the Free Quality Education (FQE) flagship program, the government should pay attention to Tertiary education as a strategic way of eradicating poverty in the country. It means that Free Quality Education (FQE) is a necessary but not sufficient solution to the extreme poverty of the household. Tertiary education provides more employable skills to individuals, which makes them competitive in the job market. Hence, offer better rewards in wages and incomes than persons with secondary, primary, or no education at all.

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