ISSN: 2415-0304 (Print)
ISSN: 2522-2465 (Online)

Indexing/Abstracting

Published by
Department of Economics

School of Business and Economics

University of Management and Technology
Lahore, Pakistan

EMPIRICAL ECONOMIC REVIEW | EER

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Submission: Septemer 04, 2018 **Acceptance:** December 02, 2019

Article Information:
To cite this document
Ewung, B. F., Ater, P. I., & Balogun, L. O. (2019). Assessment of Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) Vulnerability Index and its effect on labour productivity of rural farmers in Cross River State, Nigeria. *Empirical Economic Review*, *2*(2), 17-32.

The online version of this manuscript is available at
https://ojs.umt.edu.pk/index.php/eer/article/view/243
DOI:10.29145/eer/22/020102
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Empirical Economic Review
Vol. 2, No. 2 (Winter, 2019), pp. 17 - 32

Assessment of Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) Vulnerability Index and Its Effect on Labour Productivity of Rural Farmers in Cross River State, Nigeria

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Abstract

The research assessed the HIV/AIDS vulnerability index effects on rural labour productivity of agricultural communities in Cross River State. Using multistage random sampling techniques on infected and non-infected farm households, 308 respondents were sampled and structured questionnaires were administered by trained enumerators with adequate experience in the state. Data were analysed using the fussy set approach to health risk vulnerability, descriptive and correlation analysis to determine vulnerability index, productive labour force and relationship between vulnerability index and productivity of both infected and non-infected rural farmers. The average labour force (18 years and above) for infected households was approximately 3 persons per household as against 4 persons for non-infected farm households. The mean labour productivity for infected farmers was 6715 ton/man day while, the non-infected farmer was 8285 ton/man day, where the difference in productivity was significant. A vulnerability index of 16% was established and the indicators that contributed significantly were; care not to take unscreened blood, care not to touch blood of others, having sex indiscriminately, sharing clipper, reduction in savings, and reduction in number of working hours. Furthermore, 43.97% of infected households and 20.40% of the pooled farmers were

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found to be highly vulnerable. Also an inverse relationship between labour productivity and vulnerability index was established and data were statistically significant. The researcher recommends special inputs subsidy programme for infected farmers, institutionalization of the HIV/AIDS (public health) desk in the State and federal Ministries of Agriculture and Rural Development.

***Keywords*:** HIV/AIDS, labour force and productivity, vulnerability index,
***JEL Classifications*:** Q10

1. Introduction

There are many public health diseases that affect the Agricultural productivity, rural household poverty level and food security including; cholera, tuberculosis, typhoid, malaria, etc. But the most devastating of them is the HIV/AIDS, which has killed over 2 million people in 2008 with sub Saharan Africa accounting for 72 percent (Asenso-Okyere, Aragon, Thangata, Andam, and Mekonnen, 2010) but yet has no cure. This burden is largely been propelled by vulnerability to ill-health and diseases which remains a major problem affecting labour productivity. Food and Agricultural Organization (FAO, 2000) argued that, since 1985, seven million agricultural based workers have deceased because of HIV/AIDS in 25 Sub-Saharan Africa including Nigeria and this toll may rise to sixteen million by 2020. According to Umoru and Yaqub (2013) citing the World Bank, noted that labour productivity in Nigeria is persistently low and declining with a recorded average growth rate of 1.2 percent from 2000 to 2008.

Theoretically, the Neo-classicals postulated that output is influenced by variables such as labour, capital, technology and perhaps other socio-economic variables, (Solow, 1957). It is also expected that, good health will influence output and productivity positively. The contention is the extent to which vulnerability to ill-health and disease, particularly HIV/AIDS, will influence household productivity with regards to other complementary inputs applied to production. In other words, the counter theory suffices that it may not be sufficient to say that a sick person (being a source of labour) will suffer from productivity declinations which may have

significant effect on output level when he has access to other inputs like capital that can be used to influence output and productivity.

In spite of established link between these factors and the vulnerability of HIV/AIDS, not much have been documented in Nigeria, especially in the rainforest belt of Cross River, Akwa-Ibom and Rivers States where the epidemic currently swells. Cross River State is currently being classified among the ‘‘big six’’ States in Nigeria because of its prevalence rate of 6.6 percent (Vanguard, 2016) higher than the national rate of 3.4 percent (Federal Republic of Nigeria, 2014).

Furthermore, empirical evidence by Food and Agriculture Organization (FAO) (1997) in Eastern Africa revealed that the effect of HIF/AIDS on the agriculture and rural sector is better explainable by panel data models which can discriminate the data into spatial and temporal dimensions (Masuku & Sithole, 2009). This research assesses the effect of HIV/AIDS vulnerability on household labour force and productivity in Cross River State. It is believed that, the study would help initiate a strategy for targeting intervention on affected households by development practitioners, government and donor agencies, other major stakeholders for enhanced financing and better polices. It should be noted however, that this publication is part of the work published elsewhere particularly with respect to mean labour force for infected and non-infected households.

The objective of the study is to assess the effect of HIV/AIDS Vulnerability and scourge on household labour productivity in Cross River State. The specific objectives are to: estimate the vulnerability index of infected and non-infected households and also estimate the relationship between household vulnerability index and productivity.

2. Conceptual Framework

Majahodvwa, Micah, and Absalom (2013) noted that the term vulnerability is defined differently in different disciplines and it is based on its source. For instance, World Health Organization (WHO), (2002) defines vulnerability as “the degree to which a population, individual or organization is unable to anticipate, cope with, resist and recover from the impacts of disasters or shocks,

appears apt". Household shocks may come in the forms of disease or a health condition, natural disasters like drought, climate change effects or an economic instability at a point in time. This has continued to form part of the line of discussion amongst development expert and academics inclined to research for development. Of immense economic significance are the shocks households face as a result of a health condition or disease contacted. This study is particularly concerned about health level vulnerability which is noted here as vulnerability to HIV/AIDS and defined as the prospect that a household member can be infected with HIV/AIDS in the future if currently not infected or the inability to recover from the impact of the infection if already infected. The factors that determine vulnerability can be viewed from two perspectives. First, is vulnerability to the disease condition and secondly, is vulnerability to the impact of the disease or health condition on the affected households.

2.1. Vulnerability Index for HIV and AIDS Households

Household vulnerability index gives a quantitative assessment of a population exposure to a situation of hazard. This study has conceived exposure to HIV/AIDS as a developmental risk affecting households, that can create negative outcomes and impacts on the infected and their households. Oyekale (2004) while attempting an estimation of household vulnerability index (using the fussy set approach) to the infection in the rain forest region of Nigeria found that generally Nigerians are 19.34% vulnerable to HIV.

3. The Study Region

This study has focused on the Cross River State located at South of Nigeria. This costal state has estimation population of 2,892,988 million (Report of Nigeria's National Population Commission on the 2006 Census, 2007) and located at a latitude of 6.1670° N, and longitude of 8.6601° E comprising of the rainforest belt of Nigeria characterized by high rainfall and low temperature during the rainy season, lasting for about 7 months (March to October). Its name is derived from its main river, and name of the capital is Calabar. This state consists of 18 Local Government Areas with three major languages of Efik, Ejagham and Bekwara cutting across the three senatorial district of South, Central and North respectively. The state

has an area of 20,156km^2. The State enjoys a temperate climate with the Obudu Plateau, at 1,576m above sea level providing a major incentive for tourism.

3.1. Sample Size for the Non-infected Households

A total of 163 non-infected respondents were selected for this study using multistate sampling techniques. The first stage was the categorization of areas based on agricultural zones within the state followed by the purposive selection of the Local Government Areas with highest positivity rates in the three agricultural zones of south, central and north as well as the level of agricultural activities.

This was important to enable us define the number of respondents from the selected Local Government Areas using the appropriate ratios as, LGAs with high positivity rates and relatively higher levels of agricultural activities were selected. Available information from States AIDS and STI Control Programme (Cross River State, 2017) indicated that out of the 18 LGAs, Calabar South, Akamkpa and Calabar Municipality, Akpabuyo, Bakassi, Odukpani and Biase in the South, Ikom, Obubra, Boki, Etung and Yakurr in the central and Yala, Ogoja, Obudu and Bekwarra in the north, had high positivity rate. Out of these, information from the Ministry of Agriculture also showed that Ikom, Yakurr, Akamkpa and Yala are more involved in agricultural activities. Thirdly, this was followed by random selection of farming households with the aid of Extension workers in the respective wards and communities within the LGA. Using a sample proportion of 0.012, a total of 163 respondents were targeted. The details are shown on Table 1.

3.2. Sample Size for the Infected Households

A multi-stage sampling procedure was also adopted. First, the researcher purposively identified Local Government Areas within the state based on the level of agricultural activities and high prevalence or positivity rates. The estimated HIV/AIDS prevalence rate in the state stood at 6.6 percent.

However, the LGA with high level agricultural activities and high positivity or prevalence rate of not less than 1.0% included Yala (1%) in the north, Ikom (2.0%) and Yakurr (1.0%) in the central and Akamkpa (4.0%) in the southern zones Cross River State

(2017). Next was the determination of households that were infected (with HIV/AIDS), this was randomly sampled with the aid of Extension workers and leaders of the HIV/AIDS support groups in the respective LGAs. The farmers were targeted and accessed at the facilities where they go for their routine treatment on specific weekdays. In the final analysis, a sample proportion of 0.003 was applied in the determination of the sample size. Thus a total 145 respondents were targeted. Table 1 shows more details.

3.3. Assessment of Household Vulnerability Index

3.3.1. Fussy Set Approach

The study used the fussy set approach (Costa, 2002, 2003; Oyekale. 2004; Iheke, Okezie, & Onyekanma, 2007) to analyse multidimensional poverty given some key composite indicators. It can be expressed that given a population A of n households, A = (a_1, a_2, a_3……a_n), the subset of households that are vulnerable and B includes any household $a_i \in B$, which presents some degree of vulnerability in at least one of the m attributes of X.

The degree of membership to the vulnerable household by the *i-th* household (i =1,…., n) with respect to the *j-th* attribute (j = 1,……,m) is defined as: $\mu B [X_j (a_i)] = x_{ij}$, $0 \leq x_{ij} \leq 1$.

Specifically, (i). $x_{ij} = 1$ if the *i-th* household possesses the *j-th* attribute that tends to increase vulnerability; (ii). $x_{ij} = 0$ if the *i-th* household does not possess the *j-th* attribute such that vulnerability decreases; (iii). $0 \leq x_{ij} \leq 1$ if the *i-th* household possesses the *j-th* attribute with an intensity belonging to the open interval (0,1). The vulnerability level of the *i-th* household $\mu B (a_i)$, which implies the degree of membership of the *i-th* household to the set of B is defined as the weighted average of x_{ij},

$$\mu B (a_i) = \sum_{j=1}^{m} XijWj / \sum_{j=1}^{m} Wi \quad \textbf{(1)}$$

Where w_i is the weight attached to the *j-th* attribute and Σ is the summation sign. The attributes or vulnerability indicators are captured in Table 8 above.

Table 1: Sample Frame and Sample Size for Infected and Non-Infected Households

Agricultural zones	Sampled LGA	Ward	Community	Non Infected Households			Infected Households		
				Sample frame	**Sample proportion**	**Sample size**	**Sample frame**	**Sample proportion**	**Sample size**
North	Yala	Ukele	Wanekom	3250	0.012	39	13,394	0.003	40
Central	Ikom	Ofutop I	Okangha Nkpansi	2430	0.012	29	11,176	0.003	34
	Yakurr	Ekori	Ekori I	4840	0.012	58	13,937	0.003	42
South	Akamkpa	Oban	Oban	3120	0.012	37	9,601	0.003	29
Sample size sub-total for both infected and non-infected						**163**			**145**
Sample size total for both infected and non-infected									**308**

The vulnerability index μB (a_i) measures the degree of vulnerability of the i-th household as a weighting function of the m attributes. Hence, it measures the tendency of the households to contacting disease. The weight w_j attached to the *j-th* attribute stands for the intensity of vulnerability of X_j. It is an inverse function of the degree of deprivation of this attribute by the population of households. The smaller the number of households and the amount of vulnerability of X_j, the greater the weight w_j. A weight that fulfils the above property is proposed by Cerioli and Zani (1990) can be represented with the following expression:

$$w = \log[n/\sum_{t=1}^{n} Xijn_i] \geq 0 \quad \textbf{(2)}$$

Where; $\sum_{t=1}^{n} X_i jn_i] > 0$ and where n_i is the weight attached to the *i-th* sample observation when the data are extracted from a sample survey. Finally, the vulnerability ratio of the population μB is simply obtained as a weighted average of the poverty ratio of the *i-th* household μB(a_i)

$$\mu B = \sum_{i=1}^{n} \mu B(ai)ni/\sum_{i=1}^{n} ni \quad \textbf{(3)}$$

The contribution of each indicator to vulnerability level can be decomposed as

$$\mu B = \sum_{j=11}^{m} \mu B(Xj)wi/\sum_{j=1}^{m} wi \quad \textbf{(4)}$$

For the HVI, the sum of the weights are set to

$$\sum_{j=1}^{m} wi = 100$$

4. Results and Discussion

4.1. Household Vulnerability Index (HVI)

The HIV/AIDS vulnerability indices for farmers in the study area were estimated using the fussy set approach to health risk vulnerability. The results presented in Table 2 shows the vulnerability index for infected, non-infected and pooled farmers. Specifically, the results show a vulnerability index of 21.885 percent

for infected farmers 10.789 percent for non-infected households and 16.022 percent for all farming households in Cross River State.

Table 2: Percentage Vulnerability Index

Description of respondent category	Percentage Vulnerability Index
Infected Households	21.885
Non-infected Households	10.789
Pooled Data	16.022

Source: Computed from field data 2018

The results in Table 3 shows the contribution of each indicator to average vulnerability. The approach also explains the indicators that contributed more or less to vulnerability in the different categories of respondents. For the positive households, the indicators with high contributions to vulnerability are care not to take unscreened blood (0.3255), care not to touch blood of others (0.2638), having sex indiscriminately (0.1787), and sharing clipper (0.2092) amongst others. The indicators with high contribution to HIV/AIDS vulnerability amongst the non-infected households are reduction in savings (0.3228), sharing of clipper (0.2880), and reduction in number of working hours (0.1456), while the important indicators to vulnerability for all households are care not to touch blood of others (0.1465), sharing of clipper (0.1585), and reduction in savings (0.2341). Studies by Oyekale (2004) in the rainforest zone of Nigeria, Cross River State inclusive showed that the Household Vulnerability Index (HVI) for Cross River was 13.47%. Using the same model to estimate the vulnerability index of the state 14 years after, the index has increased significantly to 16.022 percent. The index is a measure of the farmers' exposure to risky behaviours of certain indicators that increases their probability of being infected if not infected or the probability of difficulty in coping with the effect of the infection if already infected. The result therefore shows that the infected farmers are more exposed to indicators of vulnerability some of which are connected to livelihood improvement and access to health care services.

Table 3: Contribution of Indicators to Average Vulnerability to HIV/AIDS in Cross River State

S/N	Indicator	Infected	Non-Infected	Pooled Data
1	Have sex indiscriminately	0.1787	0.0266	0.0983
2	Don't use condom with strangers	0.1142	0.0930	0.1030
3	Visit prostitutes	0.0397	0.0000	0.0187
4	Visit public sex places	0.0340	0.0000	0.0161
5	Do not care to contract HIV	0.1596	0.0000	0.0753
6	Share clippers	0.2092	0.2880	0.2508
7	Dates many girls	0.0780	0.0601	0.0686
8	Offer wives to visitors	0.0447	0.0000	0.0211
9	Share needles	0.2085	0.1139	0.1585
10	Care not to touch blood of others	0.2638	0.0418	0.1465
11	Care not to share available strings and shiringes	0.1333	0.0000	0.0629
12	Care not to take unscreened blood	0.3255	0.0114	0.1570
13	No assistance on prevention of HIV	0.083	0.0076	0.0431
14	Many confusing points about HIV	0.0638	0.0796	0.0722
15	AIDS has been exaggerated	0.0184	0.0481	0.0341
16	No health centres	0.0816	0.0286	0.0535
17	No support to publicize AIDS	0.0411	0.0285	0.0428
18	Lack access to market	0.0277	0.0418	0.0351
19	Don't believe in AIDS' existence	0.1021	0.0228	0.0602
20	Not aware of HIV preventive methods	0.1234	0.0000	0.0582
21	First time to hear of HIV	0.0404	0.0000	0.0191
22	No one warns about HIV	0.0404	0.0019	0.0201
23	Reduction in savings	0.1348	0.3228	0.2341
24	Inability to feed as at when needed	0.1830	0.1139	0.1450
25	Inability to sustain employment/Loss of job	0.1447	0.0228	0.0803
26	Reduced land cultivation	0.0709	0.2054	0.1421
27	Inability to sell farm produce	0.0709	0.0329	0.0508
28	Reduction in community participation	0.0908	0.0506	0.0696
29	Reduction in effective resting time	0.0511	0.0399	0.0452
30	Reduction in generated income	0.1319	0.1329	0.1324
31	Reduction in the number of working hours	0.1028	0.1456	0.1254
32	HIV/AIDS cases reported in the community	0.1149	0.0399	0.0753
33	Female spouse is HIV positive	0.3050	0.0000	0.1438
34	Husband is HIV positive	0.2482	0.0000	0.1171
35	Cannot access condom	0.0957	0.0348	0.0635
36	Religion encourages adultery	0.0035	0.0063	0.0050
37	Friends disown the household	0.0206	0.0032	0.0114
	Total average vulnerability	**4.1799**	**2.0447**	**3.0562**

4.2. Distribution of Household Vulnerability Index

The results in table 4 describe the categories of vulnerability as low, moderate or high. The results of the study reveal that 24.82% of the infected farmers, 100% of the non-infected farmers and 64.55% of

the pooled farmers in the state fell within the Low Vulnerability (LV) category. The result also shows that 31.21% of the infected farmers and 15.05% of the pooled farmers were within the Moderate Vulnerability (MV) category. Whereas, 43.97% of the infected farmers and 20.40% of the pooled farmers were Highly Vulnerable (HV). The HV category requires greatest investment because they are chronically vulnerable and require specially articulated and targeted social protection or livelihood improvement intervention to mitigate on the impact of this level of vulnerability.

However, the farmers within the low vulnerability category are said to have high adaptive capacity while the moderate vulnerable farmers have moderate adaptive capacity. Farmers in either categories can easily slide in and out of the high vulnerability group depending on the level of exposure to certain attributes or indicators that may increase their vulnerability level. The result differ with findings by Majahodvwa, Micah and Absalom (2013), while Food and Agricultural Organization (2000) reported that 70% of the farmers fell within the acute level of vulnerability.

The need therefore, to initiate a prevention rather than cure strategy against HIV/AIDS infection should be given deep thoughts especially at the agricultural extension policy formulation level. A deliberate institutionalization of a HIV/AIDS (public health) desk at the Ministry of Agriculture has become an obvious necessity. Given that the vulnerable eventually becomes the infected, the extension service unit of the Ministry of Agriculture in partnership with other development Agency and Health-Agriculture response intervention should intensify campaigns against HIV/AIDS especially as regarding the effect on agricultural labour force and productivity.

Table 4: Distribution Categories of Household Vulnerability Index of Infected and Non-Infected Farmers

	Infected (n=141)		**Non-infected (n=158)**		**Pooled data (n=299)**	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Lv (0-33)%	35	24.82	158	100	193	64.55
Mv (34-73)%	44	31.21	-	-	45	15.05
Hv(74-100)%	62	43.97	-	-	3	1.0
		100		100		100

Source: Computed from field survey data, 2018

4.3. Vulnerability Index and Productivity

The correlation results showing the relationship between labour productivity and vulnerability index indicates that there is an inverse relationship between the variables. Specifically, the vulnerability indices for the infected (0.191) households and the pooled (-0.133) data were statistically significant at 5% level. The result shows that the higher the vulnerability index of a household, the less productive it will be and vice versa.

This is so because the vulnerable eventually becomes the infected. This may lead to loss of man hours or reduction in number of days put in farming, as such time is often shared for care giving to household members who are infected and sick. This have implication on their farm size cultivated, income levels and productivity.

Table 5: Correlation Matrix between Household Vulnerability Index and Productivity of Infected and Non-Infected Farmers

Variable	Labour productivity	Vulnerability index
Infected farmers		
Labour productivity	1	-0.191* (0.24)
Vulnerability index	-0.191*(0.24)	1
Non-infected farmers		
Labour productivity	1	-0.119 (0.137)
Vulnerability index	-0.119 (0.137)	1
Pooled farmers		
Labour productivity	1	-0.133* (0.22)
Vulnerability index	-0.133* (0.22)	1

Source: Calculated from field survey data, 2018. Note: * significant at 5% level

4.4. Labour Force and Productivity of Infected and Non-Infected Farm Households

The correlation results for labour productivity and labour force defined here as household members who are 18 years and above and willing to work shows that the mean labour productivity for the infected farmer was 6715ton/man day while that of the non-infected farmer was 8285ton/man day. The result also shows a significant difference between the means at 5% level. This goes to affirm that healthy farmers are more productive than sick farmers. It is also in consonance with the findings of Ater, Odoemenem, and Ama (2016)

who reported that access to health services has been proven to be significant in enhancing labour utilization and productivity. Umoru and Yaqub (2013) also established that increased investment in health capital is a significant determinant of labour productivity and by implication labour force.

The result also shows that the average labour force for infected households was approximately 3 persons per household as against 4 persons for non-infected farm households. This may be responsible for the difference in labour productivity for both households.

Table 6: Descriptive Statistics for Labour Productivity and Labour Force for Infected and Non-Infected Households

S/n	Variable	Statistics Descrip--tion	Infected Household	Non-Infected Household	t-value	Df	Prob
1	Labour productivity	Mean	6715tons/ man days	8285tons/ man days	2.031**	295	0.050
2	Labour force: People willing to work at age, 18 and above	Mean	2.51	3.51	4.068***	297	0.000

Source: Based on field data analysed, 2018

5. Conclusion and Recommendation

The research assessed HIV/AIDS vulnerability index effects on rural labour force and productivity of agricultural communities in Cross River State. The non-infected farmers had more labour force and were more productive than their infected counterpart. A vulnerability index of 16% was established and the indicators that contributed significantly to vulnerability were; care not to take unscreened blood, care not to touch blood of others, having sex indiscriminately, sharing clipper, reduction in savings, and reduction in number of working hours. The researcher recommends special inputs subsidy programme for infected farmers, institutionalization of the HIV/AIDS (public health) desk in the State and federal Ministries of Agriculture and Rural Development as well as ensuring continued sensitization on HIV/AIDS prevention

methods to check vulnerability scourge and improve on labour force supply and productivity.

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To cite this article:
Ewung, B. F., Ater, P. I., & Balogun, L. O. (2019). Assessment of Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) Vulnerability Index and its effect on labour productivity of rural farmers in Cross River State, Nigeria. *Empirical Economic Review*, *2*(2), 17-32. doi: 10.29145/eer/22/020102

Received: September 04, 2018 Last Revised: October 24, 2019
Accepted: November 27, 2019