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Review Article

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Assessment of Food Insecurity and Health Challenges in African Countries

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ABSTRACT:

Background: Food insecurity, which has caused many universal public health problems in both children and adults globally, is seen as an impediment to the actualization of one of the agenda of the 2030 Sustainable Development Goals (SDGs) i.e Zero Hunger Goal which is guaranteed by available, accessible, qualitative and safe food security which stands to improve human health outcome indicators. Due to the lack of macro-level empirical studies concerning the association between food insecurity and health outcome indicators related challenges in African countries, though the continent is greatly harmed by food insecurity and its associated health problems. So, this study focuses to examine the effect of food insecurity on life expectancy at birth and under-five mortality rate in African countries from 2001-2021.

Methods: The study was linked to Climate Theory while Panel Dynamic Ordinary Least Square (PDOLS) and Panel Fully Modified Ordinary Least Square (PFMOLS) were employed to investigate the relationships between the variables.

Results: A one percent increment in people's prevalence of undernourishment reduces their life expectancy at birth by 0.045 that is statistically significant under PFMOLS while contrary is the case under PDOLS but this is insignificant. A one percent rise in the prevalence of undernourishment increases under-five mortality rate by 0.386 and 0.733 that are statistically significant under PDOLS and PFMOLS.

Conclusions: Food insecurity is inimical to the health outcome indicators in African countries, and this may hinder the realization of SDGs goal in the continent. Towards this end, the governments in the continent need to apply holistic approaches stated in this work not only to achieve food security alone but to guarantee its availability, accessibility, quality and safe nutrition also at urban areas and rural communities.

KEYWORDS: Food Insecurity, Health Challenges, Life Expectancy at Birth, Under-five Mortality Rate, African Countries.

INTRODUCTION

An extreme food quagmire is escalating across Africa, moving millions of people into an increasing risk of hunger and starvation. This food quagmire (food insecurity) in Africa is fueled by a combination of factors (identified key drivers) like extreme weather events (climate change), the ongoing effects of COVID-19 pandemic, war between Russia and Ukraine, food inflation, stagnating local production, double-digit inflation, violent conflict and the cost-of-living crisis (World Vision Inc., 2024; Al Jazeera Media Network, 2024; SIPRI, 2023). It is a

common belief that hunger endangers the lives and well-being of susceptible or unprotected communities and people, especially women and girls (World Vision Inc., 2024). Having pictured the future towards this likely ravaging and ugly incidence, the countries of the United Nations in 2015 affirmed their commitments to the attainment of 2030 Agenda for Sustainable Development. This lined-up programme identified the significance of looking farther away from hunger (starvation) towards the aims of ensuring accessibility to safe, nutritious and adequate food for all people throughout a year, and of wiping away all forms of malnutrition (SDG 2 Targets 2.1 and 2.2). Food insecurity, no doubt, can affect diet quality in diverse ways, potentially resulting into manifestation of malnutrition, undernutrition as well as overweight and obesity. Since ensuring access to a healthy diet is a precondition for attaining the SDG goal of wiping away all forms of malnutrition, then there is a need to walk the talk (FAO, IFAD, UNICEF, WFP and WHO, 2020).

SIPRI (2023) reports that global food insecurity is gradually rising. It further states that in 2021 an estimated 29.3 per cent of the global population (2.3 billion people) was moderately or severely food insecure while 828 million people in the world (10.5 per cent of the world population) faced hunger. Statistically as at 2021, while 20.2 percent of African population was encountering hunger or starvation, it was 9.1 percent of the entire Asia population, it was 8.6 percent in Latin America and the Caribbean, it was 5.8 percent in Oceania and finally, it was less than 2.5 percent in North America and Europe. The above statistics points to regional disparities and Africa shares the heaviest burden. Similarly, Global Report on Food Crises (GRFC) (2024) states that in 2023 more than 281.6 million people across 59 countries/territories (21.5% of the population of the countries under consideration) confronted high level of severe food insecurity that needs quick assistance or help. GRFC (2024) also reports that the ten (10) countries with the greatest or most hard-hit food crisis in 2023 are Democratic Republic of the Congo (DRC), Nigeria, Sudan, Afghanistan, Ethiopia, Yemen, the Syrian Arab Republic, Bangladesh, Pakistan and Myanmar. On its own part, Al Jazeera Media Network (2024) identified that Nigeria, Ghana, Sierra-Leone and Mali would be among the worst affected food crisis countries. GRFC (2024) analyzed available projections for 41 of the 59 countries/countries as of March 2024, the analysis showed that nearly 208.3 million people of the assessed population will go through serious levels of acute food insecurity in 2024 which is expected to be fueled by full-scale armed conflicts. Finally, Al Jazeera Media Network (2024) reports that nearly fifty-five (55) million people will strive to feed themselves in the coming months in West and Central African countries as escalating prices triggered a food crisis.

Researchers and policy-makers are called into actions with the above pieces of information to beam their search-lights on the effect of food insecurity on health problem in Africa, a continent where increasing number of people are living in hunger and food insecurity, thereby resulting into health quagmire challenges and millions of untimely deaths. Thus, this study investigates the effect of food insecurity on people's health outcomes in African countries. Additionally, despite the plethora of evidences on the effect of food insecurity and poor health status, there is a dearth of macro level empirical studies regarding the effect of food insecurity on people's health status in African countries, which leads to a knowledge (literature) gap that needs to be seriously investigated.

THEORETICAL FRAMEWORK AND EMPIRICAL REVIEW OF LITERATURE

Climate Theory

Climate theory propounded by Cox (1981) explains food insecurity as caused by climatic phenomena. He related the theory with the concept of famine belt in which he directly

associates climate condition to food insecurity. This theory argued that in the national or local level, climate related phenomena like drought, floods and others are a major factor causing food insecurity. Food insecurity caused by all the stated factors above take its tolls on people in forms of hunger, inadequate nutritional intakes, undernutrition resulting into stunting, wasting, and immunological deficiencies, poor diet quality, health problems and others.

With the above theoretical framework, this study (the target variables) focuses on the effect of food insecurity on health outcome, and not on the causes of food insecurity. Continued alarming health problems or challenges in African countries orchestrated by food insecurity has been a source of worry to global health experts who believe that its effect on health outcomes should be regularly investigated. Towards this end, cursory investigation of the effect of food insecurity in African region is therefore considered an important and urgent issue. To be candid, there are plenty of micro-level empirical studies geared towards its examination but macro-level empirical studies are few. In order not only to situate the current research in the center of the existing literature in this area but to also contribute to unraveling the effect of food insecurity on health outcomes at macro-level, this study reviews some literatures on food insecurity health outcomes relationship.

Starting from the most recent order, Beyene (2023) investigates the impact of food insecurity on health outcomes using secondary data collected online from the databases of the United Nations Development Programme (UNDP), the Food and Agricultural Organization (FAO), and the World Bank (WB) for the whole population of 31 sampled SSA countries selected based on data availability. The study employs a multi-country panel data and estimation techniques like Driscoll-Kraay standard errors (DKSE), a Generalized Method of Momentum (GMM), fixed effects (FE), and the Granger causality test. Findings revealed that A 1% increment in people's prevalence for undernourishment reduces their life expectancy by 0.00348 percentage points (PPs).

Also, Pengpid and Peltzer (2023) evaluated associations between food insecurity and mental, physical, and behavioural health outcomes in India using analyzed national cross-sectional population-based data. Findings revealed that food insecurity was positively associated with seven poor mental health indicators. Similarly, Sultana, Rahman, Khanam, Rayhan and Hossain (2023) focused on food insecurity and health status among the workers working in the informal sector enterprises. Moderate to severe food insecurity is responsible for the poor health status of this group population. Militao, Salvador, Uthman, Vinberg and Macassa (2022) sought to identify empirical studies that related food insecurity to health outcomes among adults in southern Africa.

It revealed that food insecurity was associated with hypertension, diabetes, anxiety, depression and others. Gassara and Chen (2021) investigated into the household food insecurity, dietary diversity, stunting in sub-Saharan Africa. Finding revealed that food insecurity resulted into stunting. Haines, Loades, Coetzee, Higson-Sweeney (2021) embarked on extensive research that considered those risk factors responsible for depression in people living with HIV. It found food insecurity as one of the key factors. Trudell, Burnet, Ziegler and Luginaah (2021) cexamined the impact of food insecurity on mental health in Africa. It found that food insecurity was associated with poor mental health. In a study that examines the relationship between food security and health outcomes, Gregory and Coleman-Jensen (2017), revealed that lower food security is related to higher probability of each of the chronic diseases examined-hypertension, coronary heart disease (CHD) and others. In the same vein, Weigel, Armijos, Racines, Cevallos, and Castro (2016) evaluated association of household food

insecurity with the mental and physical health of low-income urban Ecuadorian women with children. It found that food insecurity was associated with diabetes, hypertension. Gundersen and Ziliak (2015) investigated food insecurity and health outcomes using research evidence of the health consequences of food insecurity for children, non-senior adults, and seniors in the United States. It found food insecurity to have negativity with health outcomes.

The review of the extant studies in the preceding paragraphs exposes some lacunas in the literature. First, a survey of the extant study shows constrained time-frame in terms of chosen periods, few or limited selected countries, inadequate robust theoretical framework to support the reviewed literature, inappropriate estimation techniques and other shortcomings. Second, most of the literature reviewed were centered on micro studies. Hence, to gain better understanding on associations between food insecurity and health outcomes in Africa requires additional researches that will assist to extend the frontier of knowledge in the literature.

MODEL SPECIFICATION

Premised on the Beyene (2023) econometrics specified model, the adjusted and adopted model of this study is stated thus:

$$\text{Health Outcome Indicator} = f(\text{Prund}, \textit{control variables}) \quad \ldots (1)$$

$$\text{Health Outcome Indicator} = f(\text{Prund}, \textit{GDPPC, GHE, MNSCHOOL, URBAN}) \quad \ldots (2)$$

The above equation is adjusted by expunging MNSCHOOL and URBAN while Primary School Completion Rate, External Health Expenditure and institutional quality (GOEFF) are added. The equation 2 is specified thus to achieve the stated objective of this study.

$$\text{Health Outcome Indicator} = f(\text{Prund}, \textit{GDPPC, GHE, PRYSCH, EHE, GOEFF}) \quad \ldots (3)$$

$$\text{Econometrically, HOI}it = \alpha_0 + \alpha_1 PRUND_{it} + \alpha_2 logGDPPC_{it} + \alpha_3 DGGHE_{it} + \alpha EHE_{it} + \alpha_5 PHYSCH_{it} + \alpha_6 GOEFF_{it} + \mathcal{E}_{it} \quad \ldots (4)$$

The dependent variable used to represent Health Outcome Indicator (HOI) in this study is Child Mortality Rates (CMR), food insecurity is proxied by Prevalence of Undernourishment, while control variables are represented with log of Gross Domestic Product Per Capita (*ln*GDPPC), Domestic General Government Health Expenditure (*GHE*), Primary School Completion Rate,

External Health Expenditure and Government Effectiveness in country i at year t and $\mathcal{E}_t$ is the error term. Cueing behind the previous studies (such as Beyene, 2023), to know the extent of health challenges in Africa, it is proxied by health outcome indicator and health outcome indicator in this study is measured by Under 5 Mortality Rate (U5MR).

$$U5MRit = \beta_0 + \beta_1 PRUND_{it} + \beta_2 lnGDPPC_{it} + \beta_3 DGGHE_{it} + \beta_4 EHE_{it} + \beta_5 PHYSCH_{it} + \beta_6 GOEFF_{it} + \mathcal{E}_{it} \quad \ldots (5)$$

The dependent variable is represented with Under-5 Mortality Rate (U5MR) while the independent variable is represented with PRUND (Prevalence of Undernourishment), while *ln*GDPPC (log of Gross Domestic Product Per Capita), DGGHE (Domestic General Government Expenditure), EHE (External Health Expenditure), PHYSCH (Primary School Education Completion Rate) and GOEFF (Government Effectiveness) are control variables. *In* equ. 5, β_0 *is an intercept,* β_1 is a parameter of primary interest and is expected to be positive, the higher the prevalence of undernourishment, the higher the Under 5 mortality rate. Contrarily, $\beta_2 - \beta_6$ are expected to be negatives, the higher the control variables, the lower the

under-five mortality rate. ε signifies the error term, $t = 1 \ldots T$ denotes time, while $i = 1 \ldots N$ stands for country's number.

ESTIMATED TECHNIQUES

To estimate the models in this study, Panel Dynamic Ordinary Least Square (PDOLS) technique was used first and in other to test for the robustness of the results, Panel Fully Modified Ordinary Least Square (PFMOLS) was also employed as another estimation technique, this is in tandem with the work of Beyene (2023).

DATA AND MEASUREMENT OF VARIABLES

Variables	Symbol	Definitions	Sources
Under-Five Mortality U5MR	U5MR	Number of children lost to deaths	WDI
Prevalence of Undernourishment	PRUND	Percentage of population whose habitual food consumption is insufficient to provide dietary energy. (% of total population)	WDI
Gross Domestic Product Per Capita	GDDPC	GDP divided by the mid-year population (Constant local currency unit).	WDI
Domestic General Government Health Expenditure	DGGHE	(% of current health expenditure)	WHO
External Health Expenditure Per capita	EHE	External expenditures on health per capita expressed in current US dollars (Current external expenditure divided (by the population of a country)	WDI
Primary School Education Completion Rate	PHYSCH	Gross intake ratio to the last grade of primary education regardless of age. (% of the relevant age grade)	WDI
Effectiveness	GOEFF	Reflects perceptions of the quality of World Bank	World Bank

SCOPE OF THE STUDY

The research covered the time periods of 2001-2021 and utilized cross-sectional and annually time series data consequently for 35 selected African countries. The countries selected are Central African Republic, Chad, Guinea, Gabon, DR Congo, Ethiopia, Kenya, Madagascar, Mauritius, Tanzania, Angola, Botswana, Lesotho, South Africa, Zambia, Benin Republic, Cote D'ivoire, Ghana, Nigeria, Senegal, Congo Republic, Uganda, Zimbabwe, Mali, Togo, Sudan, Rwanda, Mozambique, Morocco, Libya, Egypt, Niger, Cameroon, Malawi and Gambia. The selection was based on the availability of data.

RESULTS AND DISCUSSION

Table 1 shows the descriptive statistics of the panel data variables collected from various organizations' databases comprising of the 35 selected African countries. The table indicates U5MR 84.3 child deaths over a 20-year period (2001–2021). Also, PRUND, GDPPC, DGGHE, EHE, PHYSCH and GOEFF revealed average, 19.87% of the entire population of the selected countries experienced undernourishment within the time-frame of this study, 547564 of GDPPC measured at the Local Currency Unit (LCU), 29.19% of DGGHE, 8.76% of EHE, 44.15% of the relevant age grade and -0.702 of GOEFF. Within the spanned time-frame of this study, the maximum values of the employed variables were 218.3 67.80, 5434176, 75.66, 50.13, 105.1 and 1.150 while the minimum values were 10.70, 0.00, 431.3, 0.00, 0.00, 0.00 and -1.87.

Table 1: Descriptive statistics of Variables

Variable	Obs	Mean	Std. Dev.	Max	Min
U5MR	735	84.27	40.12	218.3	10.70
PRUND	735	19.87	12.51	67.80	0.00
GDPPC	735	547564	893019.2	5434176	431.3
DGGHE	735	29.19	16.61	75.66	0.00
EHE	735	8.76	9.57	50.13	0.00
PHYSCH	735	44.15	34.94	105.1	0.00
GOEFF	735	-0.702	0.572	1.150	-1.879

Abbreviations: *U5MR= Under-five Mortality Rate (number of child deaths less than five years per 1000 live-births); PRUND= Prevalence of Undernourishment (% of the undernourished to the population of a country); GDPPC= Gross Domestic Product Per Capita (Local Currency Unit);DGGHE = Domestic General Government Health Expenditure (% of Current Health Expenditure); EHE = External Health Expenditure (Current Health Expenditure divided by the population); P = PHYSCH= Primary School Completion Rate (% of relevant age group); GE = Government Effectiveness (ranges between -2.5 to 2.5).*

Table 2 which shows the correlation coefficients of the employed variables suggests that a low positive relationship of 0.330 exists between U5MR and PRUND. DGGHE, EHE, PHYSCH and GOEFF show weak and moderate negative correlations of -0.243, -0.166, -0.185 and -0.417 with U5MR. Similarly, GDPPC, DGGHE, EHE, PHYSCH, and GOEFF show weak and moderate negative correlations of -0.038, -0.064, -0.138 and -0.373 with PRUND while EHE shows weak positive correlation of 0.149. DGGHE, EHE and GOEFF show weak negative correlations of -0.146, -0.069 and -0.174 with GDDPC while PHYSCH show very weak positive correlation with GDPPC. In the same vein, EHE and GOEFF show weak and moderate positive correlations of 0.228 and 0.445 with DGGHE while PHYSCH shows a very weak negative correlation of -0.011 with DGGHE. PHYSCH and GOEFF show a very weak and weak positive correlations of 0.038 and 0.233 with EHE. Finally, GOEFF shows a weak positive correlation of 0.271 with PHYSCH.

Table 2: Pairwise Correlation Analysis

Correlation coefficient

VAR	U5MR	PRUND	GDPPC	DGGHE	EHE	PHYSCH	GOEFF
U5MR	1						
PRUND	0.330	1					
GDPPC	0.060	-0.038	1				
DGGHE	-0.243	-0.064	-0.146	1			
EHE	-0.166	0.149	-0.069	0.228	1		
PHYSCH	-0.185	-0.138	0.008	-0.011	0.038	1	
GOEFF	-0.417	-0.373	-0.174	0.445	0.233	0.271	1

[Source: Researcher's computation]

The empirical presented detailed findings from the PDOLS as indicated in Table 3 shows that food insecurity as proxy by Prevalence of Undernourishment (PRUND) adversely affects Under-5 Mortality Rate (U5MR) indicating that the former escalates the latter. As a corollary, an upward movement in the level of Prevalence of Undernutrition (PRUND) increases Under-five Mortality rate i.e the coefficient of PRUND is 0.386 and is statistically significant at 5%. This indicates that PRUND increases U5MR by 386 child deaths. The coefficient of lnGDPPC is -72.38 and is statistically significant at 1%. This shows that a percent increase in lnGDPPC decrease U5MR by 72. In the same vein, the coefficient of DGGHE is -0.233 and statistically significant at 10%, indicating that a percent increase in DGGHE results into decrease in U5MR. Also, the coefficient of EHE is -0.771 and is statistically significant at 1%. Trailing behind, the coefficient of PHYSCH is -0.043 but is not statistically significant. The coefficient of GOEFF is 22.12 and is statistically significant at 1%. This means that government ineffectiveness increases U5MR by 22 child deaths.

Turning to the empirical presented detailed findings from the PFMOLS front as indicated in Table 4 shows that the coefficient of PRUND is 0.733 and is statistically significant at 1%, indicating that a percent increase in PRUND increases U5MR by 733. This is also in tandem with the a priori expectation. The coefficient of lnGDPPC is -83.50 and is statistically significant at 1%, implying that a percent increase in lnGDPPC reduces U5MR by 83 child deaths.

Table 3: Panel Model Regression Estimates Result for Under-5 Mortality Rate

Variable	PDOLS	PFMOLS
PRUND	0.386**	0.733***
	(0.175)	(0.042)
LnGDPPC	-72.38***	-83.50***
	(7.217)	(1.676)

DGGHE	-0.233*	-0.226***
	(0.129)	(0.022)
EHE	-0.771***	-0.321***
	(0.168)	(0.035)
PHYSCH	-0.043	0.003
	(0.033)	(0.008)
GOEFF	22.12***	24.51***
	(5.359)	(1.294)
R^2	0.940	0.868
S.E	11.49	14.05

[Source: Researcher's computation]

Similarly, the coefficient of DGGHE is -0.226 and is also statistically significant at 1%, also indicating that DGGHE reduces U5MR. In the same vein, the coefficient of EHE is -0.321 and also statistically significant, indicating a decrease in U5MR. Contrarily, PHYSCH coefficient is 0.003 and is not significant. Finally, GOEFF coefficient is 24.51 and is also statistically significant, indicating that government ineffectiveness results into increases in U5MR in the region.

Regarding the validity of the model, this is determined by the values of the R2. R2 quantifies the proportion of the variance in the dependent variable explained by the independent variables, representing the model's quality. The result in Table 3 shows that the explanatory variables provide the explanations of more than 93% and 83%; 94% and 86% of the variances on the employed dependent variables in this study.

DISCUSSION

The present study evaluates the effect of food insecurity on health challenges of the selected African countries using prevalence of undernourishment to proxy food insecurity while U5MR was used to proxy health challenges in the region. The results indicate that prevalence of undernourishment increases U5MR in Africa. The justifications for these results are associated with the inadequate food availability in Africa, insufficient accessibility to food and poverty that handicaps citizens from being able to pay for nutritious food. All these combined issues cause a domain where children are more liable to bear malnutrition-associated illnesses, leading into an increased U5MR.

Premised on the above results, this study concludes that food insecurity wreaks serious havocs on Africa health outcome indicator. The reason for this is that prevalence of undernourishment results into an increased U5MR by lowering the vulnerability, severity, and duration of contagious diseases like measles, cholera, tuberculosis and other. Some of the earlier works that support these results include Beyene (2023); Yasser, Asmaa, Sherif. Mohamed., Mohamed. Abdel (2023), The Childhood Acute Illness and Nutrition (CHAIN) Network (2022), Kirolos, Blacow, Parajuli, et al. (2021), Asiseh, Naanwaab, and Quaicoe, (2018); and Kanan and Swar (2016).

CONCLUSION

Some policy conclusions that are drawn from the work include the following: first the prevalence of undernourishment positively influences U5MR in all the selected countries. This means that a rise in undernourishment raises the under-five mortality rate in Africa. Toward this end, it is very important that plans, policies, efforts and initiatives should be assertively geared by the African governments towards reducing food insecurity in its entirety in the continent. One way to reverse the trend is for both the governments, agricultural organizations or well-to-do private individuals to prioritize and invest heavily in modernized agriculture. Second, review national, regional and continental policies that tackle some of the drivers of food insecurity in the continent. Third, scale-up the resources available to support food security and, fourth, focus on programmes that offer a multiple bottom-line product and other identified solutions. Even though, the present research is of extreme significance in addressing the health challenges in Africa, the central role of food security in reducing the adverse effects of undernourishment in under-five mortality rate is still an important vacuum that further investigation should concentrate. This cannot be exaggerated at this time when food security or zero-hunger continues to be one of the important blueprints towards the attainment of Sustainable Development Goals 2030.

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