Hidden Hunger Burden and Policy Responses in Nigeria: Implications for Attainment of The Sustainable Development Goal 2

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A R T I C L E I N FO	ABSTRACT
Key Words Malnutrition, Food security, Infant wasting Hidden hunger Sustainable Development Goal 2	The study analyzed the trend, sources and causes of hidden hunger in Nigeria and thereafter x-rayed the government policies to address hidden hunger and attain the SDG 2 by 2030. Institutional data (from WHO, FAO and World Bank) covering 1990 to 2018 were used. Data were analyzed using descriptive methods, trend analysis, inferential statistics (correlation analysis, t test and ANOVA). It was found that hunger situation in Nigeria (GHI) and proportion of undernourished was improving after attainment of democratic stability in 1990 till 2013, but by 2015, with the toll of economic recession, worsened. There was a high correlation between the proportion of undernourished in the population and the prevalence of stunting in children under five years in the country. The percent of adults obesity rose from 2010 to 2016, and indicated that more females were suffering obesity than their male counterparts. The most prevalent disease by cause were protein-energy malnutrition and iron-deficiency anaemia. The highest cause of death from hidden hunger arose from protein-energy malnutrition and Iodine deficiency in absolute terms while the trend of growth for Iodine deficiency related deaths gave a negative prevalence from 2000 to 2016. Nigeria had implemented a couple of initiatives targeted at reducing hidden hunger including bio-fortification of major staples and sugar with Vitamin A, and inclusion of Iodine in salts in addition to launch of some food and nutrition policies and other frameworks. Eight recommendations were made based on findings need for Government to create an enabling environment to improve access to local availability of micronutrient-rich foods; engaging relevant stakeholders to arrive at a common understanding of how national policies will be deployed in reducing undernutrition and elimination of gender barriers to learning and nutrition-based programmes among others.

Introduction

The global absolute number of undernourished people, i.e. those facing chronic food deprivation, increased to nearly 821 million in 2017, from around 804 million in 2016 (FAO, IFAD, UNICEF, WFP and WHO,2018). According to FAO, IFAD, and WFP (2014) the global figure of individuals under hidden hunger, is well over 2 billion people. This figure is morethan double the 805 million people with no access to adequate calories. Sub-Sahara Africa (SSA) and the South Asian subcontinent are the hotspots adjudged withthe highest prevalence of hidden hunger globally. In the SSA region about 23 percent of people remain undernourished (Hunger Notes, 2018) and the 2015–2017 undernourishment rate estimated at 22 percent, have also increased marginally. The level of hunger and undernutrition worldwide slipped down from 29.2 in 2000 into the "*serious"* category, at a value of 20.9 (Global Hunger Index, Concern Worldwide & Welthungerhilfe, 2018). However, the crucial question is that even though this value is viewed as improvement, will the world be able to achieve Sustainable Development Goal (SDG) 2, which aims to end hunger, ensure food security and improved nutrition, and promote sustainable agriculture, by 2030? Roser and Ritchie (2018) also noted that across the world, the prevalence

of hunger fell from 14.7 percent in 2000 to 10.9 percent in 2017. However, there was a concern over the fluctuating pattern of the growth which saw the Global

Hunger Index nosedived to its lowest levels in 2015 at 10.6 percent before *rising to 10.8 and 10.9 percent* in 2016 and 2017, respectively. The increase in the hidden hunger levels were largely attributed to increases that occurred in SSA (where rates have risen by several percentage points in recent years) and small increases in South America (from 4.7 percent in 2014 to 5 percent in 2017). The UN FAO linked this increase in undernourishment in particular to the rising extent of conflict (which is often a leading cause of famine), and exacerbated by climate-related factors (such as the El Niño phenomenon which can inflict both drought and flood conditions (Roser and Ritchie, 2018, FAO, IFAD, UNICEF, WFP and WHO. 2018). Nigeria is one of such notable countries in SSA that exemplifies the above mentioned problems. The farmers are facing risks of droughts and floods in different parts of the country especially as a result of climate change (Tambo and Abdoulaye, 2013). With a population estimate of 193 million as at 2016 (National Bureau of Statistics, 2018) Nigeria's is ranked as the seventh largest in the world and highest in Africa (United Nations Department of Economic and Social Affairs, UNDESA, 2015), and this is growing the most rapidly. Consequently, the population of Nigeria is projected to surpass that of the United States by about 2050, at which point it would become the third largest country in the world. By 2018, Nigeria became the country with the highest concentration of poor people in the world (UNDESA, 2018) thus deepening the concerns on how to take away the teeming poor population out of hunger and deteriorating living conditions. The World Bank (2018) noted that "Nigeria loses over US$1.5 billion in GDP to vitamin and mineral deficiencies annually and is ranked as 32nd in the Global ranking of stunting prevalence out of 136 countries". The Gini coefficient of Nigeria was 0.43 in 2009 (World Data Atlas, 2018) with values above 0.35 indicating high income inequality. Meanwhile, the country is a net food importer (FAO, 2018) and the number of food-insecure people is projected to more than double in ten years, from 17 million in 2012 to 43 million in 2022 (Ministry of Budget and Planning, 2016).

Unfortunately not much is known about the long term trends, current status of hidden hunger and sources as well as associated policy environment that had caused chronic malnutrition in the country. Such analysis can potentially provide evidence for policies and interventions that will help the country achieve the SDG 2 target as well as ensure inclusive growth.

Hence there is a need to deepen the understanding of the hidden hunger situation in Nigeria, Africa's largest country, with a view to learning what the situation is, why it happened and what policies as well as interventions can be offered to get the country and Africa out of hidden hunger before 2030. Findings from this study will also be useful for public health planning and diagnosis of the underlying factors associated with micronutrients deficiencies in order to assist in proper allocation of health resources towards national nutrition policy and planning. It will also be useful to Nigerian government in developing and implementing appropriate nutrition programmes aimed for improving maternal and child nutrition at both the individual and community levels regionally and across various socioeconomic strata. Other developing economies with similar context in will learn from the findings and recommendation to aid then in building their food security and nutrition (FSN) status.

Aims and Objectives of the Study
Against the above backdrop, this study was designed to analyze the status of hidden hunger, its trends, sources and relevant policies implemented to address the situation in Nigeria.
Specifically the study : (i) described the status and sources of hidden hunger in Nigeria (ii) ascertained the effects of hidden hunger on death rates in the country over the period and, (iii) identified the policies in Nigeria that has worked or failed in addressing hidden hunger in the country.

Conceptual Issues

Hunger Notes (2018) sees malnutrition as a condition resulting from insufficient intake of biologically necessary nutrients. Malnutrition include both *overnutrition* and *undernutrition*, but the focus for global hunger had been on *undernutrition,* they noted. There are two basic types of malnutrition/undernutrition: protein-energy malnutrition and micronutrient (vitamin and mineral) deficiency. The protein-energy malnutrition (PEM),the first and most important implies a lack of calories and protein. Protein-energy malnutrition is the more lethal form of malnutrition/hunger and is the type of malnutrition that is most often referred to when world hunger is discussed. This leads to growth failure. Principal types of growth failure are: moderate acute malnutrition (MAM) and severe acute malnutrition (SAM), with SAM being worse (Black et al., 2016).There are two types of acute malnutrition: **wasting** (also called *marasmus*) i.e. having a very low weight for a person's height; and *nutritional edema* (also called *kwashiorkor*) in which patient develops

swollen feet, face or limbs (UNICEF, 2015). **Stunting** is being too short for a person's age. It is a slow, cumulative process and develops over a long period as a result of inadequate nutrition or repeated infections, or both. Stunted children may have normal body proportions but look younger than their actual age.The second type of malnutrition is **micronutrient (vitamin and mineral) deficiency**otherwise referred to as **"hidden hunger"** (FAO et al, 2018). Specific examples of the most important micronutrients whose deficiencies could be precarious to health includes Vitamin A deficiency, iron and iodine deficiencies. According to FAO et al (2018) the effects can be distressing, resulting in mental impairment, poor health, low productivity, and even death. Its adverse effects on child health and survival are particularly acute, especially within the first 1,000 days of a child's life, i.e. from conception to the age of two, resulting in serious physical and cognitive consequences. Even mild to moderate deficiencies can affect a person's well-being and development. In addition to affecting human health, hidden hunger can curtail socioeconomic development, particularly in low- and middle-income countries. Welthungerhilfe, IFPRI and Concern Worldwide (2018) noted that the most commonly recognized micronutrient deficiencies across all ages, in order of prevalence, were caused by deficiencies of iodine, iron, and zinc. United Nations Regional Information Centre for Western Europe, UNRIC (2018) described hidden hunger as "a chronic lack of vitamins and minerals that often has no visible warning signs, so that people who suffer from it may not even be aware of it".Gödeckea, Steinb and Qaima (2018), noted that many countries in SS Africa, India and Afghanistan, had an alarmingly high level of hidden hunger, with stunting, iron deficiency anaemia, and vitamin A deficiency all being highly prevalent.

Gödeckea et al (2018) noticed that the existing studies did not solve the issue of how to measure "hunger" in its different forms. Various proxy measures were used that all quantified only selected dimensions of hunger or individual health outcomes, therefore unable to capture hunger in all its forms in the broader SDG2 sense. Hence, in order to overcome these shortcomings, they suggested the use of Disability-Adjusted Life Years (DALYs) as "a more nuanced and comprehensive measure to analyze the burden of hunger" (Black et al., 2008; Muthayya et al., 2013; Stein, 2014 as cited in Gödeckea et al, 2018). Gödeckea et al (2018)noted that the total DALY rates per 100,000 population, attributed to micronutrient deficiencies, were generally the highest in sub-Saharan African countries. In 36 countries, home to 90% of the

world's stunted children, deficiencies of micronutrients were responsible for 1.5-12% of the total DALYs. With respect to dimension and determinants of stunting in Nigeria, Akombi et al (2017) found that stunting and severe stunting among children aged 0–59 months in Nigeria were determined by interactions of some arrays of factors : sex of the child, perceived birth size, children who had experienced diarrhoea, duration of breastfeeding, wealth index and geopolitical zone. They also noted that the major factors associated with severe stunting were sex of the child, perceived birth size, children who had diarrhoea, wealth index, geopolitical zone and maternal Body Mass Index (BMI).

The WHO (2018a) in analyzing the progress towards the attainment of the SDGs related to health and nutrition **noticed that:** (i) In 2017, 151 million children under 5 (22%) were stunted. Three quarters of these were children living in the African Region or South-East Asia Region; (ii) It also noted that "51 million children under the age of five (7.5%) were wasted (too light for their height) while 38 million children in this age group (5.6%) were overweight (too heavy for their height). Wasting and overweight may co-exist in a population at levels considered medium to high – the so-called *'double burden of malnutrition'* – as observed in the Eastern Mediterranean Region. The Target 2.2 of the SDGs emphasized that: **"**by 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons **".**

2. Research Methods

Study Area: The research focus is on Nigeria, a West African country and the most populous country and largest economy in Africa with a population of over 193 million (FMARD, 2017 and UNDESA, 2018). Nigeria is bordered to the north by Niger and Chad, to the east, Cameroon and Benin to the west, with approximately 850 kilometres of coastline on the Gulf of Guinea to the south. It is divided into 36 States, plus the Federal Capital Territory (FCT) of Abuja and further subdivided into 774 Local Government Areas(LGAs). The total land area is 923,000 square kilometres. According to WHO (2018b) Nigeria has a Gross national income per capita (PPP international $, 2013) of $5, a life expectancy at birth for male and females (years, 2016) estimated at 55/56 respectfully. The probability of dying between 15 and 60 years was 372/333 for male and females per 1 000 population,

2016 respectfully. Nigeria has a total expenditure on health per capita (Intl $, 2014) of $217 while total expenditure on health as % of GDP (2014) stood at 3.7%.

*Sources of Data and Analytical Techniques :*The dataset used in this study were obtained from African Health Observatory and FAO (2018), World Health Organization (WHO) Data Base, FAO and World Bank. Most of the data were based on the survey implemented by the WHO (2018)based on the *Disability Adjusted Life Years (*DALYs) attributed to micronutrient deficiencies in 136 countries. According to Gödeckea et al (2018), such current indices of DALYs and maps provide crucial data that can be utilized to optimize the prioritization of intervention programmes aimed at addressing global multiple micronutrient deficiencies. They further noted that the indices (plus maps) can serve a useful advocacy tool in the call for increased commitments to scale up effective nutrition interventions. Data obtained from the data bases were subjected to descriptive analysis (e.g. use of mean, graphs and frequency distributions), and inferential statistics using paired t tests (Sheir, 2004)and Analysis of Variance, ANOVA (Field, 2009). T test was used to compare means of two different groups while the ANOVA was used to confirm if significant variation exists in means estimates of more different groups' indices or values where the groups are at least three. Trend analysis was also conducted on some relevant hidden hunger indices over selected periods. According to Encyclopaedia of Survey Research Methods (2008). They defined trend analysis as Trend analysis is a statistical procedure performed to evaluate hypothesized linear and nonlinear relationships between two quantitative variables. Typically, it is implemented either as an analysis of variance (ANOVA) for quantitative variables or as a regression analysis. It is commonly used in situations when data have been collected over time or at different levels of a variable. "In particular, the means of a dependent variable are observed across conditions, levels, or points of the manipulated independent variable to statistically determine the form, shape, or trend of such relationship." According to Parker (2002) Percentage Growth Rate is simply the percent growth divided by N, the number of years. The annual percentage growth rate used in the analysis were obtained using the Percent (Straight-Line) Growth Rates formula as follows:

$$PGR = \left(\frac{V_{Present} - V_{Past}}{V_{Past}} \times \frac{100}{1}\right) \Big/ N$$

Where : PGR = Percentage Growth Rate, $V_{Present}$ = Present or Future Value, V_{Past} = Past or Present Value and N = Period (in years).In addition to the above methods, in-depth review of literature was done to analyze the policies of Nigerian government in addressing hidden hunger in the country.

3. Results and Discussion

(i) Status and sources of hidden hunger in Nigeria

The rate of hunger in Nigeria viewed from the Global Hunger Index (GHI) perspective, as indicated Figure 1 took a downward trend shortly after Nigeria entered a democratic regime
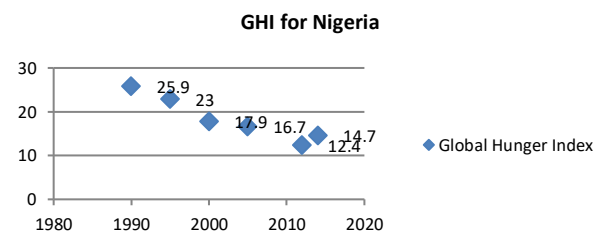

Figure 1. Status of Nigeria's Global Hidden Index.
Source: Computed by Authors based on data provided by IFPRI, Concern Worldwide and Welthungerhilfe (2014)

that had remained uninterrupted for since 1990. The GHI improved as it dropped to its lowest point, 12.4% in 2013 when Nigeria was experiencing increased revenue from oil boom in the wake of rising oil prices in the international market. However, the trend changed rapidly in 2015 when Nigeria's economy started dipping into recession and got worse at 14.7% after in the heat of the nation's economic recession. Interestingly as we will see later, this was the period when nutrition focused policies were really addressed more than any other time in Nigeria.

The trend of proportion of Nigerians who were undernoursihed, as shown in Figure 2, also followed a similar pattern falling from the 1990-1992 figure of 21.3% gradually to a record low level of 7.3% between 2011 and 2013.
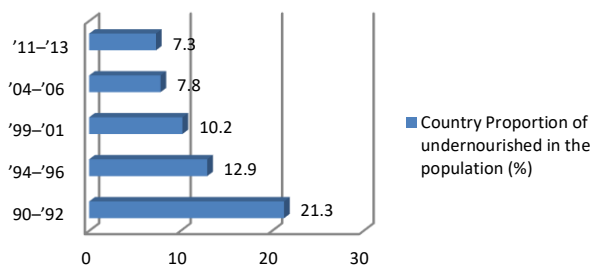

Figure 2: Trend of proportion of Nigerian population undernourished from 1990-2013.
Source: Computed by Authors based on data provided by IFPRI, Concern Worldwide and
        Welthungerhilfe(2014).

However, unlike the other two previous indices of hunger just examined, the prevalence of underweight in children under five years (%) in Nigeria from 1992 to 1997 remained unchanged. However, it later dropped by 1998-2002 before rising again in 2003-2007 and fell again between 2009 and 2013. This trend goes to support the assertion that hidden hunger is prevalent in SSA countries of which Nigeria is one (Gödeckea, Steinb and Qaima, 2018).
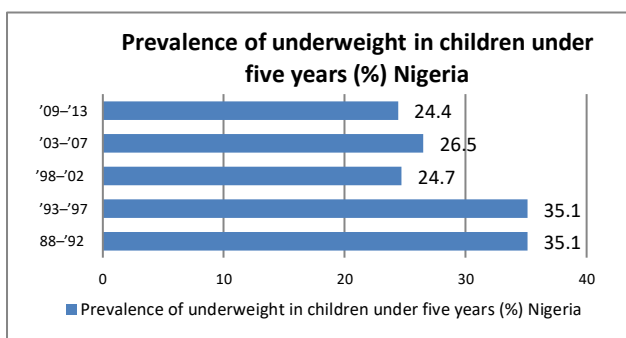

Figure 3: Prevalence of underweight in children under five years (%) Nigeria.
Source: Computed by Authors based on data provided by   IFPRI,   Concern   Worldwide   and Welthungerhilfe(2014).

An interesting pattern of hidden hunger regarding percent of adults above 18 years who were obese, in Nigeria is displayed in Figure 4. It indicated that while the indicator generally rose from 2010 to 2016, the prevalence was gender biased. More females recorded,
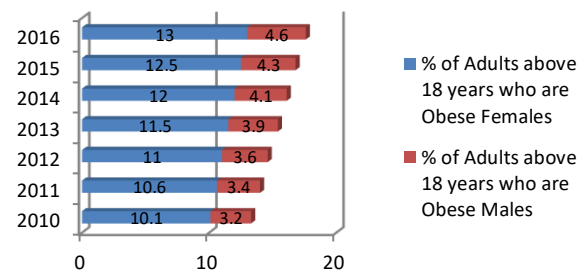

Figure 4. A gender depiction of Prevalence of Obesity among adults over 18 years in Nigeria Source: Authors' Computation based on data from African Health Observatory and FAO (2018)

incidence of obesity than their male counterparts. A cursory statistical analysis was further conducted to test whether the difference was statistically significant or not. Results indicated that, with a t ratio estimateof 37.44 at 5 % level of significanceit was confirmed that the difference in the mean proportions of obese female and male adults in the country differed significantly.

The results depicted in Figure 5 indicate a general decrease in the prevalence of all the hidden hunger indicators analyzed from 2000 when the Millennium Development Goals (MDGS) came into operation till 2010 when they reached their lowest values. Further analysis indicated that for the period 2000-2018,the proportion of undernourished in the population was 8.38%;the prevalence of wasting in children under five years during the entire period (2000-2018) was 12.72%, while under five mortality rate was at 14.47%.

The mean prevalence of stunting in children under five years was 40.55% during the post MDGs to the SDGs in Nigeria. What the pattern of growth in these indices of hidden hunger imply is that Nigerian government have failed in curtailing the rise of hidden hunger after 2010. This affirmation is further confirmed by the level of hidden hunger during the Post MDGs and the Post SDGs put together which did not exhibit any significant growth as indicated from the results of the ANOVA displayed in Appendix 2 with an F-ratio estimate of 1.95 (p<0.19).

Summary of Trend of Hidden Hunger Indicators in Nigeria from 2000- 2018

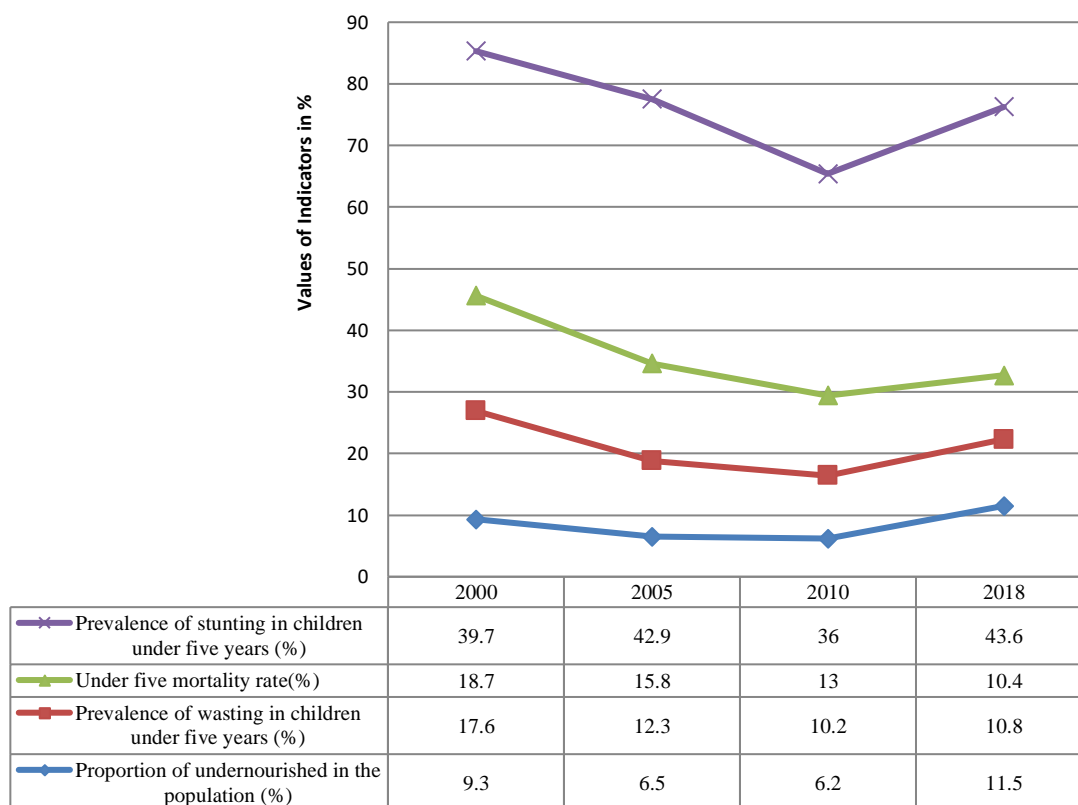|	2000	2005	2010	2018
─✕─ Prevalence of stunting in children under five years (%)	39.7	42.9	36	43.6
─▲─ Under five mortality rate(%)	18.7	15.8	13	10.4
─■─ Prevalence of wasting in children under five years (%)	17.6	12.3	10.2	10.8
─◆─ Proportion of undernourished in the population (%)	9.3	6.5	6.2	11.5

Figure 5: Graphic and Tabular Summary of Trend of Hidden Hunger Indicators in Nigeria from 2000-2018. *Source:* Computed by authors based on data from Global Hunger Index, Concern Worldwide & Welthungerhilfe (2018)

It was also observed that there was a high correlation between proportion of undernourished in the population (%) and prevalence of stunting in children under five years (%) from 2000-2018 (Appendix 3). Efforts to reduce undernourishment generally can therefore improve the stunting level in the country.

According to Global Health Index et al (2018) in the 2018 Global Hunger Index, Nigeria ranks 103rd out of 119 qualifying countries. With a score of 31.1, Nigeria suffers from a level of hunger that is serious. According to Federal Ministry of Agriculture and Rural Development (2017) with regards to micronutrient deficiencies, iodine, iron, vitamin A, folic acid and niacin deficiencies were of particular concern to the country. The report noted that children and women in their reproductive ages were especially more vulnerable due to their high micronutrient requirements. An estimated 47% of non-pregnant women of reproductive age were anaemic as at 2017 while 31% were iodine deficient. Children's anaemia was very high at 71% for children 6-59 months old and there was a record of 29.5% deficiency of vitamin A among these children. Another major issue found was the incidence of Neural tube defect which occurs in about 9500 births annually. Its risk is noted to considerably increase with folic acid deficiency.According to UNICEF and UKAid (2014) over 14 million people – 8.5% of the total population were undernourished and the country was also home to the highest number of stunted children in Africa and ranking second globally with more than 10 million stunted children. The 2013 Nigeria Demographic and Health Survey (NDHS) reported 37% of children under five were stunted, 29% were underweight, while 18% were wasted.

(ii) Hidden Hunger Prevalence in Nigeria by causes

The data in Table1 shows the various sources of hidden hunger incidences recorded in Nigeria from 2000-2016. Generally the trend of hidden hunger increased by 8.8% from 2000 to 2010, decreased by 53.8% between 2010 and 2015 then increased between 2015 and 2016 by 112.4%.Only Iodine deficiency indicated a decreasing growth trend consecutively from 2000 to 2015 in the country. The most prevalent number of source of disease by cause recorded came from **protein-energy malnutrition and iron-deficiency anaemia.** The results indicated that from 2000 to 2010, protein-energy malnutrition increased by 3.5% and decreased by 53% between 2010 to 2015 before the upward ascent by 103% between 2015 and 2016. This is a very high rate of growth. Meanwhile Iodine deficiency decreased by 16.9% and 60.6% from 2000 to 2010 and between 2010 to 2015 respectively.

However, by 2015 to 2016, it increased rapidly to 132.9%. Vitamin A deficiency prevalence increased from 2000 to 2010 by 14.1, decreased by 42.8% from

2010 to 2015 after which it rose by 106.7% by 2015 and 2016. With respect to the annual growth rate *only the protein energy malnutrition and Iodine deficiency exhibited a negative growth rate from 2000 to 2016.* Their annual growth rates were respectfully -0.1% and -1.4%.

Table 1: Data on Hidden Hunger Prevalence in Nigeria by Causes

Sources of Disease	Estimated DALYs ('000) by cause				Growth Rates			
	2000	2010	2015	2016	2000	2010	2015	2016
Protein-energy malnutrition	3941.2	4078.5	1899.9	3860.9	0	3.5	-53.4	103.2
Iodine deficiency	96.2	79.9	31.5	73.4	0	-16.9	-60.6	132.9
Vitamin A deficiency	5.6	6.4	3.7	7.6	0	14.1	-42.8	106.7
Iron-deficiency anaemia	1246.7	1552.8	718.1	1663.3	0	24.5	-53.8	131.6
Other nutritional deficiencies	71.2	116.9	43.0	121.7	0	64.2	-63.2	183.3
Nutritional deficiencies	5360.9	5834.5	2696.1	5726.9	0	8.8	-53.8	112.4

Source: Computed by authors based on data from World Health Organization (2018)

Table 2. Growth Rates of Incidence of Hidden Hunger based on estimated DALYs by cause and sex for all ages (from 2000 and 2016)

Type of Hidden Hunger	*Estimated DALYs ('000) by cause, sex for all ages in Nigeria 2016*	*Estimated DALYs ('000) by cause, sex for all ages in Nigeria 2000*	*Difference*	*Growth Rate (%)*	*Annual Growth Rate (%)*
Protein-energy malnutrition	3860.9	3941.2	-80.3	-2	-0.1
Iodine deficiency	73.4	96.2	-22.8	-24	-1.4
Vitamin A deficiency	7.6	5.6	2.0	35	2.1
Iron-deficiency anaemia	1663.3	1246.7	416.6	33	2.0
Other nutritional deficiencies	121.7	71.2	50.6	71	4.2
Total Nutritional deficiencies	**5726.9**	**5360.9**	**366.0**	7	0.4

Source: Computed by authors based on data from World Health Organization (2018)

The prevalence of Iron-deficiency anaemia increased by 24.5% from 2000 to 2010, decreased by 53.8% between 2010 and 2015 then increased between 2015 and 2016 by 131.6%. Other nutritional deficiencies in Nigeria increased by 64.2% from 2000 to 2010, decreased by 63.2% between 2010 and 2015 before increasing between 2015 and 2016 by 183.6%.

(ii) Hidden Hunger Impact on Death Rates in Nigeria

The statistics in Table 3 indicate that the highest cause of death from hidden hunger arose from protein-energy malnutrition and Iodine deficiency in absolute terms. However with respect to the growth rates, the trend of growth for Iodine deficiency related deaths gave a negative prevalence from 2000 to 2016.Meanwhile the protein-energy malnutrition related death rates indicated a continuous upward growth rates from 2000 through 2010 to 2016**.**

Table 3. Growth Rates and Prevalence of Hidden Hunger related deaths based on estimated DALYs for all ages (from 2000 and 2016) in Nigeria

	DALYs Estimates of Deaths in '000 by cause for all ages and sex Nigeria				Growth Rates in %			
Year	2000	2010	2015	2016	2000	2010	2015	2016
Protein-energy malnutrition	3.4	47.8	46.3	45.8	0	47.8	45.3	44.8
Iodine deficiency	3.4	0.2	0.2	0.2	0	-19.3	-0.9	-0.08
Vitamin A deficiency	0.0	0.0	0.0	0.0	0	0	0	0
Iron-deficiency anaemia	0.0	0.1	0.1	0.1	0	0.1	-0.7	-0.08
Other nutritional deficiencies	0.0	2.0	2.0	2.1	0	2.0	1.1	1.
Nutritional deficiencies estimates of Deaths in '000 by cause sex for all ages Nigeria	0.0	50.1	48.7	48.2	0	50.1	47.6	47.2

Source: Computed by authors based on data from WHO (2018)

The findings here corroborates that of UNICEF and UKAid (2014) who noted that , besides a lack of basic protein and energy, the immediate causes of undernutrition in Nigeria were a lack of micronutrients such as vitamin A, iodine,iron, and zinc. Almost 63% of women are anaemic and 31% are iodine deficient, while close to 30% of7 under-fives are vitamin A deficient (VAD) and 20% are zinc deficient.

(iii) Policy Initiatives to Address Hidden Hunger in Nigeria

Starting from the more recent initiatives, it is on record that Nigeria has taken major policy initiatives over the years to address hidden hunger. A remarkable effort is the mandatory fortification of key staples with major micronutrients such as Vitamin A for wheat flour, maize flour, sugar and vegetable oils, iron in wheat and maize flour, and iodine in salt. This resulted in vitamin A fortification of 70% sugar, 100% wheat flour, and 55% vegetable oil sold on the market. (UNICEF and UKAid, 2018). The fortification of wheat flour with iron, helps protect children and mother's physical and mental health. *Biofortification* has become a very important method of mainstreaming nutrition into agriculture and this is covered in the revised National Policy on Food and Nutrition in Nigeria (FMARD, 2017).

The FMARD (2017) noted that it was since 2008 when the National Programme for Food Security NPFS) was launched till date and the country's Agricultural Transformation Agenda got launched in 2011 that "nutrition began to be a key and explicit impact domain of agricultural development initiatives" in Nigeria. The focus of agricultural initiatives started changing from sheer development into the creation of transformative agricultural businesses with meaningful participation of the private sector. The paradigm shift was fortified by the launch of Agricultural Promotion Policy (APP) 2016-2020 in 2016. It is this policy, in addition to the National Policy on Food and Nutrition (NPFN) and other frameworks that provided the fundamental guidance for the establishment of priority strategic directions to improve nutrition through agriculture in Nigeria. An offshoot of the APP is the policy document developed to address the problem of food and nutrition in the country. The policy is called the Nigerian Agricultural Sector Food Security and Nutrition Strategy (AFNS). It is basically an elaboration aimed at guiding the implementation of the food and nutrition component of the Agricultural Promotion Policy as well as elucidation of the role of the agriculture sector in achieving the objectives of the National Policy on Food and Nutrition (FMARD, 2017).

According to the Ministry of Budget and National Planning(2016), the first National Food and Nutrition Policy was developed through a multi-stakeholder process and produced by the National Planning Commission in 2001. However, this policy had little or no effect in bringing about improvement in the nutrition situation in Nigeria due to the fact that the policy and the plan of action arising from it were not adequately implemented. This has been due largely to poor funding as well as ineffective coordination and monitoring of the policy implementation. Emerging concerns in the science, practice and programming of

food and nutrition activities informed the review of the policy. Some of these emerging critical issues include nutrition in the first one thousand days of life, nutrition during emergencies and upsurge in the prevalence of diet-related non-communicable diseases.

Similarly, there is increasing recognition of nutrition as a necessary condition for national development as espoused in the Millennium Development Goals (MDGs). It is also worthy to note that the post-2015 Sustainable Development Goals (SDGs) require actions that will promote nutrition in national development. The urgent need to scale up high-impact and cost-effective nutrition interventions, amplified by Nigeria's recent sign up with the Scaling Up Nutrition (SUN) movement in 2011 further justifies the need for the review. Consequently, in 2016, the Federal Government of Nigeria launched a revised version of the National Policy on Food and Nutrition in a landmark effort to address the problem of malnutrition, which has been most distressing among young children, pregnant and lactating mothers. The policy has been revised to add value and strengthen the synergy among sectors and other initiatives of Government and partners (Ministry of Budget and National Planning 2016).

With respect to hidden hunger, the Nigerian Federal Government took a couple of policy initiatives over the recent years to stem the tide of hidden hunger in the country. Prior to the launch of the policies on Agriculture Food and Nutrition Policy and the revision of the National Policy on Food and Nutrition, the Federal Ministry of Health (an arm of the Federal Government) in Nigeria by 2014,in collaboration with numerous individuals and development partners, developed a National Strategic Plan of Action for Nutrition (NSPAN). UNICEF and CHAI provided technical support and co-funded the policy document with the Federal Ministry of Health. This is in line with previous health sector strategies and efforts, such as the National strategic Health Development Plan 2010-2015 (NSHDP) and the National Food and Nutrition Policy (UNICEF and UKAid, 2014).

UNICEF and UKAid (2014) further noted that past activities to address the food and nutrition problems in Nigeria were very limited in scope before 1990 and were uncoordinated, and largely ineffective in addressing nutritional problems comprehensively. In 1990, the Federal Government of Nigeria established a National Committee on Food and Nutrition(NCFN) as an institutional arrangement to coordinate and provide leadership to articulate a comprehensive policy and

actions that could effectively reduce malnutrition considerably or eliminate it in Nigeria.

The NCFN formulated a National Food and Nutrition Policy (NFNP) in 1995, which the Federal Government approved in 1998 and launched in November 2002. The development and launching of the policy was a crucial step in addressing the malnutrition problem. This policy set specific targets, which included reduction of severe and moderate malnutrition among children under five by 30% by 2010, and reduction of micronutrient deficiencies (principally of vitamin A, iodine, and iron) by 50% by 2010.

The Federal Government also launched the Home-Grown School Feeding and Health Programme in September 2005 under the coordination of the Federal Ministry of Education. The programme aimed to provide a nutritionally-adequate meal during the school day. In addition, Nigeria had recently embarked on management of severe acute malnutrition (SAM) and currently has over 495 community management of acute malnutrition (CMAM) sites across northern Nigeria.

Nigeria held its first Nutrition Summit to create a "Roadmap to Scaling up Nutrition in Nigeria" early in 2012.At the Summit, the following interventions were recommended to drive the scale up: promoting optimal infant feeding practices, controlling micronutrient deficiency and anaemia through vitamin and mineral supplementation, food fortification and dietary diversification, and eliminating iodine deficiency through a salt iodisation programme in Nigeria. The roles of other sectors in improving food security was also acknowledged. The Nutrition Division, located in the Department of Family Health in the Federal Ministry of Health (FMOH), served as the convening Government body responsible for scaling up nutrition and has been responsible for bringing together various government ministries and departments including the Ministries of Health, Education, Agriculture, Women Affairs, Finance, Information, Science and Technology, and Water Resources, and the Planning Commission. All relevant ministries were also engaged through the Nutrition Partners Forum, which meets at least four times annually with external partners including national and international non-governmental organizations (NGOs), UN agencies, donors, businesses and the media, to discuss strategy development and undertake decisions relating to funding and nutrition emergencies (UNICEF and UKAid, 2014).

The World Bank had been supporting Nigeria's efforts to improve nutrition problems through health and

agricultural sector projects, including 1) a US$90 million extension of the Second Health Systems Development Project to target maternal and child health, 2) a US$450 million of the Third National FADAMA Development Project which has a goal to reduce food insecurity of FADAMA users, 3) and a US$150 million Commercial Agriculture Development Project which strengthens market access by small and medium farmers and agricultural production A sector study to fill in the knowledge gap in nutrition done through a landscape analysis of existing experiences in community health and nutrition programmes (The World Bank, 2011).

Conclusion

This study was designed to analyze the trend, sources and causes of hidden hunger in Nigeria and thereafter x-ray the policies put in place by the government to stem the tide of hidden hunger and attain the Sustainable Development Goal 2, particularly the aspect of ending hunger, ensuring food security and improved nutrition, and promoting sustainable agriculture by 2030. With the aid of institutional data spanning from 1990 to 2018 (from different sources) the researchers adopted descriptive methods, trend analysis, inferential statistics which included correlation analysis, t test and ANOVA to analyze the data of the study. Starting with the trend of hunger using the Global Hunger index, it was found that hunger situation in Nigeria was improving after democratic stability was attained in 1990 till 2013 and by 2015 the situation started getting worse. This was the time when economic recession took its toll on the economy. The trend of proportion of Nigerian population undernourished from 1990-2013 also followed the same pattern. However, the trend of the prevalence of underweight in children under five years (%) in Nigeria from 1992 to 2013 did not follow this pattern. It fluctuated along the years showing that hunger and hidden hunger are different issues that must be tackled using different approaches. There was a high correlation between the proportion of undernourished in the population and the prevalence of stunting in children under five years in the country. Regarding percent of adults obesity generally rose from 2010 to 2016, and indicated that more females were suffering obesity than their male counterparts. A general decrease in the prevalence of all the hidden hunger indicators analyzed were observed from 2000 when the MDGS started till 2010 after which it took an upward ascent. During the period 2000-2018, the proportion of undernourished in the population was 8.38%; while the prevalence of wasting in children under five years (for 2000-2018) was 12.72%.

Generally the trend of hidden hunger increased by 8.8% from 2000 to 2010, decreased by 53.8% between 2010 and 2015 then increased between 2015 and 2016 by 112.4%. This means that the SDG2 may not be achieved by 2030 if this trend is not urgently reversed through appropriate policies. Only Iodine deficiency indicated a decreasing growth trend consecutively from 2000 to 2015 in the country. The most prevalent number of source of disease by cause recorded came from protein-energy malnutrition and iron-deficiency anaemia**.** The highest cause of death from hidden hunger arose from protein-energy malnutrition and Iodine deficiency in absolute terms while the trend of growth for Iodine deficiency related deaths gave a negative prevalence from 2000 to 2016. Protein-energy malnutrition related death rates grew upwards from 2000 through 2010 to 2016 implying that more people are dying from hidden hunger.

Nigeria had implemented a couple of initiatives targeted at reducing hidden hunger. Top of these, include the mandatory policy of bio-fortification of major staples and sugar with Vitamin A, and inclusion of Iodine in salts. These, in addition to launch of some food and nutrition policies which include : The launch, in 2008 of the National Programme for Food Security NPFS), the National Policy on Food and Nutrition (NPFN), a component of the Agricultural Promotion Policy (APP) 2016-2020 launched in 2016 and other frameworks that provided the fundamental guidance for the establishment of priority strategic directions to improve nutrition through agriculture in Nigeria such as the revision of the existing Nigerian Agricultural Sector Food Security and Nutrition Strategy (AFNS).
As it is if Nigeria must reduce the tide of death rates emanating from hidden hunger and attain the overall goal of the SDG2, the following policy recommendations are required:

(i) Nigerian government must build on the existing national and international nutrition commitments, including the World Health Assembly targets for 2025 and increase budgets allocation to fund more nutrition sensitive programmes in the country.

(ii) There is a need for more campaigns to popularize the severity of the consequences of hidden hunger and capacity building of teachers, schools, parents and social institutions on need to adopt more healthy diets that will reduce hidden hunger incidence.

(iii) Government should create an enabling environment through good governance to improve access to and local availability of micronutrient-rich foods.

(iv) Policy analysis regarding food and nutrition security must go beyond addressing only energy intake to highlighting the relevance of dietary quality.

(v) There should be an integrative approaches that will engage all relevant Nigerian government ministries and stakeholders including civil society groups and development partners. National governments including the health, agriculture, and education ministries, as well as ministries of planning, finance, and water and sanitation on a regular basis so as to arrive at a common understanding of how national policies will be deployed to in reducing undernutrition, including micronutrient deficiencies.

(vi) Girls' access to education and elimination of gender barriers to learning and literacy should be made a priority by The Nigerian government and stakeholders. This will help girls to later become more empowered as women. As we know, women have key roles to play in the attainment of household food security and fostering of household health and nutrition. A woman with higher level of schooling could be better equipped to maintain her family's nutritional status more appropriately than a man.

(vi) There is need to promote access to nutritious foods through endorsement of targeted social safety nets and support for the poorest, particularly with focusing on pregnant, lactating women, infants under two years, and adolescents.

(vii) Nigerian government should step up efforts in interventions related to dietary diversification, bio-fortification, food supplementation, nutrition education and behaviour change, improvement of access to clean drinking water, good sanitary habits.

(viii) Interventions in reducing hidden hunger should focus on improving dietary diversity and strengthening local food systems through capacity building and prioritization of local and sustainable solutions to end hidden hunger.

References

African Health Observatory and FAO (2018) Nigeria: Factsheets of Health Statistics 2018. African Health Observatory and FAO: Rome.

Akombi, B. J., Agho, K. E., Hall, J. J., Merom, D., Astell-Burt, T., &Renzaho, A. M. (2017). Stunting and severe stunting among children under-5 years in Nigeria: A multilevel analysis. BMC pediatrics, 17(1), 15. doi:10.1186/s12887-016-0770-z

Encyclopedia of Survey Research Methods (2008) Trend analysis. Lavrakas, P. J. (Ed). DOI: http://dx.doi.org/10.4135/9781412963947.n589

FAO (2018) FAO in Nigeria: Nigeria at a glance. Retrieved on 26/09/2018 from http://www.fao.org/nigeria/fao-in-nigeria/nigeria-at-a-glance/en/

FAO, IFAD, UNICEF, WFP and WHO. (2018). *The State of Food Security and Nutrition in the World 2018.Building climate resilience for food security and nutrition*. Rome, FAO. Available at http://www.fao.org/3/I9553EN/i9553en.pdf

FAO, IFAD (International Fund for Agricultural Development) and WFP (World Food Programme) (2014). The State of Food Insecurity in the World 2014. Strengthening the Enabling Environment for Food Security and Nutrition. Rome: FAO. http://www.fao.org/3/a-i4030e.pdf

Federal Ministry of Agriculture and Rural Development (2017) Agricultural Sector Food Security and Nutrition Strategy 2016-2025. FMARD: Abuja. (95).

Field, A. (2009) *Discovering Statistics using SPSS* (And sex and drugs and rock 'n' roll), 3rd ed., London: SAGE.

Global Hunger Index, Concern Worldwide & Welthungerhilfe (2018) 2018 Global Hunger Index Results Global, Regional, and National Trends. Available at https://www.globalhungerindex.org/results/

Gödeckea,T, Stein, A. J., &Qaim, M. (2018) The global burden of chronic and hidden hunger: Trends and determinants. Global Food Security . Elsevier. 17 (2018) 21–29. DOI: http://www.elsevier.com/locate/gfs

Hunger Notes (2018) 2018 World Hunger and Poverty Facts and Statistics. World Hunger Education Services. Available at https://www.worldhunger.org/world-hunger-and-poverty-facts-and-statistics/

International Food Policy research Institute, (IFPRI), Concern Worldwide and Welthungerhilfe(2014) 2014 Global Hunger Index: The challenge of hidden hunger. IFPRI, Concern Worldwide and Welthungerhilfe: Bonn / Washington, D.C. / Dublin.

Ministry of Budget and National Planning (2016) National Policy on Food and Nutrition in Nigeria. Abuja: Ministry of Budget and National Planning. Available at https://nigeria.savethechildren.net/sites/nigeria.s

avethechildren.net/files/library/NPFN%20manu
al%20design%20%20v13.pdf

National Bureau of Statistics, (2018) National Bureau of Statistics: Demographic Statistics Bulletin. Abuja: National Bureau of Statistics. (26). Available at http://nigerianstat.gov.ng/download/775

Parker, B. (2002) Planning analysis: calculating growth rates. Available at https://pages.uoregon.edu/rgp/PPPM613/Index Main.htm

Roser, M. & Ritchie, H. (2018) Hunger and Undernourishment. *Published online at OurWorldInData.org.* Retrieved from: https://ourworldindata.org/hunger-and-undernourishment'

Sheir, R. (2004) Statistics. Mathematics Learning Support Centre. Available at http://www.statstutor.ac.uk/resources/uploaded/paired-t-test.pdf

Tambo, J. & Abdoulaye, T. (2013) Smallholder farmers' perceptions of and adaptations to climate change in Nigerian savanna. *Regional Environmental Change*, 11(2): 375–388.

The World Data Atlas (2018) Nigeria. Knoema. Available at https://knoema.com/atlas/Nigeria

The World Bank (2011)Nigeria :Nutrition at a glance. The World Bank Learning Campus .Available at : http://documents.worldbank.org/curated/en/664181468290730623/Nigeria-Nutrition-at-a-glance

THE WORLD BANK (2017) The World Bank In Nigeria: Nigeria Overview, Retrieved 5/09/2018 from http://www.worldbank.org/en/country/nigeria/overview

UNICEF and UKAid (2014) National strategic plan of action for nutrition(2014 – 2019). Available at: http://www.health.gov.ng/doc/NSPAN.pdf

United Nations Department of Economic and Social Affairs, UNDESA (2015) World population projected to reach 9.7 billion by 2050. The United Nations. retrieved on 23/09/2018 from http://www.un.org/en/development/desa/news/population/2015-report.html

United Nations Regional Information Centre for Western Europe, UNRIC (2014) Hidden hunger - missing minerals. Available at https://www.unric.org/en/latest-un-buzz/28946-hidden-hunger-hidden-problem

Welthungerhilfe, International Food Policy Research Institute, IFPRI & Concern Worldwide (2018)

World Health Organization (2018a) Progress towards the SDGs: A selection of data from World

Health Statistics 2018 . Available at: http://www.who.int/gho/publications/world_health_statistics/2018/EN_WHS2018_SDGhighlights.pdf?ua=1

WHO (2018b) Country: Nigeria.http://www.who.int/countries/nga/en/

WHO (2018) Global health estimates 2016 summary tables.June 2018. World HealthOrganization. Geneva, Switzerland.

APPENDIX 1

Table 1. Results of t test of hypotheses about mean proportions of female and male adults who are obese in the country over the period, 2010-2016

t-Test: Paired Two Sample for Means		
	% of Adults above 18 Years who are Obese Females	% of Adults above 18 Years who are Obese Males
Mean	11.53	3.87
Variance	1.09	0.25
Observations	7.00	7.00
Pearson Correlation	1.00	
Hypothesized Mean Difference	0.00	
df	6.00	
t Stat	37.44	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.94	
P(T<=t) two-tail	0.00	
t Critical two-tail	2.45	

APPENDIX 2

Results of ANOVA to examine the Trend of the indices of Hidden hunger over the Post MDG and SDG (2000-2018)

Anova: Two-Factor Without Replication

SUMMARY		Count	Sum	Average	Variance
	2000	4	85.3	21.33	167.67
	2005	4	77.5	19.38	260.68
	2010	4	65.4	16.35	179.40
	2018	4	76.3	19.08	267.53
Proportion of undernourished in the population (%)		4	33.5	8.38	6.29
Prevalence of wasting in children under five years (%)		4	50.9	12.73	11.34
Under five mortality rate(%)		4	57.9	14.48	12.80
Prevalence of stunting in children under five years (%)		4	162.2	40.55	12.08

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	50.28	3	16.76	1.95	0.19	3.86
Columns	2548.56	3	849.52	98.97***	0.00	3.86
Error	77.25	9	8.58			
Total	2676.09	15				

NB: (***) = F-ratio statistic estimate significant at 1% level.

APPENDIX 3

Results of Correlation Analysis on Relationship between proportion of undernourished in the population (%) and prevalence of stunting in children under five years (%) from 2000-2018

	Proportion of undernourished in the population (%)	Prevalence of stunting in children under five years (%)
Proportion of undernourished in the population (%)	1	
Prevalence of stunting in children under five years (%)	0.54	1

	Proportion of undernourished in the population (%)	Prevalence of wasting in children under five years (%)
Proportion of undernourished in the population (%)	1	
Prevalence of wasting in children under five years (%)	0.18874818	1