International Journal of Food and Agricultural Economics
ISSN 2147-8988, E-ISSN: 2149-3766
Vol. 10, No. 1, 2022, pp. 55-75

THE IMPACT OF GOVERNMENT SPENDING AND FOOD IMPORTS ON NUTRITIONAL STATUS IN NIGERIA: A DYNAMIC OLS APPLICATION AND SIMULATION

Djomo Choumbou Raoul Fani
Department of Agricultural Economics and Agribusiness, Faculty of Agriculture and Veterinary Medicine, University of Buea, Cameroon
Email: djomo.choumbou @ubuea.cm, ORCID:0000-0003-3028-2558

Rayner Tabetando
Department of Agricultural Economics and Agribusiness, Faculty of Agriculture and Veterinary Medicine, University of Buea, Cameroon
ORCID:0000-0003-1833-8264

Ukpe Udeme Henrietta
Department of Agricultural Economics and Extension, Federal University Wukari, Nigeria, ORCID:0000-0001-7633-5112

Siewe Francois
Department of Agricultural Economics, Faculty of Agriculture, Ahmadu Bello University, Nigeria, ORCID:0000-0002-1749-1614

Abstract

The physical and human capital stock of a country determines its economic development and functioning. Despite the Federal Government of Nigeria's initiatives and policies aimed at ensuring the country's long-term viability. Citizens' nutritional status is still a widespread issue that undermines productivity. For a period of 41 years, the impact of government expenditures and food importation on overweight and stunting was studied using dynamic ordinary least squares and simulation (1980-2020). Stunting and overweight are reduced as a result of food production and importation, according to the findings. Stunting and overweight will be reduced by 2.12 percent and 1.22 percent, respectively, if public spending increases and food imports are reduced by 30%. To complement public initiatives, the best alternative policy for improving Nigeria's nutrition status should focus on increasing government agriculture and health spending, as well as increasing food imports with a lower comparative advantage.
Keywords: *Public expenditures, food importation, stunting, overweight, food production.*
JEL Codes: *Q18; Q28; E17; E27; E6*

1. Introduction

The importance of public expenditures in ensuring healthy economic growth and fostering a catalytic impetus for overall development cannot be overstated in developing countries where the private sector is weak and the socioeconomic structure necessitates urgently putting in place the ingredients for economic growth (Akeem et al., 2015). One of the arms of government policy depends on the size of the expenditure item, but the component of the expenditure item is a key determinant when it comes to stimulating the economy through public spending. The impact of government intervention will be determined by whether the expenditures were made on productive or consuming activities. As a result, the effectiveness of fiscal policies is crucial in achieving such development objectives. Improvements in real-world areas like agriculture are consequently required to boost food production, create jobs, and drive economic growth as well as rural development. In recent years, Nigerian government spending in all areas, including agriculture has continued to rise over time to be self-sufficient in food production and reduce the country's dependency on importation (Akeem et al., 2015).

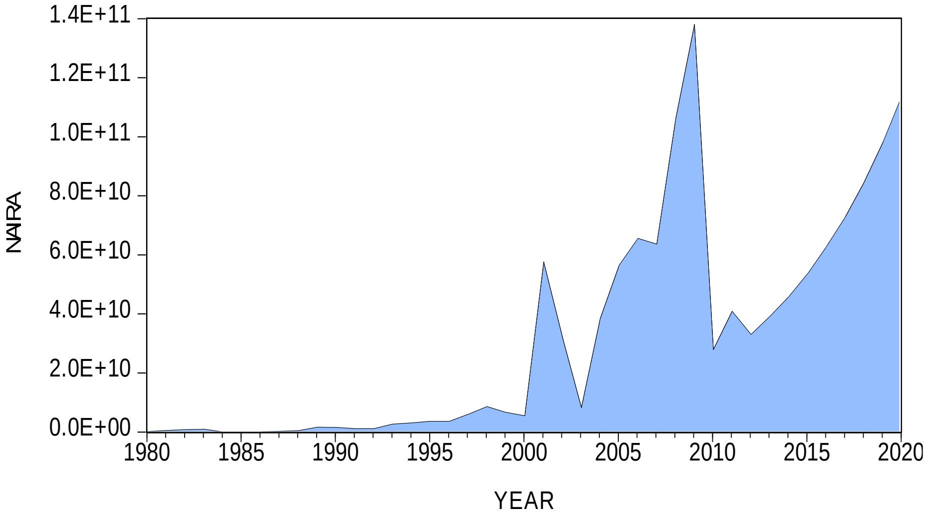


Figure 1. Trend of Public Agricultural Spending in Nigeria

Source: Author's computation

Various administrations have emphasized agriculture as a means of diversifying the economy, and several policies have been developed in this regard. For instance, in 2012, the Agricultural Transformation Agenda (ATA) was introduced to improve farmers' income, increasing food security, creating jobs, and transforming the country into a major player in the food market (Ajani and Igbokwe, 2014; PWC, 2017). Between 2011 and 2014, the ATA is said to have raised agriculture output by 11% to 202.9 million tonnes and lowered the 2014 food import cost by NGN 466 billion (Adeshina, 2015; PWC, 2017). The Central Bank of Nigeria (CBN) established the Anchor Borrowers' Programme (ABP) in 2015 as part of its developmental mission. This was done to reduce the government's high costs associated with the importation of food crops or agricultural goods that can be produced domestically. The CBN has put aside N20 billion for farmers from the N220 billion Micro, Small, and Medium Enterprises Development Fund (MSMEDF) at a single-digit interest rate of 9% as part of the intervention. The program aims to achieve objectives such as job creation, food import reduction, and economic diversification. The program intends to connect over 600,000 smallholder farmers (out-growers) with reputed large-scale processors (off-takers) to boost agricultural output and greatly improve integrated mill capacity utilization (Umeh and Adejo, 2019). The present administration has announced the Agriculture Promotion Policy (APP), which aims to address food shortages and improve output quality. Furthermore, the Economic Recovery and Growth Plan (ERGP) prioritize food security, intending to achieve selfsufficiency in tomato paste, rice, and wheat by 2017/2018, 2019/2020, and 2020/2021, respectively (PWC, 2017).

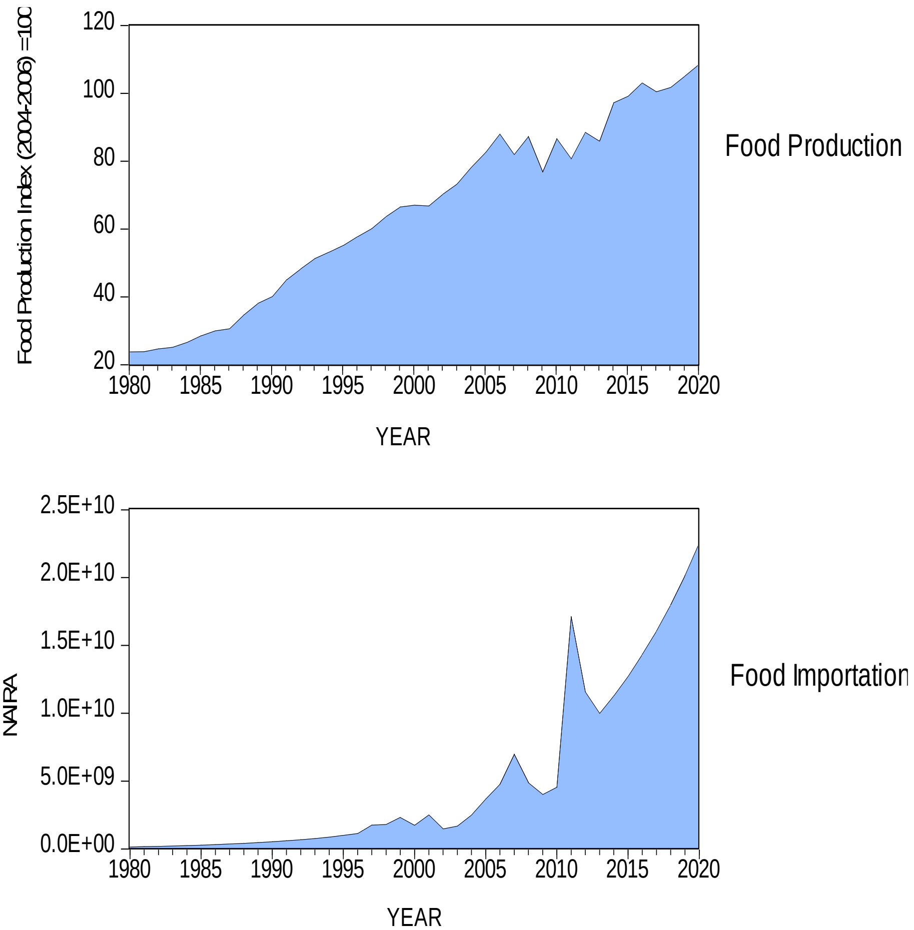
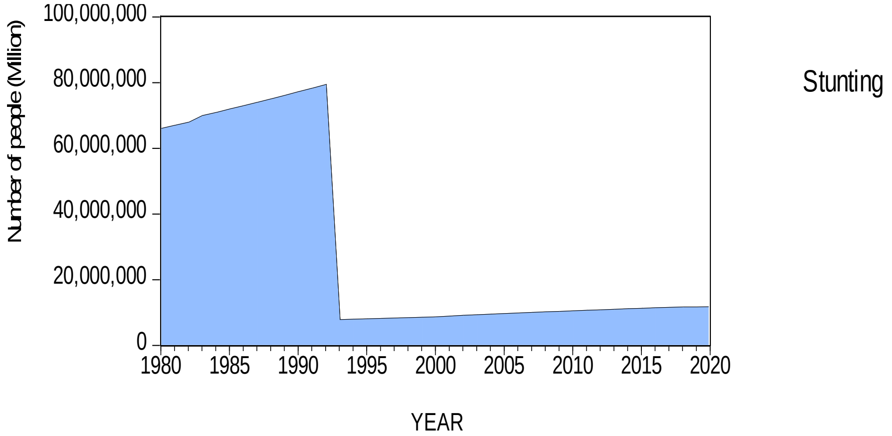


Figure 2. Trends of Food Production and Importation Expenditure in Nigeria

Source: Author's computation

Despite these policies, the rise in the number of people who are acutely food insecure during the last five years, attributable mostly to insecurity and large-scale relocation as a result of conflict, economic shocks, and extreme climate change (Maps and Facts, 2020). Food production has been hampered by a lack of agricultural inputs, such as improved seed, fertilizer, insecticides, and livestock feed, while demand has been harmed by the closure of restaurants, factories, schools, and other businesses. Intrastate mobility restrictions have also reduced the availability of labor, particularly in the agriculture sector, which employs a large number of seasonal employees. For the fact that agriculture employs a large section of the rural population, interruptions to these livelihoods are likely to worsen food insecurity. Prices of agricultural commodities and food items, in addition to agricultural inputs, are still volatile. Due to the high demand for agricultural commodities, there has been a noticeable increase in the prices of some food items, including staple foods like maize and cassava, throughout much of Nigeria, since the adoption of mitigation measures, with implications on household food consumption, food security, and nutrition (FAO, 2020).



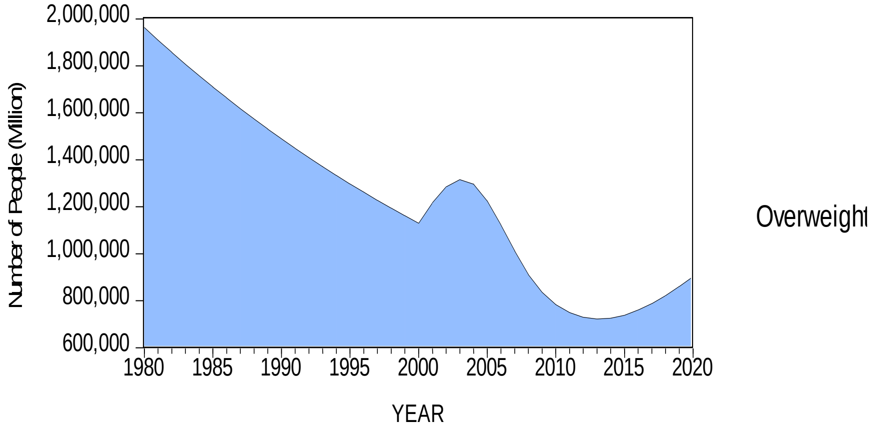


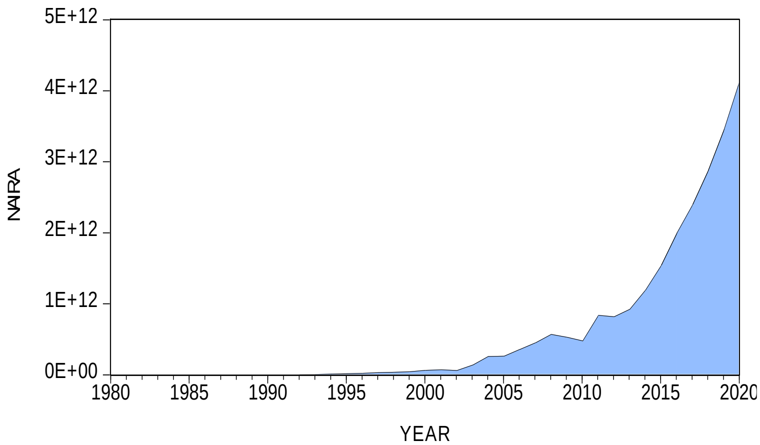
Figure 4. Trends of Stunting and Obesity in Nigeria

Source: Author's computation

One of the short-term measures is geared towards food importation in which Nigeria's agricultural commodities and food import bill has averaged over N1 trillion in the last two years. According to the Central Bank of Nigeria (CBN) guide on the program (2015), in 2013 and 2014, food products such as milk, sugar, rice, wheat, and fish accounted for N901 billion (93.5 percent) and N788 billion (88.71 percent) of the total. These figures do not include smugglers' actions. Rice and wheat import bills were anticipated to be N428 billion in 2013 and N307 billion in 2014. These vast sums were spent on things that the country could create locally, resulting in the loss of job possibilities and wealth-generating opportunities. The high importation bill has consequently caused damages among the rural poor and thereby affects their nutrition security given the low purchase power of most citizens within the country.

Nigeria continues to be one of the worst-affected countries in the Sub-Saharan area by malnutrition, with children and women of reproductive age being the most affected. According to the 2018 Nigerian Bureau of Statistics (NBS) Demographic Health Survey, 37% of children under the age of 18 are stunted, 17% are severely stunted, and 7% are wasted. Stunting is a symptom of long-term nutritional deficiency and is currently a major public health concern, particularly in poor nations (UNICEF, 2015; Adedeji et al., 2018). Stunting prevalence varies by geopolitical zone in Nigeria, ranging from North-West to the South-East (National Population Commission (NPC) and ICF International, 2014; Adedeji et al., 2018). Stunting has been linked to poor health, reduced cognitive function, poor school performance, and limited economic production in children, and is regarded to be the best measure of overall well-being (De Onis and Branca, 2016; Adedeji et al., 2018). While the prevalence of stunting has decreased from 41% in 2008 to 40% in 2013 (NPC and ICF International, 2014), the prevalence of obesity and overweight in children and adolescents is on the rise, with negative consequences on health status. Overweight is currently afflicting both young and old people from lower socioeconomic backgrounds, and according to a comprehensive analysis of Nigerian-subject surveys, reports, and published articles, the prevalence of overweight and obesity among boys under the age of twenty was 11.8 percent and 5.4 percent in 2013, and 12.3% and 3.2 percent of under 20-year-old girls, respectively (IHME, 2014; Omolu, 2021).

The situation has necessitated that all relevant Ministries, Departments, and Agencies investigate and intervene on the issue of malnutrition in Nigeria. In 2017, it was estimated that the country will require N279, 536 billion Naira ($912 million) over five years to eradicate malnutrition in all states. Despite this, the budgetary allocation for health remains low, falling far short of the World Health Organization's recommendation of 15%, and spending on nutrition falls far short of the National Strategic Plan of Action, which assumes the Federal Government will provide ten million dollars annually (Pulitzer center, 2020). Only 2.3 billion nairas ($5.9 million) were dedicated to nutrition in the national budget between 2017 and 2018. According to the World Bank, 66 million schoolchildren go to school every day hungry. About 2 million children in Nigeria are malnourished, and the country has the world's second-highest rate of stunted growth. The school feeding program was created in response to this situation to reduce the percentage. Over 8.6 million Nigerian children have benefited from the initiative, which aims to provide food for children, particularly the required dietary consumption (Pulitzer center, 2020).



Source: Author's computation

Figure 3. Trend of Public Health Expenditure in Nigeria

Despite the various research that has been carried out on stunting (Akombi et al., 2017; Adedji et al., 2018; Tull, 2019 and Imam et al., 2021), and overweight (Ene-Obong et al., 2012; Oparaocha, 2018; Omolulu, 2021 and Adeloye et al., 2021) in developing countries in general, and Nigeria in particular. These previous researches dealt mostly with determinants of stunting and overweight and have mostly been done at cross-sectional study level using nutritional intake assessment, nutritional status assessment, or nutritional anthropometry without emphasis on assessing the extent to which government policies could impact on nutrition status at country or aggregate level through fiscal policy measures. Also, these studies used demographic health surveillance systems or nutrition surveys, and have found that age, gender, marital and socioeconomic statuses, occupation, urban residence, dietary intake, and physical activity are all linked to overweight and stunting. Therefore, it is vital to constantly analyze the dynamic shifts in the underlying causes of stunting and overweight, especially in countries where there are economic and political instabilities that influence consumption patterns. Given that stunting and overweight constitute a battlement in achieving the sustainable development goal, these study hypotheses whether changes in public sector expenditures and food importation are consistent with the trends patterns of stunting and overweight or otherwise in Nigeria? This study adds to the body of knowledge by studying the links between government subsector spending, food importation, stunting, and overweight to determine the impact of government food policy on non-communicable illnesses. The outcome of this study will enable us to understand the extent to which the complementary action between public sector expenditures through local food production and food importation could decrease stunting and overweight that will serve as a baseline for prediction and policy intervention in the long run. This study will also enlighten on the necessity to plan in regulating food policy through intervening sectors given the future trends of stunting and overweight in Nigeria.

2. Material and Method

2.1 Data Sources

Annual time series data covering a period of 41 years (1980-2020) were obtained from secondary sources. Specifically, data on overweight and stunting were obtained from the UNICEF website; data on food production index were obtained from the FAO website; data on public agriculture and health expenditures, and food importation were obtained from World Bank database indicator.

2.2 Conceptual Framework and Estimation Technique

The Stock-Watson Dynamic Ordinary Least Squares (DOLS) model was used to achieve the paper's major objective, which was to assess the impact of government spending and food imports on children's nutritional levels. However, our maintained hypothesis was that the relationship can be formulated as:

$$\ln Y_t = \alpha_0 + \alpha_1 x_{1t} + \alpha_2 x_{2t} + \alpha_3 x_{3t} + \alpha_4 x_{4t} + u_t \tag{1}$$

where $\ln =$ Natural logarithm; $Y_t =$ Vector of nutritional status (Stunting or Overweight), $x_{1i} =$ Food production;

$x_{2i} =$ Public Agriculture expenditure; $x_{3i} =$ Food importation; $x_{4i} =$ Public Health expenditure;$A = \pi r^2$ $\mu_i =$ Random error; $\alpha_0 =$ Intercept term; $\alpha_1 \cdots \alpha_4$ are the slope coefficients. But in modeling the relationship between time series as in (1), it is common knowledge that careful attention should be given as touching the properties of the time series. Equation (1) will only make sense if the time series are integrated of order 0 (Camacho-Gutiérrez, 2010). In other words, evaluating whether or not the time series are stationary will help choose the type of analysis to conduct. So, our first step in examining equation (1) was to conduct a unit root test of both the dependent and independent variables in (1). This is because, in the presence of the unit root in the time series, equation (1) will be spurious (Yule, 1926; Gujarati, 2004). There are several unit root tests in the literature, but this paper considered the augmented dickey-Fuller (ADF) test, which is quite common. The following equations were used to test for the presence of a unit root in the time series under different assumptions:

$$\Delta \ln Y_t = \beta_1 + \delta \ln Y_{t-1} + \sum_{p=1}^{P} \phi_{1p} \Delta \ln Y_{t-p} + \varepsilon_{Yt}, \quad t = 1,...,T \tag{2}$$

$$\Delta \ln Y_t = \beta_1 + \beta_2 t + \delta \ln Y_{t-1} + \sum_{p=1}^{P} \phi_{1p} \Delta \ln Y_{t-p} + \varepsilon_{Yt}, \quad t = 1,...,T \tag{3}$$

$$\Delta x_{kt} = \beta_k + \delta_k x_{kt-1} + \sum_{p=1}^{P} \phi_{kp} \Delta x_{kt-p} + \varepsilon_{x_k t}, \quad t = 1,...,T \tag{4}$$

$$\Delta x_{kt} = \beta_k + \beta_{2k} t + \delta_k x_{kt-1} + \sum_{p=1}^{P} \phi_{kp} \Delta x_{kt-p} + \varepsilon_{x_k t}, \quad t = 1,...,T \tag{5}$$

$\Delta Y_t = \Delta Y_t - \Delta Y_{t-1}$

$\Delta Y_{t-p} = \Delta Y -_{t-p} - \Delta Y_{t-p-1}$

where the different variables are: $\Delta Y_t = \Delta Y_t - \Delta Y_{t-1}$, $\Delta Y_{t-p} = \Delta Y -_{t-p} - \Delta Y_{t-p-1}$, $\Delta A = \Delta X_{kt} = X_{kt} - X_{kt-1}$ and $\Delta x_{kt-p} = x_{kt-p} - x_{kt-p-1}$ with $k = 1, 2, 3, 4$; y_{t-p} and x_{kt-p} are the lagged values of y_t x_{kt} and, respectively; $t =$ time or trend variable; $\sum =$ summation operator; $\Delta =$ first-difference operator; ε_{Yt} and $\varepsilon_{x_k t}$ are pure white noise error terms; β_1 and β_k are the drift parameters; β_2 and β_2 are the trend parameters; $P =$ the optimal number of lagged terms. Note that $\sum_{p=1}^{P} \phi_{1p} \Delta Y_{t-p}$ and $\sum_{p=1}^{P} \phi_{kp} \Delta x_{kt-p}$ are the augmented terms introduced to ensur ε_{Yt} $\varepsilon_{x_k t}$ e that and are serially and mutually uncorrelated. Consequently, the number of lagged terms was chosen empirically via the time series' correlogram with this notion in mind.

The null hypothesis in (2) through (5) is that $\delta_1 = \delta_k = 0$ that is there is a unit root or that the time series under consideration are non-stationary. Assuming that the null hypothesis is not rejected, the implication is that the time series are non-stationary in which case the regressions in (1) will be spurious, otherwise they will be said to be stationary or integrated of order 0 whereby an OLS estimator could be used in estimating equation (1). Differently put, if all the parameters in (2) through (5) are different from zero, it can be said that Y_t x_{kt} and are random walk with drift according to (2) and (4), but random walk with drift around a stochastic trend according to (3) and (5), respectively (Gujarati, 2004). Note that the estimated *t*-value of the coefficient of Y_{t-1} in (2) through (5) follows the tau (τ) statistic (Fuller, 1976; Dickey and Fuller, 1979). The critical values of the tau statistic are extensively provided by Mackinnon (1991). If we can assume that all the series in (1) are integrated of order 1, the DOLS estimator instead of the OLS estimator becomes the most appropriate estimator. But with the proper transformation of the equation following Stock and Watson (1983), the OLS can still be used. The OLS with the specification by Stock *et al.* (1983) is what is being referred to as the Stock-Watson DOLS model. Here, the model was specified as

$$\ln Y_t = \theta_0 + \theta X + \sum_{j=-q}^{p} \psi X_{t-j} + u_t \tag{6}$$

where X is a vector of four regressors as earlier defined; X_{t-j} is the matrix of leads and lagged terms of X ; q and p are the optimal lead and lagged terms of X selected based on the Akaike Information Criterion (AIC); $u_t =$ white noise error term; $\theta_0 =$ constant term; $\theta =$ cointegrating vector, which represents the long-run cumulative multipliers. It is also referred to as the long-run effect of a change in X $\ln Y_t$ on. More explicitly, equation (6) was estimated as:

$$\ln Y_{1t} = \theta_0 + \theta_1 x_{1t} + \theta_2 x_{2t} + \theta_3 x_{3t} + \theta_4 x_{4t} + \sum_{j=-q}^{p} \psi_{1j} x_{1t-j} + \sum_{j=-q}^{p} \psi_{2j} x_{2t-j} + \sum_{j=-q}^{p} \psi_{3j} x_{3t-j} + \sum_{j=-q}^{p} \psi_{2j} x_{4t-j} + u_t \quad (7)$$

Where the dependent variable Y_t is a vector of two variables namely measurement of children's stunting and obesity level. To validate the model, the error term was subjected to an ADF test where the rejection of the null hypothesis would imply that the error term is stationary thereby indicating that the DOLS estimator is consistent and that model (7) is not spurious. In other words, equation (7) depicts the long-run relationship between government spending and the independent variables.

3. Results and Discussion

Table 1 summarizes the results of unit root tests performed on the primary and differential ADFs. The results show that not all the variables studied are based on the level, but on the first difference at the significance levels of 1% and 5%. As a result of checking the table, it is clear that all variables with initial differences are stationary and therefore are classified in the process I (1).

Table 1. Unit Root Test (ADF TEST)

Variables	**ADF Results**				
	At level		At First difference		The decision I(1)
	t-statistic	probability	t-statistic	probability	
Stunting	-1.551221	0.4977	-6.233338	0.0000***	I(1)
Overweight	-2.126903	0.2357	-2.054493	0.0397**	I(1)
Public agricultural spending	-2.126903	0.2357	-7.158218	0.0000***	I(1)
Public health expenditure	-0.701925	0.8348	-6.798692	0.0000***	I(1)
Food importation	-0.665743	0.8438	-6.117395	0.0001***	I(1)
Food production	-1.678630	0.7412	-3.307601	0.0804*	I(1)

Note: ***, ** and * indicate stationary at 1%, 5% and 10% level of significance respectively

3.1 Impact of Government Spending and Food Importation on Nutritional Status in Nigeria

The impact of government spending and food imports on nutritional status in Nigeria is presented in table 2. The nutritional status in this study is focused on overweight and stunting. For the overweight equation, results show that food importation and food production significantly affect overweight at a 1% level of probability. Specifically, the coefficients of food importation and food production are negative and significant. This result implies that a unit increase in food importation and food production will lead to a decrease in overweight by the values of their estimated coefficients. Food production can meet many nutritional goals by providing people with access to diverse, safe, nutritious, and affordable diets. This could explain the link between overweight and food production (Htenas and Hoberg, 2018). The link between food importation and overweight implies that a unit increase in food imports will result in a reduction in overweight. The reason is that access to healthy, local foods is becoming increasingly difficult in many countries and are accompanied by trade. Changes in agricultural and fishery policies to promote imports and trade are strongly associated with dietary changes and non-communicable diseases (NCDs) in some poor middle-income countries (Thow et al., 2011; Snowdon and Thow, 2013). In contrast, the link between food production and overweight is contrary with the findings of Mejía et al. (2018), who found that over the past 40 years, increased production and consumption of the Western diet, mainly refined sugars and grains, has been associated with negative effects on human health around the world, a surprising increase in diseases such as diabetes, overweight and obesity. However, the coefficients of public agriculture and health expenditures are not significant. Therefore, they have no significant impact on overweight.

Table 2. Impact of Government Spending and Food Imports on Nutritional Status in Nigeria

Variables	Overweight		Stunting	
	Coefficient	**P-Value**	**Coefficient**	**P-Value**
Public agriculture expenditure	1.04E-12	0.5059	2.79E-11***	0.0041
Public health expenditure	2.59E-13	0.1859	-1.35E-12	0.2184
Food importation	-7.77E-11***	0.0005	2.45E-10**	0.0314
Food production	-0.007112***	0.0025	-0.086083***	0.0000
Constant	14.53449	0.0000	20.19876	0.0000
R-squared	0.969154		0.869618	
Adj. R-squared	0.945652		0.770279	
S.E. of Regression	0.070095		0.445330	
Durbin-Watson stat	0.999278		1.306115	
Mean dependent var	13.95823		16.69556	
S.D. dependent var	0.300675		0.929140	
Sum squared resid	0.103180		4.164688	
Long-run variance	0.008679		0.276139	

Note: *** and ** are significant at 1% and 5% respectively

For the stunting equation, the coefficients of food production; public agriculture expenditure, and food importation significantly affects stunting at 1% and 5% respectively. Specifically, a unit increase in public agriculture expenditure and food importation will increase stunting by the values of their estimated coefficients. In contrast, a unit increase in food production will decrease stunting by the value of its estimated coefficient. The findings on the relationship between public agriculture spending and stunting are consistent with the findings of Weatherspoon et al. (2019) who suggested that agricultural policy in Sub-Sahara Africa can subsidize the diets of the poor by incentivizing families to sell high-quality, nutrient-rich foods such as fruits and vegetables to more nutritious foods. Similarly, the result of the relationship between food importation and stunting could be explained by the fact that food imports are linked to food prices, and if food prices rise further and food quality is no longer an option, consumers will eat less and reduce their overall calorie intake. Reducing your overall calorie intake not only increases malnutrition but also increases the risk of health shock. This is because malnutrition weakens the immune system and makes people more susceptible to disease. On the other hand, infectious diseases weaken the immune system and increase the need for food (Meerman and Aphane, 2012). The link between food production and stunting can be explained by the fact that food production is linked to high dietary diversity and micronutrient intake, as well as affecting the relative price of staple foods, which can have a big impact on the amount of food consumed. This result is consistent with the findings of Wonderimagegn (2014), which showed that agriculture/food production has a positive impact on malnutrition.

3.2 Cointegration Test - Engle-Granger (Null hypothesis: Series are not Cointegrated)

The Engle-Granger test in table 3 shows that the overweight (p = 0.6613) and the stunting (p = 0.5 59) set of equations are not cointegrated.

Table 3. Cointegration Test - Engle-Granger (Null hypothesis: Series are not Cointegrated)

Cointegration Test	**Overweight**		**Stunting**	
	Value	Prob.*	Value	Prob.*
Engle-Granger tau-statistic	-2.898414	0.6613	-3.141934	0.5459
Engle-Granger z-statistic	-14.16369	0.6601	-16.40029	0.5222

*MacKinnon (1996) p-values.

3.3 Normality Test

The normality test in figures 5 and 6 indicates that the overweight Jarque-Bera (0.422773) with probability (0.809461) and the stunting Jarque-Bera (3.836530) with probability (0.146862) sets of equations are both normally distributed.

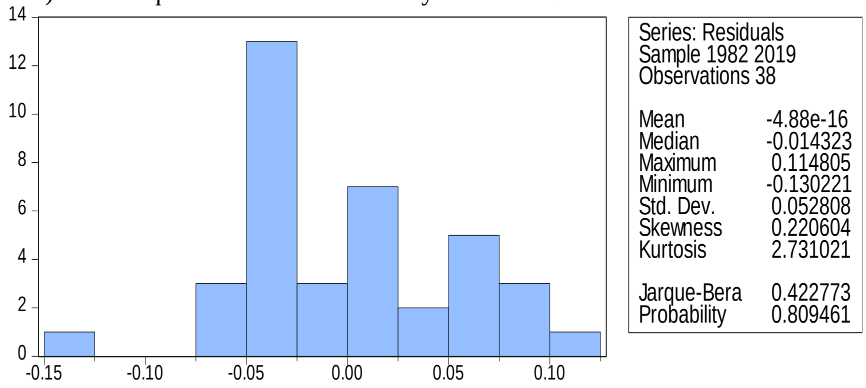


Figure 4. Normality Test for Overweight Equation

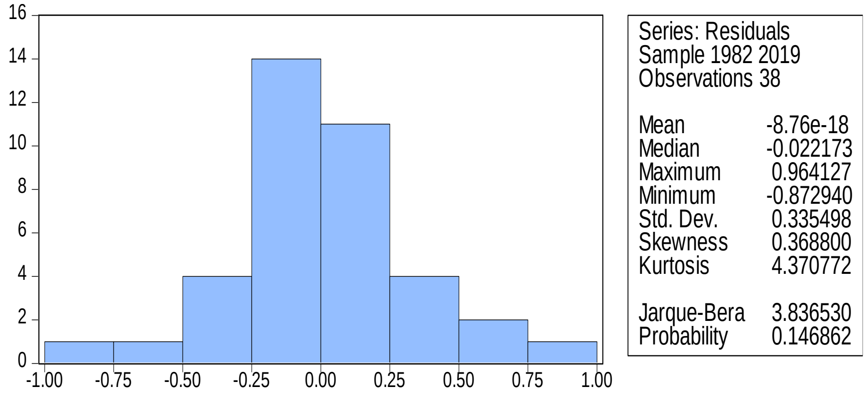


Figure 5. Normality Test for Stunting Equation

3.4 Impact of Changes in Government Spending and Food Imports on Overweight in Nigeria

3.4.1 Impact of 30% Increase in Government Spending and 30% Decrease in Food Importation on Overweight

The impact of a 30% increase in government expenditures and a 30% decrease in food importation on overweight is presented in Figure 6 and Table 4. Results show that the baseline for overweight ranges between 12.88 and 14.35 with a mean of 13.86 and standard deviation of 0.41 compared to simulated scenario 1 which ranges between 13.36 and 14.35 with a mean of 14.03 and a standard deviation of 0.22. This result shows an increase of 1.22% in overweight. This could be explained by the fact that the level of government expenditure could be mainly directed towards very low as compared to the population growth rate which is higher than the level of government expenditures. This will therefore affect the poor who are likely to be vulnerable to malnutrition. This result is contrary to the findings of Gajate-Garrido (2013).

3.4.2 Impact of 30% Decrease in Government Spending and 30% Increase in Food Importation on Overweight

The impact of a 30% decrease in government expenditures and a 30% increase in food importation on overweight is presented in Figure 7 and Table 4. Results show that the baseline for overweight ranges between 12.88 and 14.35 with a mean of 13.86 and standard deviation of 0.41 compared to simulated scenario 2 which ranges between 12.31 and 14.35 with a mean of 13.69 and a standard deviation of 0.62. This result shows a decrease of 1.22% in overweight. This could be explained by the fact that the level of government expenditure cannot be able to subsidize local production and hence encourage food imports with a very low comparative advantage and low-price affordability thereby decreasing overweight. This result is contrary to the findings of Mejía et al. (2018).

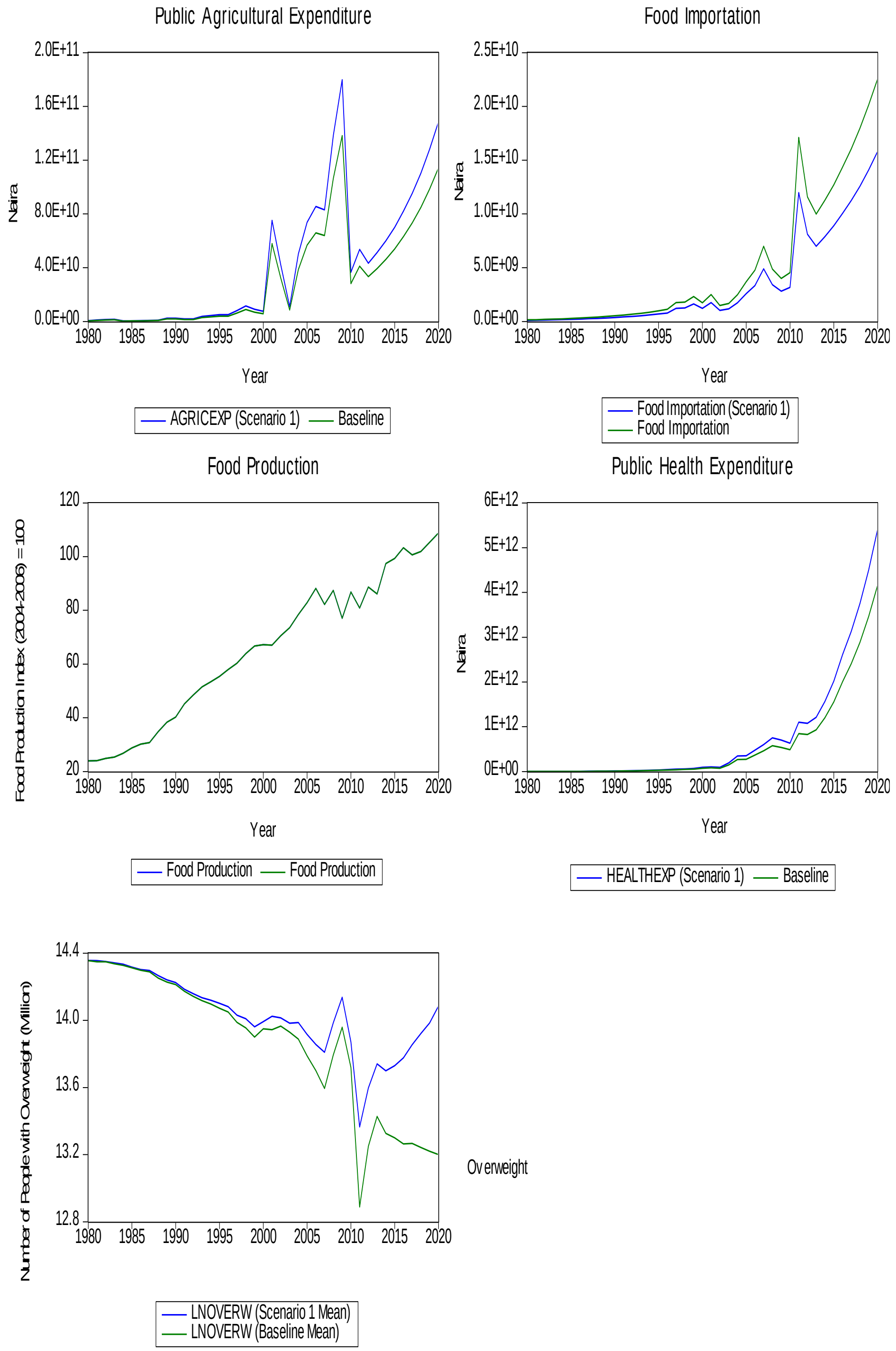


Figure 6. Impact of 30% Increase in Government Spending and 30% Decrease in Food Importation on Overweight

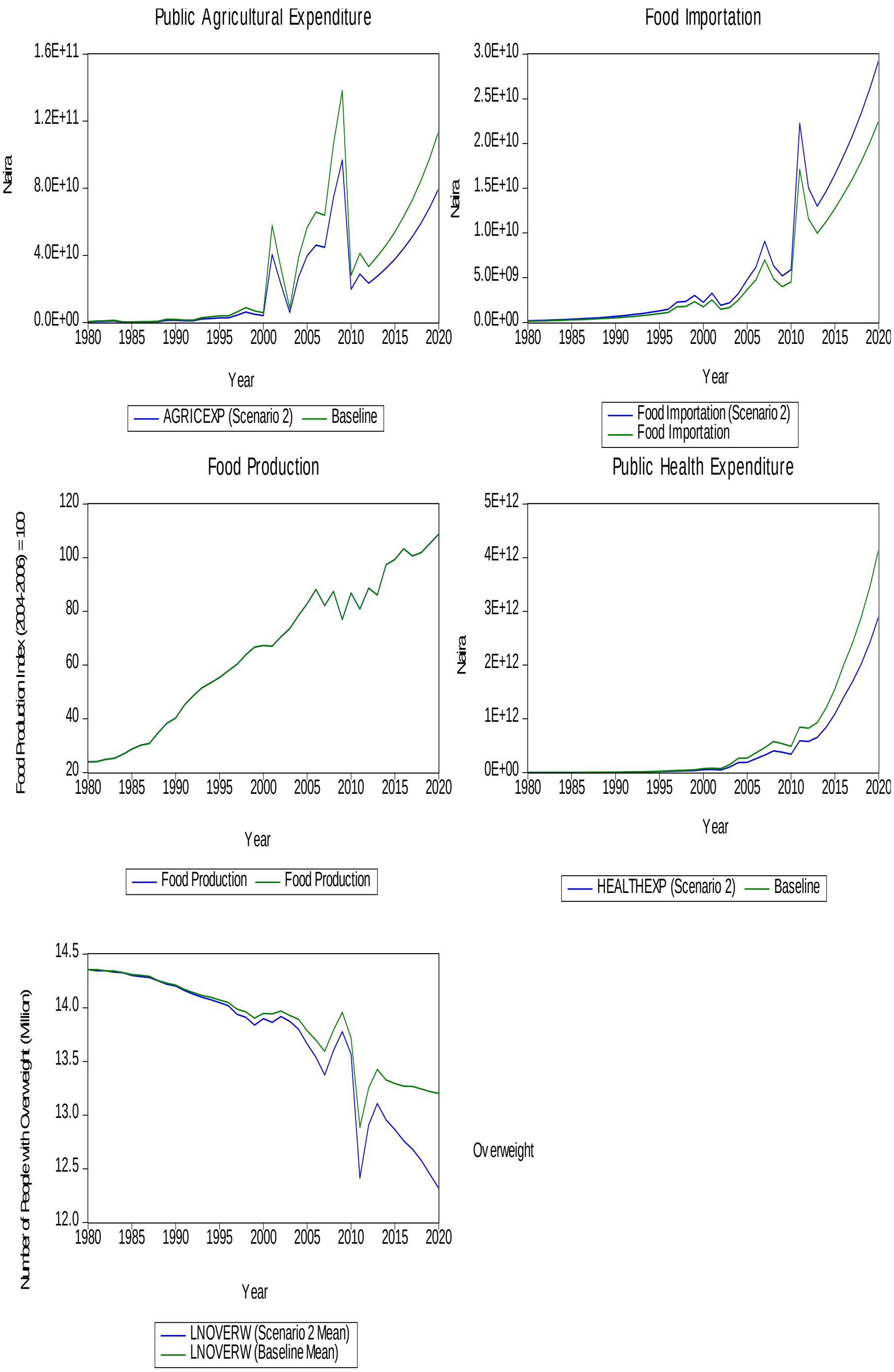


Figure 7. Impact of 30% Decrease in Government Spending and 30% Increase in Food Importation on Overweight

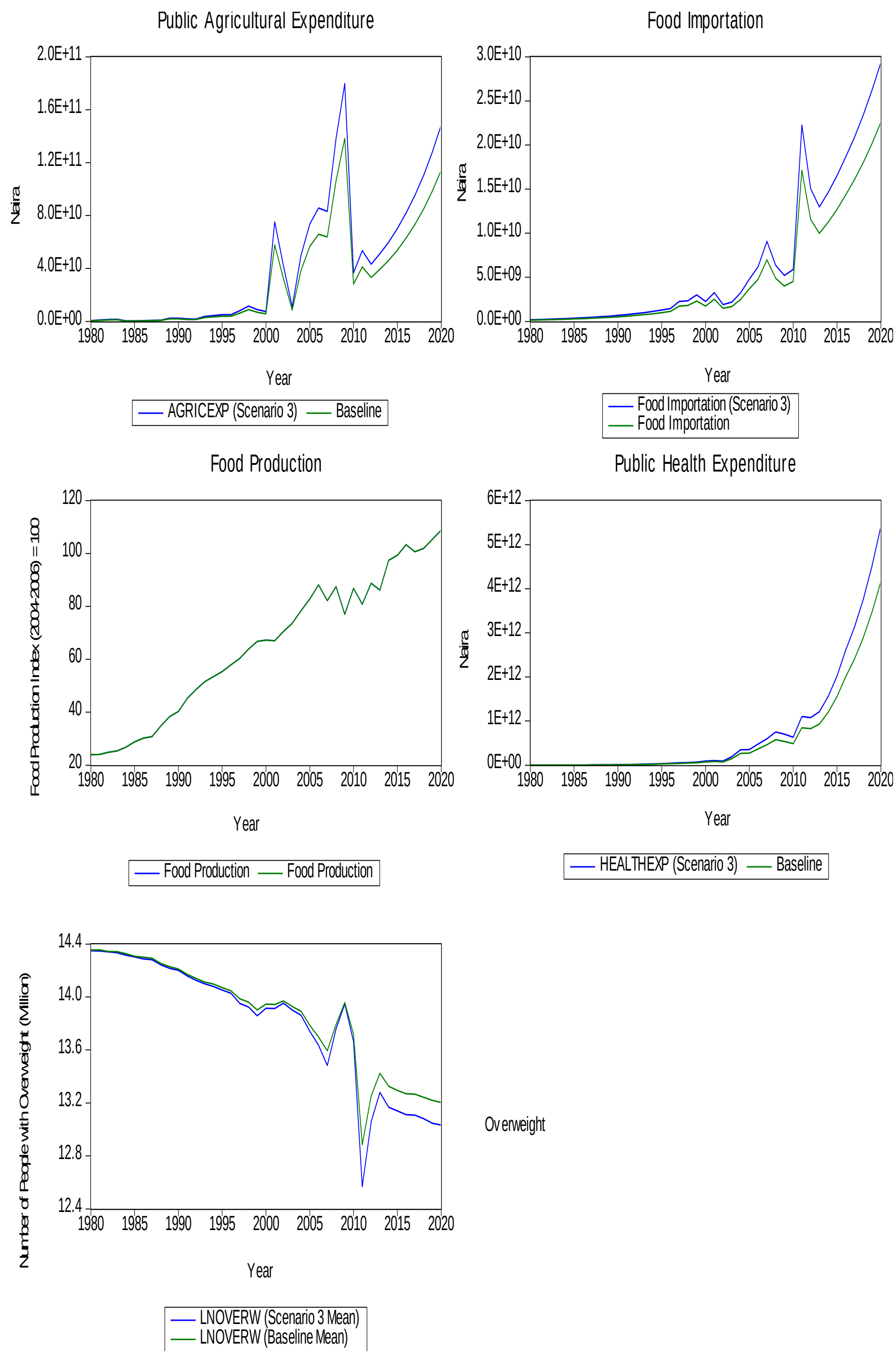


Figure 8. Impact 30% of Increases in Government Spending and Food Importation on Overweight

3.4.3 Impact of 30% Increases in Government Spending and Food Importation on Overweight

The impact of 30% increases in government expenditures and food importation on overweight is presented in Figure 8 and Table 4. Results show that the baseline for overweight ranges between 12.88 and 14.35 with a mean of 13.86 and standard deviation of 0.41 compared to simulated scenario 3 which ranges between 12.56 and 14.34 with a mean of 13.80 and a standard deviation of 0.48. This result shows a decrease of 0.43% in overweight. This could be because both public expenditures and selected food imports are complementary due to the relatively low price in selected provisions which may attract consumption and thereby reducing the prevalence of malnutrition. This result is in line with the findings of Gajate-Garrido (2013).

3.5 Impact of Changes in Government Spending and Food Imports on Stunting in Nigeria

3.5.1 Impact of 30% Increase in Government Spending and 30% Decrease in Food Importation on Stunting

The impact of a 30% increase in government expenditures and a 30% decrease in food importation on stunting is presented in Figure 9 and Table 4. Results show that the baseline for stunting ranges between 13.86 and 18.20 with a mean of 15.93 and standard deviation of 1.41 compared to simulated scenario 1 which ranges between 11.52 and 15.30 with a mean of 15.59 and a standard deviation of 1.88. This result shows a decrease of 2.13% in stunting. This could be due to the relatively low price in selected provisions which may attract consumption and thereby reducing malnutrition. This result is contrary to the findings of Gajate-Garrido (2013) who found that public spending has a significant and positive impact on children's malnutrition outcomes in rural areas.

3.5.2 Impact of 30% Decrease in Government Spending and 30% Increase in Food Importation on Stunting

The impact of a 30% decrease in government expenditures and a 30% increase in food importation on stunting is presented in Figure 10 and Table 4. Results show that the baseline for stunting ranges between 13.86 and 18.20 with a mean of 15.93 and standard deviation of 1.41 compared to simulated scenario 1 which ranges between 14.24 and 18.69 with a mean of 16.27 and a standard deviation of 1.17. This result shows an increase of 2.13% in stunting. This result is consistent with the findings of Mejía et al. (2018).

3.5.3 Impact of 30% Increases in Government Spending and Food Importation on Stunting by 30%

The impact of 30% increases in government expenditures and food importation on stunting is presented in Figure 11 and Table 4. Results show that the baseline for stunting ranges between 13.86 and 18.20 with a mean of 15.93 and standard deviation of 1.41 compared to simulated scenario 1 which ranges between 14.32 and 18.88 with a mean of 16.32 and a standard deviation of 1.29. This result shows an increase of 2.44% in stunting. This result is consistent with the findings of Weatherspoon et al. (2019).

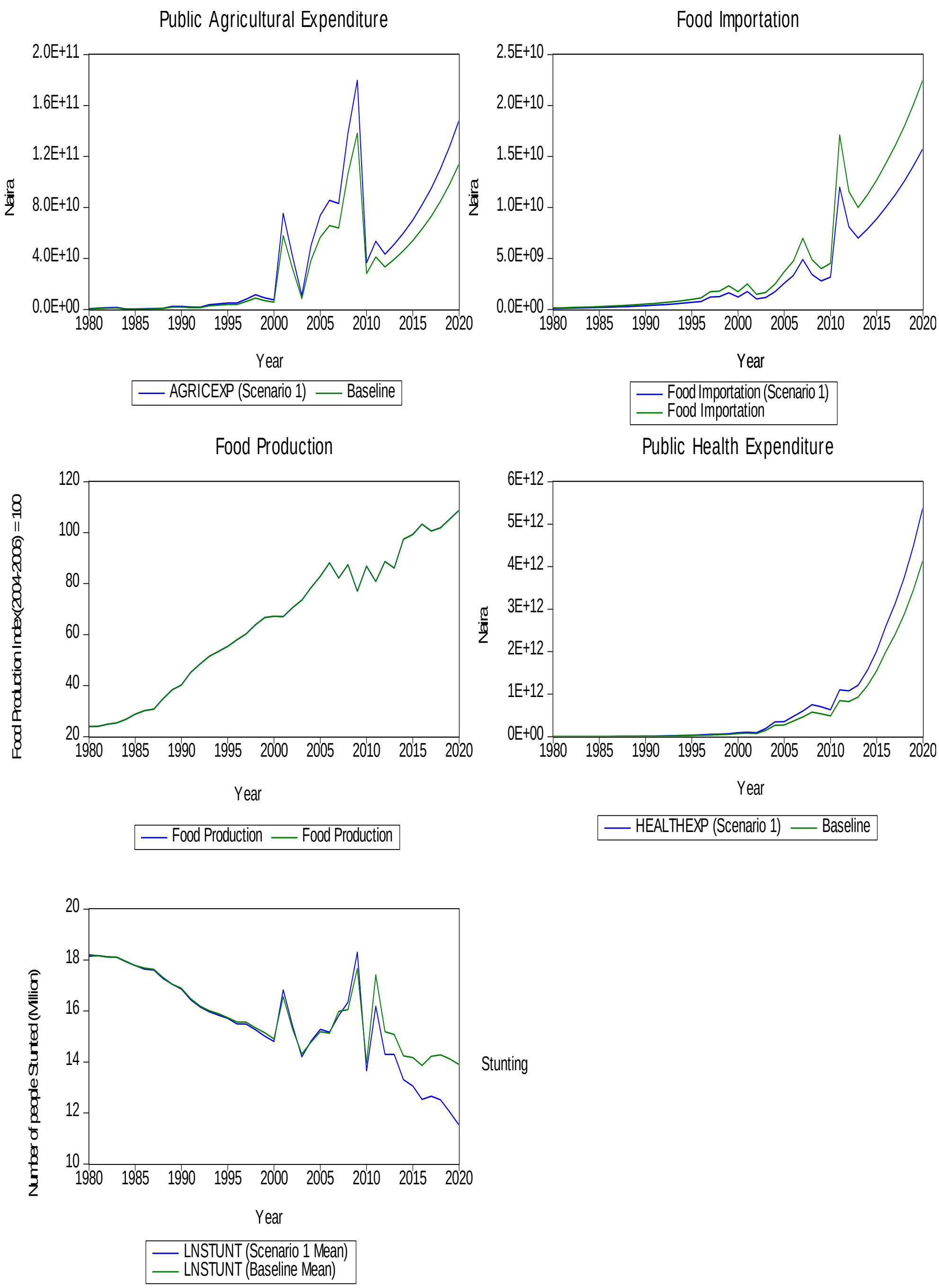


Figure 9. Impact of 30% Increase in Government Spending and 30% Decrease in Food Importation on Stunting

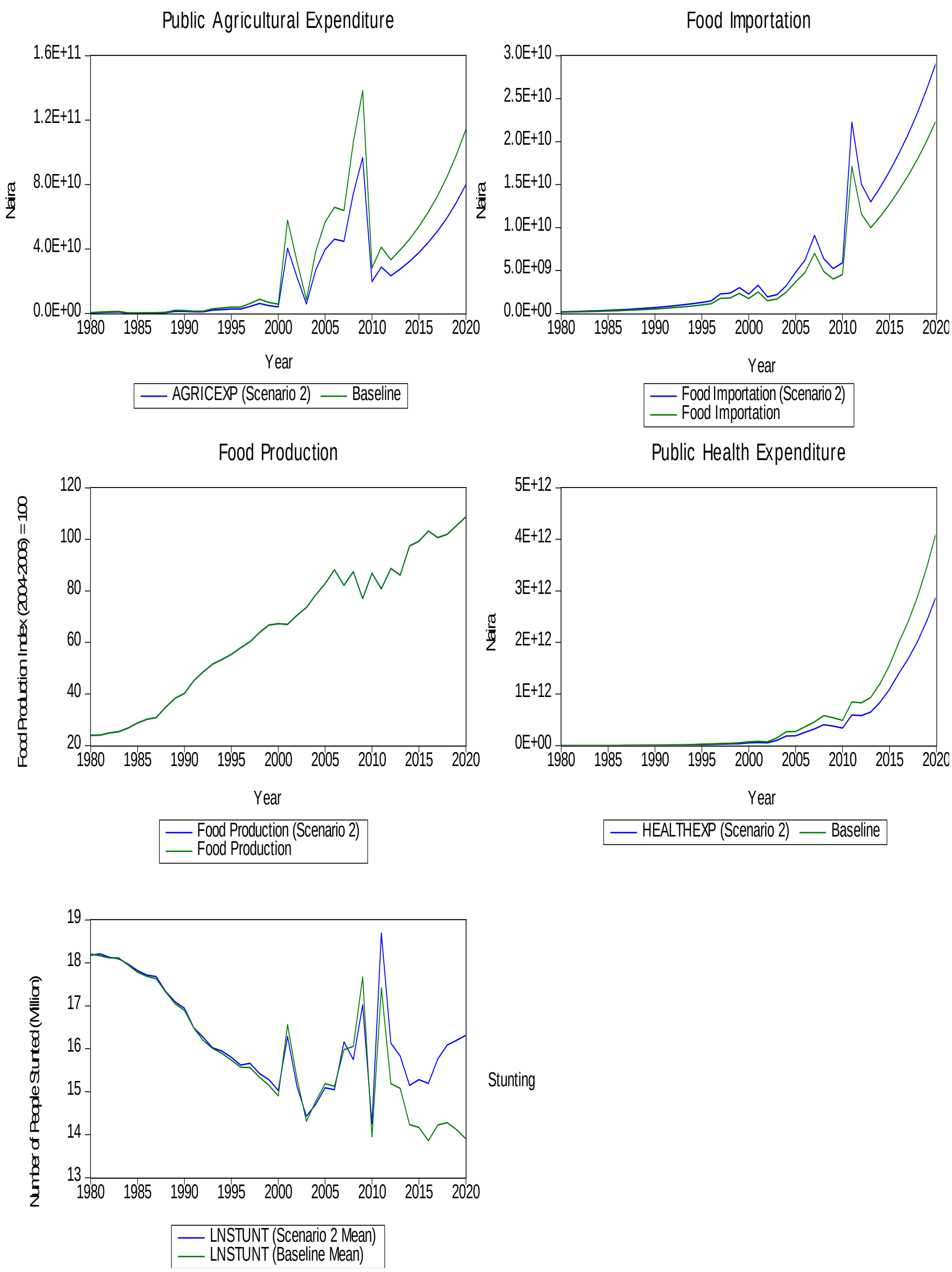


Figure 10. Impact of 30% Decrease in Government Spending and 30% Increase in Food Importation on Stunting

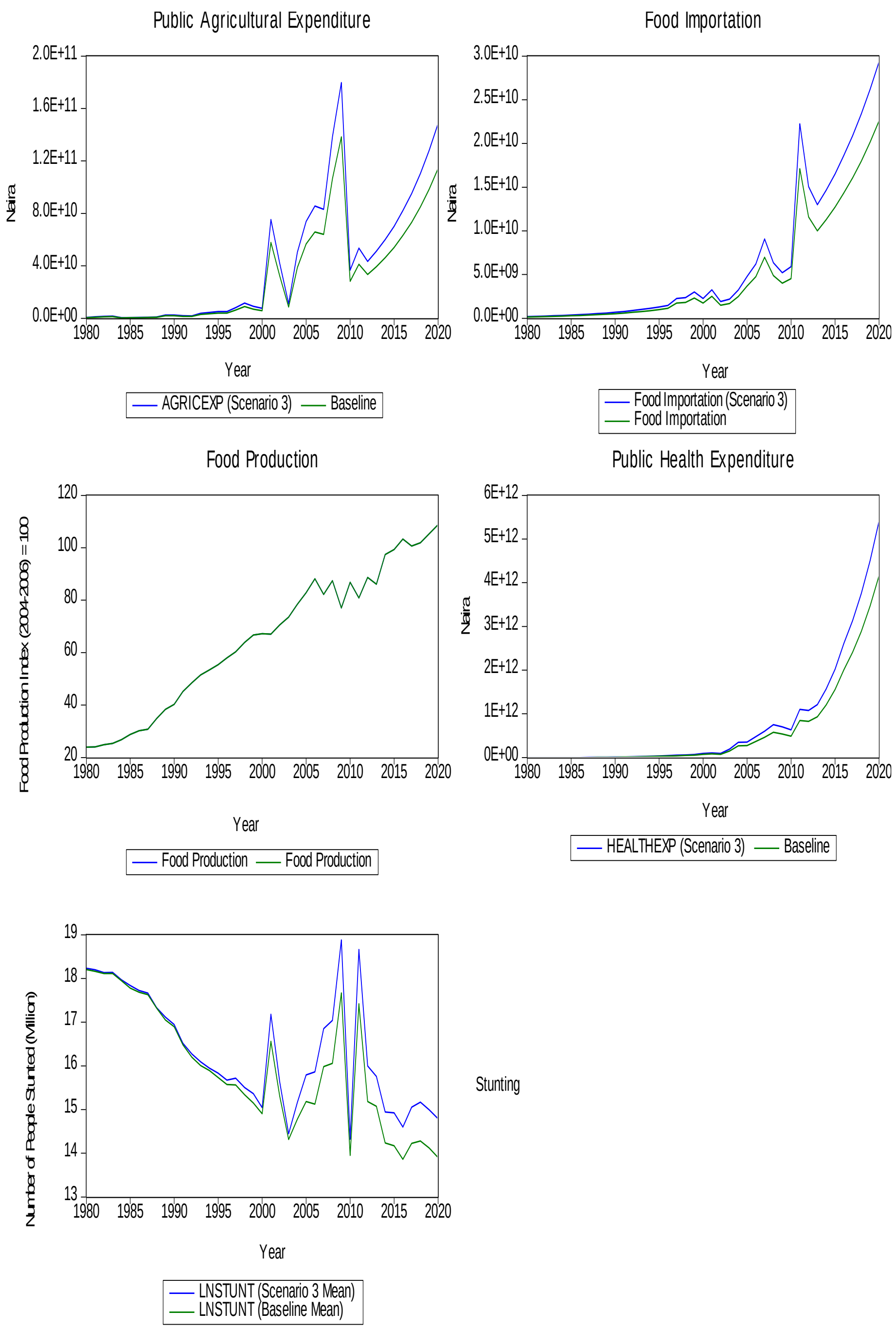


Figure 11. Impact of 30% Increases in Government Spending and Food Importation on Stunting

Table 4. Summary Statistics of the Impact of Changes in Government Spending and Food Imports on Nutritional Status in Nigeria

	Overweight				Stunting			
	Baseline	Scenario_1	Scenario_2	Scenario_3	Baseline	Scenario_1	Scenario_2	Scenario_3
Mean	13.86	14.03	13.69	13.80	15.93	15.59	16.27	16.32
Median	13.95	14.02	13.89	13.92	15.73	15.71	16.08	15.94
Maximum	14.35	14.35	14.35	14.34	18.20	18.30	18.69	18.88
Minimum	12.88	13.36	12.31	12.56	13.86	11.52	14.24	14.32
Std. Dev.	0.41	0.22	0.62	0.48	1.41	1.88	1.17	1.29
Change		1.22%	-1.22%	-0.43%		-2.13%	2.13%	2.44%
Skewness	-0.64	-0.59	-0.87	-0.77	0.199	-0.37	0.40	0.34
Kurtosis	2.23	3.24	2.44	2.46	1.75	2.26	2.13	1.90
Jarque-Bera	3.84	2.56	5.77	4.57	2.93	1.88	2.42	2.88
Probability	0.14	0.27	0.05	0.10	0.23	0.39	0.29	0.23
Sum	568.41	575.49	561.35	565.86	653.15	639.19	667.18	669.32
Sum Sq. Dev.	6.77	2.10	15.80	9.29	79.63	141.38	55.07	66.73
Observations	41	41	41	41	41	41	41	41

4. Conclusion and Policy Implications

This study assessed the impact of public expenditures and food importation on nutritional status in Nigeria. It was found that food production and food importation significantly reduce overweight and stunting. Further, it was also found that increasing public expenditures and reducing food importation will be the best alternative policy to improve nutrition status in Nigeria.

The following recommendations were therefore proffered:

i. Subsidies should be given to selected imported food with the less comparative advantage which will complement local food production and thereby reduce the prevalence of overweight and stunting

ii. Given that food production could ensure the reduction of overweight and stunting, incentives such as credit with single-digit interest rates and agrochemical should be given to farmers to encourage local food production and thereby reduce the overweight and stunting.

iii. More allocation should be given to the public agriculture subsector aimed at encouraging efficiency and flexibility in services given that it could reduce stunting and overweight.

Acknowledgements

We thank all the authors for their immense contribution for the completion of this study

References

Adedeji, I. A., Bashir, M. F., Shwe, D. D., & John, C. (2018) Prevalence and correlates of stunting among the school-age population in North-Central Nigeria. Pan African Medical Journal, 31:170. doi:10.11604/pamj.2018.31.170.15763

Adeloye, D., Ige-Elegbede, J.O., Ezejimofor, M., Owolabi, E.O., Ezeigwe, N., Omoyele, C., Mpazanje, R.G., Dewan, M.T., Agogo, E., Gadanya, M.A., Alemu, W., Harhay, M.O., Auta, A., & Adebiyi, A.O. (2021) 'Estimating the prevalence of overweight and obesity in Nigeria in 2020: a systematic review and meta-analysis', *Annals of Medicine,* 53(1): 495-507. https://doi.org/10.1080/07853890.2021.1897665

Adeshina, A. (2015). Leadership Newspaper http://leadership.ng/business/399129/2015-defining-year-agriculturaltransformation-agenda-ata and TimelinesNG newspaper (2015) http://timelineng.com/index.php/society/466-akinwunmiadesina-slams-gov-oshiomhole [Accessed 27th April 2017]

Akeem, A. T., Olumemino, O., & Olayinka, I. B. (2015). Public sector expenditure in agriculture and economic growth in Nigeria: An empirical investigation, Agrekon, 54:2, 76-92, https://doi:10.1080/03031853.2015.1073000

Akombi, B. J., Agho, K. E., Hall, J. J., Merom, D., Astell-Burt, T., & Renzaho, A. M. N. (2017). Stunting and severe stunting among children under-5 years in Nigeria: A multilevel analysis. BMC Pediatrics17:15 DOI 10.1186/s12887-016-0770-z

Ajani, E.N., & Igbokwe, E.M. (2014) "A Review of Agricultural Transformation Agenda in Nigeria: The Case of Public and Private Sector Participation" Available: https://www.researchgate.net/publication/267507156_A_Review_of_Agricultural_Transformation_Agenda_in_Nigeria_The_Caseof_Public_and_Private_Sector_Participation [Accessed 27th April 2017]

Camacho-Gutiérrez, P. (2010). Dynamic OLS estimation of the U.S. import demand for Mexican crude oil. MPRA Paper No. 30608, Texas AM International University. Retrieved from https://mpra.ub.uni-muenchen.de/30608/ on August 8th, 2021.

Central Bank of Nigeria (2015). Guideline of the Anchor Borrowers' Programme. Sharpemann Limited, Garki, Abuja. https://www.cbn.gov.ng/ Accessed on 19th July 2021

De Onis M, & Branca F. (2016) Childhood stunting: a global perspective. Matern Child Nutr; 12(Suppl 1): 12-26.

Dickey, D.A. & Fuller, W.A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association, 74: 427–431.

Ene-Obong, H., Ibeanu, V., Onuoha, N., &Ejekwu, A. O. (2012). Prevalence of Overweight, Obesity, and Thinness among Urban School-Aged Children and Adolescents in Southern Nigeria. Food and Nutrition Bulletin, 33(4): 242-250

FAO. (2020). Nigeria | Revised humanitarian response (May–December 2020): Coronavirus disease 2019 (COVID-19). Rome. https://doi.org/10.4060/cb0194en

Fuller, W.A. (1976). Introduction to Statistical Time Series. John Wiley & Sons, New York.

Gajate-Garrido, G. (2013). Excluding the Rural Population: The Impact of Public Expenditure on Child Malnutrition in Peru. Policy Research Working Paper No 6666. World Bank, Washington D.C. https://openknowledge.worldbank.org/handle/10986/16880.

Htenas, A., & Hoberg, T.Y. (2018). Seeking agriculture-related solutions for obesity, an increasing problem within malnutrition. https://blogs.worldbank.org/health/seeking-agriculture-related-solutions-obesity-increasing-problem-withinmalnutritionhttps://blogs.worldbank.org/health/seeking-agriculture-related-solutions-obesity-increasing-problem-within-malnutrition. Accessed on 03/08/2021

Imam, A., Hassan-Hanga, F., Sallahdeen, A., & Farouk, Z. L. (2021). A cross-sectional study of prevalence and risk factors for stunting among under-fives attending acute malnutrition treatment programs in north-western Nigeria: Should these programs be adapted to also manage stunting? International Health, 13: 262–271 doi:10.1093/in health/ihaa043

Institute for Health Metrics and Evaluation (IHME). (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013, Lancet 384 766–781.

Maps and Facts (2020). Food and Nutrition Crisis: Analyses and responses. P1-54

MacKinnon, J.G. (1991). Critical Values of Cointegration Tests: in Engle, R.E., and Granger, C.W.J. Long-Run Economic Relationships: Readings in Cointegration, Chap. 13, eds., Oxford University Press, New York.

Meerman, J., & Aphane, J. (2012). Impact of High Food Prices on Nutrition. Paper was originally written as a chapter for the Proceedings for FAO's Expert Consultation on Policy Responses to High and Volatile Food Prices, held in November 2012

Mejía , V.N., Reyes, P.R., Martinez, Y., Carrasco, O., & Cerritos, R. (2018). Implications of the Western diet for Agricultural Production, Health, and Climate Change. Front. Sustain. Food Syst. 2:88. doi: 10.3389/fsufs.2018.00088

National Population Commission (NPC) and ICF International. (2014). Nigeria Demographic and Health Survey. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International: 29-33

Omololu E. F. (2021).Child obesity prevention: Nigerian children and adolescents have a fair knowledge of obesity. Human Nutrition & Metabolism, 23 (2021) 2001

Oparaocha, E. T. (2018). Childhood obesity in Nigeria: Causes and suggestions for control. Nigerian Journal of Parasitology**,** 39(1): 1-7

Pricewaterhouse Coopers Limited (PWC) (2017). Transforming Nigeria's Agricultural Value Chain. https://www.pwc.com/ng/en/assets/pdf Accessed on 18th July 2021.

Pulitzer center (2020). Impact of COVID-19 on Nutrition and Food Shortages in Nigeria https://pulitzercenter.org/stories/impact-covid-19-nutrition-and-food-shortages-nigeria. Accessed on 18th July 2021

Snowdon, W., & Thow, A. M. (2013). Trade policy and obesity prevention: challenges and innovation in the Pacific Islands. Obesity reviews, 14 (Suppl. 2), 150–158 doi: 10.1111/obr.12090

Thow AM., Heywood, P., Schultz, J., Quested, C., Jan, S., & Colagiuri, S. (2011). Trade and the nutrition transition: strengthening policy for health in the Pacific. Ecol Food Nutr, 50: 18–42.

Tull, K. (2019). Stunting, Wasting, and Education in Nigeria. K4D Helpdesk Report 540. Brighton, UK: Institute of Development Studies.

Umeh, J. C., & Adejo, M. A. (2019). Assessment of central bank of Nigeria's anchor borrowers' program effects on rice farmers in Kebbi state, Nigeria. Invited paper presented at the 6th African Conference of Agricultural Economists, September 23-26, Abuja, Nigeria

UNICEF-WHO-World Bank Group joint malnutrition estimates (2015). Level and trends in childhood malnutrition. Key findings of the 2015 editions. Accessed 26-12-17.

United States Agency for International Development (USAID) (2018). Nigeria: Nutrition Profile https://www.usaid.gov/global-health/health-areas/nutrition/countries/nigeria-nutrition-profile. Accessed on 19th July 2021

Weatherspoon, D.D., Miller, S., Ngabitsinze, J.C., Weatherspoon, L. J., &Oehmke, J. F. (2019). Stunting, food security, markets, and food policy in Rwanda. BMC Public Health 19, 882 https://doi.org/10.1186/s12889-019-7208-0

Wondimagegn, Z. T. (2014). Magnitude and Determinants of Stunting Among Children in Africa: A Systematic Review. Curr Res Nutr Food Sci, 2(2). doi : http://dx.doi.org/10.12944/CRNFSJ.2.2.05