

Diseases and Sustainable Development: The Cases of HIV/AIDS, Malaria and Tuberculosis in Nigeria

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Abstract

The third goal of sustainable development is "good health and well-being." Health and wellbeing are very critical for economic performance and attainment of sustainable development. A healthy population can enhance national productivity, savings, human and physical capital formation, per capita income growth, and contribute to poverty alleviation. The presence of diseases in any society however, could undermine sustainable development activities. This is because diseases possess the inclination to cut short life expectancy, reduce quantity and quality of the labour force, and lead to decline in the level of productivity. The Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS), malaria and tuberculosis (TB) are major endemic diseases in Nigeria. Available facts have shown that the three diseases are responsible for high rates of morbidity and mortality among the nation's population than any other group of diseases in the country. This study examines the effects of HIV/AIDS, malaria and TB on sustainable development activities in Nigeria. It discovered that the menaces of the three diseases have aggravated morbidity and mortality rates, depressed investment in human and physical capital, lowered labour supply and productivity, changed demographic structure, reduced output growth, raised poverty level and increased number of vulnerable groups in the country, all of which could prevent sustainable development in the country. It is therefore recommended that efforts should be geared not only towards treating persons infected with the three diseases but their spread should be largely controlled to enable a healthy population

capable of contributing to sustainability of development in the country.

Key Words: HIV/AIDS, malaria, tuberculosis, sustainable development, Nigeria.

JEL Classification: I15, O47

Introduction

The term sustainable development (SD) is relatively new in development literature. Although it has existed in environmental and ecological fields for long (see Du Pisani, 2006; and Paul, 2008), its incorporation into development literature appears recent. Moreover, Brundtland Commission's report, *Our Common Future* in 1987 sets the stage for robust discussions around the issue, which further became more reinvigorated with the setting up of Sustainable Development Goals (SDGs). Sustainable development as defined by the Brundtland Commission is that "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report, WCED 1987: 43). Sustainable development therefore, focuses on two basic periods, the present and the future. Thus, both periods matter if development will be sustainable. So, any development activity that gives priority to the present without consideration for the future cannot be termed sustainable. Angelo (2003, p.111) noted that "sustainable development ensures a better quality of life for all human beings now, and in the future."

As development focuses on these two periods, three critical areas of the society must be embraced. These are: the economic, the social and the environmental. These three areas are fundamental for the sustainability of development. Emas (2015,p.2) maintains that the overall goal of SD "is the long-term stability of the economy and environment," which can be made possible "through the integration and acknowledgement of economic, environmental, and social concerns throughout the decision making process. "The three areas have their specific elements or objectives, which must be achieved for sustainability of development. The objectives as articulated by Soubotina (2004) include: Economic objectives (growth, efficiency, stability); Social objectives (full employment, equity, security, education, health, participation, cultural identity); Environmental objectives

(healthy environment for humans, rational use of renewable natural resources, conservation of nonrenewable natural resources).

The three critical areas of society with their objectives point to the undeniable facts that SD is about people and their wellbeing. Whether the economy, the environment or social concern, all revolve around the people and their welfare, and all can be summed up under health. As a matter of fact, health is critical for SD. Each of the objectives will be unattainable in the absence of a healthy population. Economic growth, efficiency, stability cannot be attained without a healthy population neither can there be full employment, equity, security, education, participation, cultural identity, healthy environment for humans, rational use of renewable natural resources, and conservation of nonrenewable natural resources without a healthy population. Therefore, sustainability of development must take into consideration the health and welfare of a nation's population. This is well acknowledged with the articulation of the third goal of SD as "good health and well-being."

Health is very fundamental for wellbeing, economic performance and attainment of SD of any nation. Health is a critical factor in the determination of labour force participation and a healthy population can enhance national productivity, higher per capita income, savings, investments in physical and human capital and could alleviate poverty simply because "healthier people are more productive, supply labour more efficiently, work harder and longer, and think more clearly" (Audibert, Motel & Drabo, 2012: p. 8). Thus, if development must be sustainable, people have to enjoy good health and wellbeing.

Diseases however, constitute great threats to sustainable development activities. They possess the capacity to deprive a nation's population of its productive ability; cut short life expectancy, reduce her actual/potential labour force and their productivity, depress quantity and quality of the labour force, impact negatively on savings, lower investment in physical and human capital, weaken social interaction, dampen foreign direct investment and lower economic growth and development.

The Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS), malaria and tuberculosis (TB) are the major endemic diseases in Nigeria. They are among the foremost communicable diseases prevalent in sub-Saharan Africa (SSA) with high

rates of morbidity and mortality globally. According to the World Health Organization (WHO, 2002), HIV/AIDS, malaria and TB are among the six major diseases responsible for 90% mortality caused by communicable diseases globally. The other three are: pneumonia, diarrhoea and measles. Available facts have shown that in Nigeria, HIV/AIDS, malaria and tuberculosis appear to have raised the levels of morbidity and mortality among the nation's population than any other group of diseases in the country. They have negatively affected the level of national productivity, average life expectancy, levels of savings, human and physical capital investment, increased rates of morbidity and mortality, number of the vulnerable, and raised private and public health expenditure (see Carrington, 2001; Asante & Asenso-Okyere, 2003; Angelo, 2003; Bello, 2004; Jimoh, Sofola, Petu & Okorosobo, 2007; Abdulsalam, 2010; Dauda, 2012; Onazi *et al.*, 2015; and Nwanosike, Orji, Okafor & Umesiobi, 2015).

HIV/AIDS, malaria and TB are the leading endemic communicable diseases responsible for high level of global morbidity and mortality rates. Statistics provided by UNAIDS (2016) revealed that 36.7 million people were estimated to be living with HIV/AIDS as at December, 2015 with just 46% (17 million) of them having access to antiretroviral therapy. The new infections recorded same year were put at 2.1 million while 1.1 million people died from AIDS-related illnesses. The SSA region alone accounts for 71% (about 24.7 million) of number of people living with HIV/AIDS (PLWHA) in the world, with 81% of these people living in just ten countries while half of them live in Nigeria and South Africa. The agency revealed that since the early 1980s when the virus was detected, about 78 million people have been infected while 35 million people have died as a result of AIDS. These are very frightening figures irrespective of the progress made so far in fighting the menace of the disease.

In the same vein, WHO (2015a) in its report on malaria revealed that in spite of the progress recorded so far in reducing malaria related morbidity and mortality, approximately 3.2 billion people are still at risk of the disease worldwide. According to the agency, in 2015 alone, about 214 million new cases and 438 000 malaria related deaths were recorded while millions of people have not been able to access the required services to prevent and treat the disease. It further reiterates that about 80% of malaria related deaths are in 15 countries of Africa.

Furthermore, WHO (2015b) reported that in 2014 about 9.6 million people became sick from TB while 1.5 million deaths were documented

from the disease globally. The agency noted that the year 2015 recorded higher numbers of new TB cases than in previous years; although this according to it was due to improvement and increase in national data rather than increase in its spread as the incidence of the disease has fallen by an average of 1.5% per year since 2000.

The evidence provided above show that the three diseases are capable of undermining sustainable development activities if more efforts are not geared towards combating their menaces. This paper examines diseases and SD within the context of HIV/AIDS, malaria and tuberculosis in Nigeria. The remaining part of the paper is divided thus: section two focuses on stylized facts with respect to HIV/AIDS, malaria, tuberculosis and human development index in Nigeria. Section three looks at the impact of these diseases on economic and development indicators that could undermine SD while section four covers conclusion and policy implications of the study.

Overview of HIV/AIDS, Malaria, Tuberculosis and Human Development Index in Nigeria

HIV/AIDS in Nigeria

Nigeria has the second highest burden of HIV/AIDS globally after South Africa (Nigeria National Agency for the Control of AIDS, NACA, 2015). Information provided by UNAIDS (2014) shows that as at the end of 2013 about 3.2 million people were living with HIV/AIDS in Nigeria, which is 9% of global estimate and 13% of SSA figures. Nevertheless, 80% of these people do not have access to antiretroviral treatment. New HIV infections in the country stood at 220,000, which translates to 15% of new infections in SSA. Globally, Nigeria accounts for 14% of AIDS-related deaths while the rate in SSA is 19%. Prevalence in the general population according to NACA (2015) rose from 1.8% in 1991 to 4.5% in 1996 and by 2001 it got peaked at 5.8% before it declined to 4.6% and 3.4% in 2008 and 2012 respectively. The South South geopolitical zone accounts for the highest prevalence given as 5.5% while the South East Zone has the lowest, 1.8% and among states, the highest of 15.2% was documented for Rivers State while Ekiti State has the least, which is 0.2%. Table 1 shows average HIV prevalence for adults (15-49 years), AIDS mortality (AIDS-related deaths) and HIV/AIDS morbidity (number of persons PLWHA) in Nigeria for the period 1990-2013.

Table 1: Average HIV Prevalence (Adult 15-49 years), AIDS Mortality and HIV/AIDS Morbidity in Nigeria, 1990-2013

Year	HIV Prevalence (%)	AIDS-Death (Million)	HIV/AIDS Morbidity (Million)
1990-1994	1.62	0.04	0.87
1995-1999	2.86	0.08	1.80
2000-2004	3.62	0.15	2.64
2005-2009	3.66	0.18	3.10
2010-2013	3.40	0.19	3.35

Source: Computed by Author from UNAIDS (2015)

From the table, average HIV prevalence among adults 15-49 years increased from 1.62% in 1990-1994 to 2.86% in 1995-1999. It further rose to 3.62% in 2000-2004. By 2005-2009, it had risen to 3.66% before it declined slightly to 3.40% in 2010-2013. The age bracket 15-49 years is generally seen as the productive age bracket. No doubt, productivity of the infected persons in this age group could decline and this may invariably lower productivity in the entire economy. The number of PLWHA and AIDS-related deaths also remained high and continued to increase as shown in the table. On average, PLWHA increased from 0.87 million in 1990-1994 to 1.80 million in 1995-1999. By 2005-2009, it had further risen to 3.10 million and by 2010-2013 it rose again to 3.35 million. The increasing trend in the number of PLWHA is not unconnected with the prolonged life span of infected persons due to access to antiretroviral drugs. About 20% of HIV/AIDS infected people could access antiretroviral care in Nigeria (UNAIDS, 2014), which has helped to boost the life span of people living with the virus. AIDS-related deaths rose from 0.04 million in 1990-1994 to 0.15 in 2005-2009 and further to 0.19 in 2010-2013. This implies that the contributions of the affected persons to national and global economic productivity have been terminated.

Malaria in Nigeria

Malaria is one of the endemic diseases in Nigeria and a major public health problem. It is responsible for high rates of morbidity and mortality in the country. The nation has the highest malaria morbidity and mortality rate worldwide, with 25% of global cases and 30% of worldwide malaria deaths (Arowolo, 2016). She is one of the 15 countries responsible for 80% cases of malaria and one of the 15 countries accountable for 78% of malaria related

deaths globally. Nigeria and the Democratic Republic of Congo account for more than 35% of global malaria related deaths (World Health Organization, WHO, 2015a). In 2013, out of the 128 million people estimated to be infected with malaria in SSA, 29% of them were in Nigeria (WHO, 2014). United States Embassy in Nigeria (2011) noted that 97% of the country’s population is at the risk of malaria while annual estimated cases and deaths are around 100 million and 300,000 respectively. Malaria prevalence in the country according to Arowolo (2016) is 27%; this however, varies among the six geopolitical zones, with the North West accounting for the highest, put at 37% while the least, 14% occurred in South East. The other four zones have the following: North Central, 32%; North East, 26%; South South, 19%; South West, 17%. Figure 1 below presents information on average presumed and confirmed malaria cases (PCMC) in Nigeria from 1990 to 2013.

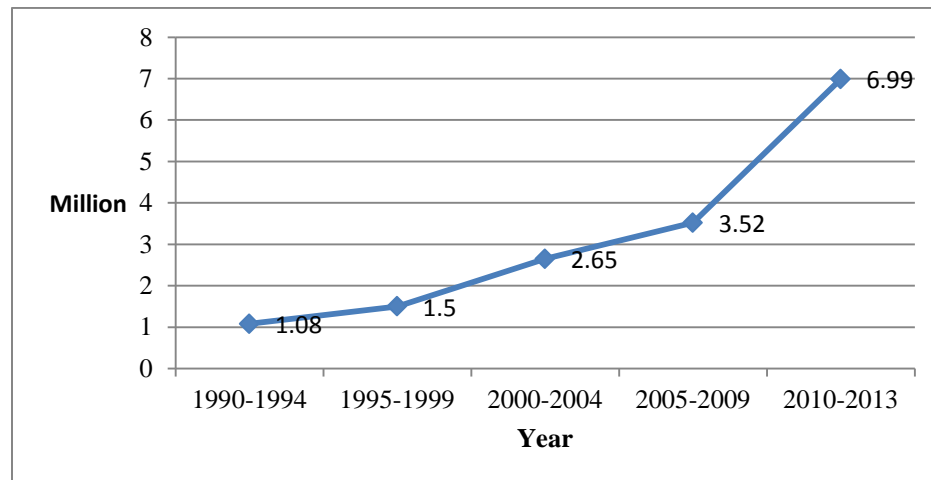


Figure 1: Average Values of Presumed and Confirmed Malaria Cases (PCMC), in Nigeria, 1990-2013

Source: Generated by the Author from WHO (2015c). *The world malaria report*

In Nigeria, PCMC over the years have witnessed an increasing trend. Averagely, it went up from 1.08 million in 1990-1994 to 1.50 million in 1995-1999. By 2005-2009 it had further risen to 3.52 million while in 2010-2013, 6.99 million PCMC were recorded. This confirms the risk of the disease among the population of the country.

Infants and children are at a very high risk of the disease in Nigeria. Rates of mortality, morbidity and prevalence among them appear very high. Figure 2 shows malaria prevalence among children age 6-59 months based on the six geopolitical zones in the country. It is apparent from the figure that prevalence of the disease is very high in the six geopolitical zones among children age 6-59 months. However, the South West zone appears to have the highest prevalence of 50.3%. Close to this are North Central and North West, which recorded prevalence of 49.4% and 48.2% in that order. The least prevalence (27.6%) is found in the South East geopolitical zone.

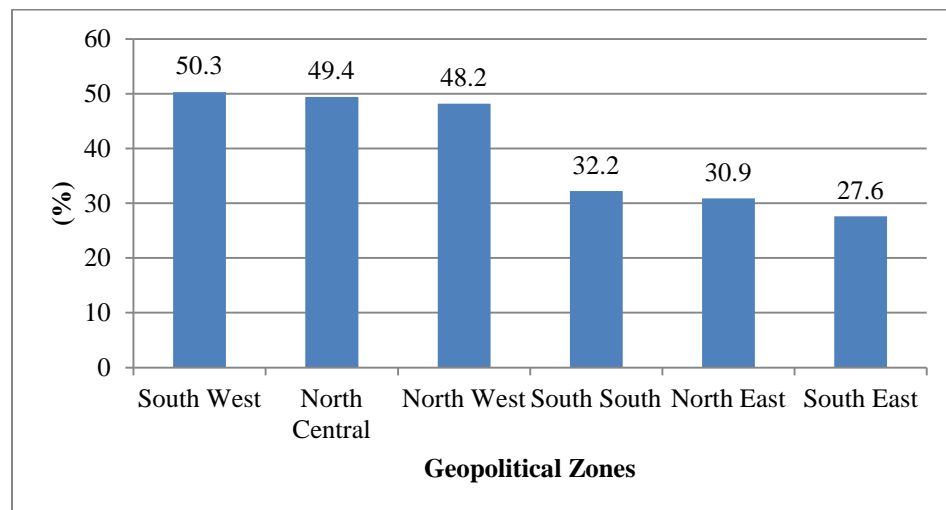


Figure 2: Malaria Prevalence among children Age 6-59 months in Nigeria

Source: United States Embassy in Nigeria. (2011). Nigeria malaria fact sheet

Tuberculosis in Nigeria

Cases of TB appear to be high in Nigeria like the two other diseases considered above. In 2014, Nigeria was one of the six countries with the highest number of TB incidence while the country and India accounted for about 33.33% of TB-related deaths worldwide (WHO, 2015b). According to Vassall (2015), Nigeria occupies the third position (after India and China) globally with respect to TB burden. The author noted that about 590,000

Nigerians were infected with the disease in 2013 while approximately 245,000 people die from TB every year; an equivalence of about 30 deaths per hour while the disease accounts for more than 10% of all deaths in the country. In Table 2, average TB detection case increased from 5.62% in 1990-1994 to 9.66% in 2000-2009; and by 2010-2013, it had further risen to 16.00%. Incidence of TB per 100,000 people which was 268.60 on average in 1990-1994 surged to 334.60 in 2000-2004. By 2005-2009, it had increased to 341.80. However, the figure declined slightly to 338.75 in 2010-2013.

Table2: Average Values of Tuberculosis Case Detection Rate (% , all forms) {TBD}, Incidence of Tuberculosis (per 100,000 people) {ITB} in Nigeria, 1990-2013

Year	TBD (%)	ITB (per 100,000 people)
1990-1994	5.62	268.60
1995-1999	5.14	301.40
2000-2004	9.66	334.60
2005-2009	15.40	341.80
2010-2013	16.00	338.75

Source: Computed by Author from World Bank (2016)

All forms of TB cases in Nigeria continue to rise. A look at Figure 3 revealed that in 2005, about 66,848 cases of all forms of TB were detected. This figure increased steadily till 2009 when around 94,114 cases were reported before it declined slightly to 90,447 in 2010 and thereafter rose to 93,050, 97,853 and 100,401 in 2011, 2012 and 2013 respectively. It however fell to 91,354 in 2014.

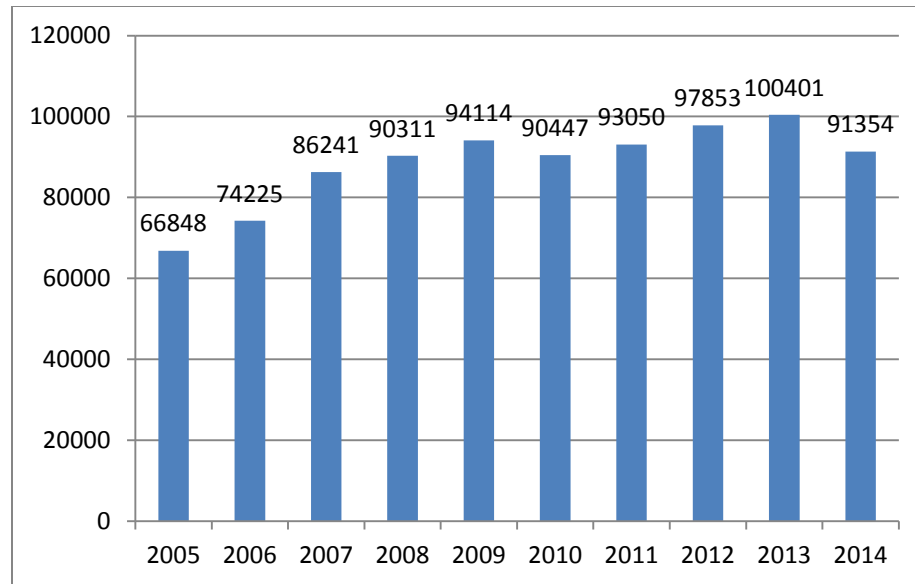


Figure 3: A Ten Year Trend of all Forms of TB Cases in Nigeria

Source: Mustapha (2015). Nigerian TB program 'Journey so far.'

Human Development Index (1990-2014), Nigeria

Nigeria over the years has continued to record low human development index (HDI). From 1990 till 2010, her HDI has remained within the 0.4 range. Statistics provided in Table 3 below shows clearly that the nation has not been doing well in the area of human development. From 1990 to 2014, it has remained in the low human development cadre. In 1990, the nation's HDI was 0.423. It increased slightly to 0.447 in 1995 and declined to 0.432 in 2005 before rising to 0.62 in 2010. By 2014 it rose to 0.514. Even at that the country is yet to break out of the cycle of low HDI group. This may not be unconnected with low values of development indicators in the country, which are made worse by the menaces of diseases such as HIV/AIDS, malaria and tuberculosis.

Table 3: Human Development Index (HDI) of Nigeria, 1990-2014

Year	HDI
1990	0.423
1995	0.447
2000	0.462
2005	0.434
2010	0.462
2014	0.514

Source: UNDP Human Development Index, Various Issues

Diseases and Sustainable Development: Cases of HIV/AIDS, Malaria and Tuberculosis

Diseases constitute great threats to sustainability of development in any society. WHO (2009, p.4) argues that diseases and injuries are capable of impacting negatively “on macroeconomic performance or output” in the area of “increased health expenditures, labour and productivity losses, and reduced investment in human and physical capital formation.” Consistent with this argument is the assertion of United Nations (2004) that diseases can slow down or reverse the growth of the labour force, reduce savings and investment, divert funds meant for investments in human and physical capital as well as deepen the level of poverty in the affected country.

The negative effects of diseases on sustainable development manifest in the form of increased mortality and morbidity (demographic effect), high public and private health expenditure, reduced labour force and labour productivity, decline in human and physical capital investment activities as well as upsurge in poverty level among others.

Demographic effect of diseases is evident in rising morbidity and mortality in society as well as modification of demographic structure, thereby contributing to increased number of dependent population, comprising larger number of old persons, children and orphans. There are evidences in the literature to show that HIV/AIDS, malaria and tuberculosis are responsible for the high level of morbidity and mortality globally (see WHO, 2015a &b and UNAIDS, 2016). These diseases have altered the demographic structure and reduced average life expectancy in the countries where their prevalence is high (see Angelo, 2003; Batini, Callen & McKibbin, 2006; Haacker, 2010; Anderson, 2010 and UNDP, 2013), which is also true for Nigeria.

Epstein (2004) reported that one third of adult deaths are caused by HIV/AIDS in Nigeria while 6 infant deaths per 1,000 live births occurred due to the menace of the disease, and it is expected to aggravate under-five mortality rate in the country. As at the end of 2013, approximately 3.23 million persons were living with HIV/AIDS in Nigeria while new infections and AIDS-related deaths the same year stood at 220,000 and 210,031 respectively (see UNAIDS, 2014; and Awofala & Ogundele, 2016). Moreover, AIDS-Orphans, children infected with the pandemic and HIV prevalence among women have continued to witness a rising trend over the years (see Dauda, 2013; and NACA, 2015). AIDS-Orphans in Nigeria reduced slightly from approximately 2 million in 2013 to 1.8 million in 2015 while women aged 15 and above living with the virus increased from 1.6 million in 2013 to 1.9 million in 2015 (UNAIDS, 2013 & 2015).

In the same vein, the demographic impact of both malaria and TB in Nigeria is enormous. About 97% of Nigeria's population is at risk of malaria, with approximately 100 million cases and more than 300,000 deaths per annum while 11% of maternal mortality is attributed to the disease in the country (United States Embassy in Nigeria, 2011). In 2014, TB mortality in Nigeria was 248,000 while prevalence and incidence were 330 and 322 per 100,000 population respectively (WHO, 2016). Centers for Disease Control and Prevention (CDC, 2015) had reported that 20% of deaths in Nigeria are attributed to malaria while HIV/AIDS and TB are correspondingly responsible for 9% and 4% mortality.

The effects of the above on sustainable development are obvious. Apparently, development activities and SD are people centered and also carried out by people. When a nation's population is battered by diseases, it becomes impossible to engage their potentials to their fullest. They are made vulnerable, have their income decreased and infected with poverty in all ramifications; all of which possess the capacity to retard sustainable development. Angelo (2003, p.111) submits that an increased number of HIV/AIDS infections in Africa has compromised the goal of sustainable development because the high mortality rate and reduced life expectancy occasioned by the disease has the capability to "weaken economic, social and political structures, threaten human security and make vulnerable groups, such as women and children, more vulnerable than they were before the epidemic."

Diseases also possess the capacity to escalate private and public health expenditure thereby diverting funds from investment in human and physical capital required for growth and sustainable development. Asante & Asenso-Okyere (2003), using cost of illness and willingness to pay approaches to examine the effects of malaria on economic growth in Ghana found that each household spends about US\$ 15.79 on average per malaria episode; which is divided into US\$ 6.87 direct cost and US\$ 8.92 indirect cost. Moreover, the study reported US\$14.1 as the average amount each household was willing to pay for malaria prevention. Similarly, Bello (2004) reported about ₦12.8 billion lost annually due to malaria related deaths and around ₦1.5 million lost yearly as a result of incapacitation from malaria episodes in Nigeria. Alaba & Alaba (2009) citing WHO (2005) revealed that in 2003, malaria gulped around “US\$3.5 million in government funding and US\$2.3 million from other stakeholders in various control attempts” in Nigeria. Sicuri *et al.* (2013, p.1) also reported that “household and health system costs per malaria episode ranged from approximately US\$ 5 for non-complicated malaria in Tanzania to US\$ 288 for cerebral malaria with neurological sequelae in Kenya” with 55% of the “costs in Ghana and Tanzania, and 70% in Kenya” bore by household. The then president of Nigeria, Dr. Goodluck Jonathan through his Health Minister, Onyebuchi Chukwu reported that Nigeria spends approximately ₦480 billion annually on “the management and treatment of malaria” (Premium Times, 2013).

With respect to health expenditure as applicable to TB, Onazi *et al* (2015, p.127) examined the cost of TB and its social effects on infected people and their households in three states in Nigeria. The authors surveyed 260 TB patients, majority of which fall within the age bracket 20-49 years. The findings (notwithstanding free TB treatment in Nigeria) indicated that the expenditure incurred by each TB patient “on all visits associated with diagnosis and receipt of diagnostic test results” was US\$52.02 on average while about US\$57.30 is lost by households as a result of TB related illness. Ukwaja, Alobu, Abimbola & Hopewell (2013) in their study on household payments for tuberculosis care in Ebonyi State, Nigeria, in which they analyzed household direct costs and income data, using logistic regression analysis, it was found that on average, households expend about 14% of their annual income as direct cost of TB treatment while “the incidence catastrophic payment was 44%; with 69% and 15% of the poorest and richest household income-quartiles experiencing catastrophic activity respectively.” Macintyre & Mwangi (2014) also

examined the costs of treating and preventing tuberculosis in 22 high burden countries from 2010 to 2012 based on the report of WHO. The study revealed that about US\$6.37 billion were spent on 14 million reported cases of TB during the period under consideration.¹ This cost ranges between \$30 and \$289 per case in 17 of these countries, which the authors classified as non-BRIC countries with an average of \$89 per case per annum while the average cost per case in BRICS countries excluding Russia stood at \$118 per annum.²

In Nigeria, HIV/AIDS funding from all sources rose from about US\$299,246,295 in 2007 to US\$415,287,430 in 2009, US\$496,917,471 in 2010 and further to US\$577,432,903 in 2012, with treatment and care, programme management and human resources accounting for over 85% of this funding (Federal Government of Nigeria, 2014 and NACA, 2014).

Increased health expenditure (whether at household or societal levels) is capable of decreasing savings, investment in physical and human capital as well as aggravating level of poverty and depressing productivity in the economy. Moreover, bloated public expenditure on health occasioned by diseases can in turn bring about reduction in available resources for investment in other sectors of the economy and capital project, with the consequence of decline in growth and development. According to WHO (2009, pp. 30 & 31), "increased health expenditures exert an overall negative impact on savings at the societal level" while "lower aggregate savings are likely to lead to increases in interest rates and the opportunity cost of investment, which can then impact negatively on the formation of capital and ultimately on economic growth" and this "can seriously compromise long run economic growth potential." The agency on page 23 reiterated that the negative effect of diseases "is not just limited to the current time period" but also affects the future because "health services and goods may be paid for from savings or additional borrowing or the sale of household assets, and thereby lead to depleted investment in (physical, financial and human) capital." The import of all these is that sustainable development will not be achieved in this type of situation because not only that the funds that could have been used for investment purpose is being

1 The countries are: Afghanistan, Bangladesh, Brazil, Burma, Cambodia, China, Democratic Republic of Congo, Ethiopia, India, Indonesia, Kenya, Mozambique, Nigeria, Pakistan, the Philippines, Russia, South Africa, Tanzania, Thailand, Uganda, Vietnam, and Zimbabwe. These countries are responsible for 80% of the overall burden of tuberculosis globally.

2The BRICS countries are Brazil, Russia, India, China and South Africa.

diverted to addressing issues that relate to diseases but also the current population is been impoverished due to paucity of funds.

Furthermore, diseases, particularly when their prevalence is high could reduce labour supply, depress labour productivity and economic growth because illnesses lead to poor health and poor health reduces productivity. When a person contracts diseases such as malaria, HIV/AIDS and tuberculosis, his or her labour hour supplied declines due to increased absenteeism from work, increase in the number of hours devoted to visiting health facilities as well as cessation of labour supplied due to the demise of infected persons. WHO (2009, p. 33), citing Weil (2007) argued that "some diseases such as HIV/AIDS affect mostly working age population groups and can contribute to reduce labour market participation and force people into early retirement, reducing the average retirement age." Angelo (2003, p. 113) also contends that HIV/AIDS has the capacity to transform "the characteristics of the labour force in terms of its size, composition, health, education and skills and this has a direct bearing on the performance of any economy." The implication of these is reduction in workers' efficiency and productivity. In a study carried out by Coulibaly (2004) on how HIV/AIDS affects the labour force in SSA, it was discovered that in countries severely affected by the disease, the pandemic has led to reduction in the growth rate of the labour force, modification of the sex distribution of labour force participation rates, alteration of age distribution of labour force participation in favour of age group 15-24 years, reduction in average school enrolment, decline in the growth rate of the agricultural labour force, and reduction in the average age of the labour force and the average years of experience.

Empirical findings in Nigeria have shown labour loss, decline in labour productivity, reduced output, labour inefficiency, low/poor farmers' extension service delivery, decline in variety of crop cultivation, fall in average farmer's gross revenue and reduction in profit in the agricultural sector due to the menace of HIV/AIDS (see Thliza & Sabo, 2007; Adeoti & Adeoti, 2008; Saliu & Adejor, 2010; and Duru & Mernan, 2011). Moreover, in Nigeria, malaria has also led to decline in labour productivity, household labour use, labour supply (work time), labour/work efficiency, worker earnings, occupational choice of workers in Nigeria while testing and treatment have assisted to increase worker earnings, labour supply, and productivity (see Eboh & Okeibunor, 2005;

Abdullateef & Adebayo, 2011; Egbetokun, Omonona & Oluyole, 2014; and Dillon, Friedman & Serneels, 2014).

Furthermore, diseases are capable of depressing per capita income and economic growth and development in severely affected society. In a study conducted by Grimard & Harling (2004) to determine the link between poor health and low productivity in 91 countries using the incidence of tuberculosis covering the period 1981-2000, and employing the augmented Solow growth, it was reported that "countries with a lower burden of tuberculosis grew faster than those which were more heavily afflicted." The study also found "a persistent effect of between 0.2 and 0.4 percent lower growth for every 10 percent higher incidence of tuberculosis" which "corresponds to an annual loss of between US\$ 1.4 and 2.8 billion in economic growth worldwide."

Arndt (2003) in his study on Mozambique (a country with about 12% HIV prevalence in the adult population), using a computable general equilibrium modelling approach to examine how HIV/AIDS affects the economy of the country reported that by 2010, the economy of Mozambique would decline by 14% to 20% on account of AIDS while per capita GDP growth per annum would reduce by 0.3% to 1.0%.

Similar results have been reported for Nigeria. For instance, Abdulsalam (2010) developed a macroeconometric model to investigate the impact of HIV/AIDS on the Nigerian economy using simulations, discovered that increased HIV/AIDS prevalence would depress the agricultural and manufacturing outputs whereas the negative impact of the disease in the oil and gas sector would be minimal and in some cases positive. The study further reported that upsurge in public expenditure on the treatment of HIV/AIDS related illnesses as well as prevention programmes would increase output across all industries while the same would lower investment in physical capital as well as capital expenditures in the entire economy.

Okorosobo *et.al* (2011) examined the economic burden of malaria in six African countries (Chad, Ghana, Mali, Nigeria, Rwanda and Uganda) between 2002 and 2005, using the production function, cost of illness and willingness to pay approaches, and reported among other things that malaria incidence led to significant decline in economic growth of about 0.08%, 0.41%, 3.8% and 8.9% in Rwanda, Ghana, Nigeria and Chad

respectively. Moreover, malaria morbidity rates also depressed real gross domestic products in the affected countries while the direct cost of malaria to each household was given as US\$ 6.87, US\$ 11.84 and US\$ 17.5 in Ghana, Nigeria and Mali in that order.

Bello (2004) gives an estimate of the socio-economic impact of malaria in Nigeria using the GDP and Healthy Life Days (HLDs) method discovered that the monetary cost of malaria related deaths amounted to about 12.8 billion naira annually while around 1.5 million naira was lost to incapacitation due to malaria yearly. In the same vein, Alaba & Alaba (2009) examined the implication of malaria incidence in Nigeria with respect to the country's efforts to "meet the targets of various domestic and global development blueprints. The authors employed the cost of illness technique for analysis, it was discovered that significant resources and domestic output are lost yearly to malaria in Oyo State of Nigeria. Specifically, the state loses about 10% of her gross domestic output to the scourge of malaria annually.

Diseases could depress investment in human and physical capital. They possess the capacity to affect both the quantity and quality of human capital negatively because of their direct effect on human resources. In the area of quantity, diseases can reduce human resource through their mortality impact. From earlier discussions, particularly as it relates to demographic impact of diseases, the number of mortality due to some major diseases in developing countries is enormous. The three diseases under focus in this study are responsible for the highest rates of mortality and morbidity globally. In Nigeria, HIV/AIDS, malaria and TB are the major causes of high rate of mortality in the country. With respect to quality of human resource, diseases bring about morbidity, which can lead to decline in school enrolment, completion and literacy rate. Moreover, diseases also deprive nations of resources meant for human capital development activities. This is due to diversion of funds meant for human capital development for treating sick persons and expenditure on disease related issues. Chen & Hanvoravongchai (2005) have asserted that HIV/AIDS attacks human capacity and social defence systems.

Akinyemi (2008) investigates how HIV/AIDS affects human capital in relation to development in Africa, and reported that HIV/AIDS has a detrimental effect on human capital in Africa as a result of loss of persons in their productive ages. Additionally, Fortson (2011) who employed

Demographic and Health Survey data from fifteen countries in the SSA region to analyze “the relationship between regional HIV prevalence and the change in individual human capital investment over time” discovered that countries which have “higher levels of HIV experienced relatively larger declines in schooling.”

Manuelli & Yurdagul (2016) developed a model to determine the impact of HIV/AIDS on the economy of SSA through its effect on human capital accumulation decision process. The authors indicated that HIV/AIDS reduced human capital formation due to the risk of its infection and decline in the life expectancy of HIV/AIDS infected persons.

Furthermore, in a study conducted in Nigeria by Nwanosike, Ikpeze & Ugbor (2015) to determine the health outcome of malaria prevalence in Nigeria, the findings suggest that malaria contributes to low average life expectancy and decline in active labour force of the country.

In the area of physical capital, diseases have the inclination to reduce savings, thereby depressing investment in physical capital. Available evidence in literature revealed that diseases have contributed to lower capital formation and their eradication has also assisted to boost capital formation in various countries (see Barlow, 1967; Grimard & Harling, 2004; and Barofsky *et al*, 2011). In a study conducted by Iya, Purokayo & Gabdo (2012) to determine the economic implication of HIV/AIDS in Adamawa State, Nigeria, it was discovered that the disease does not only have adverse effects on household productivity but it contributes to low income, declining savings and capital formation.

Finally, diseases are also capable of escalating the rate of poverty in the hardest hit societies and this can prevent sustainable development activities in such areas. According to Barter *et al* (2012), TB disproportionately affects most economically disadvantaged group in society (particularly in SSA where the level of poverty is already high) because of “the direct costs of medical and non-medical expenditures and the indirect costs of time utilizing healthcare or lost wages” the disease places on this group. Citing studies such as Siddiqi, Barnes & Williams (2001), WHO (2005), Muniyandi & Ramachandran (2008) and Hoa *et al* (2011), the authors contend that very strong association exists between poverty and TB because of the high risk of infection among the poor and vulnerable, with these groups of people having higher prevalence, worse

outcomes and display of worse TB care-seeking behavior. Vassall, A. (2015) reported that the poverty implication of TB in Nigeria is enormous in spite of the availability of free treatment. This is due to the cost of about US \$600 per household in lost earnings and costs for nutritional support because around 50% of households with TB are at the risk of losing more than 10% of their income.

From the foregoing, it is apparent that sustainable development in Nigeria may be a mirage if efforts are not put in place to eradicate the prevalence of these three diseases because of their detrimental effects on economic outcomes and development indicators.

Conclusion and Policy Implications

This paper assesses issues surrounding diseases and sustainable development in Nigeria with focus on HIV/AIDS, malaria and TB. In an attempt to do this, the study examines the growing trend of morbidity and mortality occasioned by the three diseases and analyzed their prevalence. Moreover, the effects of the diseases on economic outcomes and development indicators such as demography, health expenditure, savings, labour force and labour productivity, human and physical formation, as well as poverty were also investigated. The conclusion that emerged from the study was that HIV/AIDS, malaria and TB possess the capacity to escalate household and public health expenditures, bring about reallocation of labour from productive activities, decrease household labour hours, productivity, income, investment in education and other human capital related investment. This in turn can bring about reduction in savings, consumption of non-health related goods, which invariably could lower household standard of living, aggravate poverty and prevent sustainability of development. It is therefore recommended that the spread of these diseases be curtailed if not completely eradicated while efforts at treating the infected persons should be intensified.

Specifically, more cases of the three diseases should be prevented, mortality caused by them should be reduced, access to treatment of infected persons should be expanded while progress made in curtailing their spread in some areas should be maintained and improved upon.

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