THE IMPACT OF FOREIGN AID ON MORTALITY RATE AND LIFE EXPECTANCY IN NIGERIA

An M.Sc Thesis

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TITLE PAGE

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APPROVAL PAGE

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External Examiner	Date

CERTIFICATION

This is to certify that the work embodied in this thesis is original and has not been submitted in part or full for any other degree of this university or any other university.

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DEDICATION

I dedicate this work to God Almighty for the special favour he granted me at the time of concluding this work and also to Great Wise Trio (GWT) who would not have come into my life at a better time than this.

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This work would not have been completed without the support, encouragement and guidance of several people. First, I cannot thank God enough for his gift of life and all I needed to complete this work. Even at the time I was at the verge of abandoning this work, when neither I nor anyone else thought it was possible, you made it absolutely possible and inspired me till the very completion of this work.

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To all those who in one way or the other helped me in the course of this work who I cannot remember at this point, please kindly forgive me. The omission is not intentional I appreciate you all. May God Almighty continue to bless and protect you all.

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ABSTRACT

The relevance of foreign aid on health outcome among developing economies cannot be underestimated. Foreign aids, especially health related aids proved to important determinant of progress in key healthcare indicators among aid recipient nations. Apart from other causes of mortality in Nigeria which ranged from crisis to epidemics, the statistical evidence of under-five mortality rate (U5M) of about 104 per 1000 live births in 2016 calls for investigation. Others are the fact that under-five mortality reduced from 158 to 120 per 1000 live births between 2011 and 2016, maternal mortality stood at 814 per 100,000 in 2015 and life expectancy (LEXP) only rose to 55.2 years average with males 54.7 years and females 55.7 years in 2018. These and other indicators propelled examination of impact of foreign aids (ODA) on LEXP and child mortality rate in Nigeria. To achieve this goal, the study sought to determine the effect of ODA on LEXP, estimate the impact of ODA on child mortality rate and examine the influence of government external debt (EXD) on LEXP and child mortality rate in Nigeria. Annual time series data were sourced from Central Bank of Nigeria Statistical Bulletin 2015 and World Bank Development Indicators 2017 and covered from 1981 to 2016. The data were subjected to both descriptive analysis and dynamic regression technique of autoregressive distributive lag (ARDL) model with the aid of Eviews 9.0 econometric software. Among key results of the study were the evidence of significant positive impact of ODA on LEXP, poor contribution of ODA to reduction in child mortality rate and simultaneous deterioration of ODA's impact on LEXP and child mortality rate in the presence of incurred external debt. The above key findings led to the study's conclusion and recommendations, which includes that ODA could be useful in government's effort to improve health outcomes in Nigeria. However, recipient of ODA calls for caution as the attached conditionality could reverse its expected benefits. Lastly, government spending on education (GSE) and health (GSH) were found to be relatively below recommended benchmark by United Nations Educational, Scientific and Cultural Organisation (UNESCO) and World Health Organisation (WHO), hence the need for improvement.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

There is growing international awareness that poverty anywhere is dangerous to prosperity everywhere and prosperity anywhere must be shared everywhere. Hitherto, foreign aid was used to 'woo' elites and thus influence the affairs of the third world countries (Krueger, 1997). However, such is not the case now as developed nations have further appreciated the importance of poor countries to global security. They have also begun to understand that persistent poverty makes developing countries vulnerable to insecurity and other threats (Krueger, 1997). Consequently, donor countries have begun to mobilize additional resources for the needs of developing countries. In a 1970 resolution, the United Nations General Assembly specified that rich countries should aim to give 0.7% of their GNP to poor countries in the form of official development aid (ODA). Several donors have pledged to reach the United Nation's target level (0.7 percent of donor's gross national income) for Official Development Assistance (ODA) over the next decade and others have begun to significantly increase their commitment for development assistance. Based on new pledges and greater commitments to development assistance from donor nations, there is a possibility of significant scaling of foreign aid resources far beyond the current and past levels (Heller, 2005).

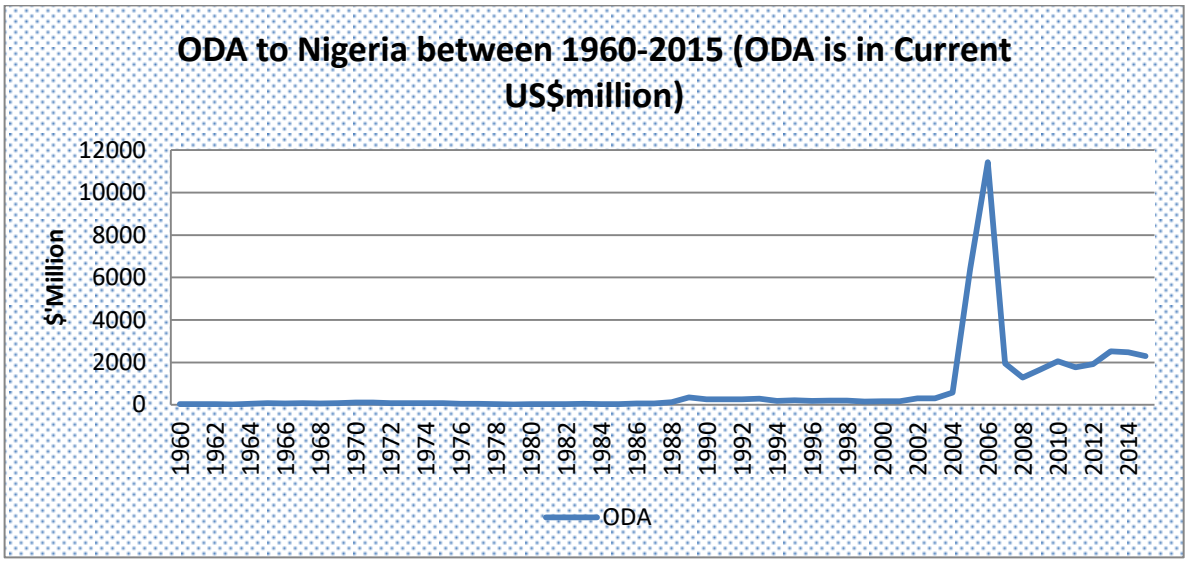
Thus, foreign aid continues to be increasingly important to many poor countries, especially in the area of health and poverty alleviation. According to the 2010 Millennium Development Goals Report, only in 2008, total official development assistance to developing countries targeting on health care was more than US$18 billion. This is owing to the serious human development and welfare issues, prevalent in such economies, and which is further worsened by their lack of adequate finance to tackle the problems, hence the understandable premium on foreign assistance. Despite the assistance, the serious health issues prevalent in these countries where aid is targeted remains unabated. The United Nations Children's Education Fund (UNICEF) stated that more than 10 million children under-five years of age die each year from preventable diseases in these countries. At the end of the year 2000, 34 million people were living with

HIV/AIDS (Human Development Report, 2001). These statistics reflect the extent of low human development in developing countries. Hence debates concerning the effectiveness of aid in improving development outcomes have been inconclusive. Aid critics (Moyo, 2009; Easterly, 2006; Winters, 2010) have in recent time voiced their concerns that aid is "dead".

Foreign Aid, as argued in the literature, is believed to have a positive effect on health and on the health care system. Although earlier, the health care system was believed to have little or no influence on decline of overall mortality (Nolte & McKee, 2003), recent studies now believe that the impact of health care system on health changed significantly not only because of the availability of the new pharmaceuticals and technologies but also due to more effective organization of the health care system (Vladescu, Marius, & Valentina, 2010). Multilateral organizations and individual countries played a crucial role in this process, especially in developing countries, by providing funds for medical education, disease prevention, administrative management of health care system, etc. (Shpak, 2012). Mishra and Newhouse (2009); Chauvet, Gubert and Mesple-Somps (2008); and Easterly (2006) had in their various studies found that foreign aid leads significantly to the decrease of infant mortality. Several other studies have also found foreign aid to impact on other correlates of health such as education (Michealowa & Weber, 2007), environment (Arvin, Dabir-Alai and Lew, 2006), avoidable mortality (Shpak, 2012).

The amount of foreign aid and official development assistance (ODA) received by Nigeria has varied over the years. For instance, the amount Nigeria received decreased from $108million in 1970 to $26million in 1979. It later rose to $344million in 1989, before plummeting again to $189million in 1996. The graph below shows the amount of ODA (in $'million) in Nigeria from 1960-2015).

Figure 1.1: Graph of ODA to Nigeria between 1960-2015 (Current US$ million)

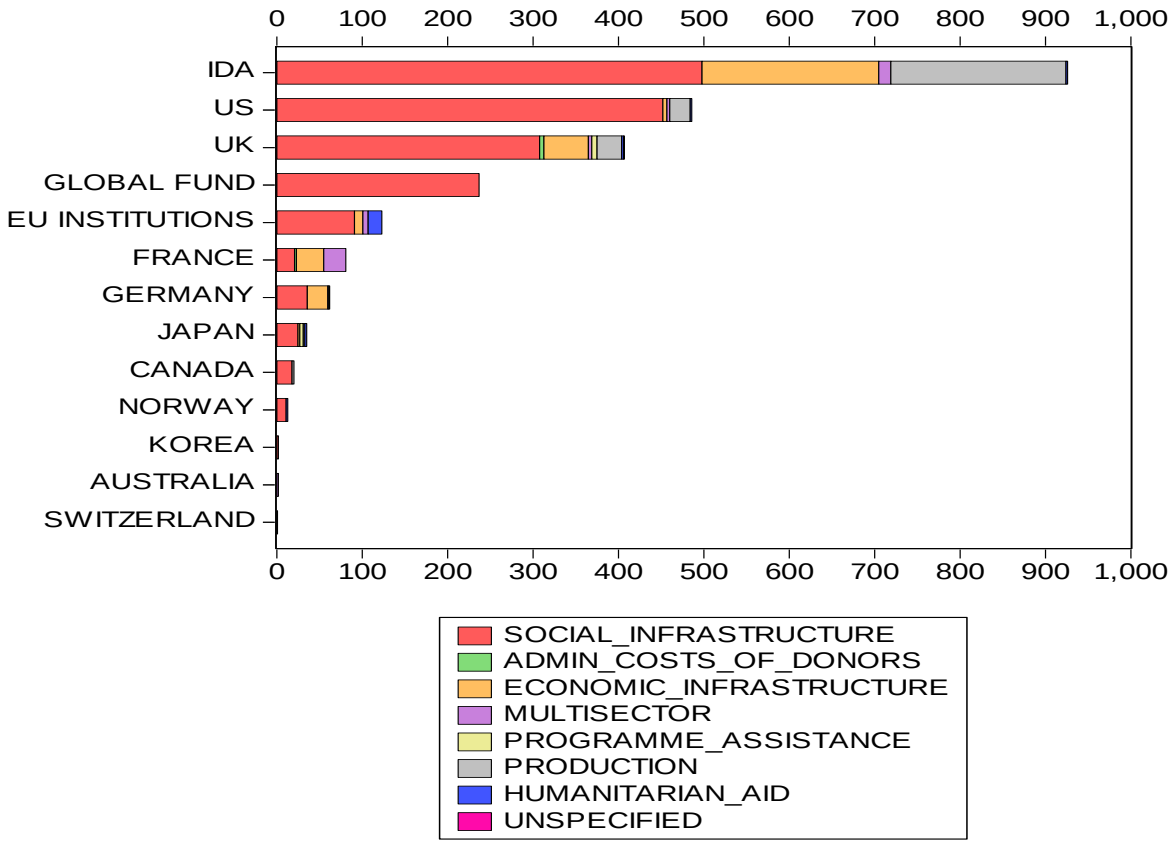


Source: World Development Indicators (WDI, 2016)

The tall spike in Figure 1.1 shows the value in 2006 when it hit $11,428million, although the value decreased after the phenomenal amount in 2006 to about $1290million in 2008, perhaps due to the global financial crises, as many of the Donor Countries were affected. However, the amount since after then has been fairly significant, and as at 2014, it was about $2,476million.

Nigeria receives aids from some DAC (Development Assistance Committees) and non-DAC countries such as the United States, UK, Germany, and Japan; and from multinational organizations like International Development Association (IDA), Global Fund, the World Bank, and the European Union. The IDA and the United States are the major contributors of ODA in Nigeria. Figure 1.2 shows the net disbursement of ODA to various sectors in Nigeria by the country's major donors. The data is for the year 2014.

Figure 1.2: Net Disbursement of ODA to various sectors in Nigeria in 2014 (Current US$ million)



Source: OECD 2016

As clearly depicted in the chart above, most of the ODA into Nigeria has been channelled to the development of social infrastructure. At least in 2014 alone, about 54percent of IDA's contribution (that is $498million), was channelled to social infrastructure development. The US and the UK allocated over 93 percent and 76 percent of their contribution to the same sector respectively (about $452million and $308million respectively). 100 percent of the Global Funds aids was dedicated to the sector, and that was about $237million. Significant amount of the ODA, especially from France, IDA, UK, US, and Germany has also been channelled to other sectors like Production and the Economic Sector.

The ODA received in Nigeria goes directly to the ministries, department or agencies (MDAs) that use the fund. The aid funds are channelled to the target ministries which then channel them accordingly into such intended sectors like Health, Education, Agriculture, Banking and Finance,

Infrastructure, and many other sectors of the economy. ODA is also channelled into servicing the debt of the nation as can be seen in the table below.

Table 1.1: Sectoral Allocation of ODA in Nigeria (Current US$ million)

Year	Debt Servicing	Basic Health	Basic Education	Health, General	Agriculture	Other Social Infrastructure	Population policy & Reproductive Health	Energy
2000	-	6.98	2.35	0.07	0.1	2.83	2.56	0
2001	-	26.01	3.63	2.18	2.54	3.73	9.83	0.01
2002	-	35.92	0.22	0.3	0.49	10.57	35.14	1.04
2003	-	21.09	0.65	0	0.74	15	16.8	0.74
2004	4,149.33	18.37	1.83	0.28	0.44	12.77	61.88	0.08
2005	11,107.95	38.2	2.39	0.88	0.36	19.57	33.04	1.63
2006	668.85	31.66	3.1	3.59	10.91	16.22	136.58	1.9
2007	0	74.97	2.98	1.04	2.44	12.87	140.18	1.15
2008	0	84.7	5.4	2.38	0.43	16.39	200.95	0.98
2009	0	321.87	7.01	11.97	5.92	6.63	228.55	2.84
2010	18.25	70.63	8.77	5.3	1.72	5.82	231.08	2.55
2011	0	119.37	5.69	14.57	3.28	10.74	224.78	20.84
2012	0	315.32	17.18	13.12	10.66	11.86	278.7	44.16
2013	0	318.03	15.42	9.55	29.87	13.56	523.7	15.2

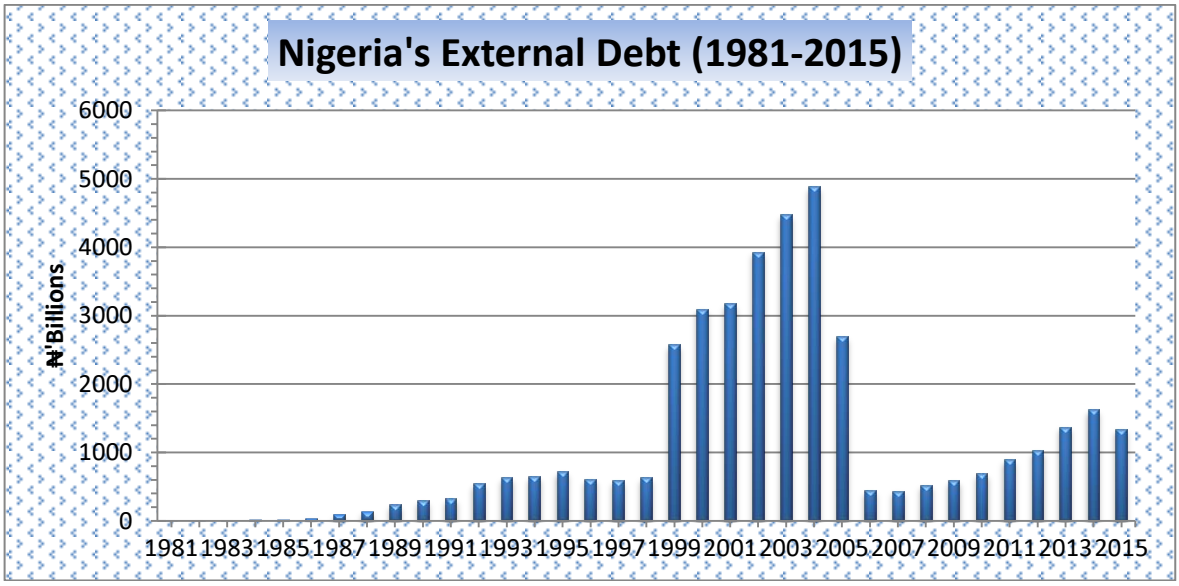
Source: OECD (Organization for Economic Cooperation and Development) 2016

Thus, Basic Health and Population policy and Reproductive Health have consistently had a significant share of the ODA received over the years. However, a huge amount of aids in Nigeria has been dedicated to servicing her debt. This is especially noticeable in 2005 and 2006, where over 97 percent and 98 percent of the total ODA received were channelled to debt servicing.

Nigeria debt is another cankerworm that bedevils the country's developmental goals. The profile of external debts in Nigeria has shown an upward trend. Nigeria's external debt increased from ₦2billion in 1981 to about ₦328.5billion in 1991 and to ₦3.2trillion in the following decade. However, it can be seen from figure 1.3 below that the amount of debt rose sharply between 1998 and 1999, increasing from ₦633billion to a whooping ₦2.6trillion. This is a very significant increase, and the value increased further in subsequent years, and by 2004 it was already approximately ₦5trillion naira, more than tripling the annual budget of the country for that year! But for the over ₦4trillion of aid that was used in servicing the debt in 2004, the country's external debt would have hit ₦7trillion. Over ₦11trillion of aid to the country was

further used to service debt in the following year. Hence, by 2006, the debt was reduced to ₦451.5 billion (Central Bank of Nigeria, 2016).

Figure 1.3: Nigeria's External Debt (1981-2015)



Source: CBN Annual Statistical Bulletin (2016)

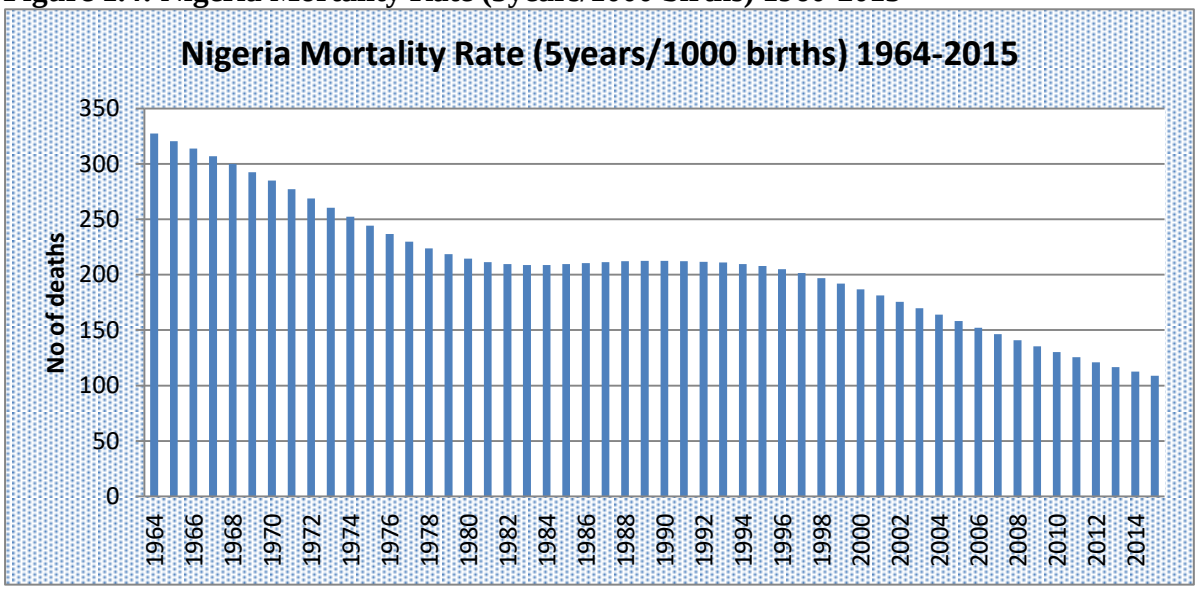
The rising costs of debts and the ever increasing interests that are to be paid for these debts are cog in the wheel of the nation's progress. This is even compounded by the misappropriation of funds from these debts, the use of these loans for the recurrent expenditures as against capital expenditure, and the diversion of these loans from the main purpose for which they were borrowed. Unfortunately, as evidenced in table 1.2 above, these loans are sometimes being serviced with aid advances.

1.2 Statement of the Problem

Despite various Aid interventions, Nigeria remains poor and underdeveloped. As aptly captured by Eregha (2009), the country occupies most of the bottom places in income per capita with large percentage of the population living in poverty and the economy is characterized by low life expectancy, high AIDS prevalence, low level of literacy, infant mortality. The expectation is that aid should induce the growth and, of course, the development of the recipient nation. However, it has not been realized in Nigeria. This could be because a large fraction of aids to Nigeria goes to

consumption rather than productive activities which crowd-out domestic savings and investment. Nigeria remains poor and undeveloped especially in the area of social infrastructure, which has received the highest attention from donors. Under-five mortality rate is still very high in Nigeria, with its rate still at 109 per 1000 live births as at 2015. The graph below shows the country's under-five mortality rate per 1000 live births from 1960 through 2015.

Figure 1.4: Nigeria Mortality Rate (5years/1000 births) 1960-2015



Source: WDI (World Development Indicator) 2016

Mortality rate marginally decreased from 214.4 in 1980 to 212.5 deaths per 1000 children under the age of 5 in 1990. It decreased significantly to 186.8 in 2000 and further to 130.3 in 2010. As at 2015, under-five mortality rate is 108.8 deaths per 1000, which is still considered very high. Although the value can be said to have decreased significantly, it should have done better compared to other African countries who received even less ODA than Nigeria. Prevalence of HIV increased from 1.2 percent in 1990 to 3.5 percent of the population in 2010. The Table below compared Nigeria with some selected African Countries on some key health indicators.

Table 1.2: Selected Key Health Indicators for some African Countries and Nigeria

Country	1990			2000			2010			2014		
	LE	**IMR**	**NMR**	**LE**	**IMR**	**NMR**	**LE**	**IMR**	**NMR**	**LE**	**IMR**	**NMR**
Nigeria	46.1	212.5	50.4	46.6	186.6	48.3	51.3	130.3	38.2	52.8	108.8	34.3
Ghana	56.8	127.4	42.3	57	100.7	366.4	60.6	74.7	31.9	61.3	61.6	28.3
Liberia	47.2	255	57	52.4	181.8	43.7	59.4	89.3	27.6	60.8	69.9	24.1
South Africa	62.3	59.9	20.4	55.8	75.3	16	54.4	53.8	11.7	57.2	40.5	11
Ethiopia	47.1	204.6	60.9	51.9	145.1	48.4	61.3	75.7	32.5	64	59.2	27.7

Source: WDI, 2016.

NB: LE=life expectancy (years); IMR=Infant Mortality Rate (Under-five/1000 births); NMR=Neo-natal Mortality Rate (per 1000 live births).

Albeit Nigeria receives higher value of ODA than the other four countries, she still records the worst health statistics as depicted in the Table 1.2 above. Life expectancy merely improved from 46.1 years in 1990 to 52.8 years in 2014, representing a meagre 14.5 percent improvement. This result is doubled and dwarfed by the figure for Liberia which had almost similar value in 1990 (about 47.2 years) but rose to 60.8years in 2014, representing a 28.8 percent increase, and this is despite the uprising that had bedevilled the country. Ethiopia recorded the highest improvement in life expectancy for the period with a 35.9 percent increase from 1990. Ethiopia also recorded a 71.1 percentage decrease in Infant mortality rate, from 1990 to 2015 (from 204.6 deaths to about 59.2 deaths in about 1000 children that are below the ages of 5). Same was not the story for Nigeria, as she merely reduced her mortality rate to 108.8 deaths in 2015, from 212.5 deaths recorded in 1990. This represents a 48.8 percent decrease. In fact, the table shows that Nigeria has the worst health statistics. Yet, it receives the highest aid.

One would wonder if these ODA received in Nigeria were utilized for the purpose or channelled to those sectors which could spur development and improve health. One worrisome fact is that a significant amount of the ODA in Nigeria is dedicated to servicing the debt of the country. Alabi (2014) reported that Nigeria utilized 66 percent of her ODA in 2009 to service her debt. He thus stated that the impact of aid in Nigeria that used more than 66 percent of ODA for debt servicing may be different from country like Ghana that used only 7.5 percent for debt service and country

like South Africa that serviced no debt with her ODA. Although Table 1.2 above shows that huge fraction of ODA to Nigeria has been channelled to debt servicing, there is also no denying the fact that a consistently significant proportion has also been dedicated to viable sectors such as health and education. Yet, the country is still characterized by poor standard of living and low Human Capital Development Index.

Aid effectiveness has been a subject of debate to many economists and different arguments on the topic has been adduced. The benefit of aid has been under severe scrutiny. Several observers argue that a very large portion of foreign aid flowing from developed to developing countries is wasted and only increases unproductive public consumption. Poor institutional development, corruption, inefficiencies and bureaucratic failures in the developing countries are always cited as reasons for these results (Alesina and Dollar, 1998).

According to McGillivray, et al. (2006), there are four main views on the effectiveness of aid: aid has decreasing returns, aid effectiveness is limited by external and climatic conditions, aid effectiveness is influenced by political conditions and aid effectiveness depends on institutional quality. The question on the role of institutions have come up in several debates on economic development and is fast gaining grounds as aid has been said to be more effective in high quality public institutions (Burnside and Dollar, 2000).

However, in a view held by Kanbur (2000), "the main reason for this "aid-fatigue" can be attributed to the fact that aid has failed to some large extents as there have been reports of corruption and poor administration, with aid management tying up valuable resources in recipient countries". Some researchers have argued that a large portion of foreign aid flowing into the country is wasted on unproductive public consumption, corruption and inefficiencies and this is as a result of poor institutional quality and bad governance.

More recent studies on the impact of foreign aid on mortality have mainly focused on infant mortality (Mishra & Newhouse, 2009; Burguet & Soto, 2012). Similarly to the economic literature, empirical evidence suggests that the effects of foreign aid on mortality are inconclusive. For example, Williamson (2008) found that foreign aid is ineffective in improving overall health. However, Mishra and Newhouse (2009) found that overall aid had no impact on

infant mortality while health aid was significant. Powell-Johnson et al. (2006) also found a positive relationship between mortality and Official Development Assistance (ODA). Considering the significant international attention paid to the Under-five mortality rate issue by the international community and donor agencies in recent years, the paucity of empirical evidence linking aid and infant mortality is surprising. This study aimed to provide some of this evidence and examine the impact of foreign aid on life expectancy and under-five mortality rate and how this impact are influenced by Nigeria's external debt.

Furthermore, foreign aid is sometimes used to service debt, especially in Nigeria. However, the debt keeps increasing, and thus makes it even more probable that more aids would be used in servicing these debts. After utilizing over $11billion to service debt in 2006, thereby reducing the countries debt to about ₦451billion, the debt has started to escalate again, and was ₦1.7trillion in 2014, just eight years later. Consequently, there continues to exist the pressure to fall back on aid for rescue. This has a negative impact on how aid would impact on its set objective in the country. Reduction in aid due to debt servicing would obviously affect what aid can achieve such as reduction in infant mortality and life expectancy. Hence it is exigent to consider debt in the study of aids effectiveness. This has been the bane of many studies as they have conspicuously overlooked this very important fact.

Alabi (2014) explained that a country specific study of the impact of foreign aid instead of cross-country studies would yield a more robust result. Perhaps, this has been the undoing of other studies which had employed a cross-sectional data, and found aids to be ineffective in most cases. Hence this study would fill this gap by studying the effect of official development assistance to health outcome in Nigeria.

1.3 Research Questions

In an attempt to solve the begging issues critiqued above, and fill the observed gap, the study is poised to answer the following questions;

1. How does ODA affect life expectancy in Nigeria?
2. What is the impact of ODA on infant mortality rate in Nigeria?

3. How does government external debt influence ODA's impact on life expectancy and infant mortality rate in Nigeria?

1.4 Research Objectives

The primary objective of this paper is to estimate the impact of ODA on health outcome in Nigeria. Thus, this study specifically aims to:

1. Determine the effect of ODA on life expectancy in Nigeria.
2. Estimate the impact of ODA on infant mortality rate in Nigeria.
3. Examine the influence of the interaction of government external debt and ODA on life expectancy and infant mortality rate in Nigeria.

1.5 Research Hypotheses

The following hypotheses were tested as stated below;

$H0_1$: ODA has no significant effect on life expectancy in Nigeria.
$H0_2$: ODA has no significant impact on infant mortality rate in Nigeria.
$H0_3$: The interaction of government external debt and ODA has no significant influence on life expectancy and infant mortality rate in Nigeria.

1.6 Significance of the Study

This study would bring to fore, the amount of aids the country has received for the period, and thus try to prove the importance of aid to Nigeria's development. The recommendations from this study would help the federal government develop policies to make aids and other form of assistance to the country more effective and properly streamlined. Ministries, Agencies, and Departments through which these aids are deployed would also find this work useful, as it would serve as a scorecard on how they have effectively utilized the aid fund, and thus provide them with a clue on the best adjustment to make in other to get maximum benefit.

This study would also be useful to Donor countries and Agencies, who would be able to determine how their assistance impacted on Nigeria's development, and how they could make it more effective and efficient. This study would also suggest ways that ODA could be deployed to achieve the optimal impact on health outcome and overall development.

1.7 Scope of the Study

This study is focused on the impact of foreign aid on mortality rate and life expectancy in Nigeria. The study utilizes time series data from 1981 to 2016 from Central Bank of Nigeria Statistical Bulletin 2016 and from World Bank's World Development Indicators 2017. The effects of public spending on health, public spending on education, per capita gross domestic product, population growth rate, external debt and official development assistance on life expectancy and under-five mortality rate were estimated.

1.8 Structure of the study

This study is comprised of five chapters. Chapter one presented the background of the study, statement of the problem, objectives of the study, research questions and hypotheses, significance of the study, scope and structure of the study. Chapter two centred the review of related literature. It was further divided into four main parts which include conceptual framework, theoretical literature, empirical literature and limitation of previous studies. While the conceptual framework defined the key concepts in the study, the theoretical framework discussed several theories related to demand for healthcare provision. Chapter three of the study dwelt on the research methodology employed in evaluating the relationship between official development assistance (ODA) and life expectancy on one hand and ODA and under-five mortality in Nigeria on the other hand. The chapter was segmented into theoretical framework upon which the study was based, model specification, estimation procedure and data source and software for estimation. Chapter four was on presentation of result, analyses, evaluation of hypotheses and policy implications, while chapter five presented the summary, recommendation and conclusion of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Framework

The following concepts- Official Development Assistance (ODA), multilateral aid, bilateral aid, aid fungibility, aid tying, health aid, life expectancy, and mortality rate- appear prominently in this study and were defined as follows:

(a) Official Development Assistance

In most scholarly and policy discussions, the terms aid, development aid and foreign aid refer to Official Development Assistance (ODA), data about which are collected and published by the Development Assistance Committee (DAC) of the OECD. According to the Committee's criteria, financial assistance is classified under ODA if it is disbursed by official agencies, has the promotion of economic development and welfare as its main objective, and involves grants or concessional loans with at least a 25 percent grant element (Cassen et al., 1994). Based on the identity of the immediate donor, ODA can be classified as bilateral or multilateral. For the purpose of this analysis, ODA was presented as lump sum as provided by Development Assistance Committee (DAC) of the OECD. According to Martinez-Alvarez and Acharya (2012), there are four modalities of giving aid- Project aid, Programme aid, Sector-Wide Aid Programme (SWAP), and Budget complement, and the way in which aid is distributed may have different implication and effect.

(b) Bilateral Aid

Bilateral assistance is administered by agencies of donor governments. They are financial assistance rendered to a country by the government of another country. Nigeria receives bilateral assistance from countries such as Japan, USA, Italy, China, and Germany.

(c) Multilateral Aid

Multilateral aid is funded by wealthy countries and allocated by international financial institutions, such as the World Bank, the Regional Banks, or the United Nations Development Programme. They are those financial assistance availed to a country by such multinational organizations like World Bank, Africa Development Bank (AFDB), DFID, UNDP, etc. Although in most cases, the resources used for this assistance are contributed by individual countries, they are not administered by them.

(d) Aid Fungibility

Aid fungibility is the process by which the aid recipient government offsets donor spending for a particular purpose by reducing its own expenditures on the same purpose. Therefore, aid substitutes rather than supplements local spending (Foster & Leavy 2001). Although the data available on health sector spending in low-income countries is often scarce and of bad quality, several studies have found that it is particularly affected by fungibility (Lancaster 1999). Fungibility is often highlighted as a cause of aid ineffectiveness, as donor funds substitute rather than complement recipient governments' budget for health, and some studies consider it synonymous with corruption (Lahiri & Raimondos-Moller, 2004). When isolating the impact of DAH (Development Assistance for Health) it is often asked whether it is legitimate to expect that the recipient sees the budget provided for health or development is as solely for the purpose of additional amount of expenditure on health. Thus US$100 million for health yields a health budget US$100 million above what the recipient would have planned on spending. This is known as the issue of fungibility. If donors earmark aid by specifying it as DAH then they expect recipient public expenditure on health should rise by exactly that much from the level planned. However, the exact level of planned health spending is very difficult to observe in this case. Thus, of greater importance is the measurability issue around fungibility.

(e) Aid Tying

Sometimes, aid is tied to some conditions which are put forth by the donors and which the recipient must have to fulfil. These are common with multilateral aid. Such conditions could

come as a restriction on how to spend aid, and on how the assistance can be used. The donor country could tie the assistance to the purchase of the donor country's goods, usually called procurement tying, which prevents the recipient country from sourcing for such goods in the cheapest markets and at the available prevailing price. Also, the donors could tie assistance to cover the foreign exchange costs of an unidentifiable project. Aid tying reduces the real worth of assistance because it prevents recipients from shopping around to find exactly the goods or services they want to buy at the cheapest markets. There are many other costs of tying apart from the inability of the recipient to buy from the cheapest markets - the project for which the assistance is given might not fit perfectly into the recipient's development programme; the technology might be inappropriate; the donor may raise the import content unnecessarily, the suppliers may exploit knowing that they have a captive consumer, and servicing over the life of the investment may be expensive.

(f) Health Aid

This is the amount of aid channelled specifically to the health sector. In Nigeria, Health aids are channelled under basic health, general health, population policy and reproductive health, and social infrastructure.

(g) Life Expectancy

Life expectancy is a measure of the length of life expected to be lived by an individual at birth. Improvement of Life expectancy to at least 70 years by 2020 is one of Nigeria's health policy targets.

(h) Infant Mortality

Infant mortality rate is the number of infants dying before reaching one year of age, per 1000 live births in a given year.

(i) Under-five Mortality Rate

Under-five mortality rate is the probability (per 1000) that a new born baby would die before reaching the age of five, if subject to current age-specific mortality rates. Maternal and child mortality in particular, is not the only indicator to measure the impact of aid on health. Nevertheless, this indicator is widely used as the best proxy for needs and results. For instance, the MDGs include the reduction of under-five mortality rates as a target in itself. Mortality is easier to measure and less subject to variation of definition than other measures of health. The reduction in mortality is a common output of health interventions that may be somewhat diverse in their immediate purposes, and so it offers grounds for comparing performance. Finally, child mortality is arguably more directly related to health interventions than adult mortality, and so should reflect the impact of those interventions more clearly. Thus, bearing in mind that child mortality is but one of the indicators of health, we investigate whether foreign aid has been able to reduce it significantly.

2.2 Theoretical Literature

The following theories were reviewed- Modernization theory, Dependency theory, Dual-Gap Model, Organizational Change Theory, the Life Course Model and Social Determinants of Health Framework

(a) The Modernization Theory

Modernization refers to a model of a progressive transition from a 'pre-modern' or 'traditional' to a 'modern' society. The theories of this school of thought put forward that each society can develop from traditionalism to modernity, and that those that make this transition follow similar paths. According to this theory, the more modern states are wealthier and more powerful, and their citizens freer, with a higher standard of living. One way to begin a study of this area of economics is to look at the early work of Walt Rostow. He developed stages of growth model. We could debate growth and development for quite a while but it is a base from which to begin. In his original model he identified five stages through which developing countries had to pass to reach an advanced economy status and they include: (1) Traditional society, (2) Preconditions for

take-off, (3) Take-off, (4) Drive to maturity, (5) Age of high mass consumption. He argued that economic development could be led by certain strong sectors; a country needed to follow some rules of development to reach the take-off: (1) The investment rate of a country needs to be increased to at least 10% of its GDP, (2) One or two manufacturing sectors with a high rate of growth need to be established – through this value could be added and incomes generated at both the micro and macro levels of the economy (3) An institutional, political and social framework has to exist or be created in order to promote the expansion of those sectors – for some this had led to a political elite manipulating inward flows of development money and not always directing the funds to their intended recipient.

Life Course Model and Social Determinants of Health Framework

Infant mortality is a complex problem that can be more effectively understood and addressed using the Life Course Model. This includes a framework for how social determinants of health impact health outcomes for individuals, as well as whole groups of people. Life course looks at health as an integrated continuum and suggests that a complex interplay of biological, behavioural, psychological, social, and environmental factors contribute to health outcomes across the course of a person's life. It builds on recent social science and public health literature that posits that each life stage influences the next and that social, economic, and physical environments interacting across the life course have a profound impact on individual and community health. Social determinants of health—often defined as the circumstances in which people are born, grow up, live, work, and age—shape individual behaviour and the choices that are available to individuals for improving health.

Some individuals, and specific groups of people, do not have the same access to health care and have limited choices for improving health. Access to health care and healthy behaviours are important, but social determinants of health can have a greater impact on health and birth outcomes. These factors can adversely impact health when nutritious food, transportation, safe housing, education, liveable and/or sustainable wages are not available or are very difficult to obtain. Persistent health inequities among people of colour and/or those living in poverty are

directly related to their living conditions and personal experiences, and these factors must be addressed in any plan designed to improve birth outcomes of all people.

To eliminate these inequities, experts in infant mortality across Michigan are working to understand the contributing health determinants from historical, social, and cultural perspectives for each population group where the rate of poor outcomes is higher than it is for more advantaged populations. Partnerships and strategies to address social determinants of health would take an interdisciplinary approach including partners in public health, housing, employment, and the court system to improve the support systems for those most adversely impacted by socioeconomic and racial disparities. Lack of critical resources and adequate support systems over a life span and over many generations creates stress for individuals, and groups of people. This historic and longstanding chronic stress can lead to chronic health conditions among individuals and demonstrable inequities across entire populations. The Life Course Model provides a framework to analyse the origins of poor birth outcomes and the inequities in infant mortality through a population-based focus that is rooted in social determinants and social equity. There are four concepts used in this analysis:

Structural Change and Patterns of Development (Chenery's Model)

This model was developed by Hollis B. Chenery and colleagues in the 1970's. Like the Lewis theory of 1954, the patterns-of-development analysis of structural change focuses on the sequential process through which the economic, industrial, and institutional structure of an underdeveloped economy is transformed over time to permit new industries to replace traditional agriculture as the engine of economic growth. However, unlike the Lewis model and the original stages view of development, increased savings and investment are perceived by patterns- of-development analysts as necessary but not sufficient conditions for economic growth. Hollis B. Chenery and his colleagues, in their empirical studies using both cross-sectional (among countries at a given point in time) and time-series (over long periods of time), of countries at different levels of per capita income were able to do the identification of several characteristic features of the development process. These included the shift from agricultural to industrial production, the steady accumulation of physical and human capital, the change in consumer

demands from emphasis on food and basic necessities to desires for diverse manufactured goods and services, the growth of cities and urban industries as people migrate from farms and small towns, and the decline in family size and overall population growth as children lose their economic value and parents substitute child quality (education) for quantity, with population growth first increasing, then decreasing in the process of development. The major hypothesis of the structural-change model is that development is an identifiable process of growth and change whose main features are similar in all countries. One limitation to keep in mind is that by emphasizing patterns rather than theory, this approach runs the risk of leading practitioners to draw the wrong conclusions about causality. Empirical studies on the process of structural change lead to the conclusion that the pace and pattern of development can vary according to both domestic and international factors, many of which lie beyond the control of an individual developing nation. Yet despite this variation, structural-change economists argue that one can identify certain patterns occurring in almost all countries during the development process. And these patterns, they argue, may be affected by the choice of development policies pursued by LDC governments as well as the international trade and foreign-assistance policies of developed nations.

The Two Gap Model

This theory supports the Harrod-Domar model that investment increases growth. This occurs when there is a gap between import requirements for a given level of production and foreign exchange earnings. This theory states that foreign aid fills the gap of required import spending and actual export earnings. It is also assumed that both imports and exports are linearly dependent on income and there is a target rate of income. Even though the saving investment gap would be small, a larger trade gap would undermine productive investment due to limited imports of capital goods needed for investment. It is argued that either the trade gap or the foreign exchange gap is binding in developing countries and foreign aid helps to fill either of the gaps. Foreign aid would not increase investment if there is little or no incentives for investment and if the productivity of such investments is questionable since the flows would go to consumption rather than investment (White, 1992), Conchesta (2008) stated that apart from the two gap model explained, there are factors limiting growth in aid dependent countries and they

include low levels of technology, education, poor infrastructure, increased growth in population, interests paid on debts and political instability evident in some developing countries. This model has been criticized on the grounds that the problem of developing countries is not necessarily the insufficiency of domestic savings or foreign exchange gap but the inadequacy of policies regarding trade and foreign exchange. However, the theory is relevant especially in this study as it tries to bring to the fore that investment gap in the health sector in Nigeria could be complemented by foreign aid.

Three Gap Model

The three-gap model, refers to the saving- investment gap, trade gap and the fiscal gap (Conchesta, 2008). The fiscal gap refers to a gap between government revenues and expenditures although the fiscal gap is a subset of the saving gap. Due to this fiscal gap, government efforts to stimulate private investment may be restrained when government resources for investment and imports are among other things, a result of debt service. There is enough evidence showing that government expenditures in Sub-Saharan African countries have been curtailed by foreign debt service despite different initiatives. Thus, the closing of this fiscal gap may be facilitated by external resources directed to the government budget.

In contrast, if aid is in form of a loan and not a grant, it may have adverse implications for savings, foreign exchange and fiscal gaps in the long-run and for the macroeconomic performance in general. For example, debt payment creates a further demand on foreign currency and government revenue in general. Also, debt service can result in the reduction of import capacity of the government thus reducing government investment, particularly in infrastructure, education and health facilities, a factor which is likely to affect negatively private investments (Conchesta Kabete, 2008). Snowdon (2009) however criticized that foreign aid most times would not boost total savings and would in fact reduce domestic savings.

Dependency Theory

The evolution of dependency theory is really as a natural progression from structuralism. The Structuralists believed that development would not be possible unless a strategy of de-linking

and import substitution was followed. External links with the developed parts of the globe would be needed. They did not appreciate the domestic dynamics that are part of all economies – developed or developing. Those promoting this theory believed that resources flow from the 'periphery' of poor and underdeveloped states to a 'core' of wealthy countries, which leads to accumulation of wealth in the rich states at the expense of the poor states. They accepted that not all societies passed through similar stages of development. More traditional states have certain unique features, structures and institutions of their own and are the weaker with regard to the world market economy. These theorists argue that underdeveloped countries remain economically vulnerable unless they reduce their connectedness to the world market. The theory states that poor nations provide natural resources and cheap labour for developed nations – a process which allows the developed countries to have a standard of living they could not otherwise enjoy. Richer nations would try to maintain this superior quality of life and want the developing world to remain dependent on the developed. This, in turn continues the poverty cycle as the poorer countries are highly integrated and dependent on the richer economies.

Basic Needs Theory

The ILO started this in 1976, feeling that other theories had not achieved any significant reduction in the inequality existing between rich and poor nations. It attempted to construct an accepted minimum level of resources necessary for long-term physical well-being – this gave rise to what we now know as a poverty line - the amount of income needed to satisfy those basic needs. Applied to development assistance it attempts to determine what a society needs for subsistence, and for poor population groups to rise above the poverty line. Supporters of basic needs argue that elimination of absolute poverty is a good way to make people active in society so that they can provide labour more easily and act as consumers and savers. Though attractive to suggest it has tended to be seen as rather naïve and unlikely to achieve little more than a reduction in extreme poverty but in doing so pays little attention to the investment needed to move beyond this.

Human Development Theory

This theory has a number of core origins, these include: ecology, sustainable development, feminism and welfare economics. It wants to avoid normative politics and is focused on how social capital and instructional capital can be deployed to optimize the overall value of human capital in an economy. Much of the theory focuses on human capabilities: what people can do and that determines their well-being – it is not simply based on income – is it from this that the Human Development Index emerged, the human-focused measure of development

The False-Paradigm Model

This model attributes underdevelopment to faulty and inappropriate advice provided by well-meaning but often uninformed, biased, and ethnocentric international "expert" advisers from developed-country assistance agencies and multinational donor organizations. These experts offer sophisticated concepts, elegant theoretical structures, and complex econometric models of development that often lead to inappropriate or incorrect policy. According to this argument, leading university intellectuals, trade unionists, high-level government economists, and other civil servants all get their training in developed-country institutions where they are unwittingly served an unhealthy dose of alien concepts and elegant but inapplicable theoretical models. Having little or no really useful knowledge to enable them to come to grips in an effective way with real development problems; they often tend to become unknowing or reluctant apologists for the existing system of elitist policies and institutional structures. In the end, advocates argue that desirable institutional and structural reforms, many of which we have discussed, are neglected or given only cursory attention.

The Transfer Problem/Dutch Disease/Resource Curse

Development aid is an 'external rent' that enters into the domestic economy. Hence, the study used the theory that before 1950 was discussed as the 'transfer problem'. Since then, it has mainly been discussed in connection with resource rents received from exported resources. Here, the theory is known as the Dutch Disease, or more ominously as the Resource Curse. The key result is that while a transfer certainly does increase the income level of the recipient, it is "paid for" by a decrease in the growth rate, making it less of an advantage in the longer run than it appears at first. The resource rent received by the Less Developed Countries (LDCs) is a couple

of times larger than the aid received, and it is even more unequally distributed. The typical natural resource deposit has a long exhaustion time, but resource prices fluctuate to give considerable variation over time; whether aid or resource rents fluctuate more is unknown. Both resource rent and development aid are received primarily by LDC governments, and they are used to finance public spending in much the same way. To the extent that development aid is fungible, it makes virtually no difference if the rent received comes as development aid or as a resource rent. Hence, the models used in the analysis should be similar, but we have found very little exploration of the links between the (Aid Effectiveness Literature) AEL and the Dutch Disease literature.

2.3 Empirical Literature

There are a lot of literature on aid and its impact on various sectors of the economy. A number of these works have studied the impact of aid on health. Some of these works have even tried to specifically study the impact of health aid on health outcome. These studies are reviewed below. They are grouped under the following thematic research areas. Aid is used to represent the different types of aid which is also inclusive of Total aid.

- Aid and Health outcomes
- Aid and Population Growth/ Fertility
- Aid and Poverty /Income
- Aid and Education
- Aid and Government Size

Aid and Health outcomes

Mary and Gomez-y-Paloma (2015) estimated the aggregate impacts of total and sector aid on the neo-natal, infant and under-five mortality rates using fractional estimation techniques for panel data controlling for time-invariant country-specific effects, measurement errors and endogeneity. Using annual data from 2002 to 2012 for the relevant countries, they confirmed that total aid has no impact on child mortality rates. They showed that sector aid can be effective, but not all sector-specific aid inflows are equally important. In particular, they found some sparse evidence

that health aid inflows significantly decrease the infant and under-five mortality rates. They also found strongly robust evidence that aid specific to agriculture has significantly large impacts on infant and under-five mortality rates. A 1-dollar increase per year in agriculture aid per capita would result in a decrease in the infant mortality rate by almost 1 death. They also found mixed evidence that health aid reduces child mortality but robust evidence that agricultural aid has large effects. They recommended that aid policies aimed at reducing child mortality in developing countries should recognize the increased importance of targeting the agriculture. This led to their suggestion that sector aid can be effective but not all sector-specific aid inflows are equally important.

Pearson, (2015) in his study used regression analysis done in 2 stages of the health development proxy statistics of under-five and maternal mortality rates in LDCs between the years 1990 and 2010. The study compared three pairs of states, which shared considerable similarities in the 1990s (Rwanda & Burundi; Benin & Togo; Mali & Niger), and observe their levels of health development over twenty years. Both under-five and maternal mortality rates displayed considerable levels of statistical significance and both show negative coefficient values, indicative of reduced mortality levels when confronted with higher levels of health development aid.

Bancham and Swiss (2014) studied the impact of foreign aid on maternal mortality. Using data from the Organisation for Economic Cooperation and Development, the World Development Indicators (WDI) from the World Bank, and the Institute of Health Metrics and Evaluation (IHME), the study analysed the effects of aid on maternal health in a sample of 106 low- and middle-income countries from 1996 through 2010. Two-stage, fixed effects panel regression models were used to examine the effect of several types of foreign aid on mortality levels. Their results showed that total foreign aid has a small but statistically significant negative effect on maternal mortality and that aid allocated to the reproductive health sector is associated with even larger reductions in maternal mortality. The study provided evidence that it is important to channel more donor assistance to reproductive health and the promotion of contraceptive use among women as it served as a tool to empower them and lead to reduction of maternal mortality.

Lim, (2014) based his study on the association between aid and infant mortality in Southeast Asia using balanced panel of seven (7) Southeast Asian countries consisting of 112 observations throughout 16 years from 1996 to 2011. The study which used time series- cross sectional data also used statistical method median and mean, and fixed effect estimation. He found that foreign aid does not have a significant effect on reducing infant mortality but rather an increase in GDP per capital and access to improved water source has both substantive and statistically significant effect on the reduction of infant mortality. Lim suggested that Foreign aid not reducing infant mortality could be as a result of Net ODA per capital not being disaggregated into different types of aid. Secondly aid is often given to developing countries that have authoritarian and often corrupt regimes. The limitation of this study is the unavailability of some data which might have contributed to the robustness of his research.

Bendavid and Bhattacharya (2014) quantified the relationship between health aid and changes in life expectancy and under-five mortality among aid recipient countries. They employed 140 aid-recipient countries for the period 1994 to 2010 for their study, using a cross-country panel data analysis of the relationship between longitudinal measures of health aid, life expectancy and under-five mortality rate. Using OLS on the 1st difference model developed and controlling for GDP per capita, urbanization and total fertility rate, they found that each one percent increase in health aid increased life expectancy by 0.24 months faster, and decreased under-five mortality by 0.14 per 1000 live births faster. The interaction variable between decade and health aid as included in the model showed that the association between health aid and health improvements have been strengthening over time, with the closest between 2000 and 2010. Thus, they inferred that an increase of $1billion in health aid could be associated with 364,800 decreases in under-five mortality. They concluded that foreign aid to health sector is related to increasing life expectancy and declining under-five mortality, and that returns to aid appear to last for several years and have been greatest between 2000 and 2010, possibly because of improving health technologies or effective targeting of aids.

Oyedele and Lawal (2013) studied the welfare implications of foreign aid in Nigeria using life expectancy at birth and household final consumption expenditure as proxies for welfare. They examined the effect of foreign aid on welfare levels in Nigeria for the period 1971 to 2010.

Employing a cointegration test and an error correction model, the study analysed the effect of official development assistance plus official aid and total bilateral aid on life expectancy at birth. The results show that official development assistance plus aid and total bilateral aid have no significant effect on life expectancy at birth in the long run and short run. Household final consumption expenditure per capita is not significantly explained by official development assistance plus official aid and total bilateral aid when foreign direct investment is included in the model. However, when foreign direct investment is excluded from the model, total bilateral aid becomes negatively significant. The study concludes that factors responsible for the insignificance and negative impact of foreign aid in the results could include the lack of democracy, political and selfish interests of foreign aid negotiators, corruption and misappropriation in favour of wealthy elites and not the poor.

Welander (2012) in his research analysed the relationship between foreign aid, globalization and health by estimating a fixed effects panel data model over 93 aid recipient countries between 1970 and 2009, using infant mortality as the proxy for health. Analysing the implications of this result using marginal effects indicated that aid is negatively associated with health at higher levels of overall globalization and that aid does not affect health at low or medium levels of globalization. Aid is negatively correlated with health in highly socially globalized countries, while the opposite holds when social globalization is low.

Shpak (2012) considered effectiveness of health targeted aid and the role of corruption level in performance of health care system which is motivated by the quality of the health care measured by avoidable mortality, which refers to all deaths that can be prevented or cured given available knowledge and technology in health care. The study sampled 34 developing countries covering the period of 1995-2009, thereby employing fixed effect methodology to estimate whether total aid and bilateral and multilateral aid separately has effect on avoidable mortality. Amazingly, the finding showed that health targeted aid does have positive effect on avoidable mortality elimination. Moreover, countries with high corruption level tend to distribute aid more effectively than those with low corruption level. He thus concluded that it is bilateral aid that seems to influence avoidable mortality level.

Yousuf (2012) examined the relationship between health aid and infant mortality, using data from 135 developing countries between 1975 and 2010. Using Dynamic panel specification, 2 stage least square equations and System GMM approaches, it was concluded that aid has a statistically significant and positive effect on infant mortality rate, as doubling of aid leads to an approximately 1.3% reduction in infant mortality rates. Thus, for an average aid recipient country, doubling per capita aid leads to a reduction of about 790 deaths per 1000 live births in a particular year. This effect, he felt in comparison to the set goals of the Millennium Development Goals, was small and might not have been enough to ensure that the MDG targets of 2015 was met. He suggested that to ensure that the MDG targets are met, donor agencies worldwide as well as governments in aid recipient nations must undertake strong actions at every level so as to strengthen the aid delivery and implementation process as well as increase aid volume substantially as well.

Mumtaz and Muhammad (2011) analysed the effectiveness of aid on the health sector of Pakistan over the period 1973-2008. The study focused on the health sector in the light of Millennium Development Goal; reducing child mortality. The main factors that were identified for health sector were GDP per capita, foreign aid for health, adult literacy rate and health expenditure. For the purpose of selection of variables, the study followed Wolf (2007) and Mishra and David (2007). They estimated an econometric model to test the short and long run relationship between foreign aid and infant mortality rate in the health sector. For this purpose, the Vector Error Correction Method (VECM) was used. The results proved the short run and long run relationship between foreign aid and infant mortality rate in the health sector in Pakistan. The model they applied was of importance to this study as would borrow a leaf from its methodology.

Wilson (2011) concludes that health aid does not affect infant mortality in poor and high mortality countries observed between 1975 and 2005 using static and dynamic models, estimated through a variety of techniques (Ordinary Least Squares – OLS, Fixed Effects, and Generalised Method of Moments – GMM). It is noteworthy to mention that, despite this conclusion, he also reported a few statistically significant and positive estimates on the effects of aid on infant

mortality (though of little economic importance) – in other words, foreign aid would increase child mortality.

Denizer, Kaufmann and Kraay (2011) studied whether the World Bank project has met its development objective. Employing a non-experimental methodology and a regression analysis of World Bank data on 6,253 projects sited both in rural and urban settings, the study found that the success of projects was correlated with overall country performance. In addition, it highlighted that the true impact of projects only becomes apparent over time and later evaluations tend to be less optimistic. This is particularly the case in the health sector, where the impact of interventions takes time to be seen. The evaluation found that some factors, such as high preparation costs and low country ownership, were associated with lower impact of projects. On the other hand, smaller size, good management and supervision were correlated with a higher impact of projects. The authors acknowledged that a significant proportion of the variation observed in project performance cannot be explained by these factors. The period of study was not specified in the work.

Gebhard et al, (2008) used GLS panel regressions to model the effects of bilateral and multilateral health aid on multiple health indicators in recipient countries from 1975 to 2000. The result showed that health-targeted aid does not lead to robust increases in health performance of the average recipient country.

Williamson (2008) used a panel over six five-year periods and one two-year period between 1973 and 2009 and 208 countries, where not all countries are aid recipients, to analyse the health effects of health sector aid. Health was measured by infant mortality, life expectancy at birth, the death rate, and level of immunization among the population. The endogeneity of aid is handled by applying lagged values of the aid variable as instruments and her findings show that aid to the health sector cannot be argued to have had an impact on health and neither can overall aid.

Chauvet et al (2008) studied the respective impact of aid and remittances on human development as measured by infant and child mortality rates. They used a panel data on a sample of 98 developing countries, and a quintile-level data on a sample of 47 developing countries from 1987 to 2007 alternatively. Furthermore, they used OLS to estimate the baseline model, and employed

the Two-stage least squares to estimate the main model with country fixed effects. In both samples, they found that both health aid and remittances significantly improve child health outcomes. The estimation of the two models showed that a one percent increase in income decreases child mortality by around 0.35 percent and infant mortality by around 0.31. The impact of health aid is non-linear therefore suggesting that aid to the health sector is more effective in the poorest countries.

Mishra and Newhouse (2007) used a large dataset covering 118 countries, from 1973 to 2004, to measure the effect of health aid on infant mortality. They estimated both OLS regressions and a system of moment equations using GMM and found that increased health aid is associated with a statistically significant reduction in infant mortality. The estimated effect of health aid was small, however, since doubling health aid within a country would reduce infant mortality in the next five-year period by only 2%. As an additional result, they do not find any significant impact of overall aid. In summary, their evidence supports the view that the micro-macro paradox, the somewhat puzzling combination of evidence that aid works at the project level and the absence of aggregate effects, would empirically apply in the case of aid and infant mortality.

Gomanee et al. (2005) investigate the effects of aid on human welfare, measured by the infant mortality rate and the HDI. They estimate a fixed effects model of 104 countries for the period 1980-2000 (four four-year periods and one five-year period) and their results indicate that aid is associated with lower infant mortality, but the results do not seem to be altogether robust to various model specifications and subsamples. Although aid seems robustly related to a higher HDI, the interpretation of the health effects of this result is problematic because HDI is an index comprising of life expectancy, GDP per capita (PPP US$), literacy, and primary, secondary, and tertiary school enrolment. Gomanee et al. (2005) did not discuss the potential endogeneity of aid.

Masud and Yontcheva (2005) used data on nongovernmental (NGO) and bilateral aid to assess the effectiveness of financial flows on two social indicators, namely infant mortality and adult illiteracy. Their underlying assumption is that NGOs intervene at the grassroots level and could be more effective to alleviate poverty than other types of aid. Using an unbalanced panel of 58

countries from 1990 to 2001, they find that health expenditure per capita reduces infant mortality as does greater NGO aid per capita. By contrast they do not find any significant impact of total bilateral aid on infant mortality. The authors then list a number of reasons why NGO aid would work better than bilateral aid in reducing infant mortality. First, NGO aid would be allocated more toward countries with high infant mortality rate while bilateral aid would favour countries with lower infant mortality. Second, NGOs would have more direct links to the poor and vulnerable, which would make them more efficient; third, in line with Boone (1996), aid transiting through recipient governments could be diverted for the benefit of wealthy elites. Pushing their analysis further, the authors do not find any evidence of a positive impact of NGO and bilateral aid on the share of spending on health care in total expenditure.

Aid and Population Growth/ Fertility

Cuberes and Tsui (2011) studied aid and fertility using Rajan and Subramanian's (2008) cross-sectional and panel methods for the period 1960 to 2000. Their cross-section results suggest that foreign aid has a positive effect on fertility. Interestingly, social sector aid (but not economic aid) was found to be responsible for such demographic effect. The panel evidence confirmed the positive effect of foreign aid on total fertility rates, and that social aid is more relevant than economic aid. Given that the literature found no robust relationship between foreign aid and economic growth, their findings raise the possibility of an aid-induced population poverty trap.

Azarnert (2010) investigated the relationship between foreign aid and population growth in sub-Saharan Africa. His work considered population growth rate and a directly related to fertility demographic indicator – total fertility rate. Using a panel of 43 African countries (including Nigeria) for the period 1962 to 2000 and the OLS estimation method with country specific fixed effects, he found a positive relationship between foreign aid and population growth and suggested that foreign aid affects population growth primarily through its effect on fertility. These findings suggest that the appreciation of the demographic effect of foreign aid can have important implications for the design of policies regarding to foreign aid for presently developing countries, particularly in sub-Saharan Africa. If foreign aid increases population

growth in the recipient countries, it may thus not only directly lead to the expansion of the poor populations, but, as follows from the standard theory on the link between population growth and economic growth, it may also indirectly lead to their further impoverishment and the population would thus exert more pressure on the potentials of health facilities in the countries.

Bahar (2009) studied the relationship between foreign aid flows and fertility rates. He used panel data from 96 developing countries across 9 five-year periods between 1960 -2004. He made use of natural disasters in neighbouring countries as an instrument variable to foreign aid receipts. Using OLS and fixed effects method of estimation, the result showed that foreign aid has positive and significant effect on fertility rates across countries but no effect on other determinants of economic growth. The study suggested that aid flow should not be eliminated but that the allocation of aid both across countries and projects should be done carefully enough to avoid undesired incentives and creating a "medicine that worsens the illness".

Aid and Poverty/Income

Olofin (2013) re-examined the effects of different types of foreign aid on poverty level in 8 West African countries between 1975 and 2010 by employing the econometrics methods of panel unit root test, cointegration test and empirical estimators with heterogeneous slopes. His results suggested that total foreign aid and food aid impact positively on poverty, while technical aid reduces poverty. Apart from total foreign aid, none of the results was statistically significant. The results showed negative relationship among poverty, life expectancy, foreign direct investment, per capita GDP and financial depth, but they were not statistically significant. This suggests that their impacts on poverty in West Africa were minimal.

Okon (2012) studied the impact of developmental aid on human development in Nigeria. The study employed two-stage least squares estimation to analyse data from 1960 to 2010, and the result shows that there is a negative relationship between development aid and human development, implying that aid tends to worsen human development in Nigeria. He concluded that the results suggest that development aid was not effectively utilized in Nigeria to promote human development. In a simple term the impact of ODA is not felt in Nigeria. He suggested

that Nigerian government should put in place an appropriate policy measures that would monitor the maximum and effective utilization of foreign aid.

Calderon et al, (2006) examined the effect of foreign aid on income inequality and poverty reduction. The study which was from 1971-2002 using both cross-sectional approach and dynamic panel data techniques, found that aid by itself does not appear to have a statistically significant effect on inequality and poverty reduction. Although both approaches seemed to suggest that good institutions may be necessary for aid to reach the poor, they failed to detect any robust impact of foreign aid, even when institutional quality was taken into consideration.

Aid and Education

Kemal and Jilani (2016), in their study attempted to reveal a link between foreign aid and educational projects in the last one and a half decade. The study used nonlinear model by adding square term of foreign aid to capture the nonlinear association with the primary enrolment, secondary enrolment and higher enrolment, separately. Nevertheless, the linear model was also estimated and in the all the three models the results were same that foreign aid in the three sectors does not affect enrolment rate. The study concludes that foreign aid could be effective in increasing primary enrolment but not secondary or higher enrolment. They therefore, concluded that foreign aid could be effective in increasing primary enrolment but not secondary or higher enrolment.

Asongu and Tchamyou (2015) in their study investigated the effect of foreign aid on education and lifelong learning using 53 countries in Africa from 1996 -2010. The study used empirical evidence based on endogeneity-robust Generalized Method of Moments. They assessed 3 Main issues – the effect of aid on education, the incremental impact of aid on education and the effect of aid on lifelong learning. The foreign aid dynamics used include: Total aid, aid from multilateral Donors and aid from the Development Assistance Committee (DAC). The empirical evidence was based on an endogeneity- robust Generalized Method of Moments. They established that the aid variables have positive effects on primary school enrolment and lifelong

learning with the exception of aid from multilateral Donors which positively affects only lifelong.

Asiedu (2014), examined whether foreign aid in education has a significant effect on growth in Sub-Saharan Africa. The analysis covered 38 countries over the period 1990-2004 and controlled for initial per capita income, inflation, investment, government consumption, openness to trade and institutional quality. The findings of the study is that (i) aid in primary education has a positive and significant effect on growth; (ii) aid in post-primary education has an adverse effect or at best no significant impact on growth; and (iii) growth increases as aid in primary education as a share of total education aid rises. The results suggested that increasing aid in primary education would benefit countries in SSA in two important ways: promote economic growth and also help with the attainment of the second Millennium Development Goal of achieving universal primary education by the year 2015.

Aid and Government Size

Phiri and Tchereni (2013) which examined the impact of foreign aid on economic growth using unbalanced panel data from 26 HIPC (Heavily Indebted Poor countries) from the Sub-Saharan Africa (SSA) over nine 3 year-time periods from 1980 to 2006. Using Random Effects Generalized Least Square and unit root test, the results showed evidence of a direct positive impact of foreign aid on economic growth. The impact on economic growth though is positive, does not compare favourably with that of capital formation and government size. The results suggested that aid cannot be a major source of long-term economic growth in SSA. The SSA should therefore not solely depend on foreign aid to fuel economic growth. Economic aid should only help to accelerate the growth rate in these countries through its effect on such key variables as capital formation, government size, labour productivity, debt service and initial level of income.

Goshu (2014) examined the impact of foreign aid on government expenditure in Ethiopia over the period 1981 to 2012 using Multivariate Vector Auto Regression analysis. All the necessary time series tests such as stationary test, co-integration, weak exogeneity, and other tests are conducted. The empirical result from the long run fungibility equation result indicates that

sectoral aid has negative effect on its sector spending in developmental sectors except for agricultural sector government spending. He suggested that effective and efficient monitoring system which was purpose oriented utilization of foreign aid is central to make sectoral spending non fungible in Ethiopia

2.4 Summary and Limitations of the Reviewed Literatures

Some of the studies reviewed held that total aid has a significant impact on health. However, majority of the studies on the contrary have found no impact of aid on health, sighting corruption, poor policies, lack of holistic implementation of aid objectives, low aid volume, aid tying, and aid fungability as the major cause of the poor performance of aid. On the other hand, some works that studied the disaggregated impact of aid found that aid on agriculture, health aid, and other sector specific aids, such as social sector aid tend to impact more on health (usually proxied by fertility rate, mortality rate, life expectancy, immunization, avoidable mortality, child morality, etc.). Other studies have also tried to estimate the impact of the different type of aids-bilateral and multilateral and have also arrived at conflicting results on how these types of aids impact on health outcome. One very obvious gap is the dearth of related studies in Nigeria. Almost all the studies on aid and health are foreign studies. The researcher could only find Olofin (2013), Oyedele and Lawal (2013) and Okon (2012), and these studies did not directly study foreign aid and health but instead studied aid and poverty, aid and welfare, and aid and human development respectively.

Another important gap is that most of the studies have used cross-country data. None of the studies tried to estimate this relationship in a particular country. Alabi (2014) explained that a country specific study of the impact of foreign aid instead of cross-country studies would yield a more robust result. The results of the cross-section studies usually depend on the countries and periods of study chosen. Such studies face numerous problems of measurement and interpretation and often ignore the stylized structural features of individual countries. For example, foreign aid was once associated with reduced domestic savings, but comprehensive surveys on individual recipient countries have proved otherwise. Foreign aid can influence, either positively or negatively, the expenditure patterns and economic development of the

recipient countries (Alabi, 2014). The level of a country's indebtedness could reduce the volume of its aid available for other developmental purpose. For instance, in Nigeria, in 2006 and 2007, about 97% and 98% of her aid was used in servicing her debts for the respective periods. This could have an adverse effect on how aid flow for those periods would perform. Hence a country's debt could affect the performance of aid. However, none of these studies have been able to control the effect of debt on the performance of aid. Hence this study estimated the interaction of aid and debt in such a way that observed changes on effect of aid would be analysed. This study would fill above mentioned gaps by developing and appropriate model and employing the suitable estimation technique.

CHAPTER THREE

METHODOLOGY

3.1 Theoretical Framework

Various works have used different frameworks to model the impact of aid on health outcome. The social determinant of health framework has been used extensively for such purpose due to its contribution in shaping individual behaviour and the choices that are available to individuals for improving healthcare. Social determinants of health can have a greater impact on health and birth outcomes. According to the World Health Organization (WHO, 2017), the social determinants of health (SDH) are the conditions in which people are born, grow, age, live and work. The wider set of forces and systems shaping the conditions of daily life, the more dynamic explanation of health outcome becomes. These forces and systems include economic policies and systems, development agenda, social norms, social policies and political systems. The SDH framework suggests that a complex interplay of biological, behavioural, psychological, social, and environmental factors contribute to health outcomes. The framework also emphasizes the fact that the level of investment in health also determines health outcome. Social and environmental factors, economic, education and access to quality healthcare are the various concepts that are identified to determine health. Hence the framework can be stated as the following function;

$$\text{Health} = f(\text{SE, ECO, EDU, HQ}) \quad - \quad - \quad - \quad - \quad (3.1)$$

where

Health = Health outcome
SE = Social and environmental factors
ECO = Economic factors
EDU = Education
HQ = Healthcare quality.

The social and environmental factors that can affect health include population, pollution and poverty level among others. Economic factors on the other hand include income level, GDP per capita, etc. Mathematically, the relationship between the variables in equation (3.1) and health outcome can be felt in the following Cobb-Douglas functional form, thus

$$\text{Health} = f(\text{SE}^{\beta 1}, \text{ECO}^{\beta 2}, \text{EDU}^{\beta 3}, \text{HQ}^{\beta 4}) \quad - \quad - \quad - \quad - \quad (3.2)$$

The parameters β_1, β_2, β_3, and β_4, determine the relative priority placed on the respective factors. For easy statistical estimation, equation (3.2) can be linearly stated in log form as,

$$In\text{Health} = In\beta_0 + \beta_1 In\text{SE} + \beta_2 In\text{ECO} + \beta_3 In\text{EDU} + \beta_4 In\text{HQ} \quad - \quad - \quad (3.3)$$

3.2 Model Specification

In order to capture objectives of the study, the researcher employed Autoregressive Distributed Lag (ARDL) bounds test approach developed by Pesaran, Shin and Smith (2001). The choice of ARDL model was supported by Keynes (1936) who contended that effect of most macroeconomic variables does not instantaneously transmit to other variables. In a similarly way, the effect of Official Development Assistance (ODA) does not instantaneously transmit to average longevity (life expectancy) and mortality rate in the recipient country. Hence, the need for a dynamic regression model to capture the effect of time lag on the relationship between dependent and independent variables. Two sets of multiple regression equations based on the ARDL model were estimated. Each equation tested the impact of official development assistance on mortality rate and life expectancy. In addition, an interaction effect was introduced to test the influence of external debt on ODA in each of the models. Hence, the functional relationships of the models were specified in line with the study by Mumtaz and Muhammad (2011) as presented below;

Impact of Official Development Assistance on Life Expectancy and Under-five Mortality Rate

$$HO = f(\Pi, \text{ODA}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.4$$

where:

HO = health outcome (life expectancy (LEXP) and under-five mortality rate (U5M))

Π = vector of control variables (public spending on health (PSH), public spending on education (PSE), per capita GDP (PGDP) and population growth rate (PGR))

ODA = official development assistance received (2010 constant US$)

Therefore, equation 3.2 is specified using ARDL version of error correction model as expressed thus:

$$\Delta(HO_t) = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta(HO_{t-i}) + \sum_{i=1}^{p} \lambda_i \Delta(\Pi_{t-i}) + \sum_{i=1}^{p} \varphi_i \Delta(ODA_{t-i}) + \psi_1(HO_{t-1}) + \psi_2(\Pi_{t-1}) + \psi_3(ODA_{t-1}) + \eta_0(ECT_{t-1}) + \varepsilon_t \quad \text{.....3.5}$$

where: β, λ and φ are coefficients of the short-run parameters (for i = 1,2,....p)

α = intercept

ψ_1 to ψ_3 = coefficients of the long-run parameters

η = coefficient of error correction term (speed of adjustment)

Δ = 1st difference operator

p = optimal lag length selected by Akaike Information Criterion (AIC)

ECT=error correction term

ε_t = white noise assumed to be normally distributed.

Introducing the interaction effect of external debt (EXD) and ODA, equation 3.5 becomes;

$$\Delta(HO_t) = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta(HO_{t-i}) + \sum_{i=1}^{p} \lambda_i \Delta(\Pi_{t-i}) + \sum_{i=1}^{p} \gamma_i \Delta(ODA * EXD_{t-i}) + \psi_1(HO_{t-1}) + \psi_2(\Pi_{t-1}) + \rho_0(ODA * EXD_{t-1}) + \eta_0(ECT_{t-1}) + \varepsilon_t \quad \text{.....3.6}$$

where:

EXD = government external debt

γ = short run differential slope

ρ = long run differential slope

One of the important assumptions of the specified ARDL model is that regressors are nonstochastic (or at least uncorrelated with the error term). The model also assumes that variables of interest are stationary at level form or at least after 1st difference (Pesaran, Shin & Smith, 2001).

3.3 Estimation Procedure

This study aims to estimate the impact of aid on health, using life expectancy and under-five mortality rate as proxies for health. The study focused on these measures because of their broad reflection of population health, the extensive efforts to improve their measurement, and their relevance to policy-makers (Igwe, 2011; Burguet and Soto, 2012). The study also estimated how Nigeria's external debt profile influences foreign aid impacts on the health variables.

To achieve the objectives set, the sampled data were sourced from Central Bank of Nigeria Statistical Bulletin and the World Bank's Development Indicators. Most studies, as reviewed in chapter two, have commented on the endogeneity issue of foreign aid and health relationship. However, this is more pronounced with cross-country analysis of the relationship. In a country-specific study, this is not so significant because the volatility of aid in a country is not strongly dependent on GDP fluctuation. Hence, when a certain amount of aid is ear-marked for a country for a certain period of time, such aid is usually disbursed whether the country experiences economic boom or doom afterwards. It would only take a decision by the donor to make any adjustment if deemed necessary. For this purpose, the study does not follow a simultaneous equation model like most cross-country studies have. However, the benefits of effective health aid may last beyond the year in which it is committed or disbursed. Aid grants are often spent over several years, and additional delayed effects may be due to lags in the provision of health services and the realization of health benefits over time. The researcher took cognizance of this phenomenon by running the regression models above with aid lags, hence the distributed-lag model specified above.

For the estimation purposes, three steps methodology were employed i.e. checking the stationarity of the data, estimating the short run and long run function, and estimating the parsimonious error correction model along with the stability and other diagnostic tests. First, Augmented Dickey Fuller (1979) test was applied to each of the variables to determine their actual data generating process (order of integration). If some of the explanatory and dependent variables were found to be integrated of the same order, a cointegration test would be conducted. A log-log model version of equation 3.6 above would be estimated so that the parameters can be read as elasticity coefficients.

Unit Root Test

The data to be employed in this study are time-series data and thus, is suspected to be spurious. Hence, the variables of this study should be subjected to stationarity test using the Augmented Dickey-Fuller (ADF) testing procedure. Because most of our data are trended, If obtained result shows evidence of the presence of unit root, then it would be differenced accordingly, in line with their respective order of integration before carrying out our estimation. When this was not the case, the stationery data would be regressed without differencing. This would ensure that the estimation is robust and devoid of any form of bias caused by non-stationary data.

Normality Test

Notably, non-normality of economic variables among other effects may be associated with the presence of outliers. It is therefore important, before embarking on empirical investigations, to examine whether or not the data exhibits normality. The study adopted the Jarque-Bera statistic for normality.

Serial Autocorrelation Test

The term autocorrelation is defined as correlation between members of some series of observations ordered in time. The assumption of the classical linear regression is that autocorrelation does not exist. In the presence of autocorrelation, the OLS estimators are still unbiased as well as consistent and asymptotically normally distributed, but they are no longer efficient (Gujarati and Porter, 2009). In testing for autocorrelation, this study employed In order

to overcome the devastating effect of auto/serial correlation, the study tested for autocorrelation by evaluating estimated d-statistic after Durbin and Watson (1951).

Co-integration Test

When a linear combination of N-variables that are *I*(1) produces a stationary series, then the variables may need to be co-integrated. This means that a long run relationship may exist among them. The Pesaran et, al. (2001) technique of bound testing approach to cointegration was adopted. Where co-integration is established, an error correction mechanism is introduced to determine the speed of adjustment from the short-run discrepancies to the long-run equilibrium

3.4 Sources and Methods of Data Collection

The study covered a period of 36 years from 1981 to 2015 and the data were sourced from the CBN Statistical Bulletin 2016 and the World Bank Data-Bank. E-views 9 econometric estimation package was used for the analyses.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSES

4.1 Introduction to Data Analyses

This chapter analysed descriptive statistics of data used and presented the pre-estimation tests of Unit Root using the Augmented Dickey-Fuller test. It also presented the ARDL bound test, regression results and their interpretations. The analyses were presented in two sections so as to satisfy the two sets regression model in chapter three. The presentation was in line with specific objectives of the study in chapter one. The first result presented an Autoregressive Distributive Lag model of estimated impact of official development assistance and other control variables on life expectancy and mortality rates. The second result estimated the influence of government external debt on official development assistance's impact on life expectancy and mortality rate. Each of the result was followed by post estimation test which confirm the statistical validity of the results. Before this, the definition of variables, descriptive statistics and Augmented Dickey-Fuller Unit Root test were presented in first three tables below.

4.2 Definition of Variables and Descriptive Analysis

Table 4.1: Definition of Variables

Variable Label	***Variable Name***
LEXP	Life expectancy (yrs)
U5M	Under-five mortality rate (per 1000 live births)
ODA	Official development assistance (US$)
GSH	Government spending on health (₦'million)
GSE	Government spending on education (₦'million)
PGDP	Per capita gross domestic product (₦)
PGR	Population growth rate (%)
EXD	Current government external debt (US$)

Table 4.2: Descriptive Analysis

	LEXP	U5M	EXD	GSE	GSH	ODA	PGDP	PGR
Mean	47.75067	177.3917	1.47E+09	92823.63	54609.13	1.19E+09	121849.5	2.587013
Median	46.11450	195.2500	6.69E+08	27368.07	9980.174	2.59E+08	26680.79	2.582130
Maximum	53.42800	212.9000	6.15E+09	390424.8	257720.0	1.14E+10	551511.5	2.857502
Minimum	45.63500	104.3000	34396000	162.1541	41.31455	31710000	685.3477	2.488183
Std. Dev.	2.519518	38.25527	1.58E+09	125921.7	79394.53	2.18E+09	178577.2	0.082752
Skewness	1.030342	-0.649776	1.454219	1.277158	1.397295	3.375425	1.417000	0.912962
Kurtosis	2.529735	1.868013	4.313709	3.168907	3.548011	15.43192	3.446712	4.168278
Jarque-Bera	6.701347	4.455341	15.27726	9.829584	12.16507	300.1899	12.34666	7.048311
Probability	0.035061	0.107779	0.000481	0.007337	0.002282	0.000000	0.002084	0.029477
Sum	1719.024	6386.100	5.30E+10	3341651.	1965929.	4.29E+10	4386582.	93.13248
Sum Sq. Dev.	222.1789	51221.29	8.70E+19	5.55E+11	2.21E+11	1.66E+20	1.12E+12	0.239674
Observations	36	36	36	36	36	36	36	36

Author's Computation

The statistics above in Table 4.2 were based on the variables used for the study. Only key statistics such mean (average), standard deviation, minimum and maximum values were discussed. The average value for life expectancy (LEXP), under-five mortality rate (U5M) and government external debt (EXD) are 47.8 years, 177.4 mortality per 1000 live births and US$1.47E+09 per year respectively. Similarly, their respective standard deviation values are 2.519518, 38.25527 and 1.58E+09. The minimum values of the variables are 45.63 years, 104.3 mortality cases per 1000 live births & US$34,396,000; and their respective maximum values are 53.43 years, 212.9 mortality cases per 1000 live births & US$11,431,960,000 in the period 1981 and 2016. Government spending on education (GSE) and government spending on health (GSH) have mean values of ₦92823.63 million and ₦54609.13 million, and standard deviation of 125921.7 and 79394.53 respectively. Also, the minimum value of ₦162.1541 million and ₦41.31455 million and maximum value of ₦390424.8 million and ₦257720.0 million respectively were obtain.

Official development assistance (ODA), per capita gross domestic product (PGDP) and population growth rate (PGR) recorded mean values of US$1.19E+09, ₦121849.5 and 2.59%

with standard deviation of 2.18E+09, 178577.2 and 0.082752 respectively. Also, their minimum and maximum values are sequentially US$31710000 & US$1.14E+10, ₦685.3477 & ₦551511.5 and 2.488183% & 2.857502%.

4.3 Stationarity and cointegration (ARDL Bound) tests

The table below shows result obtain from Augmented Dickey-Fuller stationarity test (unit root) as developed by Dickey and Fuller (1979). The estimated ADF test statistic, probability value and order of integration of those variables were reported. Next to the table is the result of cointegration test by Pesaran, Shin and Smith (2001) called ARDL Bounds Testing Approach. The approach was specifically designed for an ARDL regression model to test existence of long run relationship between the dependent variables and explanatory variables.

Table 4.3: Augmented Dickey-Fuller Sationarity Test

Variable	*ADF test statistic*	*p-value*	*Order of integration*
LEXP	-2.312352	0.0223*	*I*(2)
U5M	-2.738252	0.0077*	*I*(2)
ODA	-2.581116	0.0114*	*I*(0)
GSH	-3.794478	0.0341*	*I*(2)
GSE	-4.917783	0.0000*	*I*(1)
PGDP	-10.28754	0.0000*	*I*(2)
PGR	-3.395799	0.0015*	*I*(1)
EXD	-3.282825	0.0019*	*I*(1)

Source: Author's computation
Note: * p-value < 0.05

In line with Dickey and Fuller (1979), a time series variable becomes stationary when its estimated ADF test statistic is greater than its critical value at chosen percentage level of significance, say 1%, 5% or 10% level. Again, result of stationarity test can also be measure using the estimated probability value of an ADF statistic at chosen level of significance, usually at 5 per cent level. Following the above mentioned rule therefore, life expectancy, under-five mortality rate, government spending on health and per capita gross domestic product are stationary after 2nd difference (i.e., they are integrated of order two (*I*(2)). The variables recorded probability value of estimated ADF statistic as follows: 0.0223, 0.0077, 0.0341 and 0.0000 respectively. It implies that the variables are stationary at 5% level of significance since they are

less than 0.05 respectively. Furthermore, government spending on education, population growth rate and government external debt respectively has probability values of 0.0000, 0.0015 and 0.0019 and shows that the three variables were significant at 0.05 level after 1st difference *I*(1). Only official development assistance was integrated of order zero *I*(0) as its probability value of 0.0114 was less than 0.05 chosen level of significance. Established stationarity of the variables is an indication that regression of independent variable on the dependent variables would produce reliable estimate.

Table 4.4: ARDL Bounds Test

	ARDL Bounds Test		
	For life expectancy model		
F-statistic	10.29680		
	Critical Value Bounds		
Significance	|0 Bound	|1 Bound	Decision
10%	2.26	3.35	*Cointegrated*
5%	2.62	3.79	*Cointegrated*
2.5%	2.96	4.18	*Cointegrated*
1%	3.41	4.68	*Cointegrated*
	For under-five mortality rate model		
F-statistic	17.20650		
	Critical Value Bounds		
Significance	|0 Bound	|1 Bound	Decision
10%	2.26	3.35	*Cointegrated*
5%	2.62	3.79	*Cointegrated*
2.5%	2.96	4.18	*Cointegrated*
1%	3.41	4.68	*Cointegrated*

Source: Author's computation

The result of stationarity test discussed above shows that the dependent variables, life expectancy (LEXP) and under-five mortality rate (U5M) were of the same order of integration (*I*(2)) with about two dependent variables, government spending on health (GSH) and per capita gross domestic product (PGDP). It suggested possible existence of cointegration (long run relationship) between dependent variables and other explanatory variables in the models. Non-surprisingly, result of the Bounds testing established existence of cointegration in the two regression models. The null hypothesis of 'no long run relationship exist' was rejected since the calculated F-statistic of 10.29680 and 17.20650 for life expectancy and under-five mortality rate models were above the critical value upper bounds (which is based on the assumption that all of

the variables are *I*(1)) at 10% (3.35), 5% (3.79), 2.5% (4.18) and 1% (4.68) respectively. The results imply that there is long run relationship among the variables of study. For this reason, estimated ARDL model tested effect of the regressors on the health outcomes of (LEXP) and (U5M) in both short run and long run periods.

4.4 Effect of official development assistance on life expectancy and mortality rate in Nigeria

The dynamic regression model of ARDL technique that estimated effect of official development assistance on life expectancy and mortality rate in Nigeria was carried out in this section. This forms the first and second objectives of the study. The model is interested in short-run and long-run influence of ODA and other control variables on LEXP and U5M respectively. Achievement of the stated objectives hinged on interpretation of economic implications of the estimated responses life expectancy and mortality rate on changes in ODA alongside other control variables. In addition, recommendation of possible ways to improve health outcomes of LEXP and U5M is also important in the process. The study adopted automatic lag selection criteria which permitted the Akaike Information Criterion (AIC) to select the model with lest (which is always the best) information criterion among several alternatives. Among the top 20 sets of ARDL models for the study, the best was selected which is ARDL (3, 3, 2, 2, 2, 0) and ARDL (2, 0, 0, 0, 1, 2) respectively for the effect of ODA on life expectancy and under-five mortality rate. The graphs of the model selection based on AIC were presented in Figure 4.1 and 4.2 below.

Figure 4.1: Akaike Information Criteria based on effect of ODA on life expectancy

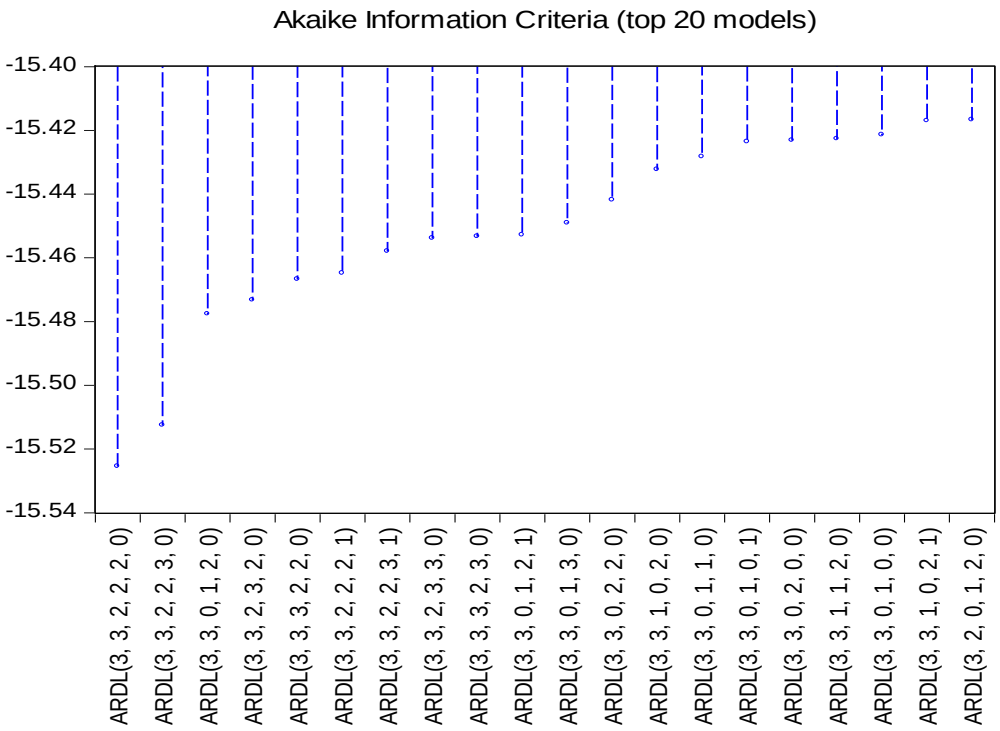
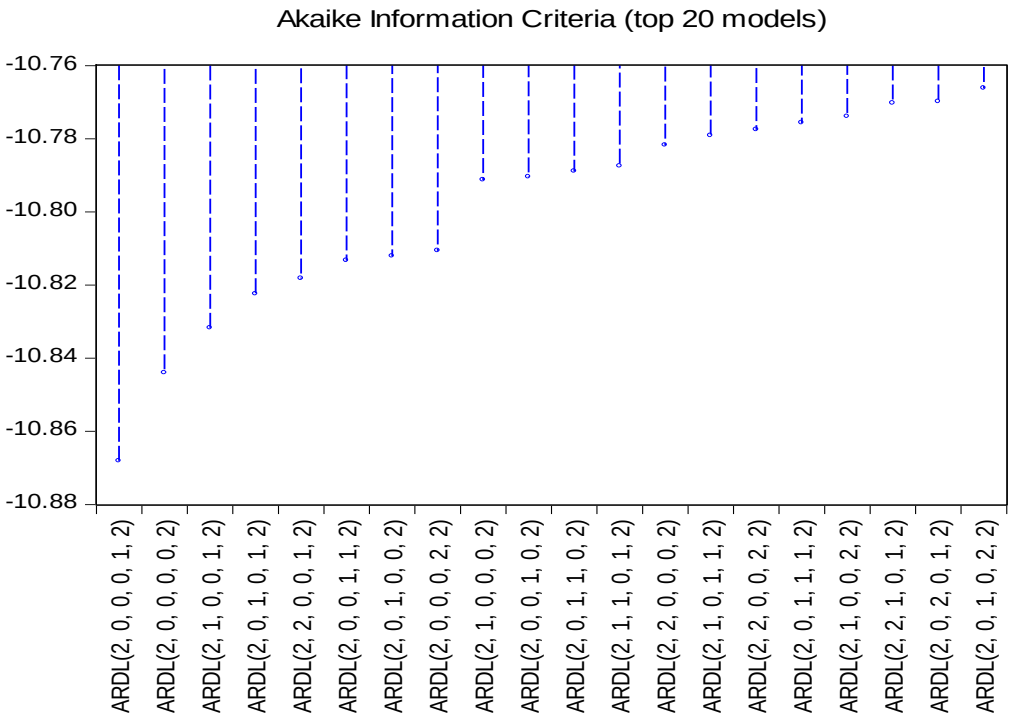


Figure 4.2: Akaike Information Criteria based on effect of ODA on Under-5 Mortality



To validate the effectiveness of calculated parameters of the variables, the study employed exact (true) level of significance (p-value) approach in testing the research hypotheses. This implies that any estimated coefficient with corresponding p-value less than or equal to (<=) 0.05 is considered statistically significantly different from zero. The conclusion would therefore be that effect of the independent variable on the dependent variable is significant in the study. Table 4.5 below presented the result on effect of received ODA on life expectancy in Nigeria from 1981 to 2016.

Table 4.5: Effect of official development assistance on life expectancy

Variable	Coefficient	HAC Std. Error	t-Statistic	Prob.
	Cointegrating Form			
DLOG(LEXP(-1))	1.758932	0.068265	25.766218	0.0000*
DLOG(LEXP(-2))	0.848366	0.055323	15.334862	0.0000*
DLOG(ODA)	0.000074	0.000044	1.691956	0.1113
DLOG(ODA(-1))	0.000085	0.000044	1.916356	0.0746
DLOG(ODA(-2))	0.000065	0.000024	2.721201	0.0158*
DLOG(GSE)	0.000120	0.000077	1.571409	0.1369
DLOG(GSE(-1))	0.000130	0.000054	2.386781	0.0306*
DLOG(GSH)	0.000196	0.000080	2.441131	0.0275*
DLOG(GSH(-1))	0.000155	0.000062	2.522573	0.0234*
DLOG(PGDP)	0.000083	0.000138	0.601969	0.5562

DLOG(PGDP(-1))	0.000194	0.000081	2.397979	0.0299*
D(PGR)`	0.003686	0.000603	6.114555	0.0000*
CointEq(-1)	-0.004974	0.001483	-3.354690	0.0043*
*Cointeq = LOG(LEXP) - (-0.0595*LOG(ODA) -0.0585*LOG(GSE) + 0.0948*LOG(GSH) + 0.0198*LOG(PGDP) + 0.7412*PGR + 2.7595)*				
Long Run Coefficients				
LOG(ODA)	0.059454	0.019781	3.005634	0.0089*
LOG(GSE)	0.058494	0.017225	3.395783	0.0040*
LOG(GSH)	0.094784	0.031740	2.986219	0.0092*
LOG(PGDP)	0.019784	0.025949	0.762443	0.4576
PGR	0.741162	0.185526	3.994918	0.0012*
Constant	2.759514	0.222010	12.429659	0.0000*
R-squared	***0.999999***			
D-Watson Stat	***2.104637***			

Source: Author's computation
Note: * p-value < 0.05

Previous values of life expectancy

Table 4.5 shows that the previous year and previous two years value of life expectancy (*DLOG(LEXP(-1))* and *DLOG(LEXP(-2)*) are positively related to its current value. With estimated coefficients of 1.758932 and 0.848366, the result implies that when effect of other variables is held constant, a percentage increase in previous year and previous two years values of life expectancy would result to about 1.76% and 0.85% rise in current year value of life expectancy on average. Simply put, the result suggests that increase in previous value of average life expectancy would likely stimulate an increase in its value at current period. This impact is on assumption that effect of other factors, say epidemic, war, famine and others that might cause a decrease on life expectancy were equal to zero over the period estimated by the study. Based on the estimated probability values of 0.0000 and 0.0000 for the two coefficients above, the result was considered to be statistically significantly different from zero at 0.05 level.

Official development assistance

Official development assistance (*ODA*) was found to be positively related to life expectancy in the short run. Coefficients of changes in its current value (*DLOG(ODA)*), 1st lag (*DLOG(ODA(-1))*) and 2nd lag (*DLOG(ODA(-2))*) are 0.000074, 0.000085 and 0.000065 respectively. It implies that a percentage increase in 1st difference of current ODA, its 1st lag and 2nd lag would cause current value of average life expectancy to increase 0.000074%, 0.000085% and 0.000065% respectively. Even though the magnitude of short run impact of ODA appeared to be very small, the effect of its differenced 2nd lag was considered significant at 5% level as its estimated probability value of 0.0158 was less than 0.05. It can be inferred from the result that official development Assistance (foreign aid) received by Nigeria translates to infinitesimal improvement on life expectancy on its citizens in the short run. This is because none of the short run coefficients contributed up to 0.0001% to citizens' life expectancy in the period under review. In the long run, however, official development assistance (LOG(ODA) produced a much better impact on life expectancy as its estimated coefficient and probability value are respectively 0.059454 and 0.0089. It shows that life expectancy was significantly improved by about 0.059% on average. Although this study is in agreement with Bendavid and Bhattacharya (2014) who equally found health foreign aid to be positively related to life expectancy, the magnitude of such impact appears to vary in both studies. While Bendavid and Bhattacharya's study found that each one percent increase in health aid increased life expectancy by 0.24 months faster, current study found same to increase life expectancy by about 0.0004 months faster in the short run (per annum) and 0.34 months or faster in the long run (i.e., short run and long run coefficients of ODA (0.000074) and (0.059454) divided by 100 and multiplied by average LEXP (47.75 years or 573 months) respectively.

Government spending on education

As a source of knowledge, education is an important factor that could improve longevity if well applied. Thus, government spending on education (GSE) was considered as useful factor that could influence life expectancy in this study. The result in Table 4.5 shows that GSE coefficient over the short run was 0.000123 and 0.000130 respectively. These coefficients indicated that a percentage rise in current 1st lag of GSE and its 2nd period lag would correspondingly lead to about 0.000120% and 0.000130% rise in life expectancy per annum, effect of other variables

held constant. The result is in line with a priori expectation because increasing education expenditure would translate to increased knowledge, including knowledge of health. Functional health knowledge would most likely contribute to improved life expectancy. Similarly, long run government spending on education (*LOG(GSE)*) was also positive and significant (given its p-value of 0.0040). It shows that a percentage rise in GSE leads to about 0.058494% in life expectancy, other variables held constant. Implication of this result is that if effects of other factors are insignificant, government spending on education would increase average life expectancy by about 0.0007 months yearly and 0.34 months in the long run. Supporting the positive relationship between spending on education and improved health indicators, Michealowa and Weber (2007) contended that education is one of the major channels through which citizens' welfare and longevity could be improved. Thus, a confirmation of evidence of current that government spending on education significantly contributes to life expectancy in the long run.

Government spending on health

Government spending on health (GSH) is yet another important determinant of life expectancy. Based on the result in Table 4.5, estimated short run (*DLOG(GSH)* and *DLOG(GSH(-1))*) and long run *LOG(GSH)* coefficients of government spending on health values of (0.000196 and 0.000155) and 0.094784 indicated a positive relationship between health expenditure and life expectancy. In the short run, a percentage increase in both the 1st lag of GSH and its 2nd lag resulted to significant increase in life expectancy by approximately 0.000196% and 0.000155% each on average per annum, other variables held constant. Interesting enough, the long run coefficient of GSH confirm the relevance of the variable as it showed that one per cent increase in long run health expenditure would cause life expectancy to increase by about 0.094784% on average. Both the short run coefficients (0.0306 and 0.0275) and long run (0.0092) p-values are statistically significant at 5%. The result can literarily be interpreted to mean that one per cent increase in health spending would increase average life expectancy by about 0.001 months per

year and 0.54 months in the long run period, assuming the effect of other factors are zero. In consolidation, the result of Shpak (2012) observed that foreign aid on health significantly reduce the rate of avoidable mortality. Hence, health expenditure is considered one of the potent factors that improve life expectancy in most economies.

Per capita gross domestic product

PGDP as used in this study measured aggregate gross domestic product per person in the country. It was used as proxy for wealth index per person which is needed to maintain a healthy life style. The short run coefficients of 1st lag of PGDP (*DLOG(PGDP)*) and its 1st lag (*DLOG(PGDP(-1))*) respectively are 0.000083 and 0.000194. It indicates that when effect of other variables is assumed to be constant, a percentage rise in changes in current value of PGDP would raise life expectancy by about 0.000083%, while its 1st lagged value would cause life expectancy to increase by about 0.000194% on average. Judging by their respective p-values of 0.5562 and 0.0299, it is only the change in immediate past value of income per capita which was significant at 5% level. Over the long run, however, the result shows that ceteris paribus, a percentage increase in *LOG(PGDP)* would result to about 0.02% or 0.11 months rise in life expectancy on average. It is worthy to note that per capita GDP was not an important determinant of life expectancy in this study. The reason could be associated with the report of Feeny (2003) which found that per capita income levels in Papua New Guinea exhibited large yearly fluctuations which are primarily driven by output in the mining and resource sectors and by external shocks experienced by the economy. According to the study, per capita income is, hence, not likely to successfully capture changes in the living conditions of the majority of the population in other sectors. In a similar way, change in per capita GDP in Nigeria is largely driven by revenue from the oil sector which employed less than 7% of the population. As such, the variable (PGDP) would be insufficient to explain what happens to average life expectancy due to already established high income inequality and poverty incidence in Nigeria.

Population growth rate

Population growth rate (PGR) is yet another factor considered to influence life expectancy in this study. The idea is that growth rate of the population could help to explain the degree of

competition for available scarce resources needed to maintain quality living standard. When growth rate of the population is so high as to dampen economic welfare, health outcomes would deteriorate and vice visa. Result in Table 4.5 shows a significant positive impact of PGR on life expectancy in both the short run and long run periods. Holding effect of other variables constant, one per cent increase in population growth rate would cause life expectancy to increase on average by about 0.003686% or 0.02 months and 0.741162% or 4.25 months in the short run and long run periods respectively. For Okon (2012), the advent of information technology is associated with growing knowledge of healthcare among the population across countries. This implies that rising population could be positively related to improved information of healthcare which could lead to increased life expectancy as was found in this study. Again, the improvement in healthcare services was associated to decline in mortality rate in both developed and developing economies. This also could explain the significant positive relationship between population growth rate and life expectancy as found in current study.

Error correction term

To ascertain the long run relationship between life expectancy and explanatory variables in the model, the error correction term (*CointEq(-1)*) was estimated. The parameter measures the speed of adjustment in the model, and its estimated coefficient is expected to be negative and significant at 0.05 level. The result in Table 4.5 shows that coefficient of cointegrating equation is -0.004974 with a p-value of 0.0043. It implies that there is cointegration between LEXP and all the independent variables in Table. The calculated coefficient (-0.004974) showed that about 0.49% of temporary discrepancies in the previous periods would be corrected annually for the variables to achieve equilibrium.

Table 4.6: Effect of official development assistance on mortality rate

Variable	Coefficient	HAC Std. Error	t-Statistic	Prob.
Cointegrating Form				

DLOG(U5M(-1))	0.942000	0.024337	38.706420	0.0000*
DLOG(ODA)	-0.000237	0.000198	-1.194354	0.2445
DLOG(GSE)	-0.000680	0.000487	-1.396213	0.1760
DLOG(GSH)	-0.001018	0.000506	-2.012593	0.0560
DLOG(PGDP)	-0.000342	0.000501	-0.682545	0.5017
D(PGR)	0.064538	0.024217	2.665024	0.0138*
D(PGR(-1))	-0.063531	0.014420	-4.405861	0.0002*
CointEq(-1)	-0.002953	0.006206	-0.475902	0.6386
*Cointeq = LOG(U5M) - (-0.0802*LOG(ODA) -0.2303*LOG(GSE) + 0.3447*LOG(GSH) -0.3814*LOG(PGDP) + 8.3214*PGR -12.4503)*				
Long Run Coefficients				
LOG(ODA)	-0.080174	0.212767	-0.376816	0.7098
LOG(GSE)	-0.230319	0.596610	-0.386047	0.7030
LOG(GSH)	-0.344708	0.837479	-0.411602	0.6844
LOG(PGDP)	-0.381374	0.632087	-0.603358	0.5522
PGR	8.321379	20.972087	0.396784	0.6952
Constant	-12.450309	46.960238	-0.265124	0.7933
R-squared	***0.999990***			
D-Watson Stat	***2.211811***			

Source: Author's computation
Note: * p-value < 0.05

Previous values of under-five mortality rate

The under-five mortality rate (U5M) in this study measures the number of children who died before their fifth birthday per every 1000 live births. Evidence from Table 4.6 showed that the Changes in the 1st lag of under-five mortality rate (*DLOG(U5M(-1))* has a significant positive relationship with current value of U5M. Its coefficients and probability value are 0.942000 and 0.0000 respectively. This suggests that holding effect of other variables constant, one per cent rise in changes in the previous year's value of U5M would cause current value of U5M to rise by approximately 0.94% on average. Hence, the result is that when previous value of under-five mortality increases, say by one per cent, there would be less than proportionate increase in current value of under-five mortality rate, holding effect of other variables constant. The effect of previous value of U5M on its current value is statistically significant at 0.05 level given the calculate probability values of 0.0000 of its coefficient. This result implies that one-year lag is very small for solution to be found and policies to be implemented so as to reduce the number of under-five deaths. Families, healthcare providers and government struggle to find reliable and best methods to curb the menace of this havoc may often take about one year before a solution is found.

Official development assistance

Again, change in current value of official development assistance (*DLOG(ODA)*) was negatively related to under-five mortality rate in the short run. It has calculated coefficient and probability values of -.0000237 and 0.2445 respectively. This implies that one per cent increase in 1st difference of current ODA would cause current value of under-five mortality rate to decrease by about 0.000237%, effect of other factor held constant. Similarly, the long run coefficient of ODA (LOG(ODA)) suggests that a percentage rise in ODA would on average lead to reduction in infant mortality rate by approximately 0.08%, other factors held constant. The result conforms to a priori expectation that health related aid would help to alleviate under-five mortality rate in the country. However, ODA's impact on mortality rate is not significant in the study given its estimated probability value of 0.2445 and 0.7098 in the short run and long run respectively. Comparing the result to previous findings by Yousuf (2012) and Bendavid and Bhattacharya (2014), one can easily conclude that health related aids were not effectively utilized in Nigeria as expected. Both Yousuf's and Bandavid's studies found statistically significant and negative effect of health aids on infant mortality rate to the tune of approximately 1.3% and 0.14% per 1000 live births respectively. When interpreted in a common parlance, the result implies that a percentage increase in health aid would reduce infant mortality rate by about 0.142 deaths per 1000 live births in the long run. This infinitesimal impact of health aid on infant mortality rate could help to explain the current high rate of mortality among new born babies which stood at 104.3 deaths per 1000 live births in 2016 despite increase in official development assistance from about US$2.43 billion in 2015 to US$2.50 billion in 2016.

Government spending on education

Increase in government spending on education (GSE) was found to cause reduction in under-five mortality in the short run and long run. Its calculated coefficients are -0.000680 and -0.230319, and their corresponding p-values are 0.1760 and 7030 respectively (see Table 4.6). Based on the figure, a percentage rise in government expenditure on education would lead to about 0.000680% and 0.230319% fall in under-five mortality in the short and long run. This means that one per cent rise in government spending on education causes about 0.4 death per 1000 live

births in the long run. Although the result is not statistically significant at 0.05 level, it conformed to expectation. Rising education expenditure would imply increase in mass literacy, which is needed to avoid certain causes of under-five mortality. According to Michaelowa and Weber (2006) who reconsidered aid effectiveness by drawing evidence from the education sector, health education and awareness among parents of child bearing age remains a potent force in curbing under-five mortality rate across developed and developing countries. Furthermore, Mumtaz and Muhammad (2011) contended that achieving the millennium development goal (MDG) in the health sector presupposes a tremendous achievement in the education sector since the duo cannot be easily separated from each other. Result of this study therefore implies that education expenditure should be increased especially those targeted at health sector so as to improve health knowledge and reduce under-five mortality in the country.

Government spending on health

Government spending on health (GSH) is expected to significantly result to decrease in the number of under-five mortality rate. From estimate of the variable in Table 4.6, a percentage increase in GSH would cause a mean decrease on under-five mortality by about 0.001018% and 0.344708% in the short run and long run respectively. This can be translated to mean that about 0.611 death of below five years would be reduced when government spending on health increases by one per cent. Similar to the case of government spending on education, this effect was found to be statistically insignificant based on estimated p-values of 0.0560 and 0.6844 respectively. The ineffectiveness of government spending on health in this study confirms the reoccurring infinitesimal proportion of health expenditure to total government spending in national budget. Health expenditure as percentage of government expenditure has maintained an average of about 6.62% in the past 20 years (1996-2015), which is below the stipulated 15% by the World Health Organization. Even though the result is in line with previous studies such as Gomanee, Morrissey, Mosley and Verschoor (2004), Masud and Yontcheva (2005), Shpak (2012) among others in direction of relationship between GHS and under-five mortality, the magnitude of such relationship becomes questionable in this study.

Per capita gross domestic product

As per capita gross domestic product (PGDP) increases by one per cent, under-five mortality tends to decrease by about 0.000342% on average, all other variables held constant. Despite the fact that PGDP disregards the relevance of income inequality, it can be assumed that increasing PGDP would be associated with increasing welfare. This, in turn, can be associated with better economic choice on healthcare services by the citizens. Given this conventional expectation, it can be concluded that effect of PGDP on under-five mortality conforms to a priori expectation in this study. Also, in the long run, a percentage rise in PGDP was found to decrease under-five mortality by about 0.381374% on average. In a literary term, the result shows that as per capita gross domestic product increases by one per cent, about 0.676 deaths of children below five years of age per every 1000 live births would be recorded over time. It is important to point out that effect of PGDP on under-five mortality rate is not significant in this study (See p-values in Table 4.6). The implication of the insignificant result remains that increase in per capita GDP does not conceal the huge income inequality in Nigeria as over 60% of the population is poor by international standard (National Bureau of Statistics, 2010). By extension, the result of this study points to the need for income redistribution effort by the government so as to maximize the effectiveness of per capita GDP on welfare, including health related indicators of welfare like low rate of under-five mortality rate and many others. Again, the result could be said to follow the report of Feeny (2003) as was previously cited in the case of life expectancy above.

Population growth rate

The short run coefficients of population growth rate (PGR) showed both positive and negative significant effect on under-five mortality rate. First, the 1st lag of current value of PGR indicated that when effect of other variables are held constant, a percentage rise in D(PGR) would induce current value of under-five mortality rate to rise by about 0.064538% on average. This implies an instantaneous momentary rise in under-five mortality resulting from immediate increase in population growth rate. The trend, however, reversed over time as increase in the 1st lag of 1st difference of population growth rate would cause under-five mortality rate to reduce by almost equivalent proportion of the initial rise. Hence, the result therefore reveal that a percentage rise in D(PGR(-1)) would lead to a fall in under-five mortality rate by about 0.063531%, ceteris paribus. The reversal trend could be associated with what Woubedle (2011) defined as

stabilization and adaption stage of effect of demographic variation on health indicators. It suggests that as demographic indicator, say population increased, the increase would trigger an immediate surge in under-five mortality rate. This would be reversed as the population stabilizes or adapts to certain health conditions that causes initial rise in child mortality. Another interesting part of the result is the positive but insignificant effect of population growth rate on under-five mortality rate. The figure in Table 4.6 shows that a percentage rise in PGR would cause under-five mortality rate to rise by about 8.32% in the long run, holding effects of other variables constant. The reason for the long run insignificant rise in PGR has been explained by the marginal imbalance between the initial rise in child mortality rate and the subsequent reversal in the short run period. It can therefore be said that a percentage rise in PGR would result to about 14.76 more deaths of under-five children per every 1000 live births over time in Nigeria.

Error correction term

Lastly, the result shows that there is no long run relationship between under-five mortality rate and explanatory variables in Table 4.6. The coefficient of the error correction term (*CointEq(-1)*) (-0.002953) was negative as expected but the p-value (0.6386) was not statistically significant to justify a long run relationship between the dependent and independent variables in the model. Therefore, explanatory variables in the model could only explain variations in under-five mortality rate in the short run as none of the long run coefficients was statistically significant at 0.05 level.

4.5 Post-estimation diagnostic checks for effect of official development assistance on life expectancy and mortality rate in Nigeria

This section presents result of the criteria for evaluation of regression result of in Tables 4.5 and 4.6 above. It includes estimates of R-squared, F-statistic, autocorrelation test, normality test and Ramsey's regression specification error test as appeared in Table 5.7.

Table 4.7: Post estimation tests on effect of ODA on life expectancy and mortality rate

Test	*Life Expectancy*		*Under-five Mortality Rate*	
	Estimated statistic	*p-value*	*Estimated statistic*	*p-value*

R-squared	0.999999		0.999990	
F-statistic	658221.5	0.000000*	222557.6	0.000000*
DW-statistic	2.104637		2.211811	
Normality Test	JB-stat (5.550688)	0.062328	JB-stat (2.467165)	0.291247
RESET	0.697195	0.4177	0.039018	0.8452

Source: Author's computation
Note: * p-value < 0.05

R-squared (Goodness of fit)

The R-squared stands for goodness of fit and measures proportion of variation in the endogenous variables (life expectancy (LEXP) and under-five mortality rate (U5M)) explained by independent variables in Tables 4.5 and 4.6. From Table 4.7, estimated R-squared value of 0.999999 and 0.999990 was obtained for life expectancy and under-five mortality rate results respectively. It suggested that about 99% of total variation in LEXP and U5M was respectively explained by 1st difference of current and lagged values of the dependent variables, ODA, GSE, GSH, PGDP and PGR. The 99% goodness of fit in the study indicated a very high reliability of the result for policy purposes.

F-statistic (Group test of significance)

F-statistic tests the null hypothesis that overall effects of explanatory variables in the models have insignificant impact on the dependent variables (LEXP and U5M) respectively. Hence, the decision rule is to reject the null hypothesis if estimated probability value of F-statistic is less than 0.05. The hypothesis would not be rejected if otherwise. Table 4.7 shows that calculated F-statistic in the two models are 658221.5 and 222557.6 and their corresponding p-values are 0.000000 and 0.000000 respectively. The p-values are less than 0.05, hence the null hypotheses of 'insignificant impact of independent variables on the dependent variables' were rejected. The study therefore concludes that all the explanatory variables in each of the model have significant impact on the dependent variables.

Test for autocorrelation

The null hypothesis that 'no autocorrelation exist among the regressors' was rejected at 0.05 level of significance because of the fact that $d_U(2.961) \lessdot d(2.104637) \lessdot 4\text{-}d_U(1.039)$ for effect of ODA on LEXP in Table 4.5. Similar trend was also recorded in the result of ODA's effect on U5M in Table 4.6 as $d_U(2.306) \lessdot d(2.211811) \lessdot 4\text{-}d_U(1.694)$. *d* stands for estimated d-statistic in Tables 4.5 and 4.6, d_U stands for upper boundary of Durbin-Watson statistic table value for 36 observations, and 18 and 11 parameters for LEXP and U5M respectively. The result means that the assumption of no auto or serial correlation in the error terms that underlies the classical linear regression model (CLRM) was violated. Fixing this problem required the study to employ Newey and West (1987) heteroscedasticity and autocorrelation-consistent (HAC) standard errors technique as presented in Tables 4.5 and 4.6. The technique was considered as the best option at a time OLS estimate suffered pure autocorrelation due to its ability to correct estimated standard errors (Gujarati & Porter, 2009). It also solve twin problem of heteroscedasticity whenever it existed.

Normality test

The notion that the residuals are normally distributed with zero mean and constant variance is one of the key assumptions of Ordinary Least Squares. The test was carried out as specified by Jarque and Bera (1987). It is an asymptotic test which follows Chi-square distribution with 2 df. From Table 5.7 the study do not reject the null hypothesis that 'the residuals are normally distributed' as calculated JB-statistic and p-value of 5.550688 and 0.062328 was found for life expectancy model and 2.467165 and 0.291247 was recorded for under-five mortality rate model respectively. The result showed that the chances of rejecting a true null hypothesis (Type I error) was reasonably high, especially in the case of under-five mortality rate model (See Appendix 5A and 5B).

4.6 Influence of government external debt on official development assistance's impact on life expectancy and under-five mortality rate in Nigeria

This section presented the effect of interaction of government indebtedness on official development assistance's impact on average life expectancy and under-five mortality rate. The objective here is to ascertain how rising government indebtedness (debts owe to foreigners) influences the effectiveness of received official development assistance (ODA) on health outcomes of life expectancy and under-five mortality rate. This was achieved by introducing the dummy variable model of *interaction effect* of government external debt (EXD) on ODA. The short run and long run estimated coefficients of the interaction term (EXD*ODA) in Tables 4.8 below were analysed in comparison to the previously discussed non-interacted ODA result in Tables 4.5 and 4.6. Although the interaction of government external debt on ODA resulted to overall changes in the previously estimated coefficients of the explanatory variables in Tables 4.5 and 4.6 (See Appendix 6A and 6B). Such changes were, however, not of interest here except that of the interaction term (EXD*ODA) which is necessary for achievement of the study's third objective.

Table 4.8: Influence of government external debt on ODA's effect on life expectancy and under-five mortality rate

Variable	*ODA*	*EXD*ODA*	*p-value*	*Debt burden*	*% change*
		Life Expectancy			
DLOG(ODA)	0.000074	0.000033	0.304	-0.000041	-55.41
DLOG(ODA(-1))	0.000085	0.000083	0.0149*	-0.000002	-2.35
DLOG(ODA(-2))	0.000065	0.000063	0.0019*	-0.000002	-3.08
		Long Run Coefficients			
LOG(ODA)	0.059454	0.019975	0.0529	-0.039479	-66.4

		Under-five Mortality Rate			
DLOG(ODA)	-0.000237	-0.00017	0.0827	0.000067	-28.27
DLOG(ODA(-1))	Nil	-0.000287	0.0005*	Nil	Nil
		Long Run Coefficients			
LOG(ODA)	-0.080174	-0.296215	0.7098	-0.216041	269.47

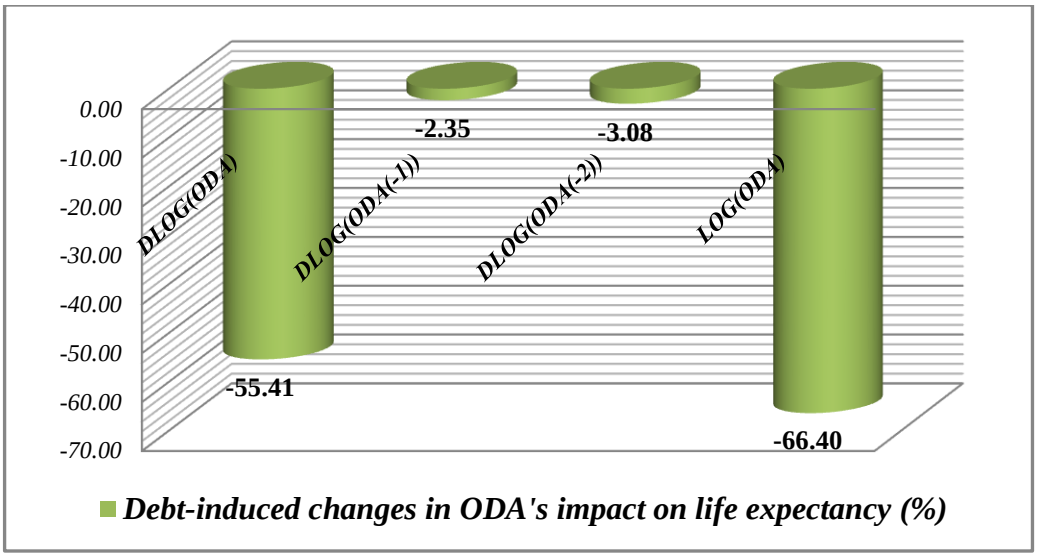
Source: Author's computation
Note: * p-value < 0.05

Influence of government external debt on ODA's effect on life expectancy

Table 4.8 shows short run coefficients of the interaction of external debt on official development assistance to be 0.000033, 0.000083 and 0.000063 respectively for *DLOG(EXD*ODA), DLOG(EXD(-1)*ODA(-1)* and *DLOG(EXD(-2)*ODA(-2)*. This implied that when effect of the cost of external debt is considered and other factors held constant, a percentage rise in the changes in current ODA, its 1st lagged and 2nd lagged values would cause life expectancy to rise by about 0.000033%, 0.000085% and 0.000063% respectively on average. When compared to the short run effect of non-interactive ODA on LEXP, the burden of external debt would cause life expectancy to drop by about 0.000041, 0.000002, 0.000002 respectively on average. This amounted to 55.41%, 2.35% and 3.08% reducation in average life expectancy (See Figure 4.3 below).

Over the long run, the interaction of external debt and ODA yelded about 0.039479 drop in average life expectancy than what it was before the interation. Hence, the effect of external debt on ODA would cause LEXP to rise by about 0.019975% as against 0.059454% before the interaction. The lesson drawn for the long run coefficient is that improvement on life expectancy as a result of a percentage rise in ODA would drop by about 66.4% when the burden of resultant external debt is considered. It is important to note that the differential slops (interaction terms) were only considered significant in the 1st and 2nd lag of the short run coefficients with p-values equal to 0.0149 and 0.0019 respectively. When analyzed in context of the argument put forward by Bradshaw, Noonan, Gash and Sershen (1993) on aid's contribution to high indebtedness of Third World economies, the result would imply that actual effect of foreign aid on health outcome in Nigeria cannot be ascertain without inclusion of incremental debt of such aid.

Figure 4.3: Percentage change in life expectancy due to interaction of debt and ODA



Source: Author's computation

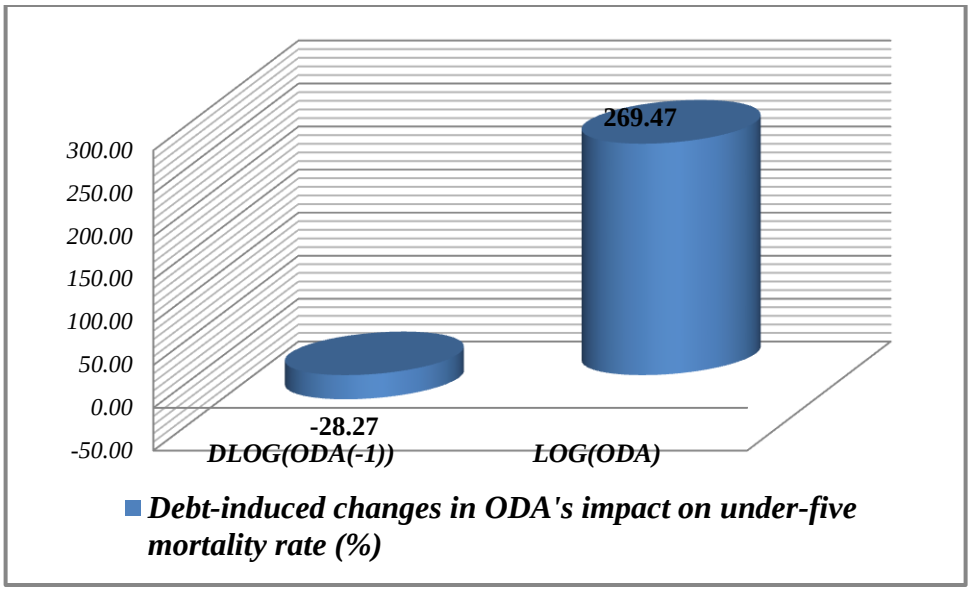
Influence of government external debt on ODA's effect on under-five mortality rate

The interaction of external debt (EXD) and official development assistance (ODA) on under-five mortality rate produced short run coefficients of -0.000170 and -0.000287 with corresponding p-values of 0.0827 and 0.0089. Prior to the consideration of influence of debt on ODA's effect on under-five mortality rate, the short run coefficient was -0.000237. This means that when effect of external debt is considered, one per cent rise in ODA would lead to an average fall in the under-`five mortality rate by about 0.000170% and 0.000287% respectively as effect of other factors are held constant. The debt burden is responsible for up to 28.27% change or 0.000067 increase in the number of under-five mortality rate per 1000 live births in the short run. It is important to observe the significant p-value (0.0005) of 1st lag of the differential slop of EXD on ODA (See *DLOG(EXD(-1)*ODA(-1))* in Appendix 6A and 6B). This demonstrates that the impact of debt on ODA does not instantaneously transmit to child mortality rate. It rather it takes some time for debt burden to reflect on health outcome due to the usual interval between borrowing and repayment periods. The same trend was equally observed in the above discussed effect of EXD on ODA's impact on life expectancy.

Not minding the fact that the long run influence of EXD on ODA's impact on under-five mortality rate is not significant as its p-value was 0.8809, its coefficient (-0.296215) presented an

interesting result. Literarily, it shows that when effect of external debt is included, a percentage rise in ODA would cause the rate of child mortality to drop by about 0.296215% on average compared to a drop of 0.80174% when effect of debt and other variables are constant. In contrast, the interaction of debt on ODA became a serious burden as it recorded a drop in child mortality rate by 0.216041 which represented 269.47% rise compared to when influence of debt was not considered (See Figure 4.4). Following Lim (2014) on its report that foreign aid does not significantly reduce under-five mortality, this study linked the claim to the fact that such aids might not be effectively utilized based on original plan. Both political and bureaucratic factors could undermine the effectiveness of government policies as Connolly and Munro (1999) rightly argue.

Figure 4.4: Percentage change in under-five mortality rate due to interaction of debt and ODA



Source: Author's computation

4.7 Evaluation of Research Hypotheses

Specified hypotheses of the study were evaluated based on results already discussed in section 4.4 and 4.6 above. Decisions were taken based on statistical significance of coefficients of variable of interest using estimated probability values.

Research hypothesis 1: ODA has no significant effect on life expectancy in Nigeria.

From result in Table 4.5, estimated short run coefficients of ODA are 0.000074, 0.000085 and 0.000065. Their corresponding probability values are 0.1113, 0.0746 and 0.0158. Also in the long run, its estimated coefficient and probability value are 0.059454 and 0.0089. The decision rule is to reject null hypothesis when probability value of the coefficient is below or equal to 0.05. This would not be rejected if otherwise. Having found p-values (0.0158 and 0.0089) of short run and long run coefficients (0.000065 and 0.059454) of ODA to be less than 0.05, the study rejected the null hypothesis that 'ODA has no significant effect on life expectancy in Nigeria'. As a result, it upheld the alternative hypothesis which stated that 'ODA has significant effect on life expectancy in Nigeria'. Hence, the study concludes that ODA has significant positive short run and long run effect on life expectancy in Nigeria at 5% level of significance.

Simply put, the conclusion implies that official development assistance (foreign aids) received in Nigeria remains one of the important factors that improve life expectancy in the country. It is therefore right to expect improved utilization of received ODA to raise Nigeria's average life expectancy which hovers around 53 years in recent period as it cannot compare with some developing economies like Egypt (about 70 years) Brazil (about 73 years), China (about 82 years) and others,

Research hypothesis 2: ODA has no significant impact on under-five mortality rate in Nigeria.

Following established decision rule in hypothesis 1, the output Table 4.6 shows that while short run coefficient and p-value of ODA are -0.000237 and 0.2445, its long run coefficient and p-value are -0.080174 and 0.7098 respectively. Due to the high p-values (0.2445 and 0.7098) of ODA's impact on under-five mortality rate, the study does not reject the null hypothesis that 'ODA has no significant impact on under-five mortality rate in Nigeria' at 5% level of significance. The result pointed out that the ODA received in Nigeria has not significantly contributed to short run and long run reduction in under-five mortality rate per 1000 live births in the country. Another interpretation of this result is that average under-five mortality rate based on sampled data and on one decade average remains so high at 177.39 and 80.65 under-five deaths out of every 1000 live births. The result projected a poor image of Nigeria on child and maternal health in comparison to fellow developing countries such as Malaysia, Chile, Romania and Tunisia that recorded 6.63, 7.43, 12.38 and 14.88 deaths per 1000 live births over the same period.

Research hypothesis 3: Government external debt has no significant influence on the impact of ODA on life expectancy and under-five mortality rate in Nigeria.

From the result of the short run and long run p-values of the coefficients of interacted external debt and ODA effect on life expectancy in Table 4.8, the short-run 1st lagged (0.0149) and 2nd lagged (0.0019) p-values were less than 0.05 but the long run p-value (0.0529) was above the benchmark of 0.05. Similarly, the short-run 1st lagged p-value (0.0005) of the interacted coefficients impact of ODA on under-five mortality rate was less than 0.05 but its long run p-value (0.7098) was above the benchmark. For this reason and in line with established decision

rule, the study rejected the null hypothesis that 'government external debt has no significant influence on the impact of ODA on life expectancy and under-five mortality rate in Nigeria.' The reason is that government external debt has significant influence on the impact of ODA on life expectancy and under-five mortality rate in the short-run at 5% level of significance. The study therefore, endorsed the alternative hypothesis, and concludes that government external debt has significant influences ODA's impact on life expectancy and under-five mortality rate in the short run in Nigeria. The study is therefore of the opinion that long term variation in life expectancy and child mortality as a result of other factors would absorb the likely transmitted effect of resultant external debt on ODA's impact on both health outcomes. This is mainly due to the indirect relationships that exist therein.

4.8 Policy Implications of the Research Findings

The result of the study shows that official development aid (ODA), government spending on education (GSE), government spending on health (GSH) and per capita gross domestic product (PCGDP) have significant positive effect on life expectancy. On the other hand, the study equally shows that above listed variables have negative and insignificant effects on under-five mortality rate. The result has strong implications for the health and education sectors, Office of National Planning and Development and to policy makers in Nigeria. First, it indicates that the policy makers should channel more resources to education and health sector since they prove to contribute to longevity of Nigerians. With improvement in the quality and cost of healthcare delivery system as well as provision of quality and affordable education services, citizens are bound to live healthier and long and thereby contributing more to the national output. Secondly, the relevance of foreign aid and per capita GDP to improvement in life expectancy implies that the Federal Government of Nigeria should articulate policies to redistribute income, increase per capita GDP and increase its efficiency in management of received foreign aids.

With respect to the prevailing high under-five morality rate in the presence of current level of foreign aid, public health and education expenditure, the Federal Ministry of Health should collaborate with the Federal Government and other development agencies in finding better ways to mitigate high under-five death rate in the country. This can be achieved through awareness

campaign in form of seminars, symposia and other channels. Again, regular vaccination and immunization exercise should be conducted by the Ministry of Health and ensure more coverage of the rural areas.

In a related development, the influence of public external debt on ODA's impact on life expectancy and under-five mortality rate was found to be significant. It implies that the burden of external public debt as surpass it expected level, and thus it becomes detrimental to long run investment in better living standard and good health. Steady increase in the rate of foreign debt growth suggests a corresponding rise in debt service charges. When it becomes uncontrollable, such huge interest and capital repayment would constitute a drain on national economy which would worsen overall living standard in the country. Thus, moderate effort should be made by the Federal Government to minimize the growth of foreign debt as well as its accumulate interest.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 Summary of major findings

Regular assessment of results and procedures involved often provides room for improvement in every human endeavour. Consequently, the need to evaluate the effectiveness of certain government transactions and contracts on defined national goals informed conduct of this study. As a one of the developing economies in Sub-Saharan Africa, Nigeria is bedevilled with high level of illiteracy, high child and maternal mortality rate, alarming incidence of poverty, and rated poor in other human capital development indicators today. Despite previously published reports of several studies on how recipient of foreign aids could ameliorate above listed human capital development indices among developing economies, Nigeria's experience remains almost unchanged. Apart from other causes of mortality ranging from crisis to epidemics, the statistical evidence that average of about 104 children dies out of every 1000 live births before their fifth birthday in 2016 calls for evaluation of national effort to curb the trend. In addition, other statistics such as the fact that under-five mortality rate was brought down from 158 to 120 per 1000 live births between 2011 and 2016, average of 814 out of every 100,000 mother as a result of childbirth and pregnancy related issues in 2015 and that life expectancy of Nigerians just rose to 55.2 years with males 54.7 years and females 55.7 years in 2018 estimate are issues to worry about. These factors propelled the study to achieve specific objectives which include determining the effect of official development assistance (ODA) on life expectancy, estimating the impact of ODA on under-five mortality rate and examining the influence of government external debt on the impact of ODA on life expectancy and under-five mortality rate in Nigeria.

In pursuit of the study objectives, annual time series data were sourced from Central Bank of Nigeria Statistical Bulletin 2015 and World Bank Development Indicators 2017 from 1981 to 2016. The data were subjected to both descriptive statistics and dynamic regression technique of autoregressive distributive lag (ARDL) model with the aid of Eviews 9.0 econometric software.

After necessary pre- and post-estimation tests, the study found both values of life expectancy and child mortality rate in previous years to significantly determine their current annual values. Surprise enough, while previous values of life expectancy contribute positively to its current value, that of child mortality contribute negatively by increasing its current values per annum. The key variable of interest which is ODA remains relevant among the factors that improve life expectancy in Nigeria as it contributed about 0.06% to that effect. This was however not the situation with child mortality rate. Not minding the fact that recipient of ODA was found to decrease child mortality by about 0.08%, its effect was dismissed as it was not statistically significant in the study. Additionally, the result of other control variables like government spending on education (GSE) and health (GSH) are useful positive determinants of life expectancy at all times. On the contrary, none of the duo played significant positive role in bring down the rate of child mortality even as their coefficients conformed to a priori expectation. Furthermore, per capita gross domestic product (PGDP) which was a proxy for aggregated wealth index and population growth rate (PGR) were also of importance in the study. While the two variables significantly contributed to increase in life expectancy in the short run and long run periods, their contribution to fall in child mortality rate over the same period were rather insignificant. In summing up the relevance of ODA and other control variables on life expectancy and child mortality in the study, it is important to note that significance of any of the explanatory variables was more of statistical issue since none of them exerted up to 1 percentage change in either life expectancy or child mortality rate.

On the other hand, results of the influence of government external debt (EXD) on ODA's impact on health outcomes of life expectancy and child mortality rate remains interesting. Over the short run and long run period, the study revealed that incurred external debt caused ODA to contribute less on improvement of life expectancy than previously observed when effect of debt was not considered. The debt burden amounted to 55.41%, 2.35% and 3.08% reduction in 1^{st} difference, its 1^{st} and 2^{nd} lag in the short run and 66.4% reduction in the long run coefficient of ODA. It is however not surprising that debt burden on ODA's impact was significant only in the lagged coefficients in the short run. This revelation was considered to represent the maturation period of debt repayment (including yielded interest) which is usually one and above after the borrowing. On a similar scale, debt burden on ODA's impact on child mortality rate was also

significant. Most importantly, debt burden deteriorated ODA's impact by increasing child mortality rate by 267.47% compare to its value in absence of debt.

Based on tested hypotheses which correspond to the objectives of the study, the null hypothesis that 'ODA has no significant effect on life expectancy in Nigeria' was rejected. It was concluded that ODA has significant positive short run and long run effect on life expectancy at 5% level of significance. Thus, recipient of ODA in Nigeria remains one of the notable factors that improve life expectancy in the country. Again, the second null hypothesis that 'ODA has no significant impact on child mortality rate in Nigeria' was not rejected as effect of ODA on child mortality rate was not significant in the study. Lastly, the study rejected the null hypothesis that 'EXD has no significant influence on the impact of ODA on life expectancy and child mortality rate in Nigeria' at 5% level of significance. It concluded that EXD significantly influences ODA's impact on life expectancy and child mortality rate in the short run in Nigeria.

5.2 Policy recommendations

Key results of this study include evidence of significant positive impact of ODA on life expectancy, poor contribution of ODA to reduction in child mortality rate and simultaneous deterioration of ODA's impact on life expectancy and child mortality rate in the presence of incurred external debt. Others include the magnitude of education and health spending impact on life expectancy and child mortality. In view of above observations, the study therefore recommended the following policies options:

i. Having found official development assistance received by Nigeria contributes positively to improving expected average life span in the country, the federal government should therefore step up on its supervision of how proceeds of health related foreign aids is spent in order to improve its expected outcome. This resonates from the fact that estimated magnitude of the ODA's impact on LEXP remains rather too meagre to be relied upon. The greatest impact is about 0.06% rise in life expectancy in the long run. This can improve when disbursement of health aids enjoy adequate supervision by health authorities in the country. Similarly, the observation of insignificant impact of ODA on under-five mortality rate justified the need for supervision and possible amendment on

how health aids gets down to primary healthcare centres, maternity homes and paediatric hospitals for onward benefits of newly born and under-five children in the country.

ii. The study's report that presence of external debt diminished the impact of ODA on health outcome by contributing less to life expectancy and more to under-five mortality rate is expected but not welcome. In addition to its benefits, public debt is associated with direct and indirect cost to recipient countries. For this reason, the federal government is expected to conduct a cost-benefit analysis of associated debt on foreign aids and strategize on how best to manage such debt before signing pact with foreign donors. The implication of observed foreign debt effect on ODA is that 'expensive' health aid could neutralize expected benefits and thereby left Nigeria worse off. As recommended in (i) above, the potential debt burden of foreign aid should serve as a reason for improvement in the process of aid disbursement and monitoring.

iii. Based on ineffective impact of government education and health spending on health outcomes, the study strongly recommends that the federal government should respond to recurrent calls to increase its spending on health and education sectors. This became very important as the country maintains steady rise on its poverty profile which is intricately interwoven with high illiteracy rate and poor health indices among Nigerians. It remains a sad experience that annual budget of the country still provide education and health spending far less than United Nations Educational, Scientific and Cultural Organisation (UNESCO) recommendation of about 25% on education and World Health Organisation (WHO) recommendation of about 15% on health.

iv. Lastly, the federal government should look inward for solutions to improve living standard on Nigerians. This can be partly achieved via diversification of revenue base of the economy away from the oil sector so as to realise better income re-distribution. One the benefits that low income inequality produces per capita gross domestic product that closely reflect aggregate wealth index of individuals in the country. This would provide average citizen with better economic choice on their health and other needs.

5.3 Limitation of the study and recommendation for further research

Although the study successfully achieved its stated objectives, it cannot be exempted from limitations which could undermine effectiveness of the results. They include issue of reliability of sample data which vary according to their source. For example, the data on per capita gross domestic product, government education and health expenditure have some variations in Central Bank of Nigeria Statistical Bulletin and the World Bank Development Indicator. This might have compromised quality of the result. Moreover, the study was influenced by availability of funds required to gather latest information on the topic. Time allocation for study is also another factor that limits study. Consequently, the researcher hereby recommends the following area of study for interested researchers;

1. Cost-benefit of foreign aids in Nigeria.
2. Evaluation of foreign debt management in Nigeria.

5.4 Conclusion

Having extensively discussed findings of the study in Chapter Four, it becomes appropriate to conclude that ODA could be useful in government's effort to improve health outcomes in Nigeria. Its ability to provide needed fund for development projects made it very attractive in low income developing countries. Yet Nigeria should reconsider its decision to settle as aid recipient with begging bowl from one donor nation to another. The fact that ODAs are not free launch calls for caution as the attached conditionality could reverse its expected benefits. The study equally affirmed that Nigeria is yet to break away from the vicious cycle of high profile foreign debt which undermines her credit rating at international level.

On the issue of government spending on education and health, the study concludes that annual allocation to the two sectors are below expected average that could allow for a better outcome in the country. Hence government spending on education should be increased so as to meet the need of reducing high illiteracy rate in the country. Similar gesture should be extended to health spending to reduce high incidence of child and maternal mortality, and other epidemics that cause mass deaths in the country. Average population growth rate of 2.58% in Nigeria is on the

high side compare to growth rate of per capita gross domestic product. These are part of the high incidence of poverty in the country which carried with it poor health indices. Lastly, government should adjust its current technique of overseeing implementation of foreign aids in the country by ensuring the proceeds of aids be fully implemented for the purpose it was received.

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APPENDICES

Appendix 1: Augmented Dickey-Fuller Stationarity Test

Government external debt

Null Hypothesis: D(EXD) has a unit root
Exogenous: None
Lag Length: 5 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.282825	0.0019
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXD,2)
Method: Least Squares
Date: 07/13/18 Time: 19:41
Sample (adjusted): 1988 2016
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXD(-1))	-2.784723	0.848270	-3.282825	0.0033
D(EXD(-1),2)	1.463999	0.780136	1.876594	0.0733
D(EXD(-2),2)	1.102077	0.651150	1.692509	0.1041
D(EXD(-3),2)	0.606605	0.493712	1.228661	0.2316
D(EXD(-4),2)	0.344233	0.331761	1.037592	0.3102
D(EXD(-5),2)	0.249549	0.172479	1.446839	0.1614

R-squared	0.703339	Mean dependent var	-1.20E+08
Adjusted R-squared	0.638848	S.D. dependent var	2.27E+09
S.E. of regression	1.36E+09	Akaike info criterion	45.08389
Sum squared resid	4.26E+19	Schwarz criterion	45.36678
Log likelihood	-647.7164	Hannan-Quinn criter.	45.17249
Durbin-Watson stat	1.987009		

Government spending on education

Null Hypothesis: D(GSE) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.917783	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GSE,2)
Method: Least Squares
Date: 07/13/18 Time: 19:42
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GSE(-1))	-0.846928	0.172217	-4.917783	0.0000

R-squared	0.422900	Mean dependent var	272.2793
Adjusted R-squared	0.422900	S.D. dependent var	45134.99
S.E. of regression	34287.75	Akaike info criterion	23.75193
Sum squared resid	3.88E+10	Schwarz criterion	23.79683
Log likelihood	-402.7829	Hannan-Quinn criter.	23.76724
Durbin-Watson stat	2.009339		

Government spending on health

Null Hypothesis: D(GSH,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 8 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.794478	0.0341
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GSH,3)
Method: Least Squares
Date: 07/13/18 Time: 19:46
Sample (adjusted): 1992 2016
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GSH(-1),2)	-22.19031	5.848053	-3.794478	0.0020
D(GSH(-1),3)	19.56048	5.711793	3.424578	0.0041
D(GSH(-2),3)	17.73030	5.461195	3.246597	0.0059
D(GSH(-3),3)	15.38170	5.061049	3.039230	0.0088
D(GSH(-4),3)	13.17622	4.454484	2.957968	0.0104
D(GSH(-5),3)	10.45434	3.789793	2.758551	0.0154
D(GSH(-6),3)	9.324053	2.940569	3.170833	0.0068
D(GSH(-7),3)	6.956656	2.006050	3.467837	0.0038
D(GSH(-8),3)	2.762003	1.048191	2.635019	0.0196
C	-26001.41	13457.06	-1.932176	0.0738
@TREND("1981")	1923.772	766.7061	2.509139	0.0250

R-squared	0.984576	Mean dependent var	-3712.213
Adjusted R-squared	0.973558	S.D. dependent var	80726.25
S.E. of regression	13126.87	Akaike info criterion	22.10289
Sum squared resid	2.41E+09	Schwarz criterion	22.63920
Log likelihood	-265.2862	Hannan-Quinn criter.	22.25164
F-statistic	89.36495	Durbin-Watson stat	1.944729
Prob(F-statistic)	0.000000		

Life expectancy

Null Hypothesis: D(LEXP,2) has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.312352	0.0223
Test critical values:	1% level	-2.641672	
	5% level	-1.952066	
	10% level	-1.610400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LEXP,3)
Method: Least Squares
Date: 07/13/18 Time: 19:48
Sample (adjusted): 1986 2016
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEXP(-1),2)	-0.069930	0.030242	-2.312352	0.0283
D(LEXP(-1),3)	1.161003	0.158238	7.337079	0.0000
D(LEXP(-2),3)	-0.365870	0.165283	-2.213603	0.0352

R-squared	0.844235	Mean dependent var	0.002226
Adjusted R-squared	0.833109	S.D. dependent var	0.013283
S.E. of regression	0.005427	Akaike info criterion	-7.503261
Sum squared resid	0.000825	Schwarz criterion	-7.364488
Log likelihood	119.3005	Hannan-Quinn criter.	-7.458024
Durbin-Watson stat	2.047379		

Official development assistance

Null Hypothesis: ODA has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.581116	0.0114
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ODA)
Method: Least Squares
Date: 07/13/18 Time: 19:49
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ODA(-1)	-0.341907	0.132465	-2.581116	0.0143

R-squared	0.162878	Mean dependent var	70327429
Adjusted R-squared	0.162878	S.D. dependent var	2.10E+09
S.E. of regression	1.92E+09	Akaike info criterion	45.61985
Sum squared resid	1.26E+20	Schwarz criterion	45.66429
Log likelihood	-797.3473	Hannan-Quinn criter.	45.63519
Durbin-Watson stat	1.825761		

Per capita gross domestic product

Null Hypothesis: D(PGDP,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on Modified AIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.28754	0.0000
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PGDP,3)
Method: Least Squares
Date: 07/13/18 Time: 19:56
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PGDP(-1),2)	-1.559526	0.151594	-10.28754	0.0000
C	2691.719	14188.73	0.189708	0.8508
@TREND("1981")	-87.00686	667.5913	-0.130330	0.8972

R-squared	0.779154	Mean dependent var	353.1699
Adjusted R-squared	0.764430	S.D. dependent var	75220.35
S.E. of regression	36508.58	Akaike info criterion	23.93499
Sum squared resid	4.00E+10	Schwarz criterion	24.07104
Log likelihood	-391.9273	Hannan-Quinn criter.	23.98077
F-statistic	52.92050	Durbin-Watson stat	2.319532
Prob(F-statistic)	0.000000		

Population growth rate

Null Hypothesis: D(PGR) has a unit root
Exogenous: None
Lag Length: 8 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.395799	0.0015
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PGR,2)
Method: Least Squares
Date: 07/13/18 Time: 19:57
Sample (adjusted): 1991 2016
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PGR(-1))	-0.107154	0.031555	-3.395799	0.0034
D(PGR(-1),2)	1.410106	0.163815	8.607939	0.0000
D(PGR(-2),2)	-1.012708	0.261124	-3.878260	0.0012
D(PGR(-3),2)	0.714613	0.201894	3.539547	0.0025
D(PGR(-4),2)	0.022708	0.115600	0.196437	0.8466
D(PGR(-5),2)	-0.267984	0.113912	-2.352549	0.0310
D(PGR(-6),2)	0.552831	0.130100	4.249296	0.0005
D(PGR(-7),2)	-0.423346	0.148858	-2.843959	0.0112
D(PGR(-8),2)	0.263097	0.093525	2.813116	0.0120

R-squared	0.942429	Mean dependent var	-2.61E-05
Adjusted R-squared	0.915336	S.D. dependent var	0.005766
S.E. of regression	0.001678	Akaike info criterion	-9.675345
Sum squared resid	4.79E-05	Schwarz criterion	-9.239850
Log likelihood	134.7795	Hannan-Quinn criter.	-9.549938
Durbin-Watson stat	1.983823		

Under-five mortality rate

Null Hypothesis: D(U5M,2) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.738252	0.0077
Test critical values:	1% level	-2.636901	
	5% level	-1.951332	
	10% level	-1.610747	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(U5M,3)
Method: Least Squares
Date: 07/13/18 Time: 19:58
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(U5M(-1),2)	-0.208936	0.076303	-2.738252	0.0100

R-squared	0.165409	Mean dependent var	-0.039394
Adjusted R-squared	0.165409	S.D. dependent var	0.230406
S.E. of regression	0.210490	Akaike info criterion	-0.248923
Sum squared resid	1.417792	Schwarz criterion	-0.203575
Log likelihood	5.107237	Hannan-Quinn criter.	-0.233665
Durbin-Watson stat	1.687834		

Appendix 2: Descriptive Statistics

Date: 07/13/18
Time: 21:41

Sample: 1981 2016

	LEXP	U5M	EXD	GSE	GSH	INF	ODA	PGDP	PGR
Mean	47.75067	177.3917	1.47E+09	92823.63	54609.13	19.60305	1.19E+09	121849.5	2.587013
Median	46.11450	195.2500	6.69E+08	27368.07	9980.174	12.54679	2.59E+08	26680.79	2.582130
Maximum	53.42800	212.9000	6.15E+09	390424.8	257720.0	72.83550	1.14E+10	551511.5	2.857502
Minimum	45.63500	104.3000	34396000	162.1541	41.31455	5.382224	31710000	685.3477	2.488183
Std. Dev.	2.519518	38.25527	1.58E+09	125921.7	79394.53	17.69043	2.18E+09	178577.2	0.082752
Skewness	1.030342	-0.649776	1.454219	1.277158	1.397295	1.664533	3.375425	1.417000	0.912962
Kurtosis	2.529735	1.868013	4.313709	3.168907	3.548011	4.526585	15.43192	3.446712	4.168278
Jarque-Bera	6.701347	4.455341	15.27726	9.829584	12.16507	20.11972	300.1899	12.34666	7.048311
Probability	0.035061	0.107779	0.000481	0.007337	0.002282	0.000043	0.000000	0.002084	0.029477
Sum	1719.024	6386.100	5.30E+10	3341651.	1965929.	705.7097	4.29E+10	4386582.	93.13248
Sum Sq. Dev.	222.1789	51221.29	8.70E+19	5.55E+11	2.21E+11	10953.29	1.66E+20	1.12E+12	0.239674
Observations	36	36	36	36	36	36	36	36	36

Appendix 3: Bond testing

Life expectancy

ARDL Bounds Test
Date: 07/13/18 Time: 23:23
Sample: 1984 2016
Included observations: 33
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	10.29680	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Test Equation:
Dependent Variable: DLOG(LEXP)
Method: Least Squares
Date: 07/13/18 Time: 23:23
Sample: 1984 2016
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(LEXP(-1))	1.733208	0.077034	22.49915	0.0000
DLOG(LEXP(-2))	0.813704	0.064649	12.58647	0.0000
DLOG(ODA)	1.29E-05	5.87E-05	0.219584	0.8292
DLOG(ODA(-1))	0.000138	4.57E-05	3.015432	0.0087
DLOG(ODA(-2))	7.90E-05	5.39E-05	1.465997	0.1633
DLOG(GSE)	2.51E-05	0.000101	0.248855	0.8068
DLOG(GSE(-1))	0.000129	0.000108	1.196923	0.2499
DLOG(GSH)	6.96E-05	0.000101	0.687449	0.5023
DLOG(GSH(-1))	0.000190	0.000116	1.633992	0.1231
DLOG(PGDP)	0.000145	0.000158	0.920657	0.3718
DLOG(PGDP(-1))	0.000152	0.000145	1.046278	0.3120
C	0.010040	0.009954	1.008640	0.3291
LOG(ODA(-1))	0.000264	5.29E-05	4.987103	0.0002
LOG(GSE(-1))	0.000125	0.000189	0.661068	0.5186
LOG(GSH(-1))	0.000377	0.000230	1.635310	0.1228
LOG(PGDP(-1))	1.18E-05	0.000134	0.088499	0.9307
PGR(-1)	0.002386	0.001174	2.031710	0.0603
LOG(LEXP(-1))	0.003233	0.003296	0.981129	0.3421

R-squared	0.999697	Mean dependent var	0.004522
Adjusted R-squared	0.999353	S.D. dependent var	0.004654
S.E. of regression	0.000118	Akaike info criterion	-14.94321
Sum squared resid	2.10E-07	Schwarz criterion	-14.12693
Log likelihood	264.5629	Hannan-Quinn criter.	-14.66855
F-statistic	2909.352	Durbin-Watson stat	2.104637
Prob(F-statistic)	0.000000		

Under-five mortality rate

ARDL Bounds Test
Date: 07/13/18 Time: 23:29
Sample: 1983 2016
Included observations: 34
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	17.20650	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Test Equation:
Dependent Variable: DLOG(U5M)
Method: Least Squares
Date: 07/13/18 Time: 23:29
Sample: 1983 2016
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(U5M(-1))	0.906886	0.036240	25.02474	0.0000
DLOG(PGDP)	9.97E-05	0.001036	0.096302	0.9241
D(PGR)	0.049649	0.028519	1.740931	0.0951
D(PGR(-1))	-0.055580	0.022269	-2.495811	0.0202
C	-0.008973	0.053352	-0.168191	0.8679
LOG(ODA(-1))	3.37E-05	0.000265	0.127415	0.8997
LOG(GSE(-1))	-0.000283	0.000843	-0.335716	0.7401
LOG(GSH(-1))	3.29E-05	0.000870	0.037796	0.9702
LOG(PGDP(-1))	-0.000960	0.000652	-1.472639	0.1544
PGR(-1)	0.018022	0.009250	1.948333	0.0637

LOG(U5M(-1))	-0.005608	0.005251	-1.068114	0.2966

R-squared	0.997819	Mean dependent var	-0.020527
Adjusted R-squared	0.996870	S.D. dependent var	0.017287
S.E. of regression	0.000967	Akaike info criterion	-10.78833
Sum squared resid	2.15E-05	Schwarz criterion	-10.29451
Log likelihood	194.4017	Hannan-Quinn criter.	-10.61993
F-statistic	1052.109	Durbin-Watson stat	2.081556
Prob(F-statistic)	0.000000		

Appendix 4: Effect of ODA on health outcomes in Nigeria

Appendix 4A: Effect of ODA on LEXP in Nigeria

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(LEXP)
Selected Model: ARDL(3, 3, 2, 2, 2, 0)
Date: 07/13/18 Time: 23:58
Sample: 1981 2016
Included observations: 33

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(LEXP(-1))	1.758932	0.068265	25.766218	0.0000
DLOG(LEXP(-2))	0.848366	0.055323	15.334862	0.0000
DLOG(ODA)	0.000074	0.000044	1.691956	0.1113
DLOG(ODA(-1))	0.000085	0.000044	1.916356	0.0746
DLOG(ODA(-2))	0.000065	0.000024	2.721201	0.0158
DLOG(GSE)	0.000120	0.000077	1.571409	0.1369
DLOG(GSE(-1))	0.000130	0.000054	2.386781	0.0306
DLOG(GSH)	0.000196	0.000080	2.441131	0.0275
DLOG(GSH(-1))	0.000155	0.000062	2.522573	0.0234
DLOG(PGDP)	0.000083	0.000138	0.601969	0.5562
DLOG(PGDP(-1))	0.000194	0.000081	2.397979	0.0299
D(PGR)	0.003686	0.000603	6.114555	0.0000
CointEq(-1)	-0.004974	0.001483	-3.354690	0.0043

Cointeq = LOG(LEXP) - (-0.0595*LOG(ODA) -0.0585*LOG(GSE) + 0.0948 *LOG(GSH) + 0.0198*LOG(PGDP) + 0.7412*PGR + 2.7595)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ODA)	0.059454	0.019781	3.005634	0.0089
LOG(GSE)	0.058494	0.017225	3.395783	0.0040
LOG(GSH)	0.094784	0.031740	2.986219	0.0092
LOG(PGDP)	0.019784	0.025949	0.762443	0.4576
PGR	0.741162	0.185526	3.994918	0.0012
C	2.759514	0.222010	12.429659	0.0000

Appendix 4B: Effect of ODA on U5M in Nigeria

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(U5M)
Selected Model: ARDL(2, 0, 0, 0, 1, 2)
Date: 07/13/18 Time: 23:51
Sample: 1981 2016
Included observations: 34

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(U5M(-1))	0.942000	0.024337	38.706420	0.0000
DLOG(ODA)	-0.000237	0.000198	-1.194354	0.2445
DLOG(GSE)	-0.000680	0.000487	-1.396213	0.1760
DLOG(GSH)	-0.001018	0.000506	-2.012593	0.0560
DLOG(PGDP)	-0.000342	0.000501	-0.682545	0.5017
D(PGR)	0.064538	0.024217	2.665024	0.0138
D(PGR(-1))	-0.063531	0.014420	-4.405861	0.0002
CointEq(-1)	-0.002953	0.006206	-0.475902	0.6386

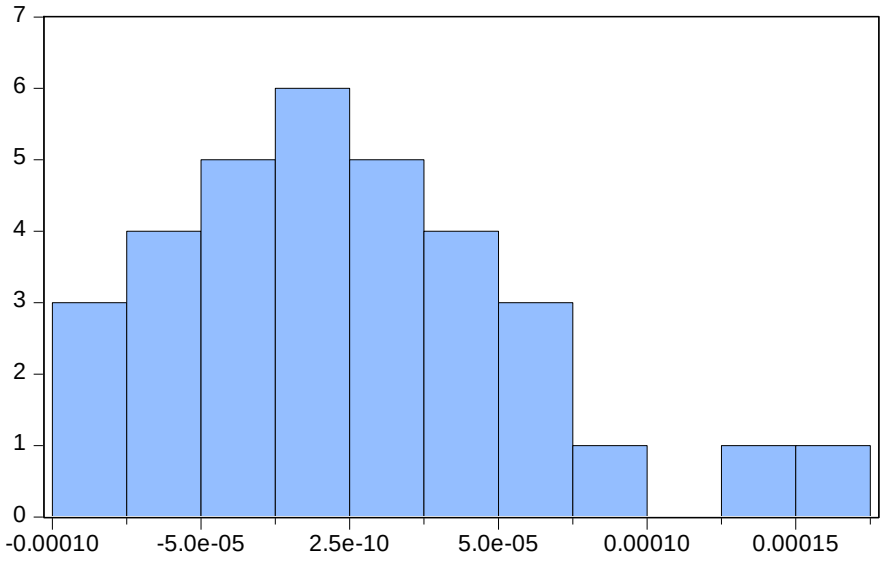
Cointeq = LOG(U5M) - (-0.0802*LOG(ODA) -0.2303*LOG(GSE) + 0.3447 *LOG(GSH) -0.3814*LOG(PGDP) + 8.3214*PGR -12.4503)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ODA)	-0.080174	0.212767	-0.376816	0.7098
LOG(GSE)	-0.230319	0.596610	-0.386047	0.7030
LOG(GSH)	-0.344708	0.837479	-0.411602	0.6844
LOG(PGDP)	-0.381374	0.632087	-0.603358	0.5522
PGR	8.321379	20.972087	0.396784	0.6952
C	-12.450309	46.960238	-0.265124	0.7933

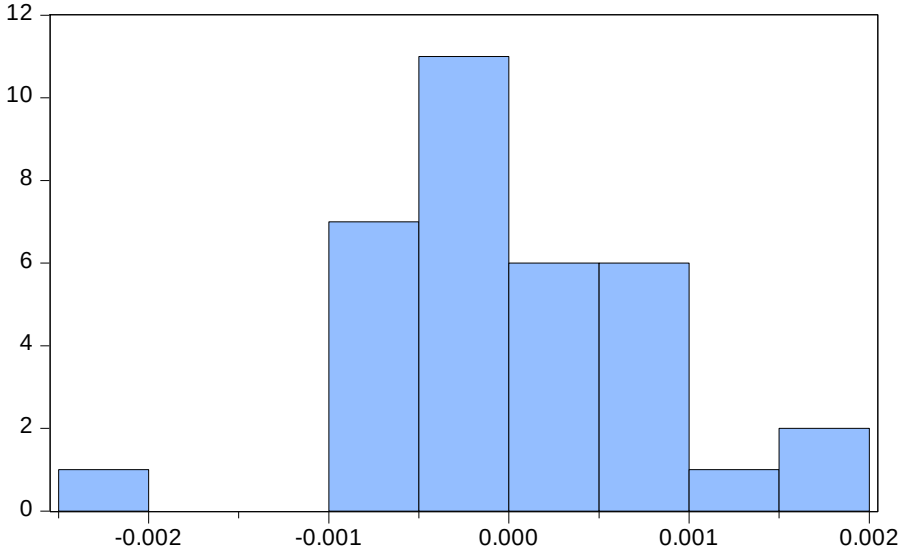
Appendix 5: Normality test tests for effect of ODA on health outcomes in Nigeria

Appendix 5A: Normality test tests for effect of ODA on life expectancy



Series: Residuals	
Sample 1984 2016	
Observations 33	
Mean	1.60e-15
Median	-1.19e-05
Maximum	0.000175
Minimum	-9.95e-05
Std. Dev.	6.06e-05
Skewness	0.896864
Kurtosis	3.905209
Jarque-Bera	5.550688
Probability	0.062328

Appendix 5B: Normality test tests for effect of ODA on under-five mortality rate



Series: Residuals	
Sample 1983 2016	
Observations 34	
Mean	2.19e-15
Median	-0.000136
Maximum	0.001810
Minimum	-0.002304
Std. Dev.	0.000776
Skewness	-0.108866
Kurtosis	4.301584
Jarque-Bera	2.467165
Probability	0.291247

Appendix 6: Influence of EXD on ODA's impact on health outcomes in Nigeria

Appendix 6A: Influence of EXD on ODA's impact on life expectancy

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(LEXP)
Selected Model: ARDL(3, 3, 3, 3, 3, 3)
Date: 07/15/18 Time: 12:56
Sample: 1981 2016
Included observations: 33

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(LEXP(-1))	1.642337	0.110727	14.832331	0.0000
DLOG(LEXP(-2))	0.704734	0.105895	6.655002	0.0001
DLOG(EXD * ODA)	0.000033	0.000031	1.090146	0.3040
DLOG(EXD(-1) * ODA(-1))	0.000083	0.000028	3.003259	0.0149
DLOG(EXD(-2) * ODA(-2))	0.000063	0.000015	4.335689	0.0019
DLOG(GSE)	0.000160	0.000112	1.424297	0.1881
DLOG(GSE(-1))	0.000052	0.000117	0.444645	0.6671
DLOG(GSE(-2))	0.000187	0.000143	1.301761	0.2253
DLOG(GSH)	0.000047	0.000091	0.513972	0.6197
DLOG(GSH(-1))	0.000172	0.000185	0.932396	0.3755
DLOG(GSH(-2))	0.000233	0.000098	2.364298	0.0423
DLOG(PGDP)	0.000568	0.000167	3.390984	0.0080
DLOG(PGDP(-1))	0.000109	0.000235	0.462238	0.6549
DLOG(PGDP(-2))	0.000200	0.000254	0.787014	0.4515
D(PGR)	-0.000448	0.008289	-0.054060	0.9581
D(PGR(-1))	-0.018551	0.018478	-1.003934	0.3416
D(PGR(-2))	-0.010396	0.007298	-1.424573	0.1880
CointEq(-1)	-0.009994	0.004359	-2.292575	0.0476

Cointeq = LOG(LEXP) - (0.0200*LOG(ODA*EXD) -0.0034*LOG(GSE)
-0.0398*LOG(GSH) + 0.0499*LOG(PGDP) + 0.4072*PGR + 1.8345)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ODA*EXD)	0.019975	0.008968	2.227268	0.0529
LOG(GSE)	-0.003417	0.029314	-0.116547	0.9098
LOG(GSH)	-0.039825	0.035267	-1.129242	0.2880
LOG(PGDP)	0.049917	0.026362	1.893505	0.0908
PGR	0.407208	0.098706	4.125462	0.0026
C	1.834462	0.348482	5.264153	0.0005

Appendix 6B: Influence of EXD on ODA's impact on under-five mortality rate

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(U5M)
Selected Model: ARDL(2, 2, 0, 0, 0, 2)
Date: 07/15/18 Time: 12:53
Sample: 1981 2016
Included observations: 34

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(U5M(-1))	0.958360	0.021287	45.020290	0.0000
DLOG(EXD * ODA)	-0.000170	0.000094	-1.818286	0.0827
DLOG(EXD(-1) * ODA(-1))	-0.000287	0.000070	-4.110545	0.0005
DLOG(GSE)	-0.000924	0.000356	-2.592592	0.0166
DLOG(GSH)	-0.001251	0.000441	-2.836493	0.0096
DLOG(PGDP)	-0.000860	0.000320	-2.685770	0.0135
D(PGR)	0.075853	0.021618	3.508833	0.0020
D(PGR(-1))	-0.071580	0.013973	-5.122600	0.0000
CointEq(-1)	-0.000746	0.004810	-0.155025	0.8782

Cointeq = LOG(U5M) - (-0.2962*LOG(ODA*EXD) -1.2386*LOG(GSE) +
1.6783*LOG(GSH) -1.1527*LOG(PGDP) + 38.7619*PGR -76.4517)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ODA*EXD)	-0.296215	1.954176	-0.151581	0.8809
LOG(GSE)	-1.238616	8.206172	-0.150937	0.8814
LOG(GSH)	-1.678309	11.152600	-0.150486	0.8818
LOG(PGDP)	-1.152658	7.046970	-0.163568	0.8716
PGR	38.761949	260.929345	0.148553	0.8833
C	-76.451733	557.826780	-0.137053	0.8922

SAMPLED DATA

YEAR	LEXP	U5M	ODA	GSE	GSH	PGDP	PGR	EXD
1981	45.635	211.5	39250000	165.4274	84.45754	685.3477	2.857502	2683829000
1982	45.866	209.6	34950000	187.9306	95.94635	692.6157	2.715063	678600000
1983	46.021	208.9	46750000	162.1541	82.78640	729.4444	2.602676	6152389000
1984	46.104	209.1	32390000	198.9040	101.5487	789.3021	2.535412	878373000
1985	46.125	209.9	31710000	258.5974	132.0247	879.5493	2.529287	420005000
1986	46.099	211.0	58120000	262.7103	134.1245	872.8680	2.562732	1411283000
1987	46.046	211.9	67620000	225.0054	41.31455	1270.271	2.603203	2932743000
1988	45.988	212.6	1.18E+08	1458.800	422.8000	1635.607	2.625639	1636896000
1989	45.937	212.9	3.44E+08	3011.800	575.3000	2460.585	2.630931	565544000
1990	45.898	212.9	2.55E+08	2402.800	500.7000	2955.288	2.612415	34396000
1991	45.873	212.5	2.58E+08	1256.300	618.2000	3367.268	2.579037	161659000
1992	45.855	211.9	2.59E+08	291.2981	150.1607	5542.176	2.545611	626263000
1993	45.843	211.2	2.88E+08	8882.378	3871.601	6960.196	2.521242	471630000
1994	45.841	210.1	1.90E+08	7382.743	2093.984	8974.894	2.502971	659960000
1995	45.852	208.3	2.11E+08	9746.400	3320.700	18595.84	2.492996	556746000
1996	45.877	205.7	1.89E+08	11496.15	3023.707	25277.37	2.489435	1047514000
1997	45.921	202.1	2.00E+08	14853.54	3891.099	25603.91	2.488365	657034000
1998	45.992	197.7	2.03E+08	13589.49	4742.267	24198.89	2.488183	273417000
1999	46.101	192.8	1.52E+08	43610.65	16638.77	27757.66	2.490724	376062000
2000	46.266	187.4	1.74E+08	57956.64	15218.08	38555.41	2.495813	95053000
2001	46.509	181.7	1.68E+08	39882.60	24522.27	39131.13	2.503397	2131000000
2002	46.834	175.9	3.00E+08	80530.88	40621.42	55400.52	2.511214	593104000
2003	47.240	169.9	3.10E+08	64782.15	33267.98	66245.96	2.521106	379715000
2004	47.717	164.0	5.79E+08	76527.65	34198.48	86219.74	2.536840	250917000
2005	48.246	157.9	6.40E+09	82797.11	55663.00	106055.7	2.559239	1414472000
2006	48.802	151.9	1.14E+10	119018.0	62253.62	131191.7	2.585222	5391972000
2007	49.356	146.0	1.96E+09	150779.3	81909.37	143022.4	2.610391	2346286000
2008	49.887	140.3	1.29E+09	163977.5	98219.32	164055.0	2.631654	771897000
2009	50.385	134.8	1.64E+09	137116.0	90200.00	163443.7	2.648967	287039000
2010	50.847	129.6	2.05E+09	170800.0	99100.00	349791.6	2.661221	72139000
2011	51.279	124.6	1.81E+09	335800.0	231800.0	391174.5	2.668747	2254505000
2012	51.699	120.0	1.92E+09	348400.0	197900.0	433955.8	2.674755	393195000
2013	52.121	115.6	2.52E+09	390424.8	179986.9	471456.1	2.677659	3048687000
2014	52.549	111.6	2.48E+09	343755.0	195976.8	510805.4	2.672919	4157416000
2015	52.985	108.0	2.43E+09	325190.0	257720.0	525316.4	2.659551	4563290000
2016	53.428	104.3	2.50E+09	334470.0	226850.0	551511.5	2.640357	2596833000