

EFFECT OF INCOME INEQUALITY ON HEALTH OUTCOMES AND HEALTH-SEEKING BEHAVIOUR IN NIGERIA

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DECLARATION

I, Timothy Oladayo, POPOOLA hereby solemnly declare that this thesis entitled 'EFFECT OF INCOME INEQUALITY ON HEALTH OUTCOMES AND HEALTH-SEEKING BEHAVIOUR IN NIGERIA' has been carried out by me in the Department of Economics, Ahmadu Bello University, Zaria, Nigeria. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree at this or any other institution.

Timothy Oladayo POPOOLA

.....

Signature

.....

Date

CERTIFICATION

This thesis entitled ‘EFFECT OF INCOME INEQUALITY ON HEALTH OUTCOMES AND HEALTH-SEEKING BEHAVIOUR IN NIGERIA’ by **Timothy Oladayo, POPOOLA** meets the regulations governing the award of the Doctor of Philosophy (PhD) degree in the Department of Economics, Ahmadu Bello University, Zaria, Nigeria, and is approved for its contribution to knowledge and literacy presentation.

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DEDICATION

To

GOD ALMIGHTY

(The Eternal, Merciful, Gracious, and All-Knowing)

DELIGHT, DESIRE and DEBORAH POPOOLA

And to

ALL THE SICK WHOM AT THE SAME TIME ARE POOR AND HOPELESS

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'It does not, therefore, depend on man's desire or effort, but on GOD's mercy' (Romans 9:16 NIV)

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Timothy Oladayo Popoola,

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ABSTRACT

During the periods of 1960s through 1980s, poor health outcomes (illness and deaths) resulting from strokes, hypertension, high blood pressure, cancers and heart diseases were very rare among Nigerian. But in recent decades, these has become more prevalent and remains deadly rising, as illnesses and deaths from non-communicable diseases rose from 21% to 29% between 2010 and 2016. However, the percentage of Nigerians with appropriate health-seeking behaviour declined from 54% in 2013 to 32% in 2019. While the share of income earned by the richest 10% of Nigerian increased from 26% in 2004 to 31% in 2017, the income belonging to the bottom 40% at the lower-end of income distribution declined from merely 6.3% to 2.8% at the same periods. Yet, the effect of income inequality on health particularly in emerging nations such as Nigeria has remained relatively unexplored. Further, how household's characteristics mediate the income disparity-health link also remains unclear. Thus, this study examined the effect of income inequality on health outcomes and health-seeking behaviour in Nigeria. The thesis draws insights from the seminal works of Wilkinson (1992, 1994) which opined that in the growth process, there will be a point at which income disparity rises and this corresponds with the shift in the main causes of ill-health from infectious to non-communicable diseases. The adapted model was estimated using Panel Logistic technique based on data collected from the four Waves of repeated cross-section surveys, the Nigerian General Household Panel Survey, conducted by National Bureau of Statistics (NBS) in 2010, 2013, 2016 and 2019. The main findings of the study are that, first, the percentage of male and female reported having an illness rose from 13.7% and 15.2% to 22.6% and 24.5% between 2016 and 2019, respectively; while those with appropriate health-seeking behaviour decreased from 27.9% to 17.9% for male and 28.3% to 19.1% for female between the periods. Second, nearly 95% of states in Nigeria had higher income disparity among their households between 2010 and 2019. Third, the likelihood of a percentage-point rise in these income inequalities worsens illness by 1.41%. Fourth, it was also evidenced statistically that larger household size, low educational level of household heads, nutritional deficiency, lack of access to electricity and drinkable water, alcoholic consumption, self-medication, non-utilization of healthcare services, and low household earnings indirectly mediate the income inequality-health outcomes effect in Nigeria. Fifth, the likelihood that income inequality will limit appropriate healthcare-seeking was 1.25%. Sixth, the link between income inequality and appropriate healthcare-seeking is also mediated by larger family size, marital status, education, and low earnings significantly in Nigeria. Therefore these results suggest that though income inequality is detrimental to both health outcomes and health-seeking behaviour in Nigeria, the devastating effect of income inequality on health is also mediated by household's factors. Hence, policies that reduce income inequality such as cash transfers, entrepreneurship programs and job creation need to be enhanced. Also, increasing human capital investment through health and education as well as raising public awareness on self-medication and healthy lifestyles can help improve health outcomes and appropriate medical-care seeking in Nigeria.

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LIST OF ABBREVIATIONS

BPLM	Breusch-Pagan Lagrange Multiplier
FCT	Federal Capital Territory, Nigeria
FE	Fixed Effect
GE	Generalized Entropy
HDI	Human Development Index
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HSB	Health-Seeking Behaviour
IIAH	Income Inequality-Adjusted to Health
IIH	Income Inequality Health
IMF	International Monetary Fund
NBS	National Bureau of Statistics
NCDs	Non-Communicable Diseases
NDHS	Nigeria Demographic and Health Survey
NGHPS	Nigerian General Household Panel Survey
OECD	Organization for Economic Co-operation and Development
POLS	Pooled Ordinary Logistic
RE	Random Effect
SDGs	Sustainable Development Goals
SSA	Sub-Saharan Africa
SWIID	Standardized World Income Inequality Database
UN	United Nations
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The prevalence of poor health outcomes¹ particularly from non-communicable diseases (NCDs) is on the disastrous rise among the populations of both developed and developing nations (World Bank, 2019; United Nations Children’s Fund, UNICEF, 2019). At the global level, NCDs make up 4 of the 10 leading causes of chronic illnesses and deaths in 2000. This issue increased speedily to 7 of the world’s top 10 causes of poor health outcomes in 2019 (World Health Organization, WHO, 2020). The statistics clearly suggest the urgency and need for an intensified global focus on preventing and treating NCDs in all regions of the world, as set out in the agenda for the United Nations Sustainable Development Goal (SDG) 3 of achieving good health for all at all ages.

It is worthy of note that prior to the 1990s, infectious diseases such as, malaria, yellow fever, tuberculosis, pneumonia, cholera, measles, polio and sexually transmitted diseases, were the main causes of human ill-health and deaths, especially in Africa (Gubler, 1998:442; WHO, 2017). The discovery, effective use of insecticides, control and prevention programs in the last three decades contributed significantly to reducing the prevalence of infectious diseases globally. For instance, pneumonia and bronchitis were the deadliest group of communicable diseases and together ranked as the 4th leading causes of poor health outcomes in 2000. However, it claimed fewer lives in 2019, with the global number of deaths decreasing by nearly half a million (WHO, 2020). Tuberculosis is also no longer in the global top 10 causes of death, as it decreased from 7th place in 2000 to 13th in 2019, with a 30% reduction in global’s poor health outcomes. Again, HIV/AIDs (an infectious diseases) is not among the world’s top 10 causes of poor health outcomes, having reduced from 1.5 million in 2000 to less than a million in 2019. For example, HIV/AIDs dropped from the 8th leading cause of deaths in 2000 to 19th in 2019. All these reflect the success of efforts to prevent infection, test for the virus and treat the disease over the last two decades.

However, from the 1990s onwards, global medical sciences began to emphasize the serious threat and growing trends of poor health outcomes from NCDs particularly in low and middle-income countries (WHO, 2017). Chronic illness from diabetes alone claimed 1.6 million lives globally in

¹ Health outcomes are the changes in the health status of people. It could be poor or better. While the former relates to illnesses and deaths; the latter concern functioning well mentally, physically, socially and being alive.

2016, up from less than 1 million in 2000 (WHO, 2018a). The deaths from diabetes increased by 70% between 2000 and 2019, with an 80% rise in deaths among males (WHO, 2020). Similarly, illness cases due to dementia (symptoms of decline in memory) more than tripled between 2000 and 2019, making it the 3rd main cause of global deaths in 2019 compared to 14th in 2000 (WHO, 2020). Heart diseases and stroke are the world's biggest killers, accounting for about 17.7 million lives in 2016. Similarly, the number of deaths from heart diseases increased by more than 2 million since 2000 to nearly 9 million in 2019; which represents 16% of total deaths from all causes of poor health outcomes at the period (WHO, 2020). While illnesses from heart diseases, diabetes, stroke, and all forms of cancer collectively responsible for nearly 100 million deaths, in total NCDs accounted for more than 71% of deaths globally in 2019 alone (WHO, 2020). These issues also associated with weak healthcare seeking behaviour (HSB) as non-use of appropriate health facilities and undesirable HSB such as patients using traditional remedies or self-medication especially in developing countries leads to more health issues (Kuuire, Bisung and Luginaah, 2015; Khan, 2018).

Interestingly, reports of WHO (2017, 2018, and 2020) established that tackling the risk factors of poor health outcomes from NCDs will not only save lives; it will also provide a huge boost for the economic development of countries. These risk factors are chronic stress, anxiety, unhealthy diet, raised blood pressure, shock, poverty, smoking, lack of economic investment and inaccessibility to preventable healthcare services. As Mikkelson (2019) and Ganju (2020) noted, NCDs prevention will be most effective when focusing policy on its roots. These poor health outcomes according to considerable evidence in the health economics literature are inextricably and largely linked to income inequality (see Bakkeli, 2016; Liu, 2017:35; Tan, Shi, Liang and Xu, 2018; Sigh, Antunes and Pere, Harford, 2018; and Hill, Jorgenson, Ballistite and Clark, 2019).

Wilkinson's seminal papers of 1990s were the first to formalize the income inequality-health link (See Wilkinson, 1992; 1994). He opined that in the process of economic growth, there will be a *point* at which income disparity rises. This point corresponds with the shift in the main causes of ill-health from infectious diseases to more of chronic illnesses particularly the NCDs. This suggest that rising income inequality is the primary cause of poor health outcomes, because of it explicit psycho-social impacts through chronic stress, status anxiety, debt burden, long working hours, depression and frustration (Patel, 2018; Kim, 2019), as well as social dysfunction that causes fear

and shock via low social capital (Kragten and Rozer, 2017). The synthesis of all these explanations is that, rising income inequality relates with social comparison, competition, social dysfunction, reduced social cohesion and trust. These intensify fear and shocks which lower the immunological resistance to health issues.

Though, widening income inequality is necessary to reward talents, skills and a willingness to innovate and take entrepreneurial risks; increasing disparities in income hurts everyone, particularly their health outcomes and HSB. This is because it is related with violent crimes, insecurity and kidnapping that intensify fear and shock for all citizens, including those at the top and bottom of the income distribution (Seery and Arendar, 2014; Hardoon and Fuentes-Nieva, 2016). With rising income inequality, the budget line of households chiefly those at the bottom income-quintile is constrained, due to allocation to other competing needs such as food, education, house rent, and so on. This basic need amidst low economic opportunities rises the debt burden on all citizens, which could also culminate in fear and shock which may in turn lead to stroke and high blood pressure. All these implies that the adverse consequences of income disparities via disinvestment in public health and human capital could affect the health of all citizens, not only of those citizens at the bottom of the income distribution (Coady and Dizidi, 2017; Dotollenaere *et al.* 2018).

Again income disparities concern less stable and inefficient economic system (Stiglitz, 2012). As it accelerates the vulnerability of people to economic crises, creating poverty traps and discourages every effort of establishing healthy outcomes especially in times of ill-health (Matthew and Brodersen, 2019). This further suggests that, rising income disparities could motivate inappropriate healthcare seeking; mainly because of its tendency to limit quality access to healthcare services and reduce the quantity and quality of health-promoting goods and services. Thus, the high income inequality, in addition to its implication on social unrest and purchasing-power disparities, suggests that income inequality may exert both direct and indirect effects on health outcomes and HSB.

In Africa, the 2nd most (income) unequal continent in the world after Latin America, 46% of the adults above the age of 25 are hypertensive (WHO, 2018a; African Development Bank, ADB, 2019). Due to the epidemiologic transition of diseases in Africa, the continent is expected to have the world's largest increase in NCDs illness and deaths over the next decades. For instance, while the number of poor health outcomes from HIV/AIDs dropped by more than half in Africa, falling from 1.5 million in 2000 to 435,000 in 2019 (WHO, 2020); in most African countries, NCDs are

responsible for more than three-quarters (75%) of all deaths, which could continue if urgent and evidence-based policies are not successfully implemented (Idris, Mensah and Kitamura, 2020). This explain that the widening income gaps in Africa could be detrimental to both poverty reduction efforts and health policies, because rising income inequality can have an adverse effect on political representation and cause political capture (Bartels, 2008; Wolf, 2015), where the rich citizens use their favour at the expense of everyone else. Tita and Aziakpolo (2016:2) observed that the greatest challenge facing the African continent is rising levels of income inequality and poorest health outcomes.

In Nigeria, there is also a growing income gap since the 1990s (Isah, 2011; Aigbokhan, 2017). While the nation's income inequality was merely 0.36 in 1980s, poor health outcomes from NCDs were very rare in Nigeria at the same periods. Surprisingly, as income disparity rose steadily in the nation, illness and deaths particularly from NCDs increase speedily (Federal Ministry of Health, 2013; WHO, 2018b). According to Seery and Arendar (2019), Nigeria has slightly average growth rate than Bangladesh before her economic recession of 2015-2016, but it is far less equal in terms of income distribution. Consequently, a child born in Nigeria is three times more likely to die before his or her 5th birthday, than a child born in Bangladesh (see World Bank, 2019). This seem to suggest that the widening gap between the rich and poor coexist with poor health outcomes and weak HSB in Nigeria. It further implies that the rising income inequality in Nigeria might have a major effect on health outcomes and HSB.

These issues also underscores the United Nations SDG number 3 and 10 of achieving good health for all at all ages and reduce income inequality within and among nations, respectively, before the year 2030. However, efforts geared at these have been hindered partly by insufficient knowledge of how income inequality affects health outcomes and motives inappropriate healthcare-seeking among households. This perhaps inhibits policy planning and formulation toward achieving the United Nation's goals.

Therefore, with the advent of the SDGs, in-depth studies of both direct and indirect effects of income inequality on health outcomes and health-seeking behaviour of households are needed in order to articulate necessary measures for improving good health for all citizens and reducing income disparities in Nigeria with a view to inform policies to achieve these goals.

1.2 Statement of the Research Problem

The poor health outcomes and weak healthcare-seeking behaviour in Nigeria has been a major concern for both scholars and policy makers over the past decades. This issue is also reinforced by international pressures on nations (Nigeria inclusive) to achieve the SDGs target 3 before 2030 (United Nations, 2018). Though illness and deaths from NCDs are not a new problem having long been of concern in developed countries; they are however, of increasing issue in Nigeria. For instance, the percentage of deaths in Nigeria from NCDs alone such as, dementia, stroke, heart disease, and high blood pressure increased rapidly from 21.9% in 2000 to more than 29% in 2016 (WHO, 2019). Furthermore, more than 31% of Nigerian adults older than 25 years are hypertensive (WHO, 2020). Again 23% and 25% of men and women, respectively, reported having an illness in the four weeks preceding the Nigeria General Household Panel Survey (NGHPS) Wave 4 of 2019, compared to 14% and 15%, respectively, in Wave 3 of 2016 (National Bureau of Statistics, NBS, 2016, 2019).

There is also a growing concern about weak healthcare-seeking behaviour in Nigeria. Arguably, inappropriate health-seeking behaviour worsen health outcomes (Nonvignon, 2017). This is because HSB is all behaviours associated with establishing and maintaining physical, social and mental health (WHO 2015). However, with the rise in the number of public, private and non-governmental health facilities between 1980 and 2019, the trend of inappropriate HSB in Nigeria (that is healthcare services from chemist, traditionalist, spiritualist, and self-medication) increase steadily from 46.7% in 2013 to 68.1% in 2019 (NBS, 2013, 2019). In addition, 71% and 53% of rural and urban dwellers respectively, reported inappropriate HSB during their last illness episode (Latunji and Adeyemi, 2018). This suggest that the nation's HSB is weak (Fagbemigbe, 2015:2; Abiola *et al.*, 2018:381).

These poor health outcomes and weak HSB in Nigeria could pose devastating health, social and economic consequences for individuals, families and nation at large (Becker, 1964; Cai and Kalb, 2005). It could lead to a decline in working-age population, and participation in the labour force, reduce productivity and in turn limit per capita Gross Domestic Product (GDP). It can also affect households' finance and drive them to poverty through catastrophic healthcare expenditures (Fukai and Iwamoto, 2003). This implies that poor health outcomes linked to NCDs is predicted to much higher risk of falling into poverty trap. This is especially true for inpatient treatment. Overall, it

could lead to reduced human capital and opportunities because those with poor health outcomes often have lower educational attainment and poorer access to employment (Becker, 1964; Cai and Kalb, 2005; UNICEF, 2019).

Despite these adverse consequences, poor health outcomes and weak HSB are neglected in public health policies and discourse in Nigeria. Furthermore, the Nigeria's public health policies for many years have focused on the control of infectious diseases, with attendant dearth of necessary data for policy decisions to reduce the poor health outcomes from NCDs and promote appropriate HSB in Nigeria. As a way forward, both UNICEF (2019) and WHO (2020) reports revealed that, larger burden of health problem from NCDs is avoidable in developing countries if policy is targeted on reducing risk factors of these health issues.

Wilkinson's hypothesis (Wilkinson, 1992 and 1994) argued that there is a strong link between income inequality and health outcomes and HSB. Perhaps income inequality relate to comparison, competition, chronic stress, status anxiety, depression, frustration, insecurity, low trust and social capital, and kidnapping. All these intensifying fear and shock for those at the top and bottom of income distribution, and then increasing illness and deaths (Liu, 2017; Tan *et al.* 2018; Massa *et al.* 2018; and Hill *et al.* 2019). Hence income inequality has a direct detrimental effect on health (Wilkinson, 1994). However, the pathways or the mediators of income inequality-health links is still unknown. According to Grossman (1972, 2000 and 2017), health depends on many factors particularly those that associated with household characteristics, such as, family size, diets, water, housing conditions, education, people's lifestyle, and demand for medical services. This suggest that these characteristics could link income inequality to poor health outcomes and inappropriate HSB in Nigeria. These explanations are lacking in previous income inequality-health studies in Nigeria, such as, Orji *et al.* 2013, Alawode and Lawal, 2014, Karimo *et al.* 2017, Ogunsanya and Agboola, 2018.

The level of income inequality also remains high in Nigeria. For instance, the income belonging to top 10% at the upper-end of income distribution in Nigeria rose rapidly from 26.6% in 2004 to 31.1% in 2016 (International Monetary Funds, IMF, 2018). However, the income shared by the 40% at the lower-end of income distribution in Nigeria decline from merely 6.36% in 2004 to as low as 2.8% in 2016 (IMF, 2018). This reveal that the income gap between the rich and poor is

wider now in Nigeria than ever (Reinders and Dekker, 2019). Similar pattern also exists in several societies and regions of the country (See Isah, 2011; Usman, 2016; Aigbokhan, 2017:6). However, information on level and magnitude of income inequality across the 36 states and FCT Abuja is not available. This might hinder effective welfare policies particularly those that relates to the health of citizens.

Though income disparity is commonly understood as a problem for low-income citizens. However, evidence have further opine that high income gaps is also bad for the affluent (Organization for Economic Co-operation and Development, OECD, 2015:67; Hill *et al.* 2019:268). This is because inequality fosters crime and social unrest, reduces trust and social capital, which is not only detrimental to health but also any economic developmental efforts that can lead to improvement in health status. Hence, income inequality has a direct effect on health (Kragten and Rozer, 2017). Likewise, it can widen the debt burden, constrains budget in the face of competing needs. It can also reduce ability of households to obtain health-promoting goods and services. Perhaps high level of income inequality increases purchasing-power disparities between the less well-off households and wealthier ones. While low-income citizens could resolve to self-treatment and low-price healthcare by unregulated private and traditionalists (Fuentes-Nieva, 2014). This will constrain aggregate HSB of all households in the society.

All these suggest that the wide income gaps between the rich- and poor-households in Nigeria might have a major effect on health outcomes and HSB directly and/or mediated by some pass-through factors. Hence, a careful study of the effect of income inequality on health outcomes and health-seeking behaviour (both directly and indirectly) in Nigeria is invaluable.

1.3 Research Questions

The foregoing thus gives rise to the following research questions that this study addressed:

- i. What has been the trends of health outcomes and health-seeking behaviour in Nigeria?
- ii. What is the level and magnitude of income inequality across the 36 states and FCT Abuja?
- iii. What is the direct and indirect effect of income inequality on health outcomes in Nigeria?
- iv. What is the direct and indirect effect of income inequality on health-seeking behaviour among households in Nigeria?

1.4 Objectives of the Study

The broad objective of the study was to estimate the effect of income inequality on health outcomes and health-seeking behaviour of households in Nigeria. The specific objectives were to:

- i. Examine the trends of health outcomes and health-seeking behaviour in Nigeria;
- ii. Estimate the level and magnitude of income inequality across the 36 states and FCT Abuja;
- iii. Estimate the direct and indirect effects of income inequality on health outcomes; and
- iv. Estimate the direct and indirect effects of income inequality on health-seeking behaviour among households in Nigeria.

1.5 Justification for the Study

Theoretically, the income inequality-health (IIH) hypothesis as pioneered by Wilkinson (1992, 1994) and its extension by Pickett and Wilkinson (2015) argue that income inequality has a direct effect on health through stress, status anxiety, competition, comparison, depression, long-working hours, frustration, low trust, insecurity, fear and shock. These affects the health outcomes and HSB of both the rich and poor citizens alike (Bakkeli, 2016; Khan, 2018; Mattew and Brodersen, 2019). However, little is known about the potential pathways through which income inequality affects health outcomes and HSB (for instance, the so-called “indirect effect”). The understanding of these indirect effects could have important implications for the design of health policies to achieve the SDGs 3 before year 2030.

Noteworthy, the major determinants of health outcomes and HSB are largely associated with household characteristics (Grossman, 1972; Galama and van Kippersluis, 2013). These factors such as, family size, access to healthy food, water, housing conditions, education, and people’s lifestyle, all have considerable impacts on health outcomes; whereas the more commonly considered factors is access and use of healthcare services (WHO, 2013). This then suggest that these factors are the interlinking vary between income inequality and health outcomes and HSB. Thus, the indirect link from income inequality, household’s characteristics, and health is also key to this study. This is because, income inequality affects the quality and quantity of healthy goods and services that people buy, consume or have access to. For instance, income inequality reduces the purchasing-power of household’s resources and trapped them into poverty. This could leads to poor health outcomes and inappropriate HSB (Lewis, 1972), low-quality diet (Food Research and Action, 2018); and unhealthy lifestyle (Macinko, 2003). Again, citizens particularly low-income

households in unequal societies often use a high share of their income on other basic needs such as food, shelter and education amongst others, and sometimes, burdened by debt and long working hours. However, existing literature on IHH in Nigeria such as, Orji *et al.* (2013), Alawode and Lawal (2014), Karimo *et al.* (2017), Odusanya and Agboola (2018) focused on financial burden (anxiety, competition, and stress) among households.

In terms of empirical findings, Olaniyan *et al.* (2015), Karimo *et al.* (2017), Odusanya and Agboola (2018) found that income inequality is detrimental to health outcomes in Nigeria. Conversely, the results by Nilson and Bergh (2012), Pulok (2012), Fatukasi and Ayeomoni (2015) indicated that rising income inequality associated with better health outcomes in Nigeria. The major limitation of these studies is that they remain inconclusive regarding the transmission channel of the impact of income inequality on health in Nigeria. This may not be appropriate as it could lead to misleading inferences drawn for policy planning and formulation.

Furthermore, no studies investigate the income inequality-HSB links, except Fagbemigbe, *et al.* (2015). While their study focused on people living with HIV/AIDS in Nigeria, it might not be adequate for policy to improve appropriate HSB for over 200 million Nigerian. This, therefore, necessitated the estimate of the effect of income inequality on HSB to cover the entire country. The thesis also contributes to existing studies by examining the level and magnitude of income inequality across the 36 states and FCT Abuja. This is important due to heterogeneity across households in various states and regions. Therefore, the findings hope to inform policies to achieving the United Nation's SDGs 3 and 10 in Nigeria before 2030.

The study further contributed to methodological literature in terms of the use of Nigerian General Household Panel Survey (NGHPS) database² by National Bureau of Statistics – Waves 1, 2, 3 and 4. Survey-data provide ample opportunity to carry out in-depth assessment of household welfare and allied matters. Recently, scholars turned to micro-based data because it accounted for household heterogeneity to conduct health research (for instance, See Tan *et al.*, 2018 for China; Massa *et al.*, 2018 for Brazil; Singh *et al.*, 2018 for Australia; and Matthew, 2018 and Hill *et al.*, 2019 for United States).

²NGHPS data provide detail statistical information on welfare trends of households. The data was collected in 4 waves for the period of 6 months in each for detail coverage, while each wave consists of post-planting and post-harvest.

Unlike the studies of Orji *et al.* (2013), Alawode and Lawal (2014), Karimo *et al.* (2017) for Nigeria that relied on ordinary logistic model but failed to account for heterogeneity issue. This study used Panel logistic (pooled OLS, FE, RE and Hausman test) and Multi-level techniques. These have several advantages over ordinary logit regression test. For instance, changes often occur over time among households within states and these approaches are able to track these changes (Rozer and Volker, 2015). Secondly, they also control for unmeasured confounders such as health status difference (see Deaton, 2018:105-110). And lastly, it's substitute for longitudinal cross-sectional data, which shift focus from macroeconomic to more detailed microeconomic data (Kragen and Rozer, 2017).

1.6 Scope and Limitation of the Study

The study focused on the effect of income inequality on health outcome and HSB of households across the 36 states and FCT in Nigeria. The analysis explored not only the direct effect from rising income disparities, but also the indirect mechanisms pass-through household characteristics – size of the family, food/diet, water, housing conditions, education, people's lifestyle, and their demand for healthcare services.

The units of analyses in the study were households and states. While the dataset for this study was secondary data from Wave 1, 2, 3 and 4 of the Nigerian General Households Panel Survey³ (NGHPS). These datasets were collected by the National Bureau of Statistics (NBS) in 2010, 2013, 2016 and 2019, respectively. Thus, the scope of the study was from 2010 to 2019.

An important limitation of the study draws from the fact that self-reported incomes from various sources (wages and salaries, business enterprise/trading, farming/livestock, remittances, monetary transfers, pensions, dividends from investment, and properties owned) might be lower or higher than the actual incomes. This could influence the level and magnitude of income disparities among households. Also, the cultural and/or religious beliefs may pose a significant influence on perception of health outcomes and orthodox healthcare-seeking. These issues are important but not captured in the panel survey data but can serve as the basis for further research as data becomes more available. Notwithstanding, the NGHPS remains the most recent and valid source of

³ With the technical support from the World Bank, the Wave 1 data was published in March, 2012. Wave 2, 3 and 4 were similarly published in October, 2016, and July, 2017, and December, 2019, respectively. The NGHPS emerged from the micro-level analysis of the World Bank's Living Standards Measurement Study (LSMS) of late 1990s.

secondary data required for the analysis carried out in this thesis. Furthermore, it provides detailed information on households and has a wide coverage across the six geo-political zones, and 36 states (including FCT).

1.7 Organizations of the Study

The study is organized into six chapters. Following the introductory Chapter one, two focused on stylized facts on income disparity, health outcome and HSB in Nigeria. Detailed literature reviews was presented in chapter three. Chapter four dwells on theoretical framework, methodology, data and variables descriptions. However, chapter five was dedicated to findings and detail discussions of results. This was followed by summary, conclusion, and recommendations in chapter six.

CHAPTER TWO

STYLIZED FACTS ON INCOME INEQUALITY, HEALTH OUTCOMES, AND HEALTH-SEEKING BEHAVIOUR IN NIGERIA

2.1 Introduction

Evidence-based health and welfare policies towards achieving SDG 3 and 10 require background information on income gaps and health indices. Therefore, this chapter proceeds with examining the trends of income inequality, health outcomes and health-seeking behaviour issues in Nigeria *vis-à-vis* other countries.

2.2 Stylized Facts on Income Inequality in Nigeria

2.2.1 Trends of Income Disparity in Nigeria

Despite Nigeria's remarkable economic growth over the last four decades, albeit the slowdown recorded in 2007/2008 due to global financial crises, and the economic recession from the third quarter of 2015 through quarter two of 2016, income inequality remains high in Nigeria (see NBS, 2016; Standardized World Income Inequality Database, SWIID, 2018; World Bank, 2019). Income inequality has also become an important issue of concern in Nigeria (Aigbokhan, 2017; Oxfam International Report, 2018) because it has far-reaching implications for economic development, social capital and health in society.

Figure 2.1 indicates that the income belonging to the top 10% at the extreme upper-end of income distribution in Nigeria increase marginally from 26.59% in 2004 to 27.82% in 2013 (World Bank, 2016; IMF, 2018). The percentage-point change of this increase is merely 1.23%. However, the top 10% income shared in Nigeria increase speedily from 27.83% in 2013 to 31.1% in 2017. This is about 3.27% percentage-point changes. The report of IMF (2018) further reveal that more than one-third of income in Nigeria belongs to the 10% at the upper end of the income distribution in year 2017 alone. The reality of this is that Nigeria has experienced a rapid increase of income shared by the few richest Nigerian. This hinders social and political stability through reducing productivity and deterring investment (UN, 2018). This also enforce social dysfunction – theft, crime, violence, insecurity and kidnapping – which intensify fear and shock that transcends to rising illnesses and deaths from heart-failure, strokes, and high blood pressure for both the richest and poorest citizens (Wilkinson, 1994; Wagstaff and van Doorslaer, 2000).

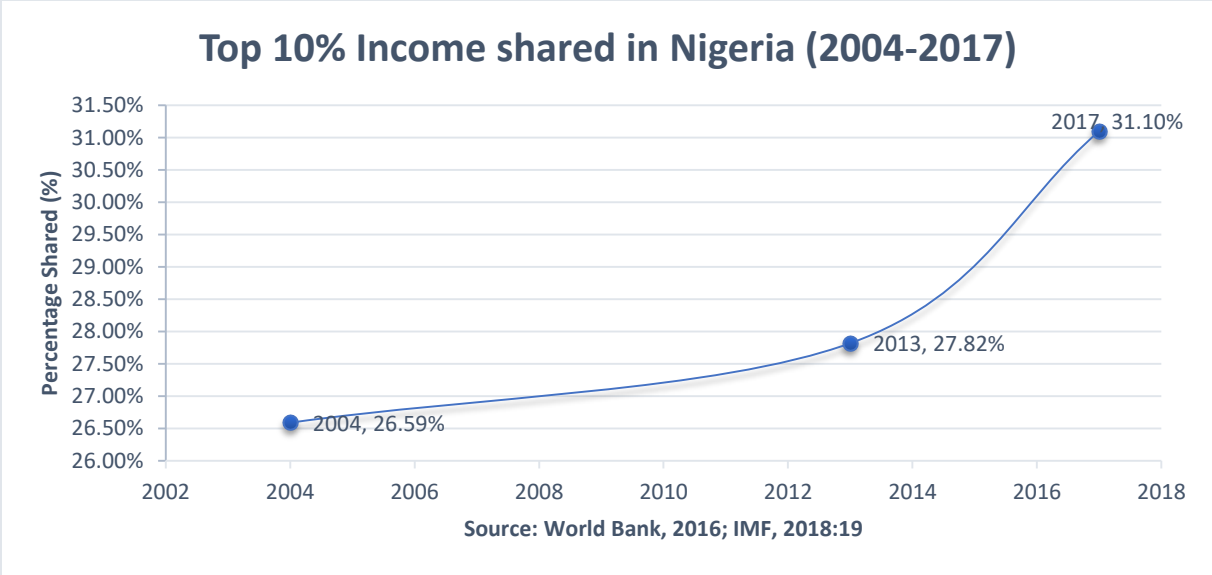


Figure 2.1: Income belonging to top 10% at the Upper-End of Income Distribution in Nigeria

According to Oxfam International Report (2018), the common index of welfare in both developed and developing nations is the relative income shared by the bottom 40% at the lower-end of income distribution. The larger this income the more rapid an increase in economic growth is shared with the most vulnerable groups (Aigbokhan, 2017). In Nigeria, the bottom 40% of Nigerian received merely 6.36% of total incomes in 2004 as Figure 2.2 shown (World Bank, 2016). In other words, on average 4 out of 10 Nigerians (over 82.9 millions) received 6.4% of aggregated incomes in Nigeria in 2004 (NBS, 2019).

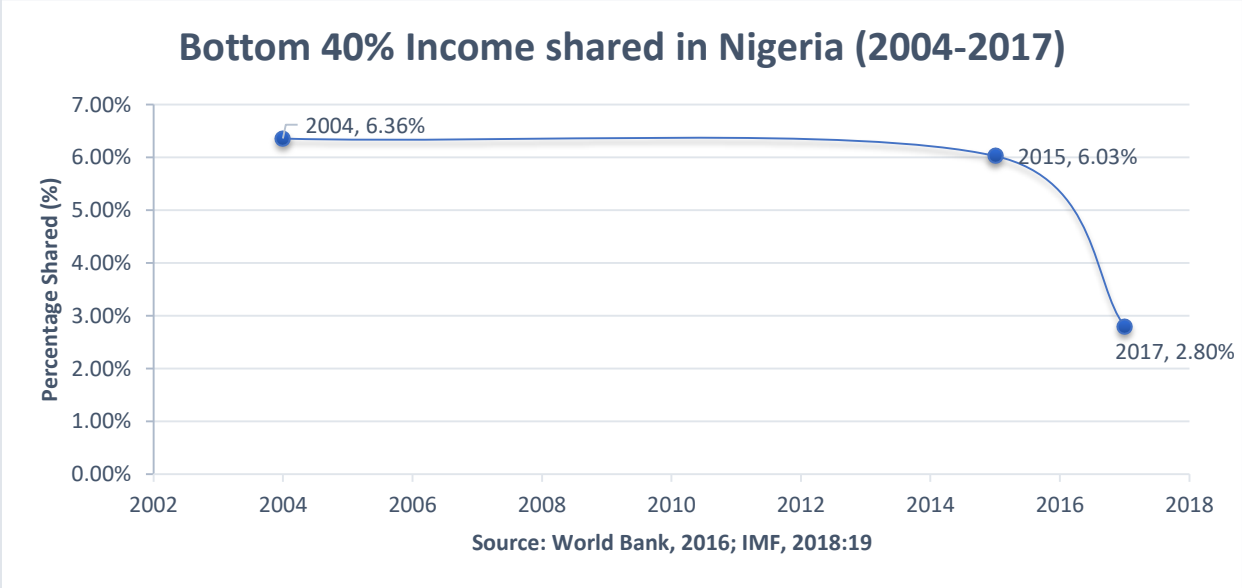


Figure 2.2: Income Shared by bottom 40% at the Lower-End of the Distribution in Nigeria

Figure 2.2 further depicts that this statistics decline from 6.36% to 2.8% between 2004 and 2017 by percentage-point of 3.56% (IMF, 2018). This shows that there is high income gap between the richest- and poorest-groups in Nigeria. It further suggest that the benefit of economic growth in the last decades has not been pro-poor as income inequality in the nation persisted (Aigbokhan, 2017:4). It also show clearly that the gain by the top 10% of the population was at the expense of low-income (the bottom 40%) in Nigeria.

The wide income gaps between the rich- and poor-families is a major economic and social problem in Nigeria and is likely to further increase in the coming years due to continuing economic hardship (Isah, 2011; Odusanya and Agboola, 2017; IMF, 2018). Nigeria was also ranked last among 152 countries assessed on Oxfam’s 2017 Commitment to Reducing Inequality Index that captures government’s actions with respect to social spending, tax and labour rights (Oxfam International Report, 2018:53). This implies that, in spite of Nigeria being the largest economy and biggest oil exporter in Africa, there is a persistent disparity in welfare and consumption that explains poor health outcomes and weak HSB.

In terms of regional income inequality, Figure 2.3 further shows that since 2004, income inequality increased in all zones except the South-West, where it declined by almost 2 percentage points. The Gini coefficient rose by almost 0.13 points in the South-South and the North-East from levels at around 0.33. The largest contributors to the rapid widening in income disparity in Nigeria were therefore the South-South and North-East between 2004 and 2013 (World Bank, 2016).

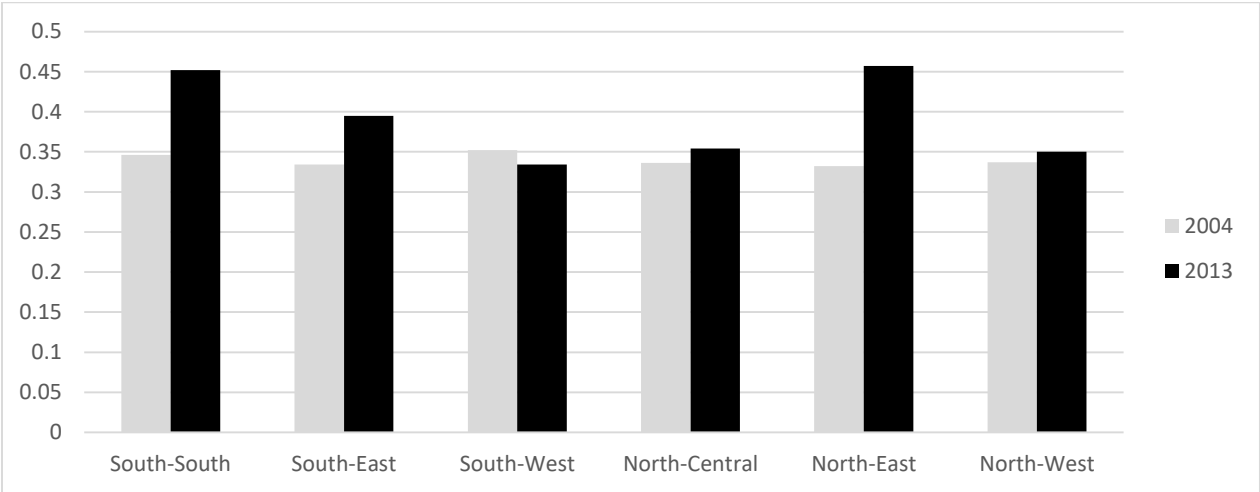


Figure 2.3: Index of Income Inequality by Zones in Nigeria, 2004, 2013

Source: World Bank’s (2016) calculations based on National Bureau of Statistics NLSS 2003-2004 and NGHPS 2010-2011, 2012-2013

2.2.2 Trends in Income Distribution in Africa

After Latin America, Africa remains the second continent with the highest level of income inequality in the world (United Nations, 2020). In 2019, the share of income going to the richest 0.001% of Africans is 40% of the continent's entire wealth (World Income Inequality Database, 2019). This demonstrates that despite economic progress in some countries in Africa, income are increasingly concentrated at the extreme upper-end of the income distribution.

Table 2.1 shows the comparative statistics of income inequality for selected African countries from 1990 to 2015. Between these periods, income inequality as measured by the Gini-coefficient increased steadily in 5 out of 6 selected countries. The income disparity in Nigeria increase slightly from 0.44 in 1990 to 0.45 in 2010 (see SWIID, 2018), with Gini coefficient-adjusted to health of 0.43 in 2015 (UNDP, 2019). The figure suggest that wide gap exists among households in Nigeria relative to Cote d'Ivoire whose index fell from 0.42 in 2000 to 0.37 in 2010, and 0.38 in 2015. For Ghana, the inequality rose slightly from 0.34 in 1990 to 0.35 in 2005, and and a further to 0.38 in 2015.

Table 2.1: Trends of Gini-Coefficient of Selected Africa Countries, 1990 to 2015*

Countries	1990	1995	2000	2005	2010	2015*
Nigeria (WA)	0.447	0.458	0.45	0.446	0.452	0.432
Ghana (WA)	0.345	0.332	0.372	0.347	0.370	0.377
Cote d'Ivoire (WA)	0.345	0.339	0.424	0.385	0.366	0.379
Botswana (SA)	0.564	0.568	0.58	0.575	0.589	0.335
South Africa (SA)	0.561	0.562	0.567	0.581	0.586	0.316
Republic of Congo (CA)	N/A	N/A	0.421	0.429	0.437	0.477

Source: SWIID (2018) for 1990-2010; where WA, NA, CA, and SA represent West Africa, Central Africa and Southern Africa sub-regions respectively * denoted that 2015 figure is adjusted to health (UNDP, 2019)

This evidence (as presented in Table 2.1) suggests that highly unequal societies in Africa are less effective at reducing poverty than those with low levels of income inequality (IMF, 2018). It also reveal that inequality in income distribution has grown in most African countries over the last three decades. Though the levels and trends differ among countries that are at similar levels of growth and development, and equally exposed to trade and even the effects of climate change. Therefore, there is need to discount these levels of income inequality to human capital index, particularly the health indicators. This is called income inequality-adjusted to health (United Nations, 2020).

2.2.3 Income Inequality-Adjusted-to-Health

A growing economy is reflected by the nature of its human capital (especially those that concern health and education). The United Nations (2018) and IMF (2018:19) opine that, income inequality associated with poverty. This implies that reduction in income inequality improves human capital. Thus, the income inequality-adjusted consider the country's average achievements in health and education by discounting each dimension of human capital index to income inequality level. For example, the income inequality-adjusted to life-expectancy – health (IIAH) for Nigeria is 0.432 in 2018, compare to SSA average of 0.386 in the same period (UNDP, 2018, 2019).

It is pertinent to note that Nigeria has the unenviable distinction of being at the bottom of the Commitment to Reducing Income Inequality (CRII) Index (see Oxfam Report, 2018:8). This indicates that Nigeria's social spending on human capital, including, health, education and social protection is comparatively low as reflected in the country's poor socioeconomic outcomes. From the foregoing, it is apparent that Nigeria is characterized by relatively poor health indicators and high income-inequality. This rated the nation as one of the highest IIAH when compared with other sub-Saharan Africa (SSA) countries (see UNDP, 2018, 2019).

Figure 2.4 depicts the income inequality-adjusted to health in selected SSA nations for year 2018. For instance, the IIAH for Zimbabwe was 0.268, the Ghana's IIAH was 0.37, South Africa with 0.316, and Sierra Leone's IIAH was 0.33 in year 2018. This implies that, the loss in health-human capital is so massive as income inequality in the nation is rising.

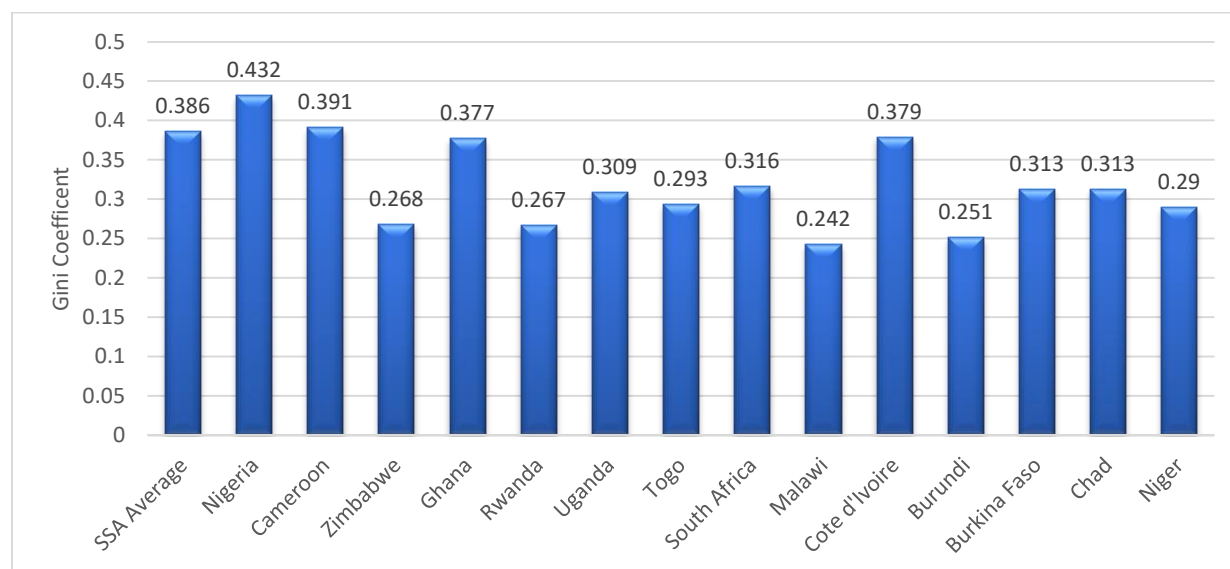


Figure 2.4: Income Inequality-Adjusted to Health in selected SSA nations for year 2015
Source: UNDP (2018a)

It is worthy of note that the Gini-indexes was 0.383 and 0.481 for Ghana and Nigeria in 2017, respectively (Odusanya and Atanda, 2018; SWIID, 2018). However, with higher annual GDP growth rate in Nigeria of 6.3% in 2015, compared with Ghana's statistics of 4% (approximately) at the same period, the average life expectancy at birth was merely 54 years for Nigeria, and 64 years for Ghana in year 2017 (World Bank, 2019). From the foregoing, the income inequality-adjusted to health of Nigeria is the highest comparatively in recent years as depicted in Figure 2.4. It further implies that a loss in health-related human capital from income gap between the richest and poorest citizens in Nigeria is high. Perhaps as income inequality rises, the drag on human development also increases (See UNDP, 2019).

2.3 Causes of Income Inequality in Nigeria

2.3.1 Regional and States' Factors

The growing rise in wealth gap among households and states in Nigeria is attributed to uneven distribution of natural resources since the late 1970s. Oyeleye (2013) and Raheem *et al.* (2014) opine that income inequality arises mainly from disparity in regional endowment of natural resources, difference in climate, soil, vegetation, and topography of states in Nigeria. For instance, while the Southern part of the country enjoys longer period of rainfall, forest vegetation, and proximity to the continental shelf, the northern zone experiences shorter rainfall, grass vegetation and is located in the arid/semi-arid zone. Most often, these account for differential in the concentration of industries, as well as economic activities in Nigeria (Oyeleye, 2013).

Furthermore, several Southern states have more industrial establishments compared to Northern states such as Yobe, Zamfara, and Katsina (Raheem *et al.* 2014). It is pertinent to note that the Northern states are also endowed with natural resources but have not been fully discovered or extracted yet to commence. Most often, industries are established in natural resource-endowed states or regions, where production costs can be minimized (Amini, 2018). More so, certain categories of investment are attracted to the Southern part of the country because of the proximity of the region to the sea ports.

In addition, the states' disparity in Nigeria is also striking. While states like Lagos, Abuja, Kano, and Rivers are home to numerous multi-national organizations, industries and large markets in the nation, several other states including Yobe, Zamfara, Jigawa and Gombe are still lacking behind (Isah, 2011; Aigbokhan 2017).

2.3.2 Household and Individual's Factors

In terms of individuals' income differences, Charles-Coll (2011) and Dabla-Noris *et al.* (2015) relate income disparity to individual-specific and exogenous causes. The former relates to a set of circumstances or characteristics intrinsic in individuals that have the potential to determine their current and future income, health, longevity and employment outcomes as well as influencing their comparative advantages in the form of higher productivity (Cingano, 2014 and Dabla-Noris *et al.* 2015). This could further be related to innate abilities embedded in individuals such as, intelligence, talents or gift, personality, charisma, and innovative minds; or even physical attributes such as strength or skills, height, race and gender, which have been proven to have a positive correlation with both current income inequality as well as their future possible income.

On the other hand, exogenous causes include infrastructural, educational and regional gaps, legal restrictions, gender difference, and financial exclusion. Limited access to basic infrastructure and utilities such as portable water, vaccination, education, healthcare services and electricity could further worsen income differences and limit any productive activities (World Bank, 2012). For example, the financial exclusion which is the percentage of Nigerians without any account at the financial institutions could reduce savings for unforeseen health issues (Fatukasi and Ayeomoni, 2015). This is important because low financial inclusion may lead to inefficient allocation of resources and low ability to make investments in health-related human capital (Corak, 2013).

The gender gap in terms of labour force participation restricts the skill-set in the labour market and economic participation of females (Cuberes and Teigner, 2015; Novignon *et al.* 2015). This could widen the gender income disparities. Hanushek (2013) demonstrate that education drives both current and future income of households. Thus, educational policies and the variations in access to education potentially influence the levels of income inequality (Dabla-Noris *et al.* 2015; Rajan, 2015). Bakare (2012) identifies these exogenous causes as follows: regional, ethnic, rural expenditure pattern and even political disparities; where these factors produce a similar pattern of income distribution and also create a context of rural infrastructure through policies that influence public healthcare services in Nigeria.

Finally, the gap between the rich and the poor may be a worldwide problem, but in Nigeria the level of income inequality is high. This could pose a serious threat on her citizens' health outcomes and health-seeking behaviour.

2.4 Health Outcomes in Nigeria

Illness and deaths are common examples of poor health outcomes. Those that stem from NCDs, namely strokes, heart diseases, dementia, high blood pressure, cancers, diabetes, chronic lung and respiratory diseases are on the increase especially in developing nations of the world (WHO, 2018; WHO, 2020).

Figure 2.5 depicts that illness from NCDs alone responsible for over 36 million deaths globally in 2017. Nearly half of these deaths (appropriately 18 million) are from cardiovascular diseases such as stroke and heart diseases. Worse still, while 9 million people die prematurely every year before the age of 60 from brief illness that are associated with these diseases; 8 million of these premature deaths occurred in Africa (WHO 2018a; WHO, 2019).

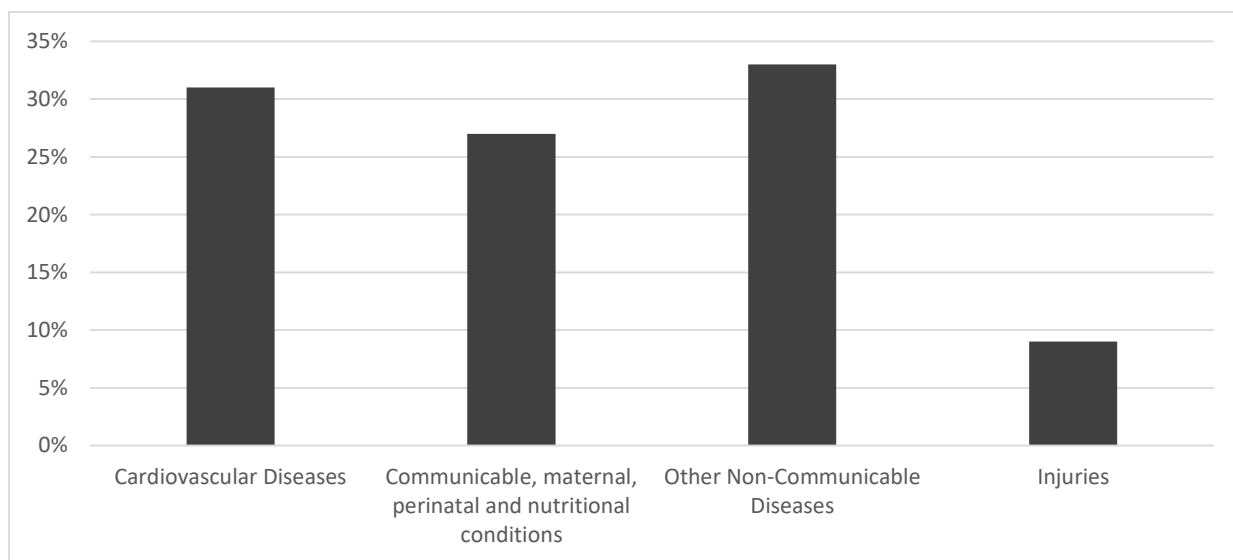


Figure 2.5: Global Deaths from Ill-Health causes - 2017

Source: WHO, 2018; 2019

African continent also has the highest prevalence of hypertension which affects 46% of adults aged over 25 years (WHO, 2018). Furthermore, heart disease and stroke are the leading causes of deaths and chronic illnesses in Africa (World Heart Federation, 2017).

Table 2.2 further depicts a comparative statistic of people living with heart diseases in Nigeria and South Africa in 2015. Both nations are seen as Africa's largest economy and one of the fastest-growing in the world (World Bank, 2019). Yet about 360 people in every 10,000 are reported to be living with heart diseases in Nigeria. For South Africa, the numbers of people with heart diseases was 220 per 10,000.

Table 2.2: People living with Heart Diseases (as at 2015)

Country	per 10,000 people
Nigeria	360
South Africa	220

Source: World Heart Federation, 2017

Figure 2.6 reflects that the trend of poor health outcomes (self-reported illness) of respondents' health status in the four weeks prior to the household visit. These was collected from the Nigeria General Households Panel Survey (NGHPS) wave 1 2010/2011 to wave 4 2018/2019 (NBS, 2013, 2019). Visibly, while average responds of self-reported illness was 1.72 in wave 1 (2010), this increase steadily to 1.9 in wave 4 (2019). The trend revealed that poor health outcomes is rising in Nigeria.

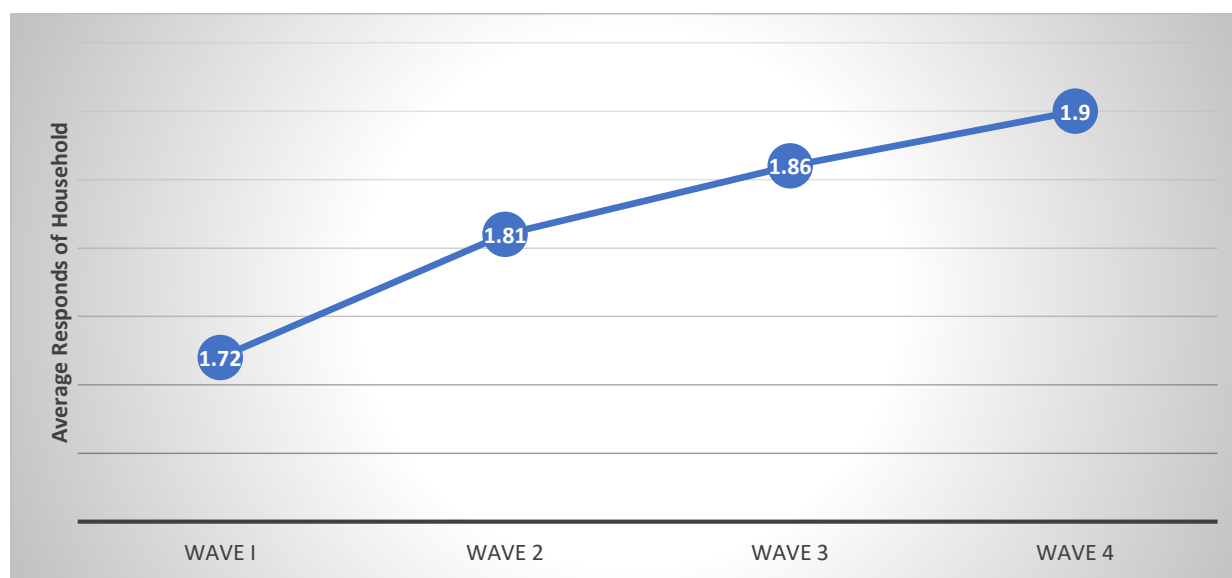


Figure 2.6: Trend of Poor Health Outcomes (Self-Reported Illness) in Nigeria, 2010-2019

Source: NBS (various years)

A higher percentage of households indicated having health problems (in the past four weeks preceding the NGHPS) in Wave 4 of 2019 compared to Wave 3 of 2016. This is presented in Figure 2.7. The percentage of males with more sick-days increased from 13.7% to 23.6% between 2016 and 2019, respectively (NBS, 2017, 2019). Similar trend was found for females which also increase from 15.2% in 2016 to 24.5% in 2019. This further implies that both males and females reported more health problems during the reference periods in Nigeria.

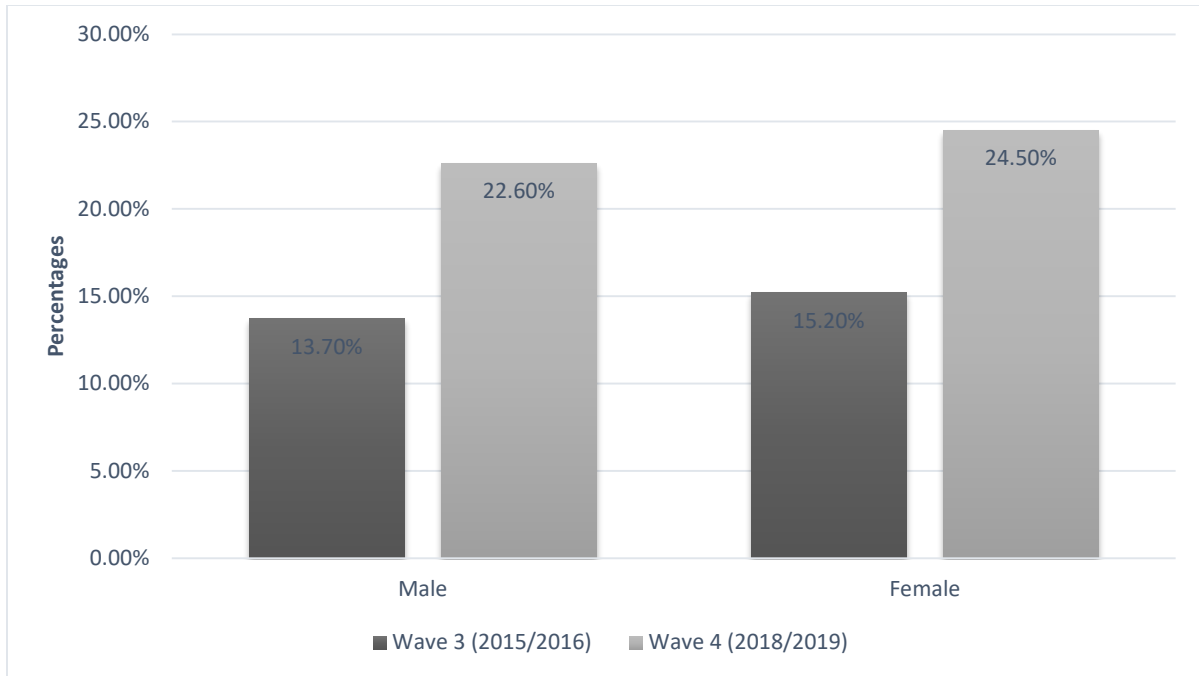


Figure 2.7: Health Problem Experiences in Nigeria (2016-2019)

Source: NBS (various years)

The findings as presented in Figures 2.6 and 2.7 clearly shows that health outcomes is performing very poorer in Nigeria. This is not surprising as its corresponding with the facts that, the percentage of deaths in Nigeria from NCDs alone such as, dementia, stroke, heart disease, and high blood pressure increased from 21.9% in 2000 to more than 29% in 2016 (WHO, 2019). Again, more than 31% of Nigerian adults older than 25 years are hypertensive (WHO, 2020).

2.4.1 *Infectious and Communicable Diseases*

Another health outcomes issues are from infectious diseases. Table 2.3 shows the percentages of infectious diseases reported by sex in Nigeria from 2010 to 2015. In the table, the most reported infectious diseases or causes of ill-health issues in 2010 and 2015 is malaria. The males reported 66.9% and females 55.9 of the disease in 2010 while in 2015, the percentage reduced slightly to 56.8% for males, but rose to 70% for female in the same period.

The next ailment after malaria is HIV/AIDs, which was reported by 13.7% of males and 24.4% of females 24.4% in 2010, respectively. However, this reduced to 10.2% by males and 12.3% by females in 2015. Other causes of ill-health in the nation in descending order of reported cases also includes diarrhea, pneumonia, measles, meningitis, all forms of hepatitis, tuberculosis, yellow fever, cholera and STDs.

Table 2.3: Percentages of Reported Infectious Diseases by Sex in Nigeria (2010-2015)*

	2010		2011		2012		2013		2014		2015	
	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>
HIV/AIDs	13.7	24.4	12.3	23.4	5.9	10.2	13	13	23.4	24.4	10.2	12.3
Pneumonia	4.9	3.5	5.1	4.3	3.9	2.9	2.6	2.6	4.3	3.5	2.9	5.1
Malaria	66.9	59.9	70.3	62.1	68.6	56.8	56.8	56.8	62.1	59.9	56.8	70.3
Hepatitis	0.1	0.1	0.3	0.3	4.4	0.4	0.5	0.5	0.3	0.1	0.4	0.3
Tuberculosis	1.1	1	1.1	0.9	0.8	1	0.9	0.9	0.9	1	1	1.1
Yellow Fever	0.1	0	0	0	3.8	0	0	0	0	0	0	0
Measles	0.5	0.4	0.9	0.8	5.6	4.4	4.4	4.4	0.8	0.4	4.4	0.9
Diarrhea	12	9	9.3	7.2	6.1	22.3	19.5	19.5	7.2	9	22.3	9.3
Meningitis	0.1	0.1	0.2	0.1	0	0	0	0	0.1	0.1	0	0.2
Cholera	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0.1	0.1	0.1	0.1
STDs	0.3	0.3	0.2	0.2	0.1	0.9	1.1	1.1	0.2	0.3	0.9	0.2
Pertussis	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Others	0.1	1.1	0.1	0.5	0.6	0.9	1.1	1.1	0.5	1.1	0.9	0.1
Total	100	100	100	100	100	100	100	100	100	100	100	100

Source: NBS (2015); Federal Ministry of Health for various years (Male = M, Female = F)

*The case rate is the numbers of reported cases of a specific disease or illness per 100,000 population during a given year.

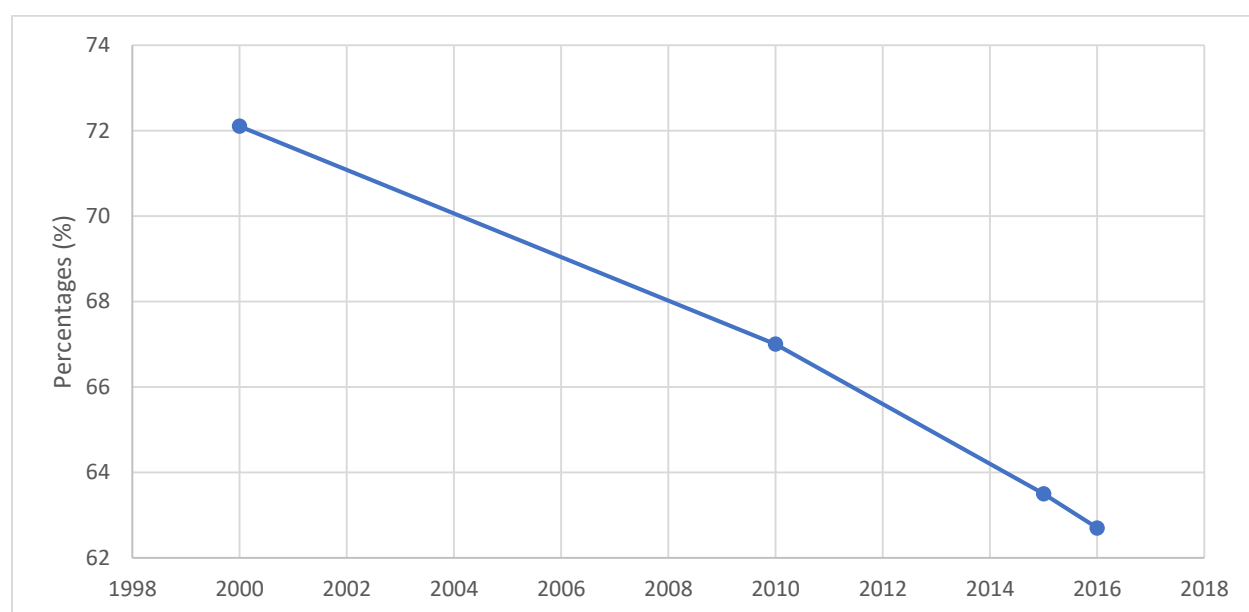


Figure 2.8: % of Infectious Diseases in Nigeria

Source: NBS (various years)

Figure 2.8 shows the percentages of infectious diseases (malaria, polio, measles, and so on) in Nigeria from decrease from 72.1% in 2000 to 62.7 in 2016 (WHO, 2018). This is also in line with the Table 2.4. The table shows that the causes of malaria further reduced to 63.67% in 2017. This issue was followed by common cold (that stands at 6.92). The other types of illnesses respondents suffered from in Nigeria includes; typhoid, diarrhea, yellow fever, cholera, tuberculosis, common cold, meningitis, and pneumonia (NBS, 2017).

Table 2.4: Percentages of Infectious Diseases causing illness in Nigeria

Communicable Diseases	Percentage
Malaria	63.67
Tuberculosis	0.61
Yellow Fever	1.86
Typhoid	6.31
Cholera	0.61
Diarrhea	2.48
Meningitis	0.11
Chicken pox	1.71
Pneumonia	10.64
Common Cold	6.92
Injury	5.08
Total	100.00

Source: National Bureau of Statistics (2017).

2.4.2 Non-Communicable Diseases (NCDs)

The major causes of poor health outcomes are NCDs. This is presented in Figure 2.9, where the percentage of NCDs in Nigeria increase rapidly from 21.9% in 2000 to 29% in 2016 (WHO, 2018). These includes, stroke, heart diseases, high blood pressure, cancers, and so on. These are diseases with long duration and slow progression.

Generally, the main types of NCDs are cardiovascular diseases (such as, hypertension, heart attack and stroke), cancer, chronic respiratory diseases (such as asthma and chronic obstructed pulmonary disease) and diabetes. These diseases were very rare among Nigerians in 1980s. But in recent years, they has become prevalent (WHO, 2018). For instance, more than 31% of Nigerian adults older than 25 years are hypertensive (WHO, 2020). Again, one in every five Nigerians between 30 and 70 years die from brief illnesses associated with hypertension, stroke and heart failure in 2017 (WHO, 2018).

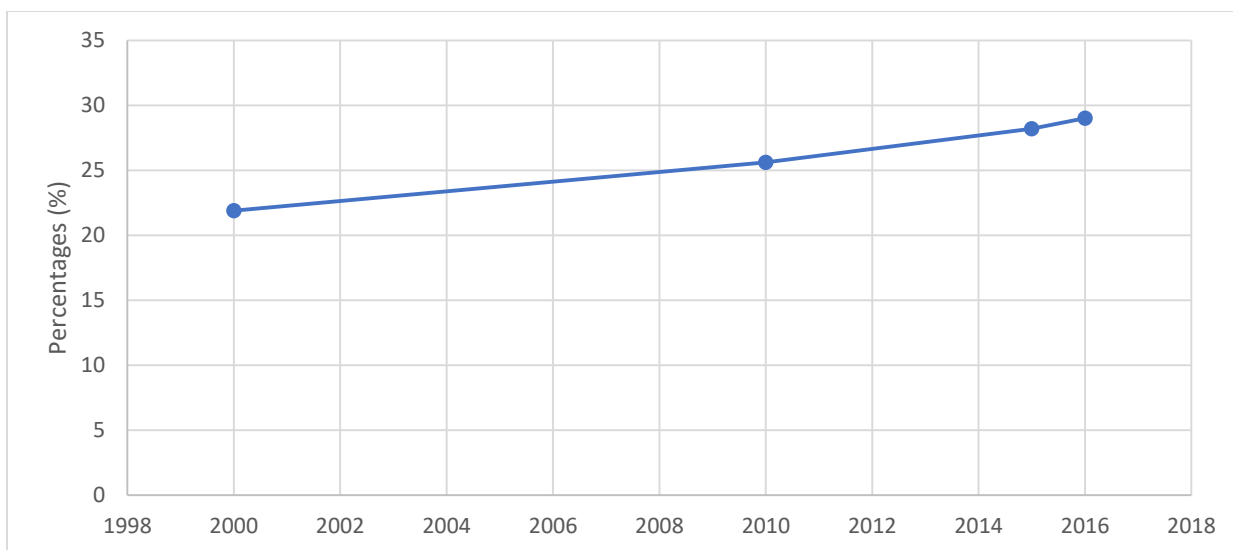


Figure 2.9: % of Non-Communicable Diseases in Nigeria

Source: NBS (various years)

Table 2.5 finally provides a summary of the share of communicable and NCDs between 2000 and 2016. Observably, the menace of illness from communicable, maternal, and nutritional conditions put together declined rapidly from over 72% in 2000 to 67% in 2010. It decrease further to 62.7% in 2016. Despite this decline, WHO (2018) still notes that malaria-fever, HIV/AIDs and other infectious diseases should be treated with utmost urgency as a result of their immediate and easily noticeable consequences.

Table 2.5: Causes of Illness in Nigeria

	2000	2010	2015	2016
Non-Communicable Diseases	21.9%	25.6%	28.2%	29.0%
Communicable, Maternal, Perinatal and Nutritional Conditions	72.1%	67.0%	63.5%	62.7%
Injuries (for instance, accidents)	6.0%	7.4%	8.3%	8.3%

Source: World Bank Indicators, 2018; WHO, 2018

On the other hand, the poor health outcomes (illnesses) from NCDs is rising rapidly over the recent years. Table 2.5 also shows that this causes of poor health outcomes rose from 21.9% in 2000 to 26% in 2010 and a further increase to 29% in 2016. This reveals that the prevalence and incidences of NCDs is on the rise in Nigeria. Compare to infectious diseases, the menace of NCDs, namely strokes, hypertension, heart disease, cancers, diabetes, chronic lung and other respiratory diseases is more alarming. These could be hidden and silent for decades, and results to sudden deaths.

Figure 2.10 shows the annual mortalities from hypertension, cancers, stroke and heart failure brief illnesses of both male and female Nigerian. These especially from those between the ages of 30 and 70 years alone rises from 254,600 to 293,700 cases for male, and 285,200 to 323,600 for female between 2008 and 2016. The statistics imply that, there were more cases of brief illness from chronic cancers for female that are between the ages of 30 and 70 years in Nigeria (WHO, 2016). This also suggest that nearly 24% of over 2,083,000 deaths that occurred in 2016 were from hypertension, cancers, stroke and heart failure brief illnesses alone in Nigeria.

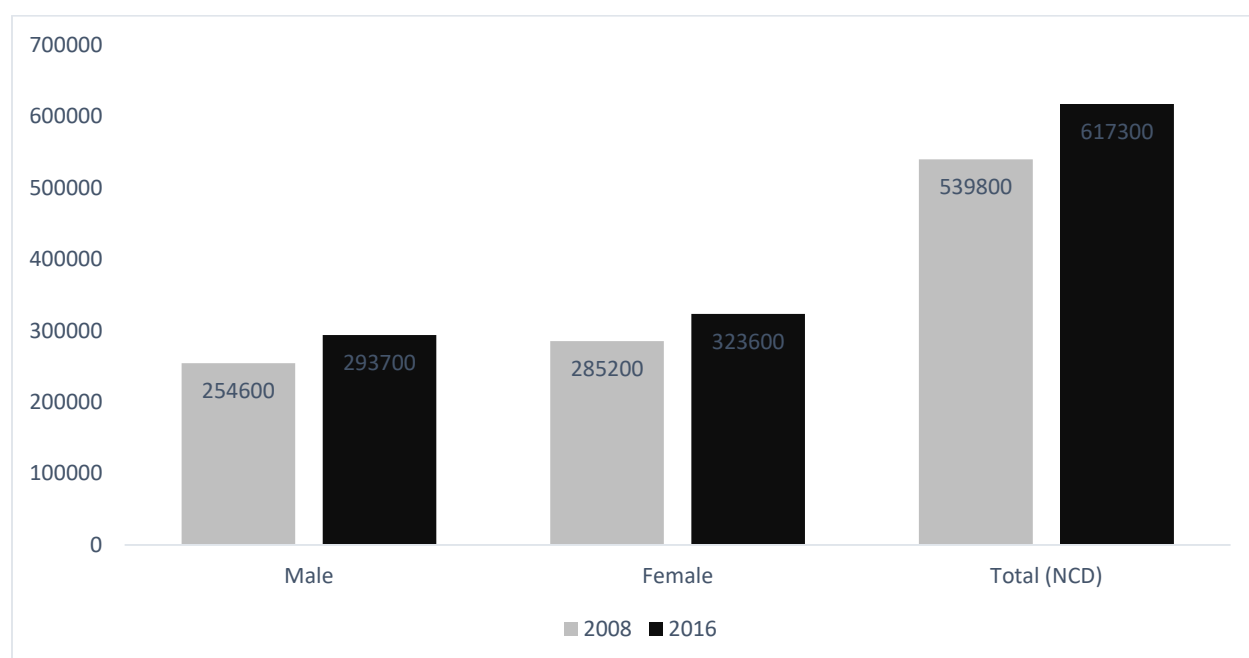


Figure 2.10: Annual Deaths from NCDs Ill-Health in Nigeria
Source: WHO (2011, 2018)

2.4.3 Under-five Mortalities

In terms of the indicators of health outcomes, Figure 2.11 shows that, despite the declining under-five deaths across all the regions of the world, sub-Saharan Africa (SSA) region still experiences the highest under-5 mortalities. While global under-5 deaths reduced by 9.8% from 42.4 to 38.4 per 1,000 for 2015 and 2018, respectively; the SSA's rate merely decreased from 84.8 to 77.5 per 1,000 between 2015 and 2018 (World Bank, 2019). Furthermore, among the nations in SSA region, Nigeria loses an estimated 2,300 under-5-year old's children daily (UNICEF, 2018). This makes the country the second largest contributor to global child and under-5 deaths after the Republic of Congo (World Bank, 2019). This issue is also associated with all forms of illnesses from both NCDs and communicable diseases in Nigeria (UNICEF, 2018).

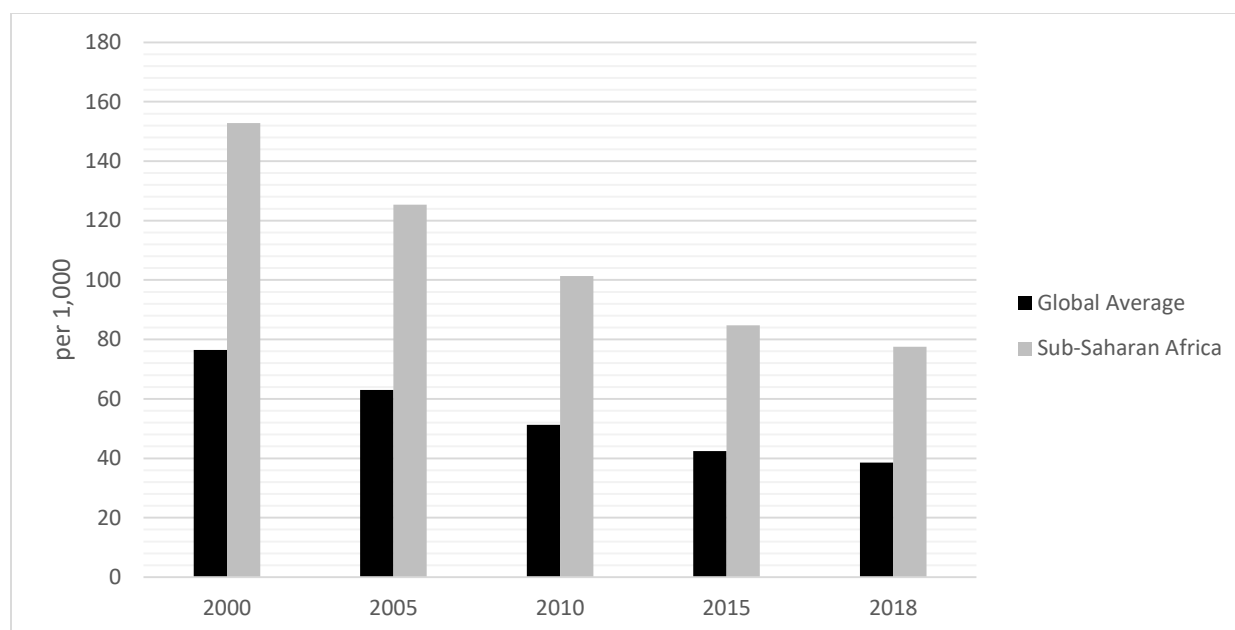


Figure 2.11: Global Comparative of Under-five Deaths

Source: World Bank (2018)

Table 2.6 shows that in 1975, the under-five-mortality (U5M) of Rwanda was about 245 deaths of every 1,000 under-five children. At the same period, the Nigeria's U5M was slightly lower at 244 per 1,000. While by the end of 1995 when the figure rose to 268 per 1,000 for Rwanda, Nigeria's was still relatively lower at 213 per 1,000. However, Rwanda's under-5 deaths fell to as low as 42 deaths per 1,000 in 2015. In the same period for Nigeria, the U5M was as high as 109 deaths in every 1,000 children (WHO, 2017; World Bank, 2019). This nearly triple Rwanda's U5M in 2018. Therefore, compare to Cote d'Ivoire, Ghana, South Africa, and Rwanda, the under-five deaths in Nigeria is the highest, where 120 in every 1,000 children under the ages of 5 years old die in 2018.

Table 2.6: Comparative Under-5 Deaths (per 1,000) in selected SSA countries

	1975	1980	1985	1990	1995	2000	2005	2010	2015	2016	2017	2018
Cote d'Ivoire	201	167	154	153	153	146	129	109	93	92	84	81
Ghana	186	166	155	127	113	101	87	75	62	59	50	48
South-Africa	127	93	71	60	62	75	75	54	41	43	35	34
Rwanda	245	218	160	152	268	184	111	64	42	39	37	35
Nigeria	244	214	210	213	208	187	129	127	125	124	122	120

Source: Compiled from World Development Indicator, 2019

2.4.4 New-born and Maternal Deaths

Figure 2.12 also presents the infant deaths in Nigeria. Compared to the global average and OECD members indices of 53.2 and 10.5 per 1,000 in 2000, respectively, the SSA average was as high as 92.4 per 1,000 (World Bank, 2019). Though in 2018, this rate declined to 28.9 and 5.5 per 1,000 for world and OECD members averages, however, the SSA infant deaths was 52.7 in every 1,000 new-born babies less than 12 months.

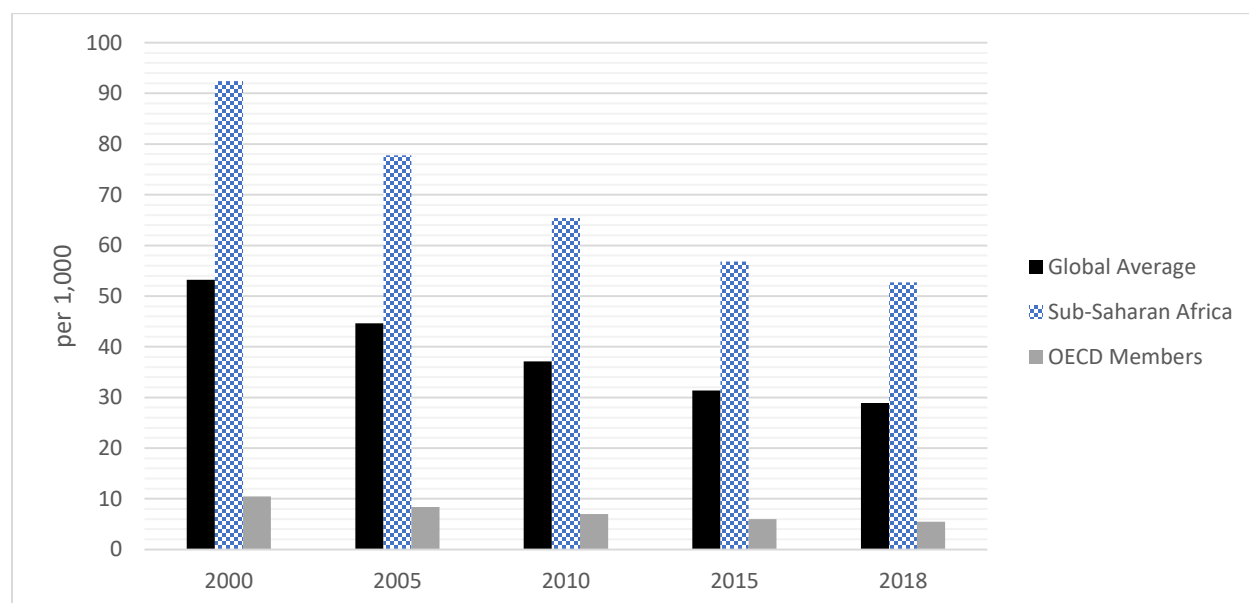


Figure 2.12: Global Comparative of Infant Deaths

Source: World Bank (2019)

Similarly, among the five nations namely India, Pakistan, Nigeria, Democratic Republic of Congo and Ethiopia accounting for half of all global new-born deaths in 2017, sadly Nigeria is the third largest contributor to new-born mortalities in the world. This is presented in Table 2.7.

Table 2.7: Five Nations Accounted for Half of the Global Infant deaths in 2017

Countries	Global Percentages of New-born deaths
India	24%
Pakistan	10%
Nigeria	9%
Congo (Democratic Republic)	4%
Ethiopia	3%
Total	50% of World's New born deaths

Source: WHO (2018b)

In terms of the maternal deaths, 40,000 women die during pregnancy or childbirth health-related causes each year, and another 1 to 1.6 million suffer from serious and permanent disabilities from pregnancy- and birth-related causes annually in Nigeria (WHO, 2017). Majority of these deaths often occur within the first week of birth mainly due to complications during pregnancy, delivery and post-delivery; reflecting the link between their survival and quality of maternal care (UNICEF, 2015).

Figure 2.13 shows the trend of infant deaths in Nigeria. Though, the new-born deaths (per 1,000) globally have declined, the infant mortality rate is still relatively higher in Nigeria compared to Ghana and South Africa indices, and global averages. The figure clearly shows that infant deaths in Nigeria is still high compared with her peer nations and global average. Although improvements are visible overtime.

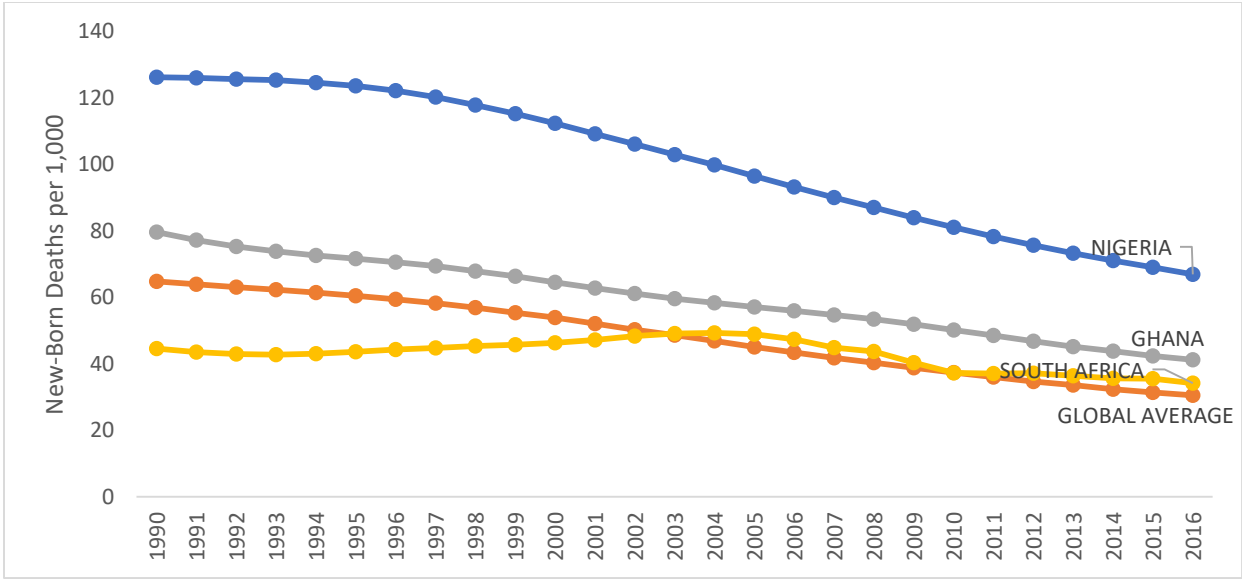


Figure 2.13: Trend of Infant Deaths in Nigeria
 Source: World Bank, 2018

2.4.5 Average Life Expectancy at birth (Longevity)

Figure 2.14 further demonstrates that longevity trend has been increasing moderately since the last three decades worldwide. The SSA region’s average life expectancy at birth (total) rose from 48 years in 1980 to 50 years in 2000. The statistic further increased from 56 years to 61 years between 2010 and 2017, respectively (World Bank, 2019). For Middle East and North America (MENA), and East Asia and Pacific (EAP), average life expectancy increased from 70 and 71 years in 2000, to 74 and 76 years in 2017, respectively.

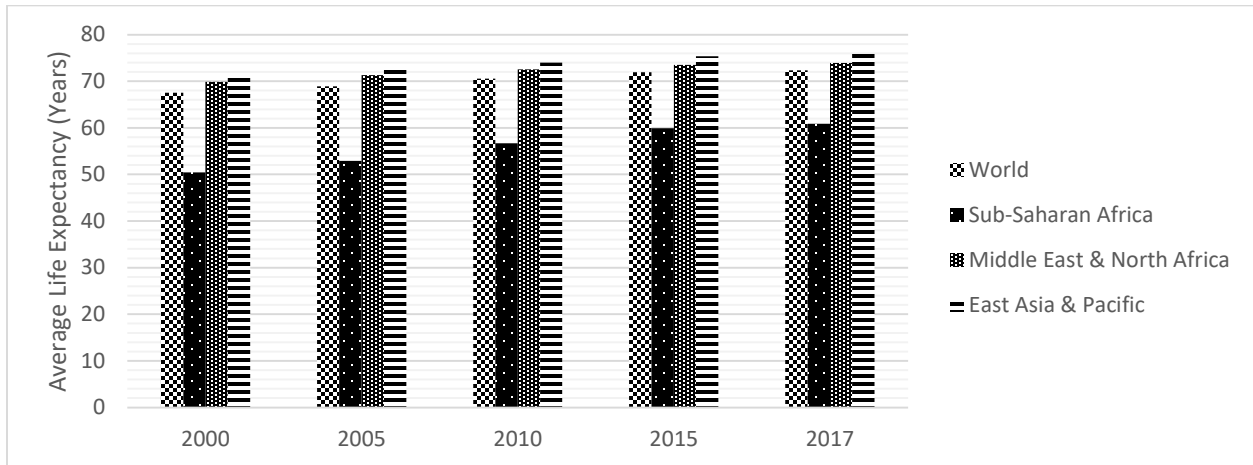


Figure 2.14: Global Comparative of Longevity

Source: World Bank (2019)

Figure 2.15 reveals the average life expectancy of Nigeria and global average between 1990 and 2017. For instance, the longevity for Nigeria merely increased from 46 years in 1990 to 54 years in 2017. This is compared to global average that rose rapidly from 65 years to more than 72 years at the same periods. This shows that despite being the largest economy in Africa, the average life expectancy (at birth) in Nigeria has remained intriguingly unimpressive.

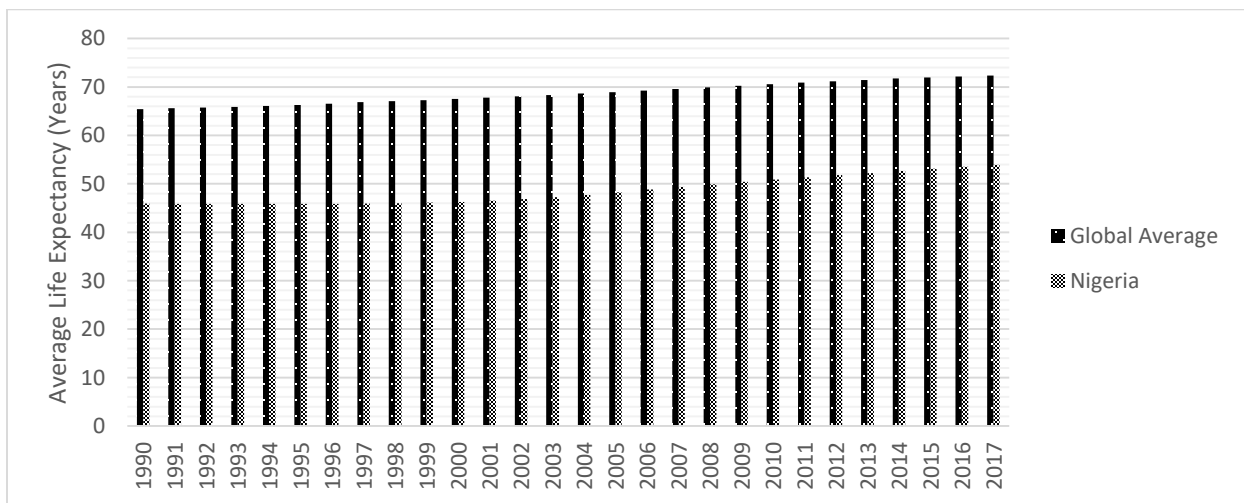


Figure 2.15: Trends of Average Life Expectancy in Nigeria

Source: World Bank, 2019

Table 2.8 further depicts a comparative average life expectancy (at birth) of Cote d'Ivoire, Ghana, South Africa, Rwanda and Nigeria in the same SSA region. While longevity in Nigeria increased from 43 years in 1975 to about 54 years in 2017, the Rwanda's life expectancy rose from 45 years

to about 67 years during the same period (World Bank, 2017). For Ghana, her life expectancy increased steadily from 51 years in 1975 to 64 years in 2017. Comparatively, the average life expectancy at birth in Nigeria is lower compared with Rwanda, Ghana and South Africa. This may be explained by the sever ill-health issues in the nation from rising NCDs.

Table 2.8: Comparative Average Life Expectancy at birth in selected SSA countries

	1975	1980	1985	1990	1995	2000	2005	2010	2015	2017
Cote d’Ivoire	48	51	53	53	50	47	48	50	52	54
Ghana	51	52	54	57	58	57	59	61	61	64
South-Africa	54	57	60	62	61	56	52	54	57	63
Rwanda	45	48	50	33	32	48	55	61	65	67
Nigeria	43	46	46	46	46	47	49	51	53	54

Source: Compiled from World Bank Development Indicator, 2019

2.5 Health Outcome Issues Across Regions and States in Nigeria

Compared to the Southern part of the country, ill-health is more prevalent in the Northern part of Nigeria (UNICEF, 2018). This region is associated with the highest cases of malaria, cholera, tuberculosis, HIV/AIDS, and polio (see Federal Ministry of Health, 2010; and Bello, 2015). Evidence from UNAID (2018) shows that new HIV infections decline from 250,000 (in 2005), to 220,000 (in 2010), and further fall to 210,000 (in 2017). The National Agency for the Control of AIDs (NACA) (2019) indicates that Rivers State has the highest prevalence rate of HIV/AIDs (15.2%), while Ekiti State (with 0.2%) has the lowest prevalence in Nigeria. The epidemic has left behind many orphans who are cared for by elderly grandparents with little or no income sources in some heavily HIV/AIDs infected states (Fagbemigbe *et al.* 2015).

The studies of Renne (2010) and Bello (2015) show that more than 95% of all polio and malaria cases frequently occur in Borno, Jigawa, Katsina, Kebbi, Sokoto, Yobe, and Zamfara States. Poor children and adults in rural areas are at the greatest risk of deaths from malaria which, drains the resources of families (UNICEF, 2018). Importantly, malaria can strain economic growth by increasing healthcare expenses of citizens, days lost in education, lower output, and high mortality (McCord *et al.* 2017). The under-5 deaths ranges between 89 per 1,000 live births in South-West zone and 222 per 1,000 live births in North-East (see Adedini, 2013:2).

Table 2.9 depicts the mortality statistics from all health issues across the geo-political zones in Nigeria. It shows that the North East geo-political zone has the highest under-five and maternal deaths in 2017 (UNICEF, 2018). This region accounted for 1,549 in every 100,000 live births maternal mortalities, compared to 165 per 100,000 in the South West zone. The difference between these regions is almost 10-fold. There is also the case of highest under-five deaths within 28 days of birth in the North East and North West regions. And the highest death rate of under-5 children is in the North East and North West regions. This further show that some region in the nation (such as, North East and North West) experiences more poor health outcomes.

Table 2.9: Mortality Statistics from all II-health cases across the Geo-Political Zones

Under-5 Deaths per 1,000		Maternal Mortality per 100,000	
North West	260	North West	1,026
North East	269	North East	1,549
South West	176	South West	165
South East	103	South East	286

Source: UNICEF, 2018 (North Central and South-South figure are not available)

2.6 Trend of Health-Seeking Behaviour in Nigeria

The trends of health outcomes above then suggests that there could be weak appropriate healthcare-seeking behaviour in the nation. Inappropriate HSB greatly worsens health outcomes and is partly responsible for poorer health statistics (Novignon *et al.* 2017).

Table 2.10 indicates a steady decline among those who consult appropriate healthcare services in Nigeria. For instance, more than half of households (53.05%) seek healthcare services from skilled medical doctors and other health workers in 2013 (NBS, 2013). However, this statistic declined to 31.9% in 2019 (NBS, 2019). Only 31.9% of households (the lowest between 2013 and 2019) had appropriate HSB in 2019 (NBS, 2019).

Table 2.10: Trend of Healthcare Consultation during illness in Nigeria

	2013	2015	2017	2019
Appropriate Healthcare consultation from nurses, medical doctors and other skilled health workers	53.05%	48.95%	47.39%	31.9%
Inappropriate Healthcare consultation	46.73%	50.52%	52.13%	68.1%

Source: National Bureau of Statistics (for various years)

While the percentage of people seeking healthcare services from unskilled and/or inappropriate sources, namely chemist, traditional healer, spiritualist, patent vendor, and self-medication increase from 46.73% in 2013 to 68.1% in 2019. These evidences (as presented in Table 2.10) also indicates that with the rise in the number of public, private and non-governmental health facilities between 1980 and 2019, the trend of appropriate healthcare-seeking behaviour (seeking medical-care from skilled doctors and nurses) is weak in Nigeria.

Figure 2.6 presents the percentages of health-seeking behaviour in Nigeria from the households’ responds. For instance, in Wave 1 (2010/2011) and Wave 4 (2018/2019) more than two-thirds (about 68.1%) of the country’s households relied on inappropriate healthcare services (NBS, 2013, 2019). The figure indicates that the percentages of Nigerians with appropriate HSB in 2019 is 46.73% which is quite low relative to 2010 when the nation recorded 53.05%. The percentages of those that seek appropriate healthcare from medical doctor declines from 36.2% to 20.8% between 2010 and 2019. Similar trend was found for HSB from skilled nurses, as it decline from 16.85% to 11.1% over the same periods. However, more households had inappropriate HSB as the percentages of those that seek medical-care from chemists and those that resort to self-medication increase from 29.3% and 6.53% in 2010 to 41.3% and 13.1% in 2019, respectively. This indicates that appropriate HSB is very weak.

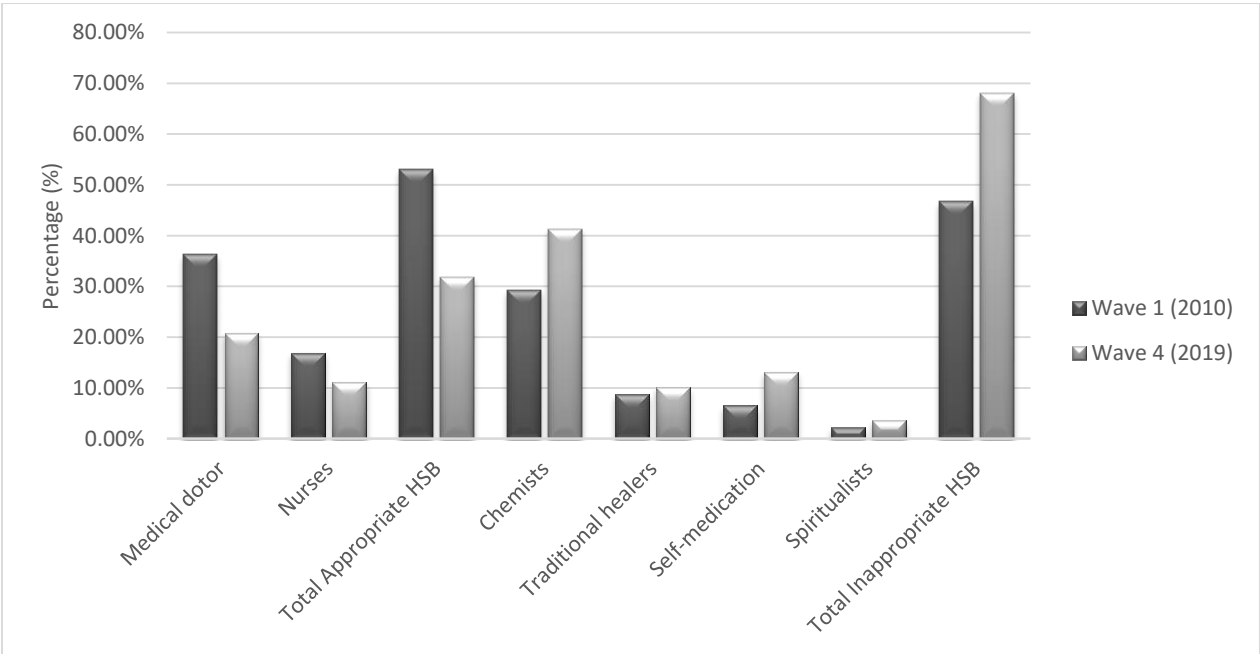


Figure 2.16: Health-Seeking Behaviour in Nigeria (2010-2019)

Source: National Bureau of Statistics (2013, 2019)

These findings are not surprising as it corresponds with the reports of NBS on HSB in Nigeria. Figure 2.17 shows that only 27.9% of men have access to appropriate medical services from the hospital facilities in 2016. This decrease to 17.9% in 2019. However, several men seek healthcare inappropriately from chemists, which increase from 33.2% in 2016 to 47.7% in 2019. The percentage of men that resort to self-medication also increase from 5.7% to 13.3% between 2016 and 2019. This further reveal that HSB among men is very weak in Nigeria.

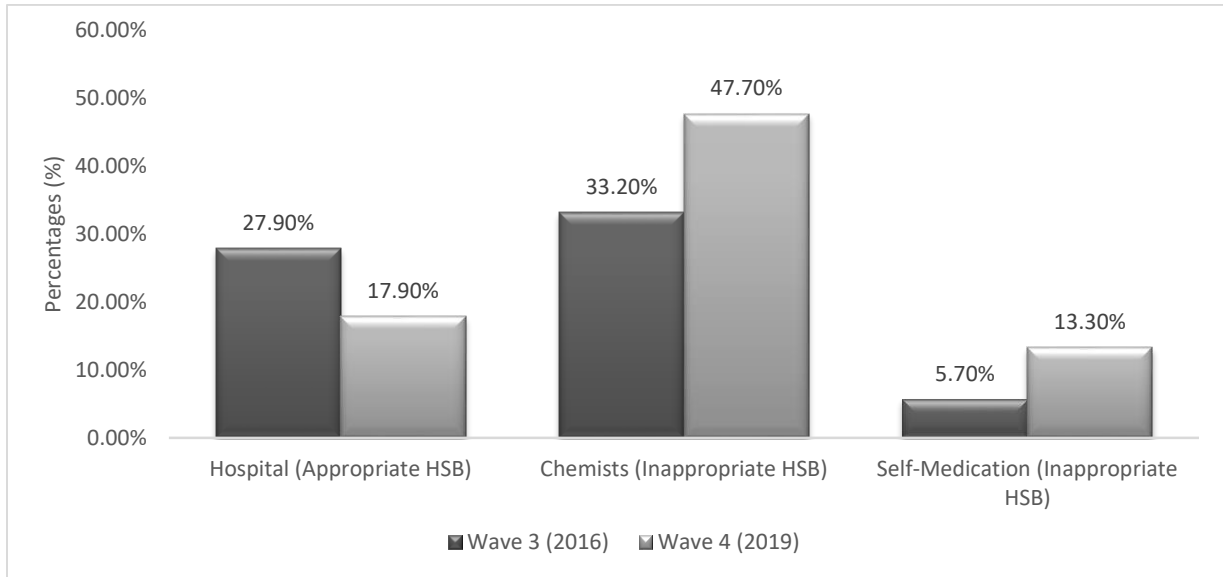


Figure 2.17: Healthcare-Seeking among Men reporting Illness in Nigeria
 Source: National Bureau of Statistics (2017, 2019)

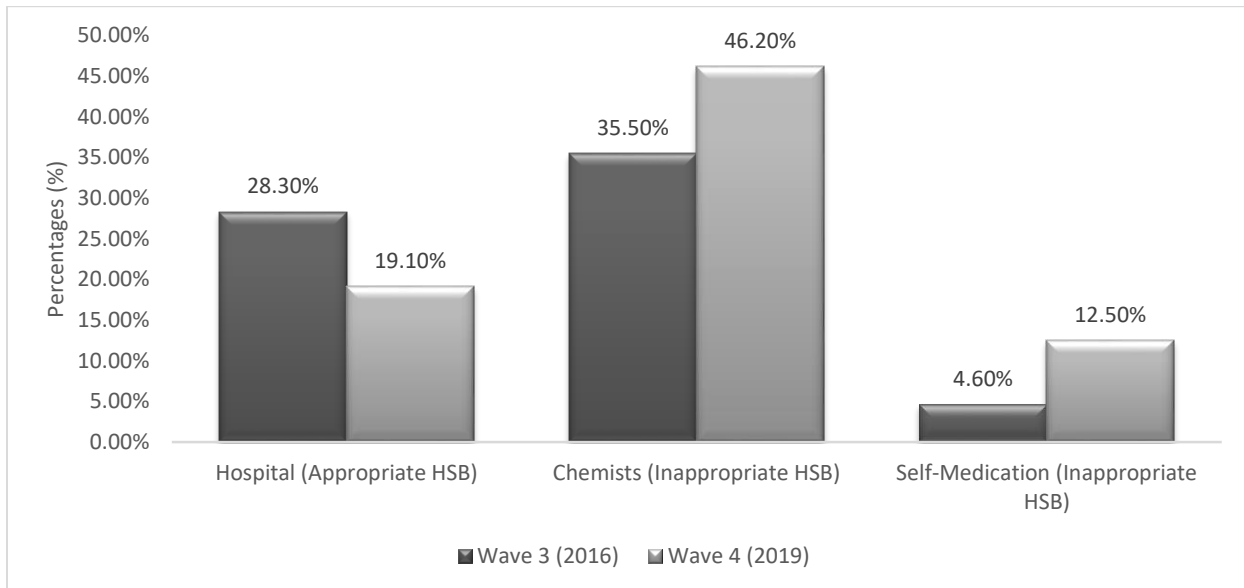


Figure 2.18: Healthcare-Seeking among Females reporting Illness in Nigeria
 Source: National Bureau of Statistics (2017, 2019)

The percentages of females with appropriate HSB also declines from 28.3% to 19.1% from 2016 to 2019 in Nigeria (see Figure 2.18). Several females seek healthcare services from chemist in 2019 compare to 2016's statistics, as the percentages of HSB from chemists increased from 35.5% to 46.2% between 2016 and 2019. Figure 2.17 further shows that 4.6% of females resort to self-medication in 2016. This inappropriate HSB increased to 12.5% in 2019. The weak HSB in Nigeria could further leads to poorer health outcomes.

Conclusively, the trend analyses in this chapter clearly revealed that poor health outcomes, such as, illnesses and deaths from NCDs are rising in Nigeria. This perhaps accounts for poor health indicators (infant, under-five, maternal and adults deaths) in the nation comparatively. These findings were consistent with previous literature, such as, Adedini, 2013; Novignon *et al.* 2015; and UNICEF, 2018. More so, this study found that Nigeria is characterized with weak health-seeking behavior between 2010 and 2019. This is also in line with prior literature on HSB, such as, Fagbemigbe, 2015 and Abiola *et al.* 2018.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

The existing state of knowledge has consistently established that health indices in Nigeria are generally poor. In addition, the level of income disparity in Nigeria remains high in recent decades. However, the extent to which income inequality affects health outcomes and health-seeking behavior remains understudied. This chapter thus focused on a review of conceptual, theoretical, and empirical literature with a view to identifying gaps in extant studies.

3.2 Conceptual Review

3.2.1 Income Inequality

Income inequality simply means the disparity or gap between rich and poor citizens in an economy, society or nation (Wilkinson and Pickett, 2006). It resembles a *champagne glass* in which a large concentration of income trickles down from top to bottom (Ortiz and Cammins, 2011).

The concept of income inequality is often used by economists to describe a situation in a society or country where there is absence of equality (and fairness) in the distribution of economic and non-economic well-being indicators (Isah, 2011:43). However, Sutter (2013) explains income inequality as how evenly or unevenly income is distributed among individuals, societies or nations. Afonso, LaFleur and Alarcon (2015) further conceptualized income inequality as the state of not being equal, especially in status, rights and economic opportunities. The Institute for Policy Studies (2018) explains it as the extent to which income is distributed in an uneven manner among a population. The concept is also regarded as how material resources are distributed in a society, state or nation (Organization for Economic Cooperation and Development – OECD, 2018; Deprez, 2018).

These conceptualizations by several authors underpin certain converging points on income inequality, as the difference between the income of the rich and the poor citizens in a given economy. In general terms, income inequality is the gap between rich and poor and unequal distribution of wealth in any economies. It is also a broader concept than poverty in that it is defined over the entire population, not just for the portion of the population below a certain quintile (World Bank, 2004; Tan *et al.*, 2018).

Wilkinson and Pickett (2006) suggest that most people consider increasing income inequality as morally undesirable and bad for instrumental reasons – causing conflict, limiting co-operation or creating psychological and health stresses. This is because, income inequality often raises the purchasing power disparities among citizens (Brockway *et al.* 2014). Similarly, income disparity influence housing condition, clothing and other factors that affect health outcomes (Benzeval *et al.* 2014; Liu, 2017). This implies that there will be fewer economic resources among the poorest individuals, resulting in lessened ability to avoid risks, cure injury or diseases, and/or prevent illness (Macinko *et al.* 2003).

The level of income inequality in the global economy is among the most pressing, disturbing, and challenging issues. This often result to social tension and conflicts (Kakwani and Hyun, 2015). It also raises social problems that affects the well-being, and ability to borrow (Thompson, 2016). In line with Barro (2008), Kakwani and Hyun (2015) and Thompson (2016) income inequality concerns credit-market imperfections, social unrest and low saving rates. They also corroborate that low-income citizens often face imperfect credit market and lack collateral to start or expand business. This suggest that the low-level of income could prevent people from seizing investment opportunities that would benefit themselves, their children and households. Barro (2008) further demonstrate that low-income households might not be able to offer their children healthy food and cannot afford health insurance.

In addition, with high income disparities among households, the overall savings rate becomes lower. This is because higher rate of marginal saving is usually found among the *middle-income class* as high-income earners spend much of their income on imported luxury goods (Bricker and Krimmel, 2014). Income inequality also associates with lack of income mobility and a reflection of persistent disadvantage of poorer households (Dabla-Norris *et al.*, 2015). This is because high income disparities could deprive the ability of lower-income households to stay healthy and accumulate human capital needed for better economic growth (Galor and Moav, 2004). For instance, income inequality might lead to under-investment even in education. As children of the low-income households might end up in lower-quality schools, and are unable to move on to higher institutions, with the circle of lower welfare and poor health status (Wilkinson, 2010).

The question of effects of income inequality has since dominated economic researches. This is because individuals that are stressing or struggling to maintain (or improve) their welfare status in

the social hierarchy in nations with wide gaps between the rich and poor, will often experience increased numbers of ill-health (Black, 2010; Liu, 2017; Hill *et al.* 2019). This perhaps suggests the possibility of child and mother deaths, because the stress to acquire more income for pregnant women are attributed to pre-term births and short gestational length and possibility of low longevity (Klabber, 2009). The concept also relates with longer work hours and possibility of low social life; by implication, citizens might be forced to spend longer time working than raising or caring for offspring and their welfare (Lynch *et al.* 2010).

Clearly, income inequality is the concentration of citizens either at the top or at the bottom of the distribution. It also implies the hollowing out of middle-income group in the society. Most often, the extent, pattern, level and magnitude affect economic growth and development, social capital, cohesion, education, health and longevity (Desbordes, 2011; Benzeval *et al.*, 2014; Rebeira *et al.* 2017). For instance, high level of income inequality frequently produces unfavorable environment, such as, political and opportunity captures, that affect economic activities. Its pattern often aroused serious welfare, health and living-hood concerns. All these are linked to households' consumption (Bricker and Krimmer, 2014) and air-pollution (Hill *et al.*, 2019) that affect health outcomes and health-seeking behaviour.

3.2.2 Health Outcomes

There has not been a general consensus on the definitions of 'health outcomes', even though the concept is central not only in medical or health science but also in the health social sciences (health economics, health psychology and medical demography). Perhaps because of its multi-dimensional, the concept presents a form of ambiguity. In 1948, the WHO defined 'health' with a phrase that is still used today: *a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*. That is, what concerns the general condition of the body or mind. Nordenfelt (2007:16) defined 'health' as a state of affairs which tends to lead to a certain degree of happiness. It is the state of being free from illness (Rai, 2016).

However, the concept 'outcome' is the likely final state of health, or the way health status turns out in the end. The foregoing thus implies that, health outcomes are changes in the health status of an individual or household (Bhattacharjee *et al.* 2014). This changes often results to illness, deaths or affects quality of life (WHO, 2018). It is the quality and length of life at the micro-level and on a comparable basis across nations (Or, 2000). Health outcomes also relate to changes in health

status that result from specific healthcare investments or interventions (Kindig *et al.*, 2008). Sansoni (2016:7) conceptualizes health outcome as a change in the health status of an individual, or a group of people or population.

The health outcomes of any citizen are classified as: *poor or negative* and *good or positive* (Or, 2000). The former concerns illness, lack of well-being, disability or deaths (Pickett and Wilkinson, 2015). On the other hand, the latter relate to being alive and healthy, functioning well mentally, physically and socially. The *poor* health outcomes often affect economic development by reducing households' labour supply and their ability to effectively utilize resources (Nwanosike, 2015). Conversely, healthy outcomes are key to human capital as it relates to an improvement in cognitive development, particularly in early childhood. For instance, healthy children learn fast and gain more from school. This is because, the tendency of having fewer days absent from school is related with positive health outcomes. In addition, healthy adults add to labour force and human capital (Grossman, 1972, 2000). It is often stated that healthy workers are more productive, because of fewer days off work (Hartwing, 2010).

Interestingly, healthy outcomes often contribute to economic development, since healthy people and those with healthy dependents have far greater economic opportunities than do the sick. In addition, since good health is a powerful enabler of education and income (WHO, 2002:10), it improves human capital. Finally, improving health outcomes such as, reducing infant and under-five deaths or increasing longevity, is likely to give low-income citizens choices where they have none (WHO, 2002:10-11; Grossman, 2017).

The foregoing suggests that finding an appropriate or encompassing definition of health outcomes may be difficult. This is because the absence of ailments is viewed as good health; but the presence of NCDs (stroke, heart-attack or cancers) in the body implies poor health. Again, people often differ in susceptibility to certain disease due to genetic, biological and environmental factors. Thus, both Australian Institute of Health and Wealth (2014) and Sansoni (2016) summarized the causes of poor health outcomes as those that concern internal and external as Figure 3.1 shown. The figure suggests that the internal causes of poor health outcomes includes their gene, immune response, lifestyle and psychological factors. The external factors causes are noise pollution, ultraviolet rays, weather and climate, environmental factors or urban design, interactions with humans (or lack of), toxins in air, food and water, healthcare interventions, pathogens (virus, bacteria, fungi, parasites,

and prisons), stress and workplace hazards. These causes of poor health outcomes frequently limit people's functionality to improve economic growth (Sen, 1999, 2001).

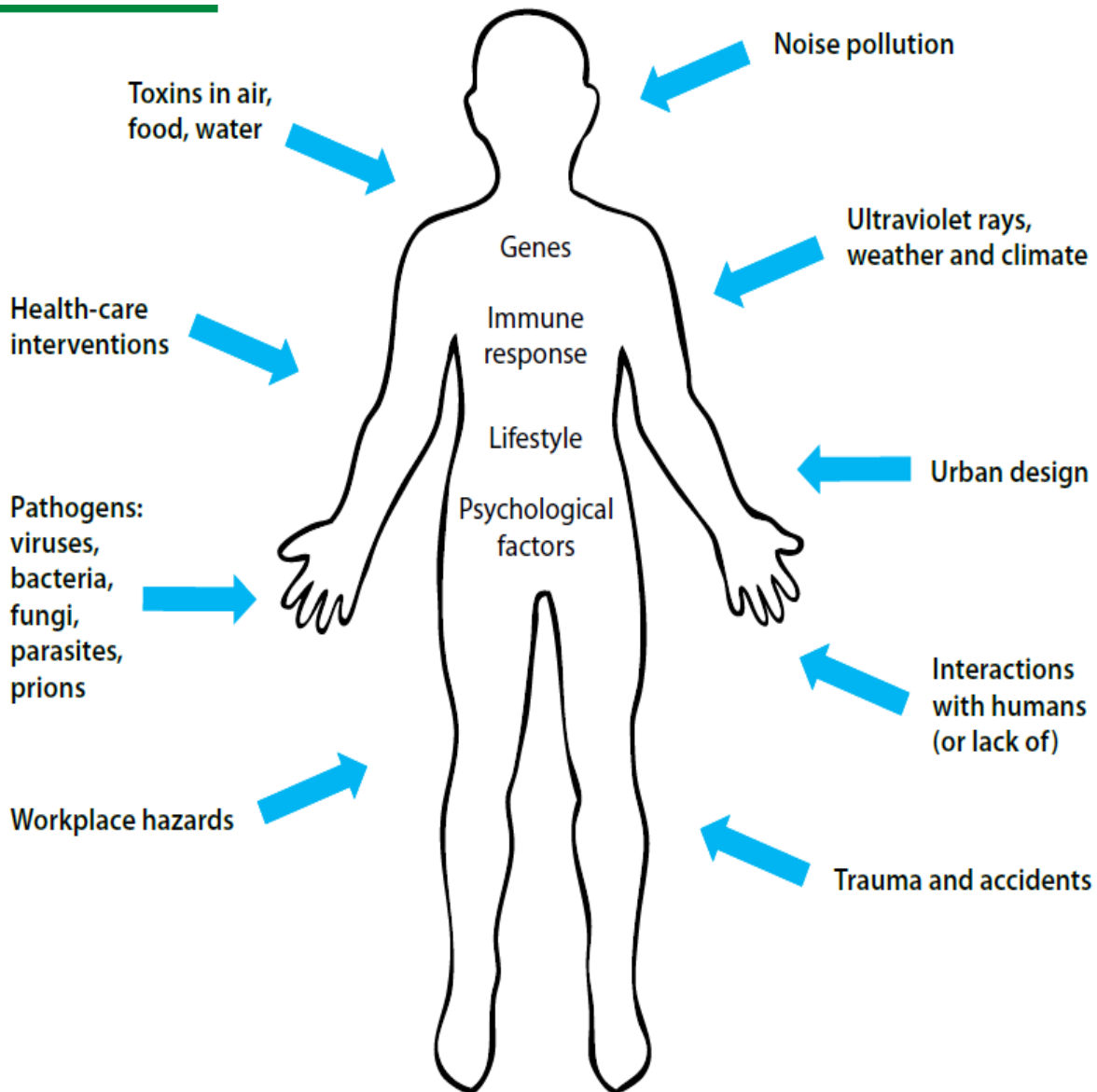


Figure 3.1: Internal and External Causes of Health Outcomes

Source: Sansoni (2016) and Australian Institute of Health and Welfare (2014:5)

Measures of Health Outcomes

There are various measurements of health outcomes. These are grouped into two: subjective and objective measures (see Sakurai and Hashimoto, 2010:1833; Miething, 2012:163). Though, the health economics studies often use subjective and objective measures interchangeably. Table 3.1 presents the major differences between subject and objective measures of health outcomes with appropriate examples.

Table 3.1: Subjective and Objective Measures of Health Outcomes

<i>Subjective Measures</i>	<i>Objective Measures</i>
Self-rated health is when individual is asked to rate his/her own health quality. The question often takes a general perspective on health quality, which allows the respondents to assess their overall health. Example, individual self-rated health such as illness experience.	This is health outcomes at the aggregate level that take the form of a physical attribute. These can be easy to diagnose. Examples, deaths (infant, under-five, maternal and adult deaths), life expectancy, morbidity and diseases burden statistics.

Source: Hansson, 2013:7

Both ways of measuring health and its outcomes – subjective and objective – have their advantages and disadvantages. Objective measures tend to be more reliable since it can be empirically observed by standard diagnosis (Hansson, 2013). However, the limitations of this measure are very obvious: because such measures only apply to people who are hospitalized or those on health records. It cannot be applied to a majority of individuals visiting their family doctors (the wealthy households) and those with inappropriate HSB (mostly the low-income households). Thus, it is inadequate to measure population’s actual health outcomes (Johnston *et al.* 2007).

Health issues are also mostly inner sense of an individual’s feeling unwell, which are often difficult to measure mechanically (Johansen, 2015; Seidlein and Salloch, 2019). This led to a focus on subjective measures even though these measures can be affected by the people’s state of mind that may vary from day-to-day. Furthermore, the respondents may report their health differently based on their socially driven conceptions of what ‘health’ means their expectations (Bago d’Uva *et al.* 2006). These factors are problematic because they are likely to vary systematically with observed demographic and socio-economic factors such as health, education, poverty and income (Johnston *et al.* 2007).

Therefore, because of the complexity of developing a reliable, actual and valid health outcomes measurement, economists rely evenly on subjective or self-reported measures (for instance, See Tan *et al.*, 2018 for China; Massa *et al.*, 2018 for Brazil; Singh *et al.*, 2018 for Australia; and Hill *et al.*, 2019 for United States). Asfaw (2018), Musinguzi (2018) and Evans *et al.* (2017) have similarly shown that health outcomes of citizens largely associated with their health-seeking behavior.

3.2.3 Health Seeking Behavior

The definition of health-seeking behavior (HSB) is often considered vague and difficult to define. There is no common definition agreed in literature, despite referring to the same activity. In the broadest sense, HSB refer to all behaviors associated with establishing and maintaining a healthy physical and mental state (WHO, 2015). It is what people do in order to maintain healthy outcomes and/or return to health, ranging from individual behavior to collective behavior (Oberoi, 2016). These suggest that HSB are directly related to health outcomes.

It also implies that HSB is a sequence of remedial actions that people undertake to rectify perceived poor health outcomes, such as sick-days and illness. It is seen as individual's action that promote maximum well-being, recovery, and rehabilitation (Novignon *et al.*, 2017). HSB is often preceded by a decision-making process. This largely related with individuals and/or household behavior, community norms, and expectations as well as provider-associated behavior and characteristics (Poortaghi, 2015).

It has also been defined as any action undertaken by people who perceived themselves to have a health problem or to be ill for the purpose of finding a remedy that is appropriate (Evans *et al.* 2017). This indicate that, HSB is how health services in a society or nation are used or utilized, and in turn the health outcomes of populations. Indeed, the utilization of healthcare system largely depend on educational level, economic factors, cultural beliefs and practices (Musoke and Boynton, 2004).

In addition, health-seeking behaviour entails reducing the impact or progression of an illness or diseases (Martucci and Galamide, 2012). This is because people's health outcomes and their HSB are closely associated (Novignon *et al.*, 2017). In this account, Clewley and Rho (2018) explains HSB as broader issues that determine health and aids understanding how people engage with the healthcare systems in their respective socio-cultural, religion, economic, political and demographic domains.

Therefore, health-seeking behaviour was conceptualized as, how people interface with the health facilities, how often they visit, the costs and quality of healthcare service consumes (Huang *et al.* 2017). That is, all efforts to establish positive health outcomes. These could be associated with both demand- and supply-side factors.

Determinants of Health-Seeking Behaviour

There are various determinants of HSB as Figure 3.2 summarized. These include, non-cognitive and cognitive factors. HSB is a multi-dimensional concept relying on time and context that as to do with individual's perceptions of health needs, and other various factors (MacKian, 2003). These factors are numerous, for instance the time difference between the onset of an illness and getting in contact with healthcare professionals. It also includes the type of healthcare provider patients sought help from, how compliant patients are with recommended treatment; reasons for choice of healthcare professional; and for not seeking help from healthcare professionals (WHO, 2020).

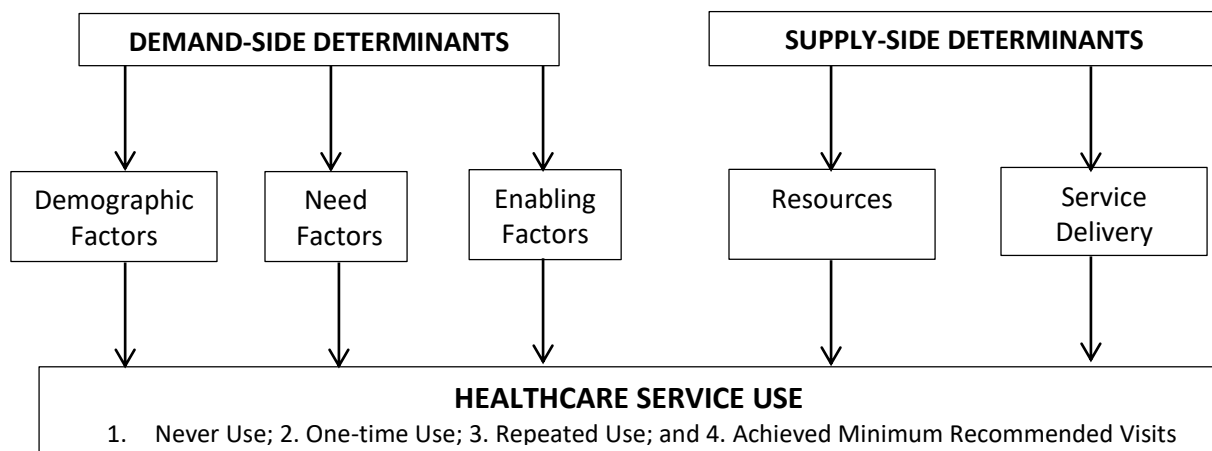


Figure 3.2: Determinants of Health-Seeking Behavior

Source: Nguyen, Kim and Tran, 2016:5

Substantially, these determinants associate with demand- and supply-side factors (Novignon *et al.* 2017; Rathi and Meena, 2018). The demand-side factors concern demographic factors (education, occupation, ethnicity), need factors (child age, gender or weight), and enabling factors (incomes and distance). On the other hand, the supply-side determinants are resources (staff skill, salary and work pressure) and service delivery (Nguyen *et al.* 2016). There is a general consensus in literature that socio-economic and educational factors also play a vital role in predicting HSB (Huang *et al.* 2017; Olaniyan *et al.*, 2015). Others factors such as political and environmental conditions may also influence HSB especially in a diverse cultural society like Nigeria (Fagbemigbe *et al.* 2015). Under-funding of health sector, inadequate water, and poor sanitation facilities have a significant impact on HSB and health outcomes in developing nations (Huang *et al.* 2017, Evans *et al.* 2017). From the foregoing, the high-level of income inequality could explain the poor health outcomes, and likely cause inappropriate health-seeking behavior in Nigeria.

3.3 Theoretical Review

This section is concerned with the explanations of how income inequality matters to health outcomes and HSB. These theories stem from the classical perspectives on functional income distribution. However, not until the Wilkinson's seminal contributions of 1990s that showed explicitly how income inequality and health⁴ are linked, there was no serious or well-articulated explanation on the link.

3.3.1 Classical Thought

Early economic thinkers including Adams Smith and David Ricardo continued to theorize the possible positive effect of income inequality on health (Atkinson, 1997). Their thought was on functional income distribution – how income is received by each factor of production (land, capital and labour). This view was embedded in Ricardian propositions that: ‘the produce of the earth (land) – all that is derived from its surface by the united application of labour, machinery, and capital, is divided among three classes of the community; namely, the proprietor of the land, the owner of the stock or capital and the labourers...’ (Ricardo, 1951:5). Simply, he considers the existence of only three classes in society (landowners, capitalists and labourers).

David Ricardo further assert that: ‘nothing contributes so much to the prosperity and happiness of a country as high profits’. This assertion gave rise to the thought that income inequality could be beneficial for healthy status of citizens (Bigsten, 1983:4). One of the possible reasons for this has been that the effect of income distribution is so tied up with economic issues that also concern health (Sandmo, 2013:3).

The basic idea in Ricardian⁵ thought is that, a differential rent is produced only when less fertile lands are exploited requiring more capital and/or labour. This leads to an increase in the price of agricultural product. As a consequence, the land-owners of the more fertile lands receive a raised rent – the surplus over the production costs (Gallo, 2002:13). In short, Ricardian theory singles out the main causes of income inequality – rent – in the technical fact that different plots of land have various degrees of fertility. So that the more fertile plots yield their owners differential gains. Therefore, since marginal propensity to consume (MPC) increases with profit (or rents), this differential gain (that creates income disparity) channels resources towards individuals (landowners) whose

⁴ Henceforth, health is used to mean both health outcomes and health-seeking behavior (HSB)

⁵ David Ricardo was the first to derive a meaningful income distribution theory (Bigsten, 1983:4). The preface to his *Principles of Political Economy and Taxation (1817, 1951:5)* also explains that the determination of the laws of distribution was, ‘the principal problem in political economy’ (see Atkinson, 1997).

MPS is higher, increasing aggregate savings to decline poor health issues of the capitalists (Stiglitz, 1969).

The classical economists thus argued that rising income inequality from differential gain is nothing of concern as it's creates incentives (to acquire more fertile land) that push the society toward a healthy status (Bourguignon, 2004). This demonstrate that individuals are largely responsible for their health outcomes. Though their main idea resides in incentives (rent) as Ricardo explained. However, the theory of the functional income distribution did not build a unified theoretical structure that explain normative and welfare issues (Sandmo, 2013). Karl Marx also recognized that rent, benefits and interest were often received only by one class: the capitalists (Ferran, 1997).

3.3.2 Neoclassical Theories

The revival of Neo-Classical economists during the 1980s, in a context of rising income inequality as experienced by Latin American nations, once again put income inequality at the forefront of the debate (Gallo, 2002:14). From neoclassical perspective, market could, and should play a central role in rationing scarce goods and in income distribution. Their explanation is also an integral part of the 'marginal revolution' that took place in the 2nd part of the 19th century. By their explanations, income inequality is an outcome of free market mechanism, therefore the issue is inevitable. They assert that if top income concentration generates savings, given the difference in propensity to save between the rich and the poor, unequal distribution of income might be allowed. Under this, there is positive relationship between income inequality and health (see Kosta and Novica, 2018:319).

From their perspective, income inequality generates savings and thus, stimulates health outcomes and economic growth. For instance, since savings and investment are directly related, it is possible to conclude that a certain level of income inequality can be good for economic development that improves health. The central assumption of this thought is that, unequal income distribution often diverts income from consumption to savings, and as the marginal propensity to save increases with an increase in income, marginal propensity to consume decreases.

The basic idea of Neoclassical theories is that, poor health outcomes from income inequality is beyond individuals' control (Gallo, 2002). From their perspective, some of the issue that arise in income inequality include the absence of social assets as well as market failures that exclude unhealthy individual (especially the low-income households) from the health-credit markets or

health insurance. They argued that rising income inequality is associated with wide productivity gaps between the high and low-income earners (Marshall, 1890, 1920:533).

It is pertinent to note that, the neoclassical theory lay too much emphasis on individuals' marginal propensity to save (Kosta and Novica, 2018). Their main focus is on people and material means that improve health. This explanation fails to account for the role of government in terms of intervention, regulation and promoting healthy living. This may be far from reality especially in the context of a developing nation like Nigeria where government is key to health policies. Secondly, the division of income between savings and consumption is often based on an individual's preference and exogenous constraints (Gallo, 2002). However, by seeing income concentration as a source of incentives for higher effort and saving, Neoclassical theory delivers an ideological backing for individualism (Green, 1991). This, as an explanation of, and justification for the income inequality, and support of free market solutions.

3.3.3 Marxian Theories

In the 1860s, Karl Marx argued in *Das Capital* that income inequality is attributed to an inherent feature of capitalism. Marx uses the Ricardian 'labour theory of value' to diagnose exploitation of workers. Like David Ricardo's ideas, he agreed that an unlimited labour supply will allow the capitalists to hold down the wages at a subsistence level (Gallo, 2002). In contrary, he emphasized strongly that a central feature of the capitalist system was its ability to accumulate profit. This is because one of the ways to maximize profits is to keep production costs (most especially, the wage or labour costs) as low as possible.

Capitalism creates situations that promote income inequality between the capitalists (the rich) and working class (the poor). The result of this is what Marx named: *industrial reserve army* of the unemployed who live in extreme poverty, misery and poor health (Sandmo, 2013:18). He also noted that the existence of this reserve army of miserable workers is in fact, in the interest of the ruling class – the capitalists. His theory then sees labour being substituted by modern technologies and machines. This reduces the need for labour-hours and the wage cost. It also implies more profit for capitalists. In Marx's argument, new technology often increases industrial concentration, lower labour demand and pushes wages down. In the context of growing population, the net result of these effects is poverty and poor health outcomes (Brown, 2004). As a result of this, the economy will collapse due to declining wages and poverty among workers, in the face of capitalistic

accumulation in the long-run (Cline, 1975:361). Thus, this argument views rising income inequality from capitalism as key constrain to healthy outcomes among the workers (Clark, 1994:7). As solution to this issue, Karl Marx suggested communism⁶.

3.3.4 Keynesians Views

Keynes in his argument strongly contested the claim for communism. He posited that publicly provided health facility and government interventions, that include healthcare services has a major role to play in reducing poor health outcomes. This is contrary to giving money to member of the community (workers) to reduce income inequality (as Marx argued) or letting them take care of themselves through market forces as Neoclassical thinkers concluded (Evans, 2004).

Unlike Marxian thought, Keynes made more than a passing comment on the effect of income inequality in Chapter 8 ('The Propensity to Consume') of the 1936 'General Theory'. His comment that: 'if fiscal policy is used as a deliberate instrument for the more equal distribution of incomes, it effects in increasing the propensity to consume (healthy goods and services that improve health) is, of course, all the greater' (Keynes, 1936:95). This clearly demonstrate that income distribution matters to health if, *ceteris paribus*. A change in income distribution often causes a change in the aggregate propensity to consume healthy goods and services (Brown, 2004).

The theories of Keynesian and Neoliberal economists also emphasize on government interventions in the establishment of public services. Particularly, those that concern healthcare, water and public housing, and public income transfers –pensions and cash transfers (Schultz, 1961). Hence, contrary to the argument of Marxian, Keynes in General theory of 1936 emphasize that government focus on public goods and more equitable income distribution will reduce poor health outcomes. Unlike the Classical explanations, Keynesians ideas is that rising income inequality is detrimental to healthy outcomes (Hansen, 1939:13; Samuelson, 1947, 1948).

However, the weakness of this argument is that, although many developed countries experience an improvement in their health indicators in 1960s, while their income inequality is also rising (Pulok, 2012:2). This reality appear that they are in agreement with the classical and neoclassical explanations, that income inequality is associated with health positively. Nonetheless, the effect of income inequality on health seems not to be settled in mainstream economic theories. This

⁶ Communism is a theory or system of social organization in which all property is owned by the community and each member contributes and receives according to their ability and needs.

particularly led to post-Keynesian theories that the effect of income inequality on health concern absolute and/or relative income perspectives.

Specifically, the 1970s to date have witnessed resurgence in theoretical attention on the effect of income disparity on health by economists. For example, several contemporary authors (Grossman, 1972, 2000; Preston, 1975; Wilkinson, 1992, 1994, 1996; Deaton, 2003; and Pickett, 2015) present numbers of perspective and hypothesis to better explain income inequality-health links. Several income hypotheses and mechanisms to explain the effect of income inequality were presented:

3.3.5 Absolute Income-Health Hypothesis

The argument of income inequality suggests that a rise in absolute income can lead to improved health and reduction in deaths (Liu, 2017:5). The absolute income hypothesis (AIH) assumed that there are two income-groups in any society – low- and high-income groups (Preston, 1975). Hence, any one-unit of naira transfer from the high-income group to the low-income would improve overall or aggregate health. This is the central idea of AIH (Deaton, 2003). It then contends that though higher income level will always guarantee people to have healthy outcomes, however, income inequality does not directly impact health (Babones, 2008). According to the hypothesis, absolute level of income determines consumption, while low-income and poverty will lead to poor health outcomes (Laporte, 2002).

In other words, more income typically reduces illnesses/diseases as more resources are devoted to higher quantity and quality of health-promoting goods (diet, clothing and housing). It also provides healthier environments particularly in developing countries (Deaton, 2003). Both Preston (1975) and Grossman (1972) are one of the pioneers of the hypothesis with emphasize that an increase in income will increase investments in health-enhancing goods. Their explanation further argued that the relationship between absolute income and health outcomes is *concave*. The concavity shape demonstrates that any naira transferred to the poor will not only improve the health outcomes of the poor, but also the aggregate health status of all households in the society – the wealthy inclusive (Wagstaff, 2000:546; Deaton, 2003:116).

3.3.6 Relative Income-Health Hypothesis

Since the 1980s, there has also been developments in health economic literature suggesting that poor health outcomes might be linked to income inequality (see Legrand, 1987; Pampel and Zimmer, 1989). However, no theory explicitly provides adequate explanations for this link, not until Wilkinson's seminal papers of 1990s (Wilkinson, 1992, 1994).

Wilkinson and Pickett (2010) contended that people in more equal nations live longer and have positive health outcomes. The premises of Wilkinson's hypothesis was based on observations on income inequality-health links of 21 developed countries (see Figure 3.3). The figure shows that with increasing income inequality to the right on the horizontal axis, the higher the poorer health outcomes. He then argued that the two (income inequality and health) are extraordinarily closely related in both developed and developing nations (Wilkinson, 1994). Hence, the prevalence of poor health outcomes and weak HSB in any society strongly associated with income inequality, but not the average living standards (Wilkinson and Pickett, 2010:20).

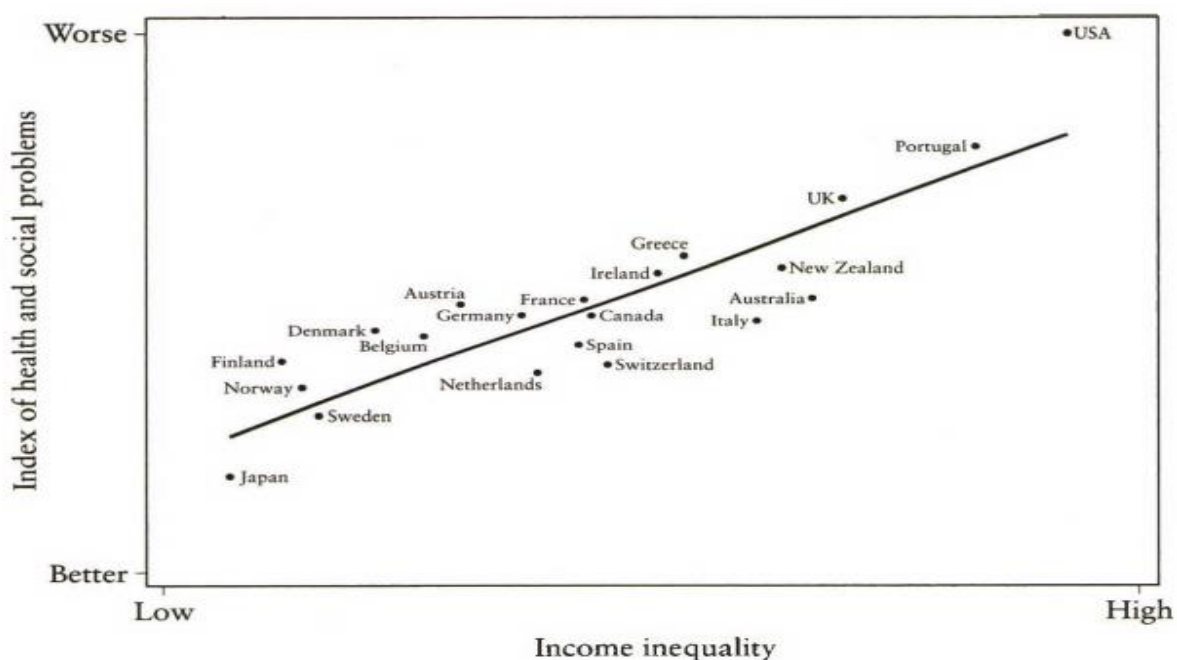


Figure 3.3: Income Inequality-Health Problems among rich countries

Source: Wilkinson and Pickett (2010:20)

One of the major contribution of his argument is that; in the process of economic development, there will be a *point* where a vast majority of citizens gaining access to basic necessities of life. That is where income differences among individuals rises. This point corresponds to the shift in the main causes of death arising from infectious diseases to more of degenerative NCDs⁷. Simply put, rising income inequality is detrimental to healthy outcomes and main causes of illness (Wilkinson, 1994:62). This is known as relative income or income inequality-health hypothesis.

⁷ According to WHO (2018), deaths from NCDs (heart attacks, hypertension and strokes) is on the deadly rise in Nigeria in recent years; and 1 out of every 5 Nigerian adults over the age of 30 will continue to die prematurely from hypertension and other NCDs if adequate measures are not taken.

The Wilkinson ideas was also built on the ‘theory of epidemiologic transition’ as proposed by Omran (1971). By the mid-1990s, Omran’s explanations formed the key theoretical basis that links health with economic development processes. There are five epidemiologic transition stages that explains phases of development witnessed by a sudden and stark increase in population growth rates and health, as Figure 3.4 shown.

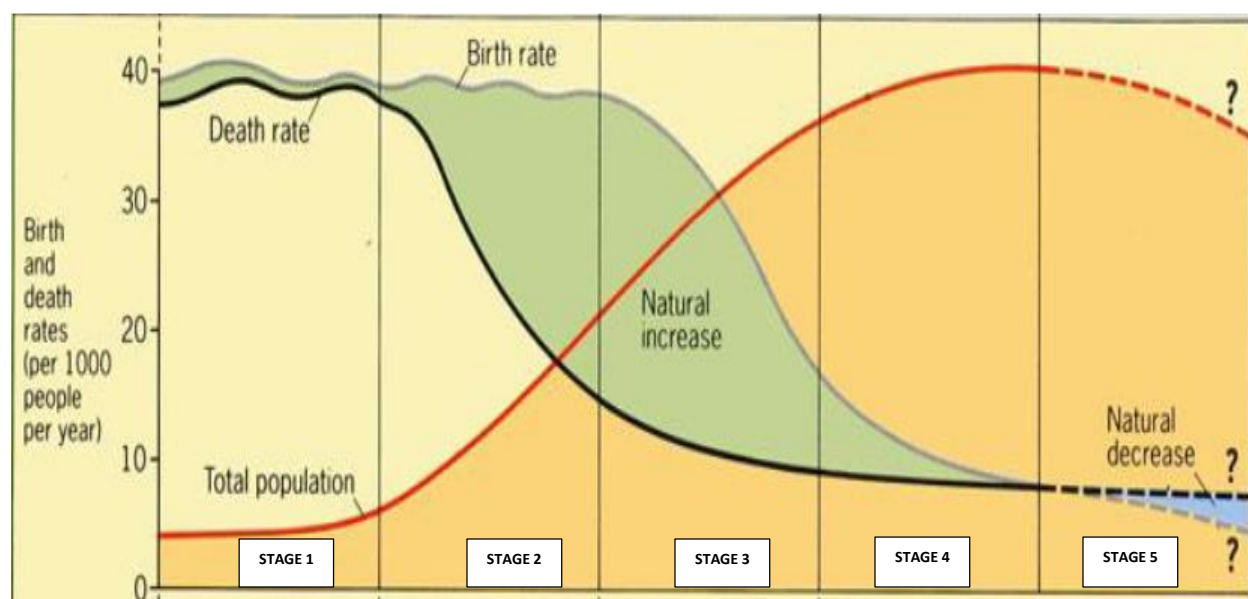


Figure 3.4: Stages of Epidemiological Transition

Source: Epidemiologic Transition Model (www.murrieta.k12.ca.us)

Stage 1 is called pestilence stage where infections, parasitic diseases and famine are the principal causes of human deaths and ill-health issues. In this stage, the annual birth and death rates (per 1,000 people) co-moves but greater than 35 per 1,000 citizens. Stage 2 is receding pandemics with annual death rate per 1,000 people declining at steady birth rate as total population increases.

Stage 3 refers to the degenerative and human-created diseases stage where both birth and death rates from infectious diseases decline with rising population. This is called human-created diseases because deaths at this periods strongly related with stress, fear, shock, anxiety, depression, crime, insecurity and kidnapping (Liu, 2017:36; Patel, 2018:76). The stage is mainly characterized by a fall in deaths rate from infectious diseases and a rise in cardiovascular diseases⁸. However, stage 4 and 5 are the extension of stage 3 (see Omran, 1971).

⁸ Nigeria is in *Stage 3* since her annual death rate per 1,000 *declines rapidly* from 25 per 1,000 in 1970s to 12 in 2017, and annual birth rate *falls rapidly* from 47 to 38 per 1,000 in 1970s and 2017 respectively; while total population rises from 70 million in 1970s to nearly 200 million in 2018 (World Bank, 2019).

The explanation of Wilkinson is that at stage 3, health of citizens is affected by income inequality (Wilkinson, 1994:66). This prompted the *relative income-health hypothesis* (RIH) that income inequality itself (rather than, absolute income) has an impact on the health of individuals in any nation. This implies that citizen's income relative to others in his or her 'group' rather than an individual's absolute income will predict their health outcome. Accordingly, if the income of everyone but one in a neighborhood rises, that person's health is expected to deteriorate (Drabo, 2011).

Income inequality-health hypothesis (IIH) further asserts that the chronic stress provoked by this comparison may lower resistance to some diseases or harm their health status. Hence, the central explanation of IIH is that there is a direct negative effect on people's health from income disparity, independent of individual's absolute income (Wilkinson and Pickett, 2010). This implies that if citizens assess their income level in comparison to their strata, their health would also be affected by other's income (Wilkinson, 1992).

What is unclear is the pathways/mechanisms through which income inequality affects health (Liu, 2017:14). Hill *et al.* (2019) recently argued that ways that income inequality affect health in United States could be via air pollution. In theory, it is reasonable to think that the level of air pollution in developed countries is relative more, because of their level of industrialization.

All the same, the Wilkinson's (1992, 1994) RIH triggered new insight on income inequality-health links. However, the way income inequality affect health is still *not clear* (Truesdale, 2016; Liu, 2017:14). These potential causal mechanisms largely include: political capture (Bartels, 2008, Fuentes-Nieva and Galasso, 2014; Wolf, 2015), social capital (Kragten and Rozer, 2017), socio-biological (Brockway *et al.* 2014), neo-material (Benzeval *et al.* 2014), and psycho-social (Lynch *et al.* 2010).

3.3.7 Political Capture Mechanisms

The income inequality-health link relates with 'political capture' (Bartels, 2008; Gilens, 2012; and Wolf, 2015:1). Political capture implies that the gap between the rich (mostly, the ruling class) and the poor coexists with less public goods (for example, public healthcare, children vaccination, safe water and sanitation) in turn affecting health (Lynch *et al.* 2000). Bartels (2008) argued that most policies pursued by government often lead to massive rise in income inequality. In 17th century,

Adam Smith asserted that: ‘no society can be flourishing and happy of which the far greater part of members is poor and miserable’. This assertion suggests *wide* gap between the wealthy- and poorer-households related with political capture (see Fuentes-Nieva and Galasso, 2014:5).

The gap may also translate into less public spending as income inequality may increase the political influence of the few rich citizens. If their policy preferences restrict health-related public goods, the health outcomes of the poor citizens may be worsened (Gilens, 2012). In developing nations, public infrastructures are generally paramount to health. Although Fuentes-Nieva and Galasso (2014) argued that income inequality is good for economic growth, as it rewards those with talent, hard earned skills, and the ambition to innovate and take entrepreneurial risks. However, extreme levels of wealth concentration excludes hundreds of millions of people from realizing the benefits of their talents and hard work is bad to health outcomes.

3.3.8 Social Capital Mechanisms

The widening gap between the high and low-income earners might influence the social fabric of a society through reducing social trust. Consequently, declines of *social capital*. Income inequality affects social trust because it creates differences between citizens (Kragten and Rozer, 2017:1017). It also raises *social dysfunctions* (theft, kidnaping, insecurities and violent crimes). This in turn increases fear and shock which may leads to ailments such as heart-attack, stroke, hypertension and death (Kawachi *et al.* 1997). Income inequality often affects health resulting from *decay of social capital* as it frays the social fabric, reducing social capital and mutual trust among citizens (Wilkinson *et al.* 2010).

Finally, income inequality creates distrust at the individual level, translating to anti-social behavior and reduced civic participation. This weak social relation may have health consequences because socially integrated people have been shown to display increased immunological resistance to certain diseases while social isolation is related with unhappiness (Pabayo, *et al.* 2013).

3.3.9 Neo-material Mechanisms

The neo-material mechanism as suggested by Lynch *et al.* (2000) explains that, any society with greater income disparity will have a higher number of citizens with low incomes. This limits access to education, employment, healthcare and healthy housing, etc. Further, individuals living in the most income-deprived societies may be more exposed to pollution (Bhattacharjee *et al.*, 2014). Income inequality implies that fewer economic resources reach the most vulnerable groups. This

thereby reduces their capacity to mitigate risk, address injuries and/or diseases, and to prevent ailments (Macinko *et al.* 2003:416).

Interestingly, health outcomes of citizens are often predicted by various factors (Grossman, 1972). These include clothing, housing conditions, and healthy calorie/diet which are also called material (see Lundberg *et al.* 2010; Benzeval *et al.* 2014). This implies that health status of individuals (H_t) depreciate during their lifetime (when important health-enhancing goods and services are lacking or inadequate). But individuals can invest in their health to offset this depreciation (Grossman, 1972, 2000; Berkman *et al.* 2000).

Such that:

$$H_t = \delta_t H_t + I_t \quad (3.1)$$

where H_t denotes citizens' healthiness at current period; $\delta_t H_t$ is the depreciation in households' health status through diseases and sick-days, δ_t the rate of depreciation, while I_t the gross investment in health status.

This implies that:

$$\Delta H_t / \Delta t = I_t - \delta_t H_t \quad (3.2)$$

where $\Delta H_t / \Delta t$ will always be positive anytime $I_t > \delta_t H_t$, that is, when citizens invest more in their health status H_t ; but $\Delta H_t / \Delta t$ will be negative anytime $I_t < \delta_t H_t$ (Jacobson, 2000). Therefore, Grossman (2000; 2017) concludes that to increase gross investment on health requires the availability of health-promoting goods and services.

3.3.10 Psycho-social Mechanisms

The psycho-social idea presents the view that income disparity leads to social comparison that enforce social class and strata. This raises competition, stress and frustration leading to poor health outcomes for those citizens at the *bottom* (Lynch *et al.* 2010). This means that people in unequal societies do not have efficient social support system and lack total control over their life. It also means that income inequality creates a sense of hopelessness and insecurity.

These situations affect health status through *stress-induced behaviours* and *chronic stress* (Kawachi *et al.* 1999). The mechanism often results to invidious processes of social comparison and cohesion as presented in Table 3.2.

Table 3.2: Relationship between Income Inequality and Health

Psycho-Social Explanation
<p><i>Social Status and Competition:</i></p> <p>Income inequality results in ‘<i>invidious processes of social comparison</i>’ that enforce social hierarchy causing chronic stress leading to poor health outcomes.</p>
<p><i>Social Cohesion and Crimes:</i></p> <p>Income inequality reduces social resources, erodes social bonds that allow people to work together, and results in less trust and civic participation, greater crime and homicides. All these could lead to poor health outcomes.</p>

Source: Macinko *et al.* (2003:416)

There are other explanations for the income inequality-health links. These are mainly through medium/channels. These mechanisms could be through debt burden and long working hours with little or no time for leisure, family and health needs (Benzeval *et al.* 2014). Income inequality can also lead to fewer life opportunities for low-income households. Therefore, the potential causal channels by which income inequality in any society could result in poor health and inappropriate HSB are as depicted in Figure 3.5.

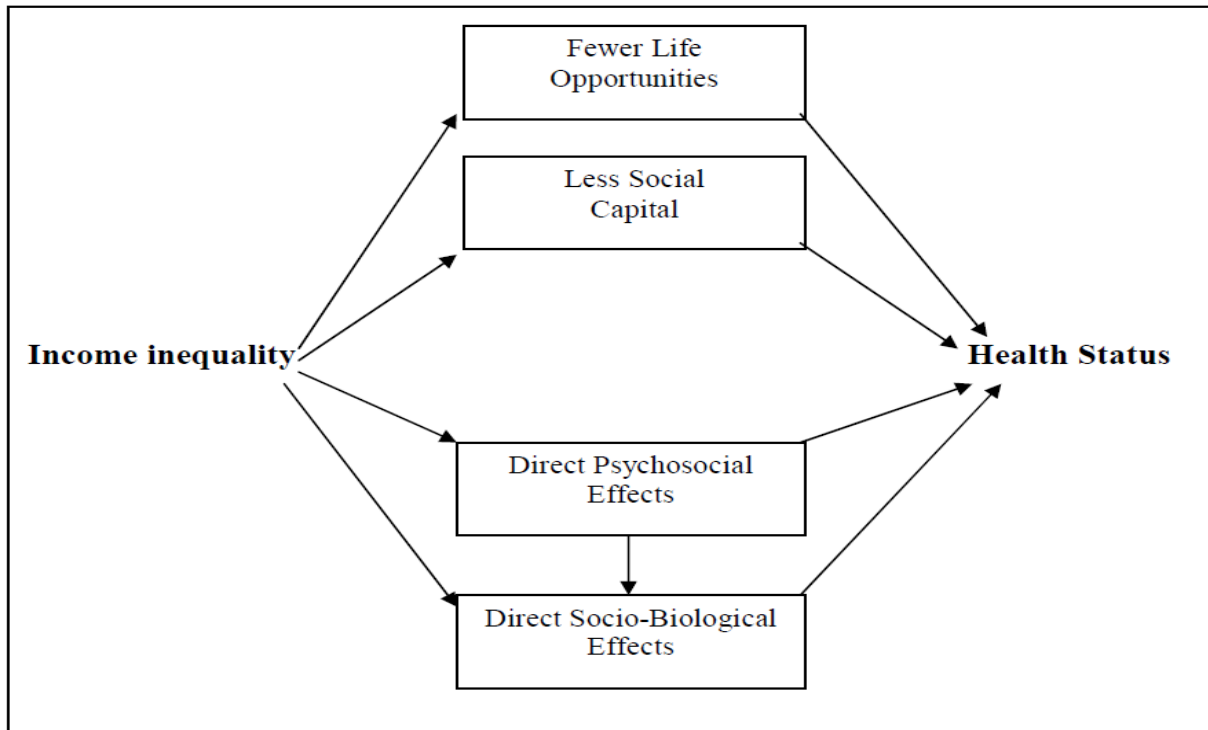


Figure 3.5: Income Inequality-Health Mechanisms

Source: Vafaei (2008:15)

Figure 3.5 depicts that the mechanisms through which income inequality affects health is through fewer life opportunities, less social capital, chronic stress and socio-biological effects. However, the advocates of income inequality-health hypotheses have argued that income disparity has *direct* effect on health through various channels. One of the strengths of the Wilkinson's hypotheses is that income inequality is detrimental to health. This is because, it could enforce *negative* psychosocial effects that produce higher levels of frustration and chronic stress. The end results being poor health outcomes.

However, one of the major challenge that has puzzled health economists in developing countries is the weakness of Wilkinson's income inequality-health hypothesis to explain the indirect links from income inequality and health outcomes. For instance, in Nigeria where under-nourishment, poverty, environmental, insecurity, kidnapping and poor housing conditions remains some of the serious problem facing rich and poor households alike. The understanding of these transmission mechanisms from income inequality to health could inform health and welfare policies especially is an emerging nation like Nigeria.

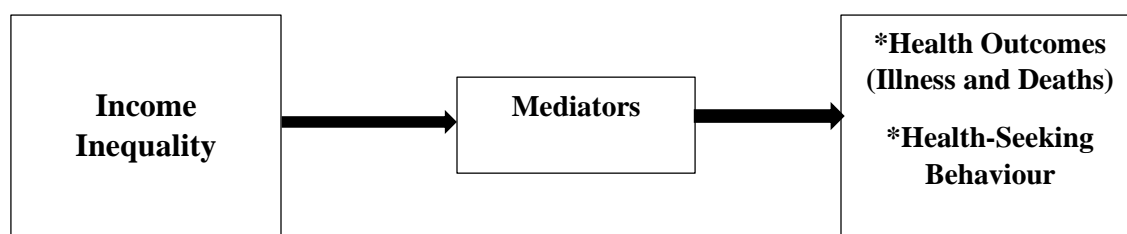


Figure 3.6: Income Inequality-Health Mediators

Source: Insight from theories and empirics

Notably, health status itself is produced by what people consumed particularly their dietary choices, access to medical-care and infrastructure, and their lifestyle (Grossman, 1972). In addition to this argument, the theoretical contributions since Grossman's explanation have added other determinants of health (see Bolin *et al.* 2003; Gahama and van Kippersluis, 2013). These largely relates with household characteristics, namely family size, access to healthy food, water, housing conditions, education, and people's lifestyle. These arguments also form the basis for this study as Figure 3.6 shown. Thus, in meeting household needs, rising income inequality could impose more psycho-social stress on household's members to affect their health outcomes and discourage appropriate HSB (Wilkinson and Pickett, 2010; Liu, 2017).

3.4 Review of Empirical Studies

Numerous empirical studies have been conducted on the relationship between income inequality and health in both developed and developing countries. This section focuses on the empirical findings and methodological debates on these studies. It is important to note that excellent survey of previous empirical evidence prior to year 2000 can be found in studies like Lynch *et al.* (2004), Wilkinson and Pickett (2006).

3.4.1 Cross-Country Evidence

Evidence from cross-country studies on income inequality-health nexus are the major dominant in literature. While numerous of these studies⁹ found statistical significant *inverse* effect of income inequality on health. Others indicated that as income inequality rises health status improve. For instance, Neumayer and Plumper (2016) show that there is a significant *negative* relation between income inequality and average life expectancy of 28 developed nations. Their main finding from panel co-integration and Error Correction Model (ECM) indicates that an additional percent point in income inequality between the rich and poor citizens in the countries examined *reduces* longevity by 0.013% points in the short-run and by 0.058% in the long-run.

Deurzen *et al.* (2014) looked at the link between child deaths and wealth inequality in 52 low- and middle-income nations. The multi-level logistic regressions result from United States Agency for International Development Health Survey (USAIDs) indicates that *higher* levels of household wealth differences related to *worsen* child-health, such that, a 1-unit point increase in Household Wealth Inequality associated with 0.65% child mortalities.

Avendano (2012) also provides the evidence of significant impact of income inequality on infant mortality in a fixed effects models for the periods of 1960 to 2008 for 34 countries members of OECD. The author's findings indicate that a 1-point increase in income inequality was significantly associated with a 7% rise in infant deaths at 5% level. Torre and Myrskylä (2011) found negative and significant relationship between income inequality and newborn deaths. These authors tested the IHH hypothesis on 21 developed countries over a period of 30 years. Their results further show income inequality strongly and directly associated with newborn deaths, such that a 1% rise in income inequality increases infant deaths by 0.47%.

⁹ Berkman, Glass and Seeman (2000), Blakely, Glass and Kawach (2000), Diez-Roux and Link (2000), Leigh and Jencks (2007), Babones (2008), Shkolnikov, Andreev, Zhang, and Vaupel (2009), Torre and Myrskylä (2011), Avendano (2012), Deurzen, Oorschot, and van-Ingen (2014), Neumayer and Plumper (2016).

In another cross-country study focusing on 135 nations, Babones (2008) investigated the causality and correlation between income inequality and population health. The author found that changes in income distribution for these countries are directly associated with changes in infant deaths and life expectancy among citizens from 1970 to 1995. The panel regression results suggest significant causal nexus between income inequality and health. However, the association vanished when income per capita per head after controlling for income.

Dorling (2007) explore whether the apparent impact of income inequality on health varies by ages in 126 nations. The observational analysis found that income disparity is closely correlated with younger adult deaths and those living in developing nations. The statistical findings also show that the correlation between mortality and income inequality was 0.559, which is significant at 1%. Thus, the study concluded income inequality to have an influence globally, especially for younger adults. This relation is especially strong among the poorest countries in Africa.

De Vogli *et al.* (2005) present evidence that income inequality is directly related to low life expectancy after controlling for per capita GDP and educational attainments in 21 developed nations. Multivariate linear regression was employed while the results show that income disparity of -0.433 at 1% level associated with longevity adjusted by per capita income, education, and GDP from 1995 to 2000. The study suggests that to promote health of citizens, governments of these countries need to minimize income disparities.

Asafu-Adjaye (2003) empirically investigated the effects of income inequality on health outcomes on 44 cross-countries. The study covering six time periods (1970, 1975, 1980, 1985, 1990 and 1995) found that, income inequality has a significant inverse effect on longevity when we control for the levels of income, savings and education. It tested the Wilkinson's hypothesis using Panel regression analysis. The empirical results indicated that a unit increase in income inequality in the previous period reduces life expectancy in the current period by 0.036 years. The study also shows that reducing income inequality has a greater effect in low-income nations than in high-income countries.

Observably, one of the potential limitation of these studies especially Dorling (2007), Babones (2008), and Deurzen *et al.* (2014) is the heterogeneous bias, where both developed and developing nations were lopped together. Secondly, these studies collectively suggest that there might be certain health risks that are stress-associated when the society's income is unequal.

In contrast, ample evidence from others cross-country studies (see Lynch, 2000; Mellor and Milyo, 2001; Shibuya, Hashimoto and Yano, 2002; Gravelle, Wildman and Sutton, 2002; Beckfield, 2004; Lynch, Harper, Davey-Smith and Hilleneier, 2004; Lynch *et al.* 2007, 2009; Schell *et al.* 2014; Herzer, 2015; and Rebeira, *et al.*, 2017) found that *rising* income inequality is related with good health outcomes.

Rebeira *et al.* (2017) examined the impact of income inequality on mortality. The study employed both dynamic OLS and panel co-integration techniques on 10 developed countries from 1950 to 2008. Their study indicate that *rising* income disparity appears to have long-run significant *inverse* effect on adult deaths; such that for every 1% *rise* in income disparity, deaths *decline* by 0.038% points. Herzer and Nunnenkam (2015) analyzed the relationship between income inequality and health from both developed and developing countries. The authors also used dynamic OLS model and found that *rising* income inequality has *direct* effect on longevity in 19 developed nations; where income inequality has been responsible for 2.32% of the annual increase in longevity in these developed countries.

Schell *et al.* (2014) applies multivariate linear regression to explore the effects of income disparity on health outcomes in 152 developed nations. The study finds *no* support for IIH hypothesis but indicate that rising income disparity accounts for lower infant deaths. The results from the 2003 World Bank Indicator reveals that a unit increase in income disparity would improve children health by 0.51% at 1% significant level.

Herzer and Nunnenkam (2011) examined the impacts of income inequality on health in a panel of 35 developed countries. Their findings likewise show that income inequality typically rise average longevity; but had an inverse effect on longevity in developing countries. The OLS model indicate that a 1-point increase in income inequality would rises life expectancy by 0.065%. Shkolnikov *et al.* (2011) investigated the losses of expected lifetime in the United States and other 16 developed countries. The fixed effect estimation findings revealed that rises in income inequality does *not* explain reduction in life expectancy losses.

Leigh and Jencks (2007) empirically analyzed long-run effect of income inequality on mortality from 12 developed nations from 1903 to 2003. Their study found that increasing income inequality *directly* related to higher longevity. Bechfield (2004) questioned if income inequality harm health

in 115 countries. The authors applied fixed effect model to consider unobserved heterogeneity in and obtained *no* support for IHH hypothesis.

In a sample of 75 countries, Gravelle *et al.* (2002) investigated the relationship between income, income inequality and health. The panel regression results also fails to find any significant relation between income distribution and health. Mellor and Milyo (2001) re-examined the evidence of an ecological association between income inequality and health in 47 countries. The panel regression technique results reported *direct* nexus between the disparity in income distribution and longevity once education was controlled for.

Clearly, these findings reveal rising income inequality does not retrogress health. They suggest possibility of other factors such as the globalization, health-related welfare policies, gender and class relations, racial inequalities and environmental changes declining health. However, due to the comparability of trans-country data, both health economists and epidemiologists alike have raised some doubts about these findings and suggest using country-specific data on income inequality-health (IHH) hypothesis.

3.4.2 Country-Specific Evidence

The nation-specific studies on the effects of income inequality on health is quite enormous, but also with mixed findings. Several of these studies such as, Weich *et al.* (2001) for Britain; Lynch *et al.* (2004), and Hill *et al.*, (2019) for United States; Liu (2017) for Canada; Wilkinson (2008) for Britain, Juan (2013) for Ecuador; Basundhara (2014) for Nepal; Pabayo *et al.* (2013), and Massa *et al.* (2015) for Brazil; and Tan *et al.* (2018) for China shown support for income disparity-health hypothesis. Clearly, these studies found that rising income inequality worsen health status.

On the other hand, Mellor and Milyo (2001), Daly and Wilson (2013) for the United States; Barafi (2012) for Brazil; Dotollenaere *et al.* (2018) for Britain; Bhattacharjee *et al.* (2014) for Scotland; Yinghua and Zeng (2015), Bakkeli (2016) for China; Sigh *et al.* (2018) for Australia; and Adjaye-Gbewonjo *et al.* (2018) for South Africa showed that rising income inequality is related with good health.

Hill *et al.*, (2019) investigated if air pollution is detrimental to the health of United States citizens characterized by more inequitable distribution of income. The study used employed longitudinal data for 49 US states between 2000 and 2010. The two-way fixed effects panel regression findings

indicated that the association between air pollution and life expectancy intensifies in states with higher income inequality.

Tan *et al.* (2018) examined the effects of state income disparity on health-related quality of life from 2008 China-National Health Survey. Their ordinary logistic regression findings revealed that income disparity has damaging effect on health in Shaanxi, China. The result further reveals that a 1-point rise in income disparity yields -4.8% in health. A similar study for adult aged 18+ years of 27 Brazilian capitals by Massa *et al.* (2018) employed 2013 National Health Survey to assess the nexus between income disparity and self-reported health status. Their findings also indicate greater odds of poor health status exist among those living in areas with high income inequality level. The finding further shows greater odds of poor health outcomes at 0.31% among citizens living in areas with high income inequality.

Liu (2017) examined the impact of income inequality on health in Canada. The study employed data from the Canadian Census and the Canadian Community Health Survey (CCHS) and binary logistic regression model. The finding showed that income inequality significantly and inversely affect the health level, such that a percent point rise in income inequality reduce good health by 1.85% over the latest decades in Canada.

Pabayo *et al.* (2015) focus on the effects of income inequality on risk of heart attack in 50 states of United States from 2000 to 2007 using Health, Well-Being and Aging Survey. Their Cox-Hazard regressions result was that rising income disparity raises the risk for heart attack among Americans. The empirical results from the study support the possibility of a threshold effect of income disparity on risk for deaths when the income inequality index is above 0.20.

Basundhara (2014) empirically examined the income inequality-health link from Nepal data. The logistic regression results show that lower income households in Nepal face relatively more health challenges with similar exposure to environmental pollution. Juan (2013) also examined the impact of income inequality on children health in Ecuador. The logistic regression findings from 2004 and 2014 Maternal-Child Health Survey, shown that children-health have worsened from rising income disparity in Ecuador. The results further revealed that a 1-unit rise in income inequality rise infant deaths by 4.25% (in 2004) and 11.94% (in 2014). Wilkinson (2008) employed data from United Kingdom's Health and Lifestyle Survey to indicate that changes in adult deaths were

directly related to changes in low relative incomes. Lynch *et al.* (2004) investigated the income inequality-health relationship in United States. Their findings show that income inequality worsen health outcomes significantly at 5% level between the periods of 1978 and 2000.

Weich *et al.* (2001) empirically investigated the effect of income inequality on health in Britain. Their major finding indicate that high income inequality is more likely to worsen mental health status. In another similar study, Diez-Roux *et al.* (2000) estimated the impacts of income inequality on cardiovascular disease-risk factors. They found that rising income disparity related with increasing Cardiovascular diseases (stroke, hypertension and diabetes).

In contrary to all these evidences, the study of Singh *et al.* (2018) indicates that *rising* income inequality *enhance* health. Their study analyzes the nexus between state-level income disparity and oral health from 5,165 adults from 2013 National Dental Survey in Australia. The logistic regression results established that income disparity was not related with poor health. This finding further shows that citizens in states with highest Gini had relative odds of 0.77 for having healthy outcomes.

Adjaye-Gbewonjo *et al.* (2018) analyzed income inequality and cardiovascular disease risk-factors in South Africa. The study also investigated whether sub-national income inequality accounted for Cardiovascular disease (CVD) in South Africa. Their estimated fixed-effects regression result from National Household Income Survey indicated that changes in districts' income disparities were not significantly related with rising Cardiovascular diseases in South Africa at 5% level. In a similar study for China using Health and Nutrition Survey from 1989 to 2011, the fixed effects result of Bakkeli (2016) shown that higher income-disparity does not also have significant impact on the likelihood of having *poor* health outcomes. His finding also indicated that any 1-unit rise in income disparity will yields healthy outcomes by 0.2%.

Daly and Wilson (2013) further employed panel data estimation to test income inequality-health hypothesis in United States. The finding indicates that increased income inequality is associated with declines in mortality at the country-level in United States. Subrananian (2006) also analyzed effects of state income inequality on individual self-rated health in United State but found that rising income disparity did not worsen health outcomes.

Others studies such as, Deaton (2013), Lynch *et al.* (2007), Miller *et al.* (2006), Shibuya *et al.* (2002), Mellor and Milyo (2001) and Wagstaff (2000) also indicates with evidence that rising income inequality may not worsen health. These findings suggest that direct effect of income inequality on health should not be unilaterally emphasized. Rather, attention should be given to indirect links between income disparity and health.

3.4.3 Evidence from Nigeria

In terms of evidence from Nigeria, numerous approaches were employed to examine IHH link. The first distinction relates to the type of data employed, where several studies used aggregated or panel data (see Nilson and Bergh, 2012; Pulok, 2012; Fatukasi and Ayemoni, 2015; and Odusanya and Agboola, 2017; Odusanya and Atanda, 2018). Others employed cross-sectional or survey data (see Orji *et al.* 2013; Alamode and Lawal, 2014; Lawanson and Olaniyan, 2014; Olaniyan *et al.* 2015; and Karimo *et al.* 2017). These studies had found different findings.

Odusanya and Atanda (2018) examined the effects of income inequality on health in 34 SSA nations. The study adopted the ADRL bounds testing approach for the period of 2001 to 2016. Their finding revealed that income inequality worsens newborn deaths significant both in short- and long-run in Nigeria. In a similar study on Nigeria, Odusanya and Agboola (2017) employed ARDL Bounds test on 1980-2014 data. It was revealed that income inequality relates with health inversely, both in the long- and short-runs.

Meanwhile, Karimo *et al.* (2017) analyzed the financial burden associated with elderly ill-health in Nigeria. The study in a survey data drawn from 2010 National Living Standard Survey covering six geo-political zones in Nigeria indicates that huge financial burden was associated with adults' ill-health in Nigeria and that 50% of elderly people in the country have unmet healthcare needs due to poverty.

Olaniyan *et al.* (2015) investigated the socio-economic inequalities in adult mortality among the Geo-political zones in Nigeria. The study used 2008 National Health and Demography Survey (NHDS). They found that socio-economic inequalities were related with worsen health outcomes most especially in Northern part of the country. In another study, Lawanson and Olaniyan (2014) employed Sub-National Health Accounts data for 17 states from 2003 to 2005. Their finding indicates that households' income is paramount to healthy outcomes at 5% level.

Alawode and Lawal (2014) examined the pattern of income inequality and self-rated health in rural Oyo State. The study used multinomial logistic regression to show that unequal distribution in income (with Gini-coefficient of 0.245 which was significant at 1 per cent) increases the likelihood of having good health status in rural Oyo State, Nigeria. In adopting a multilevel approach, Orji, Ogbuabor, and Okechukwu (2013) utilized data from National Demographic and Household Surveys (2008) in Nigeria. Their results show that relative income has no significant impact on health. This contradicts the findings of Odusanya and Agboola (2017), Karimo *et al.* (2017); Olaniyan *et al.* (2014), and Lawanson and Olaniyan (2014).

3.5 Income Inequality-Health Seeking Behaviour Nexus

The effect of income inequality on HSB critically depends on the perceived demand, and supply side factors. Regarding the demand-side factors, their effect can be detrimental to appropriate HSB through resource' constraints (Hombres *et al.* 2012:47). This is because, rising income inequality might prevent the utilization of appropriate healthcare services for those belonging to the 'bottom' of the income distribution. Furthermore, in virtue to purchasing-power theory, increasing income inequality tend to reduce purchasing-power of the household's resource to access appropriate health-seeking behavior.

In term of the supply-side factors, rising income inequality presents a significant threat to inclusive political and economic systems in both developed and developing countries (Fuentes-Nieva and Galasso, 2014:3). This often limits the provision of public health facilities, and thereby discourages appropriate HSB. In addition, it can concentrate economic resources in the hands of fewer people. This might lead to 'opportunity capture' (Fuentes-Nieva and Galasso, 2014:2), in which some fewer individuals have access to National Health Insurance Scheme (NHIS).

In contemporary society, HSB has also become an important issue of concern. It is another aspect of health issue that affect the low-income households the most (Novignon *et al.* 2017). Though the literature on income inequality-HSB is not as robust as that of health; however, attempts have been made to analyze the effect of income inequality on health-seeking behaviour.

Musyoka, Korir, Omolo and Nzai (2018) investigated the impact of income inequality on medical-care utilization in Kenya. The study used micro-data from 2013 Kenya Household Survey dataset. The results from Binomial Regression approach on 33,675 Kenyans revealed that healthcare utilization is inversely affected by income inequality at 1% level. The result is consistent with the

‘political capture’ argument by Wolf (2015:1) and Gilens (2012) that income inequality is detrimental to seeking appropriate healthcare.

In a similar evidence, JaiKishan and Kefale (2016) viewed rising income inequality as an important factor in determining healthcare-seeking in Ethiopia. They utilized data from interview, case studies, Focus Group Discussion (FGD) and observation. The study found that, although access to health is relatively expanding in the nation, the poor households often resort to inappropriate health-care seeking, such as, spiritual, traditional healer and self-treatment due to high poverty and wide gap between the poor and rich households.

Furthermore, the study of Patil, Parbhabkar and Singh (2016) empirically investigated the major determinants of HSB among attendees of urban health center in India. The finding on 400 attendees indicated that only 34% of attendees thought of appropriate HSB during their minor illnesses.

Kuuire, Bisung and Dixon (2015) analyzed health-seeking behavior during times of illness among adults in a resource poor setting in Ghana. The study used data from a cross-sectional survey with 2,119 respondents. Their logistic regression results show that low-income individuals with NHIS were less likely to seek treatment in a health facility, compared with citizens from wealth quintile at 5% level. The study also found that in spite of rise in NHIS enrolment to bridge the gap between the poor and rich in healthcare services utilization in Ghana, income inequality is still detrimental to health-seeking behavior.

Lawanson and Opeloyeru (2016) empirically examined inequality in healthcare utilization in Nigeria. The study observed inequality in utilization of healthcare facilities in Nigeria by employing Nigeria Living Standard Survey (2010) dataset. Their results further show that inequality in utilization of healthcare across the nation is generally skewed against the poor citizens/households comparatively.

Fagbemigbe *et al.* (2015) investigated the impact of Nigeria wealth distribution on health-seeking behavior. The authors used the 2012 National HIV/AIDS and Reproduction Health Survey on 30,855 households. The results of the chi-square and ANOVA test revealed that members of households in lower quintiles having lesser likelihood (33%) to receive antenatal care than among those in the highest quintiles (92%) at 5%. The study has also indicated that income inequality is detrimental to appropriate HSB.

Lawson (2004) investigated the determinants of health-seeking behavior in Uganda. The study employed multinomial logistic regression on 10,696 households obtained from Uganda National Household Survey (UNHS). The author's result show that income inequality significantly related with poor health-seeking behavior of Ugandan citizens.

Uzochukwu and Onwujekwe (2004) analyzed the relationship between socio-economic differences and HSB in South-East Nigeria. Their study focuses on 1,594 female household primary care givers or household head. It was found that, the least poor groups of respondents had a higher probability of seeking inappropriate HSB because of their low-level of income significantly. The richer households complained more about poor staff attitude and lack of drugs as their reasons for not attending health centres.

3.6 Observed Gaps in the Literature

Previous studies on the effect of income inequality on health had the following limitations:

First, much of the studies on the effect has been on direct link as Wilkinson hypothesis¹⁰ presented. However, this explanation ignored indirect-channels¹¹ from income disparity to health that related with household's characteristics. Again, for such postulation to be tractable to achieve meaning progress in health and welfare policies, it requires some simplifying assumptions, which themselves drive the particular results regarding income inequality and health.

Second, literature on the effect of income inequality and healthcare-seeking are very scanty. The available studies focused on socio-economic factors that might not properly depict an emerging economy with rising income inequality. Third, with vast literature on the effect of income disparity on health in Nigeria, the transmission channels were lagging.

Fourth, there is a big gap in methodological literature concerning the effect. Previous studies with cross-sectional data relied on logistic regression. These studies ignored the heterogeneity issues – difference and within-estimation – in their analyses. This therefore making such results suspect.

Fifth, available studies in Nigeria on the subject were very limited either by scope or locations. For

¹⁰ Advocates of the income inequality hypothesis have argued that, income inequality has a *direct* effect on health by affecting people's psychosocial well-being through stress, competition, frustration and social cohesion.

¹¹ According to Kragten and Rozer (2017:1017), individuals may try to cope with these psychosocial stress and frustration to some extent. But as people become more susceptible to unhealthy food or additions (due to low-income level), more health-related problems (such as cancers) surfaces.

instance, the study of Alawode and Lawal (2014) focus only on rural Oyo State; Orji *et al.* (2013) utilized data from 2008 National Demographic and Household Survey; Lawanson and Opeloyeru (2016) used the Nigeria Living Standard Survey (2010) data; and Karimo *et al.* (2017) considered the 2010 National Living Standard Survey (NLSS). None of these literatures combined survey data for different years on the income inequality-health link to aid appropriate health policies.

Thus, an in-depth enquiry into the probable effects of rising income inequality on health outcomes and health-seeking behavior in Nigeria is critical to policy strategies. As a result, this study used all Waves of the Nigeria-General Household Panel Survey that contains more detailed information on welfare trends of 26,176 households in Nigeria. The dataset provides recent trend and nature of income inequality and health outcomes in Nigeria. It is expected that the outcomes of the analysis will aid in formulating both health and welfare policies, that promote sound physical and mental health, and reduce income inequality across various strata in Nigeria before the year 2030.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Preamble

This chapter presented the research methodology for the study. It focused on the theoretical framework, model specification, research hypotheses, estimation procedures, data issues, and measurement of income inequality.

4.2 Theoretical Framework

The theoretical foundation of the thesis is predicated on Wilkinson's income inequality-health hypothesis, and its extension by Grossman (2017). Unlike extant theories, the approach emphasizes that in the process of economic growth and development, there will be a point at which income inequality rises rapidly. This corresponds with the epidemiological transition, the shift in the main causes of poor health issues from infectious diseases to more of NCDs, such as, stroke, heart failure, and hypertension (Wilkinson, 1994:62). As the scholar observed, income inequality is detrimental to human health. This is noted because, it is the mechanism that enforces competition, psycho-social stress, depression and frustration, which affect the state of health (Wilkinson and Pickett, 2010).

The theory thus asserts that people's health is influenced not only by their income, but also by income disparities in their area of residence (Lynch *et al.* 2004:9-11). Algebraically, it implies:

$$H_i = f(Y_i, Z) \tag{4.1}$$

where H_i = the health outcomes of individual i

i = 1, 2, 3, ..., N .

Y_i = absolute incomes from all sources.

Z = the relative income within his/her reference group.

The basic premise of the hypothesis is: "health outcomes is significantly affected by.... economic differences among population" (Wilkinson, 1992:3). This assertion implies that, the magnitude or degree of income inequality in the economy can affect health. More so, it is not only the nation's income inequality that matter, but also the level and magnitude of income disparity in society or group(s) that people belongs to (Mellor and Milyo, 2002; Deaton, 2003:121).

The underlying assumption of the Wilkinson's idea is that H_i depends on the deviation of the Y_i from the population mean income Y_N . That is, the relative income:

$$Z = (Y_N - Y_i) \quad (4.2)$$

where Y_N is the average income earned per person in a given area (group, society or country), at a particular period. It is calculated by dividing the area's total income by its population N . If every household in a group apart from one (say, P) sees their income rising, Equation 4.2 implies that the $(Y_N - Y_P)$ will be positive (and vice-versa, if otherwise). As a result of this, the health status of P 's household (H_P) will worsen relatively (see Wagstaff and van Doorslaer, 2000:546).

Wilkinson (1996:4) postulated that the income inequality-health link closely associated with social comparison in a group – *people like me*. This means there is frequent comparison among people of the same age, income, social class, education or group. For instance, the ratio of real household's income to average income in corresponding social class. He hypothesized that when:

$$Y_N > Y_P \quad \rightarrow \text{worsen } H \quad (4.3)$$

That is, anytime average income in a given group is *greater than* that of a particular household (say, P), P 's households will experience poor health outcomes. When $Y_N > Y_P$, this will result to invidious processes of comparison that enforce social strata or hierarchy. This rises competition, long working hours, and debt burden leading to low immunological resistance to certain diseases that limit health (Lynch *et al.*, 2004; Massa *et al.* 2018). It further implies that citizens with lower income will be exposed to competition and stressful situations, then depression, frustration; and finally, poor health outcomes sets in (Singh *et al.* 2018). As Mullahy *et al.* (2004) explains, the perceptions of being relatively deprived and “to keep up with the Joneses ” may perpetuate stress and illnesses. On the other hand, when:

$$Y_N < Y_R \quad \rightarrow \text{worsen } H \quad (4.4)$$

If average income in a given group is *less than* that of a household (say, R), R 's households will experience poor health outcomes. This implies that, the more the $Y_N < Y_R$, the higher the positions of R in the social strata. It can lead to social dysfunctions (theft, crime, violence and kidnapping). This intensify fear, shock and feeling of insecurity which transcends to poor health, such as, heart-attack, strokes, hypertension and high-blood pressure for R (Kawachi *et al.* 1997; Tan *et al.*, 2018). Both Equations (4.3) and (4.4) hold for all citizens whether they live in developed or emerging nations, and wherever they are in the *epidemiological transition* process (Deaton, 2003:121).

In general, rising income inequality concerns stress, social comparison, frustration, fear, debt burden, insecurity and high rate of crimes. These flows through and within every strata in every economy (Pickett and Wilkinson, 2015). Hence, the Wilkinson's hypothesis implies;

$$H_h = f(Y_h, Z) \quad (4.5)$$

The subscript h denotes household identity h ranges from 1, 2, 3, ..., N , in the economy. Notably, the Equation (4.5) posits that Y_h and Z directly affects H_h (see Wilkinson, 1992, 1994 and 1996).

Taken together, the Wilkinson approach provides important insights on the income inequality-health link. Nevertheless, his perspective assumed household's factors are given. There is no doubt that income inequality through these characteristics, such as, level of education, food/diet, and housing conditions exert considerable impact on health (see Nilsson and Bergh, 2012; Truesdale, 2016:12).

This is essential because, income disparity impact health through the goods and services that people buy, consume or have access to (Benzeval *et al.*, 2014). In unequal societies, non-availability of these often results to long-working hours, debt burden, stress, anxiety and frustration, which are detrimental to health. Thus, the effects of income inequality on health is likely via the household's characteristics (Nilsson and Bergh, 2012; Grossman, 2017). In line with this perspective;

$$H_h = f(Y_h, Z, X_h) \quad (4.6)$$

where X_h stands for vector of households' characteristics, such as, food, housing conditions, family size, availability of health-promoting goods and services.

Equation 4.6 was based on the approach by Grossman (2010, 2017). He noted that in addition to income inequality, X_h are key determinants of health outcomes. As he argued, peoples' health has some determinate history from time t (birthdate) to t' (death-date). The underlying assumption is, health is a stock variable that depreciates as $t \rightarrow t'$ due to sudden sickness, stress, depression, and injuries. Notably, within t and t' , health is predicted by all exogenous factors associated with X_h . It is pertinent to note that households will pay larger percentages of their incomes on electricity, water and health bills, school fees, house rents, and health-promoting goods in rising income-inequality nations (Brockway *et al.* 2014).

This is the indirect effect of income inequality on health, because income distribution is one result of political-economic, cultural, social and historical process. These influence resource available to households' education, availability of food, quantity and quality of housing and environmental

factors (Hill *et al.* 2019). In contemporary society, income distribution influences a wide variety of health-promoting factors that often have an indirect impact on health. The aggregate effect of income inequality on health is through the direct and indirect channels.

Panel A: Income Inequality-Health Outcomes

Figure 4.1 (panel A) provides a lucid exposition of the flow path of directional effect of income inequality on health outcomes. For the direct effect, ample evidence suggest that income inequality can affect health through social comparison and competition. Duesenberry (1949) earlier called this ‘envy’ effect, but to Fehr and Schmidt (1999), it is upward-income-comparison effect. Given P (say, low-income) and R (the rich) in a society, where $Y_R > Y_P$. P will be expose to competition, long-working hours, depression, frustration, stress and anxiety, and finally poor health outcomes, such as illness and deaths (Singh *et al.*, 2018). Similarly, the perceptions of being relatively deprived, and *to keep up with the Jonnes* often leads to lack of social cohesion and dysfunctions, such as, theft, crime, low trust, and kidnapping issues. These results to fear, shock, and insecurity for both P and R alike. All these directly worsen health outcomes (Drabo 2011; Massa *et al.*, 2018).

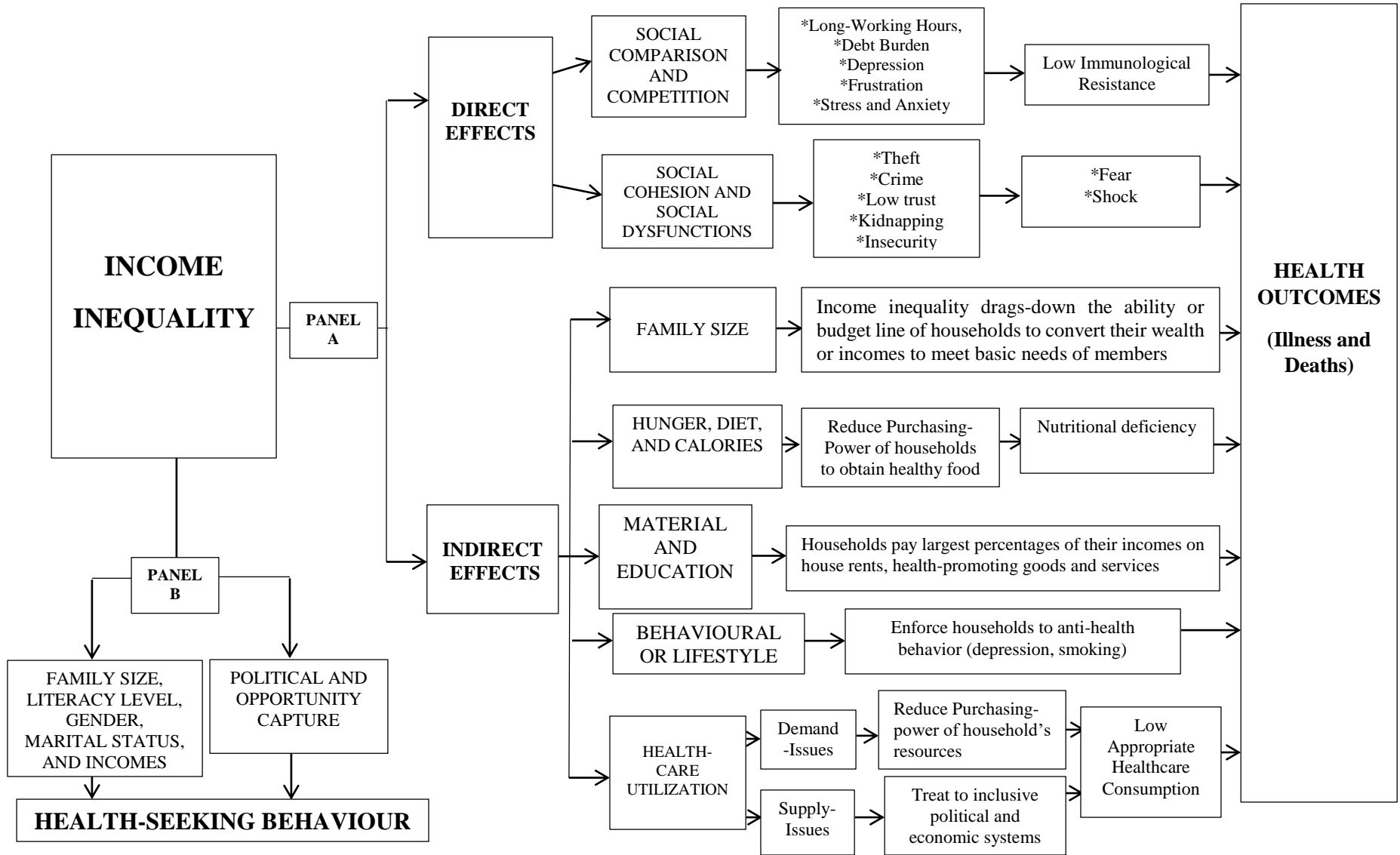
It should be noted that income inequality often drag-down the ability of households to convert their wealth or incomes to meet basic needs of their family members. It can also reduce their purchasing-power to obtain healthy diet and foods. Households frequent pay largest percentages of their incomes on house rents, school fees, electricity and water bills, with little or no income (sometimes, with debt burdens) to obtain these health-promoting goods and services (Brockway *et al.* 2014). This can enforce households, especially the low-income earners to anti-health behavior, such as, smoking. Income inequality also results to low appropriate healthcare utilization and causes households’ members to resort to self-medication. All these indirectly results to poor health outcomes of households as Figure 4.1 (panel A) summarized.

Thus, one of the contributions of this study to literature is the assessment of these direct and indirect income inequality-health links:

Direct: Income Inequality → **Health Outcomes** (via stress, depression, frustration, fear and shock)

Indirect: Income inequality → **Household characteristics** (through family size, quality and quantity of foods, access to drinkable water, housing conditions, lifestyle, and demand for timely healthcare services among households) → **Health Outcomes**

FIGURE 4.1: CONCEPTUAL FRAMEWORK



Source: Researcher's Initiative, 2018

Panel B: Income Inequality-HSB

The study subsequently considered the effect of income inequality on HSB during times of illness, as depicted in Figure 4.1 (panel B). According to neoclassical thought, rising income inequality often generates savings. Therefore, if the few income concentrations generate savings, given the difference in propensity to save between the rich and the poor, unequal distribution of income might bode well through the investment channel (see Kosta and Novica, 2018:319). As such, this increase access to appropriate HSB during the time of ill-health. This possibly conclude that, a certain level of income inequality can be good for seeking appropriate healthcare services.

In a contrary context, Bartels (2008), Gilens (2012), Stockman (2013), Lawson and Mariotti (2018) argue that income inequality is detrimental to seeking appropriate healthcare services. Largely through the issues from *political and opportunity captures* – to use the terms by Fuentes-Nieva and Galasso (2014). As Lawson and Mariotti (2018) agued, the most important effect of rising income disparity is from political sphere. This not only produces ill-gotten wealth through rent-seeking that perpetuates income inequality, but also, favour the few over the masses. According to Acemoglu and Robinson (2012), income disparity often imposes tremendous social and economic costs on society – creating conditions that not only weaken appropriate healthcare-seeking, but also contribute to exclusion through high-cost from private facilities.

Kefale (2016) state that resorting to spiritualists, traditional healers and self-treatment are product of widening income inequalities. According to this theory, people will grow frustrated when they perceive that health facilities to improve their health are not efficient and inaccessible, while the available ones are very expensive (Musyoka *et al.* 2018). As Figure 4.1 (panel B) shows, this often lead to inappropriate HSB. Thus, the study also estimated the effect of income inequality on HSB in times of illness among households in Nigeria.

4.3 The Model

The model adopted for this study draws strongly from income inequality-health hypothesis as proposed by Wilkinson (1992, 1994) and extended by Pickett and Wilkinson (2015). This approach observes that the direct effect of income inequality on health is through comparison, competition, cohesion, and social dysfunctions. However, the thesis account for the impact of other key factors that determines health in the spirit of Grossman (2017). These factors are: family size, food/calorie,

housing conditions, education, and other health-promoting goods and services, peoples' lifestyle, and demand for medical services. These are referred to as household characteristics X_h .

Thus, from equation (4.6), the general specification for the study is:

$$H_{ht} = \alpha + X_{ht}\beta + Y_{ht}\delta + Z\gamma + \varepsilon \quad \varepsilon|X_h, Y_h, Z \sim N\{0, \sigma^2\} \quad (4.7)$$

where H_h represents the health outcomes of the h^{th} household, and t denotes the time frame. β , δ and γ are parameters to be estimated, ε_h is a random error that follows a normal distribution with a non-constant variance.

Hypothesis 1 (H₀): Rising income inequality is not detrimental to health outcomes

Dependent Variable

To investigate the direct and indirect effects of income inequality on health outcomes in Nigeria. The thesis relies on illness – the main poor health outcomes that limits people's ability to live a normal and healthy life. The use of illness has been guided by the previous health economics literature (e.g., Johansen, 2015; Novignon *et al.* 2017; Seidlein and Salloch, 2019); as well as from available data in NGHPS waves on the question: 'during the past four weeks have you suffered from an illness/sickness?' (see NBS, 2019). The variable is presumed to be good and objective indicator of self-rated health outcomes of households (Yiengprugsawan, 2010; and Novignon *et al.* 2017).

Independent Variables

The explanatory variables were grouped into three components: households' characteristics (X_{ht}), household's aggregated income (Y_{ht}), and income inequality (Z_t).

Households' Characteristics:

The first component concerns X_{ht} . Surprisingly, rising income inequality implies higher poverty where a smaller share of income is received by those at the bottom of the income distribution. Furthermore, since the quality of early childhood, food security, materials and housing conditions are all in part determined by income inequality (Benzeval *et al.* 2014). The thesis accounts for the role of family size, hunger, food or diets, material (health-promoting goods and services), lifestyles and behavior, and health-seeking behavior for X_{ht} .

Family's Size

Surprisingly, *family size* affects family needs. Each addition to a family requires adjustments and at time sacrifices by the older members of the family (Dasgupta and Solomon, 2017). Thus, income inequality lead to shifts in priorities as family size rises. It also inhibits the ability of households to convert their incomes and wealth to well-being or to meet their basic needs – foods, clothing and shelter – resulting in poor health outcomes (illness).

The size of the household could also have a negative influence on diet and nutritional levels. This suggest that, in small households, there is a greater likelihood that resources (income, food, housing, and clothing) per each member would be more. Thus, the effect of household's size on health likely have bearing from income inequality. Simply put,

↑Income Inequality → ↑Purchasing power Disparities among households → ↓Resource (to meet the basic needs) per each households' member → ↑Poor health outcomes (frequent illness)

This implies, as income inequality is rising, the purchasing-power disparities between the rich and poor households in a group, society or nations increases (Kakwani and Hyun, 2015). This in turn, drag down the ability of households' incomes for healthy living. Apriorily, the thesis expects a positive indirect effect of income inequality on health outcomes (illness) through larger family size.

Hunger, Diet and Calories

Typically, households with the least economic power suffer hunger or mal-nutrition. This is because hunger, and general well-being in all its forms are rooted in income inequality (Brian 2015:74). Though less healthy food might be relatively cheap; however, healthy diets is often prohibitively expensive in developing nations, probably because of the climate change issues and weather patterns (Eckstein *et al.*, 2018:9).

The effect of income inequality through hunger/diet on health can be expressed as:

$$Diet_h = f(Z) = f(Y_N - Y_P) \quad (4.8)$$

where Y_N is the average income to meet basic needs in a given area or group, Y_P is the aggregate household's incomes, and Z denotes the level of income inequality. Anytime $(Y_N - Y_P)$ is positive, that is, $(Y_N > Y_P)$, the quality and quantity of healthy diet will reduce (and vice-visa, if otherwise). In this situation, low income households (Y_P) will purchase cheap and energy-dense foods that

maximize their calories per naira in order to stave off hunger with nutritional deficiency (Benzeval *et al.* 2014). According to WHO (2017c), nutritional deficiency occurs when the body doesn't get or absorb the necessary amount of a nutrient from food.

Deficiencies can lead to a variety of health problems. These can include, digestion problems, skin disorders, stunted or defective bone growth and dementia – loss of memory (WHO, 2017c). It then implies, unhealthy diets/hunger are detrimental to poor health issues, such as, type II diabetes and cancers (Wight *et al.* 2017). Thus,

$$H_h = g(Diet_h) \quad (4.9)$$

where there is positive nexus between health outcomes and diet. Thus, by combining equations (4.8) and (4.9) together, the effect of income inequality on health through hunger/diet is:

$$H_h = g_{diet}\{f(Z)\} \quad (4.10)$$

Clearly, income inequality is likely to influence the quantity and quality of food people buy (Lynch *et al.* 2000:299). It can also result to unequal access to healthy diets. Thus, this study expects a positive and negative of income inequality on illness via hunger and healthy diet, respectively.

Materials (Health-Promoting Goods and Services)

Furthermore, income inequality is likely to increase inequality in health-promoting goods and services (Lundberg *et al.*, 2010). Income disparity is also likely to be a drag on the ability to convert household's income and wealth to well-being for its members (Hill *et al.* 2019). For instance, every family has certain basic needs which are indispensable for decent family living. These are called neo-material, including, mosquito net possession, access to electricity supply, drinkable water, education, sanitation and toilet facility (Mulley *et al.*, 2004). The availability of these goods at the household's level are expected to contribute to positive health outcomes and reduce illness.

Unhealthy Behavior or Lifestyle

Unhealthy behaviors are also related to income inequality, because individuals with low incomes are prone to behaviors that have a negative impact on health outcomes (Stewart, 2010; Cerda *et al.* 2011). For instance, frustration and competition from rising income inequality may lead people to smoking, depression, consumption of excess alcohol, use of hard drugs and inadequate relief of chronic stress. These are the key contributor to chronic illnesses, including, type II diabetes, heart diseases, and hypertension (Harper *et al.* 2011; WHO, 2017c).

Furthermore, several anti-health behaviors are usually linked to poverty and thus to bottom-end inequality. These behaviors include exposures and risk factors (e.g., exposure to pollutants and external causes of injuries, and unhealthy behavior such as, drinking and smoking (Macinko *et al.*, 2003:410). Apriorily, the thesis expects positive effect of unhealthy behavior or lifestyle on illness (see Stewart, 2010; Cerda *et al.* 2011). In terms of estimation, alcoholic consumption and self-medication during ill-health issues is relied upon in this study.

Healthcare Utilization

HSB also have links with income inequality, because rising income disparity often constrain the purchasing-power of household's resource to access appropriate health-care services. For instance, households at the bottom quintile often result to self-treatment and low-price health care provided by unregulated private and traditional personnel (Rathi and Meena, 2018). From the supply-side, rising income inequality is likely to be the major treat to inclusive political and economic systems. This often limit the provision of public health facilities, and thus discourage appropriate HSB. In addition, it can concentrate economic resources in the hands of fewer people to establish private facilities with huge charges. Thus, since income inequality can likely lead to both 'political and opportunity capture' as Fuentes-Nieva and Galasso (2014:2) noted, seeking appropriate healthcare services would improve positive health outcomes.

On the other hand, millions of people often follow inappropriate healthcare seeking. Hence, they encounter chronic illness, disability and even death (WHO, 2018a). Thus, the effect of income inequality on health outcome (illness) through HSB is highly important.

Households Income from various Sources:

The second component of the model is Y_{ht} . As observed in literature (see Nilsson and Bergh, 2012; Barufi, 2012; Oyekale *et al.* 2014), the effects of income inequality relate with various composition of households' aggregate incomes. This is because, households' absolute incomes often stem from various sources. This can greatly affect their health outcomes through access to health-promoting goods and services.

Interestingly, the Nigeria-General Household Survey (NGHS) from NBS (2017) classified Y_h into eight parts: the wages and salaries from both private and public firms/organization (Y_h^1), incomes from enterprises, trading and business (Y_h^2), incomes from agriculture, crop and livestock activities

(Y_h^3), remittances from domestic and abroad (Y_h^4), monetary or conditional transfers and assistance (Y_h^5), pension and grants (Y_h^6), dividend and interest from investment (Y_h^7), and incomes from land and house ownership (Y_h^8). Also in line with the theoretical expectation, these sources are expected to exert a negative impact on illness (Benzeval *et al.*, 2014; Bayar, 2016; Novignon *et al.* 2017).

Income Inequality

The third component of the model is the income inequality (Z). The Gini coefficient (measure of income inequality) is expected to be positively associated with illness (poor health outcomes variable). This is in tandem with the postulation of income-inequality hypothesis by Wilkinson (1992, 1994), and Pickett and Wilkinson (2015).

The combinations of these three components (X_h, Y_h, Z) thus yields;

$$\begin{aligned}
 Illness_{ht} = & \alpha_i + \sum_{i=1}^1 \beta_{1i} FAS_{hit} + \sum_{i=1}^6 \beta_{2i} DIET_{hit} + \sum_{i=1}^4 \beta_{3i} EDU_{hit} + \sum_{i=1}^1 \beta_{4i} MNP_{hit} \\
 & + \sum_{i=1}^2 \beta_{5i} ATE_{hit} + \sum_{i=1}^4 \beta_{6i} DWA_{hit} + \sum_{i=1}^3 \beta_{7i} TOL_{hit} + \sum_{i=1}^2 \beta_{8i} UHL_{hit} + \sum_{i=1}^2 \beta_{9i} HSB_{hit} \\
 & + \sum_{i=1}^8 \delta_{1i} Y_{hit} + \sum_{i=1}^1 \gamma_2 GIN_{it} + \varepsilon_{ht} \quad (4.11)
 \end{aligned}$$

where the symbol i is called the summation index.

FAS represent family size,

DIET is food, diet and calories,

EDU denotes highest education,

MNP indicates mosquito net possession,

ATE represent access to electricity,

DWA is the drinkable water access,

TOL denotes toilet and sanitation,

UHL is unhealthy lifestyle,

HSB indicates health-seeking behavior,

Y is households' incomes, and

GIN is the Gini-coefficient (see Table A1 for details).

Table 4.1: A-priori Expectations (Income Inequality-Health Outcomes Links)

COEFF.	SIGN	WHY?
DIRECT EFFECT:		
Income Inequality	+	Income inequality rises stress, frustration, insecurity, fear, shock and frequent illness (Wilkinson, 1992, 1994)
INDIRECT EFFECT:		
Family Size	+	II reduces the resources, wealth and incomes with more illness (Lewis, 1973)
Hunger	+	II → Nutritional Deficiency → ↑ Ill-health (Food Research and Action, 2018)
Food	-	Access to healthy diets in rising II → ↓ Illness (Food Research and Action, 2018)
Education	-	Education → ↑ Employment and Income → ↑ Healthy goods and services → ↓ Illness (Liu, 2017)
Electricity	-	Access to Electricity → ↓ Daily stress, anxiety, depression → ↓ Illness (Abokyi, 2018)
Water	-	Safe Water → ↓ Infectious Diseases → ↓ Illness (Ribeiro, 2018)
Toilet & Sanitation	-	Quality of toilet → ↓ Infectious Diseases → ↓ Illness (Grossman, 1972 & 2017)
Unhealthy Lifestyle	+	II → ↑ Unhealthy lifestyle (Alcoholic consumption) → ↓ Illness (Macinko, 2003)
Incomes	-	In rising II, ↑ Employment and Income → ↑ Healthy goods and services → ↓ Illness (Grossman, 2017)

Source: Insights from both theories and empirics

Hypothesis 2 (H₀): Rising income inequality is not detrimental to health-seeking behavior

Dependent Variable

Health-seeking behavior is any action undertaken by people who perceive themselves to have poor health outcomes or health challenges, for the purpose of finding an appropriate remedy. Therefore, the thesis relies on the medical-care consultation as utilized by households in times of their ill-health. This was guided by previous studies (see Rozi, Mahmud and Lancaster, 2017 for Pakistan; Rochelle, 2019 for China).

It is also based on the question: *‘during the past four weeks have you consulted health workers or traditional healer or patent medicine vendor or visited Health Centre?’*. The responses were ‘Yes’ and ‘No’ (NBS, 2019). Those households that visited orthodox health facilities and hospital had appropriate HSB. But those who visited pharmacies, spiritualists and traditionalist for health issues, had inappropriate health-seeking behaviour (See Senbeto *et al.*, 2013; Evans *et al.* 2017; Novignon *et al.* 2017).

Explanatory Variables:

Household's characteristics (X_{ht}) are likely to influence the type of healthcare services that household's members seek. These factors from the demand-side includes: family size, level of education, gender, marital status, and household's area of residence. The second is (Y_{ht}), their level of incomes from various sources. While income inequality (Z), could result to both 'political- and opportunity-captures' that affects HSB (see Fuentes-Nieva and Galasso, 2014:2).

Household's Size

Intuitively, as family's size increases, there could be more needs for timely healthcare services. Rising income inequality weakens the purchasing-power of households to meet timely health needs. The effect of large family size in the presence of rising income disparity could results to inappropriate HSB (see Huang *et al.* 2017).

Level of Education

Literacy level of household's head is crucial to the type of healthcare services the household will demand for during ill-health issues. This means that household heads with little or no education are likely to seek healthcare from other channels other than the conventional healthcare providers. Thus, in line with Hopkins (2017) and Rochelle (2019), inappropriate HSB is largely related with level of education.

Gender

Previous studies suggest that women seek more appropriate healthcare compared to men (see Senbeto *et al.* 2013; Matheson, 2014; Rochelle, 2019). Women often take time to care for children, and others. However, both men and women are likely to pay more for medical services in income-unequal societies (Senbeto *et al.* 2013). Most often, where health-insurance facilities are available, women are changed more because they could likely use healthcare system more (this is called 'gender rating'). In line with these, income inequality through gender issues might leads to inappropriate healthcare consultations among households.

Marital Status

Vespa and Painter (2011) opine that marriage frequently increases the use of healthcare services. This suggest that married households should seek more appropriate of healthcare than others. But rising income inequality might influence their decision to resort to inappropriate healthcare. Hence, inappropriate HSB is expected in the presence of rising income inequality.

Level of Incomes(Y_{ht})

The effects of income inequality on HSB associated with various composition of households' aggregate incomes. This is because, households' absolute incomes stem from various sources. This can greatly affect their access to timely appropriate medical-care services (Nonvignon *et al.* 2017). These (Y_{ht}) were from; wages and salaries from both private and public firms/organization (Y_h^1), incomes from enterprises, trading and business (Y_h^2), incomes from agriculture, crop and livestock activities (Y_h^3), remittances from domestic and abroad (Y_h^4), monetary or conditional assistance (Y_h^5), pension and grants (Y_h^6), dividend and interest from investment (Y_h^7), and incomes from land and house ownership (Y_h^8). Also in line with the theoretical expectation, these sources are expected to exert positively on appropriate healthcare seeking (Benzeval *et al.*, 2014; Bayar, 2016; and NBS, 2017).

Income Inequality (Z)

Furthermore, since income inequality can likely lead to both 'political and opportunity capture' as Fuentes-Nieva and Galasso (2014:2) observe, income inequality could then result to inappropriate HSB. The Gini coefficient (measure of income inequality) is expected to be inversely associated with appropriate healthcare seeking/consultation in Nigeria. This is in tandem with the postulation of the income-inequality by Wilkinson (1992, 1994), Pickett and Wilkinson (2015).

Hence, the effect of income inequality on HSB among households in Nigeria is presented as:

$$HSB_{ht} = \alpha_i + \sum_{i=1}^1 \beta_{1i} FAS_{hit} + \sum_{i=1}^4 \beta_{2i} EDU_{hit} + \sum_{i=1}^2 \beta_{3i} GND_{hit} + \sum_{i=1}^6 \beta_{4i} MRS_{hit} + \sum_{i=1}^8 \delta_{1i} Y_{hit} + \sum_{i=1}^1 \gamma_2 GIN_{ht} + \varepsilon_{ht} \quad (4.12)$$

where FAS represent family size,

EDU denotes level of education,

GND indicates the gender of the respondent,

MRS is their marital status,

Y is households' incomes, and

GIN is Gini-coefficient (see Table A2 for the detailed).

Table 4.2: A-priori Expectations (Income Inequality-Health-Seeking Behaviour Links)

COEFF.	SIGN	WHY?
DIRECT EFFECT:		
Income Inequality	-	Rising II increase Political and Opportunity Capture. This could lead to Inappropriate HSB (Fuentes-Nieva, 2014)
INDIRECT EFFECT:		
Family Size	-	II weaken purchasing power, and more FS could leads to Inappropriate HSB (Huang et al. 2017)
Education	+	Literacy level is crucial to medical-care seeking (Rochelle, 2019)
Gender	+	With II, both male and female seek medical services (Senbeto et al. 2013)
Marital Status	+	With II, all citizens should seek medical services (Vespa & Painter, 2011)
Incomes	+	With rising II, ↑ Employment and Income motives seeking medical-care (Nonvignon et al. 2017)

Source: Insights from both theories and empirics

4.4 Estimation Procedures

4.4.1 Panel Logistic Regression

As previously stated, the dependent variables estimated in this study are dichotomous in nature. That is, they take the value of 0 or 1. Consequently, appropriate statistical techniques are required in order to account for this nature. Therefore, the study makes use of panel logistic regression considering the observations on households over multiple time periods. Deaton (2018) noted that following the same households over a substantial period of time, is an important consideration when conducting analysis with panel data¹².

The general specification to estimate the effect of income inequality on health outcome and health-seeking behavior in the presence of panel data is:

$$H_{ht} = K_{ht}\beta + L_t\delta + v_{ht} \quad (4.13)$$

where H_{ht} represents the dependent variables of household h in wave t . K_{ht} is a vector of time-varying covariates, including household's characteristics (X_h) and aggregated household's income (Y_h). L_t is the time-invariant covariates, such as, income inequality (Z_t). The subscript h runs from 1 to N, the sample size of households in 36 states and FCT (Abuja); and t from 1 to T, where T is usually small often just two (see Deaton, 2018:106).

¹² In NGHPS (like some of the World Bank's Living Standards Measurement Study), households were visited twice (post-planting and post-harvest) for repeat interviews and without replacement.

Equation (4.13) is a simple *pooled OLS model* (POLS) which is not the most consistent or efficient approach in the presence of panel data. It is important to note that, the estimators β , δ and γ in POL model is inefficient because of the unobserved effect in v_{ht} . This generate serial autocorrelation; thus, robust test statistics will be needed to deal with this issue. Nevertheless, this study shows estimates from POLS models to make the thesis's results as comparable as possible to other estimators (Johnston *et al.* 2014).

Another approach to estimate the effect of income inequality on health outcomes and HSB with panel data is the Random Effect estimator (RE). In this approach, the composite error term (v_{ht}) in Equation (4.13) is splits as follows:

$$v_{ht} = \alpha_h + u_{ht} \tag{4.14}$$

where α_h is a set of time-invariant unobserved households characteristics (e.g. personality traits, genetic inheritance, culture and traditions) and other covariates that explains H_{ht} ; u_{ht} is the usual random error in regression estimation.

Contrary to POL, RE model assume that the unobserved effect is unknown and can be represented as a random variable and treated as part of error term. It also imposes more restrictive assumption than POL, because it includes the unobserved heterogeneity in v_{ht} to obtain consistent and efficient estimators β , δ and γ .

Thus, by combining (4.13) and (4.14) together, Equation (4.15) becomes:

$$H_{ht} = X_{ht}\beta + Y_{ht}\delta + Z_t\gamma + \alpha_h + u_{ht} \tag{4.15}$$

However, consistent estimation of the random-effect model is contingent on the assumption that α_i is uncorrelated with other covariates $\{E(\alpha_h|X_{ht}, Y_{ht}, Z_t) = 0\}$. For Fixed Effects (FE), it is assuming that α_h varies among each state but fixed over time. The parameter α_h is a fixed effect for observation i ; it measures the unobserved state's characteristics (conflicts, criminal behavior, widespread corruption, and rise of factionalized elites). Thus, the basic idea of FE model is that a set of α_h can capture all the unobserved heterogeneity. Because of that, FE estimator is also known as dummy variable estimator.

4.4.2 Heteroskedasticity

Intuitively, X_h are not homoscedastic for all. Even when household generates the same behavior within a state, most often there is heterogeneity between states (Deaton, 2018:79). Hence, there will be heteroskedasticity issue in the overall regression. Surprisingly, previous studies the effect

of income inequality on health in Nigeria (see Orji *et al.*, 2013; Alawode and Lawal, 2014; Karimo *et al.* 2017) ignored the heterogeneity issues – difference and within-estimation – in their analyses.

To solve this issue, assuming the coefficients of households' characteristics (β) and their incomes (Y_{ht}) differ by households (h) in each state. We could treat them as random, that is:

$$E(H_{ht}|X_{ht}\beta, Y_{ht}\delta) = X_{ht}\beta + Y_{ht}\delta; \quad (4.16a)$$

$$\text{where, } \{V(H_{ht}|X_{ht}\beta, Y_{ht}\delta) = \sigma^2\} = \sigma^2 \quad (4.16b)$$

Equation (4.16a) is the standard error, while (4.16b) is the variance function.

Suppose that β and δ have average mean $\bar{\beta}$ and $\bar{\delta}$ respectively, and variance-covariance matrixes of Ω_β and Ω_δ respectively, then Equation (4.16b) generates the heteroskedastic regression model:

$$V(H_{ht}|X_{ht}, Y_{ht}) = 2\sigma^2 + X_{ht}'\Omega_\beta + Y_{ht}'\Omega_\delta \quad (4.17)$$

Equation (4.19) motivate the standard test procedure for heteroskedascity such as the Breusch-Pagan (1979) test as also employed in this study.

The POLS residuals from the regression with suspected heteroskedascity are first normalized by division (Deaton, 2018:105-108). Therefore, to check the homogeneity or heterogeneity for this thesis, Breusch-Pagan Lagrange Multiplier test was employed. The null hypothesis (H_0) of the test is 'homoskedasticity of households and states in Nigeria, that is, POLS might be the appropriate model'. This makes the model comparable as possible to FE and RE.

4.4.3 Hausman Specification Test

It is a standard approach in econometrics literature to estimate the panel data model in a fixed effect (FE) or random effect (RE) framework (Baltagi, 2013; Greene, 2011; Wooldridge, 2010). Thus, to test for the appropriateness of FE and RE models, Durbin-Wu-Hausman (simply refer to as Hausman) test as proposed by James Durbin (1954) and Jerry A. Hausman (1978) was used. The test evaluates the consistency of an estimator when compared to an alternative, less efficient estimator which is already known to be consistent (Baltagi, 2013).

The null hypotheses (H_0) for Hausman test is that RE model is appropriate and consistent when the p-value is high, against the alternate (H_1) of FE model is consistent when p-value is close to zero.

4.4.4 Other Estimation Issues

Since the dependent variables are treated as binary factor. Therefore, their probabilities could be given as:

$$Pr(H_h = 1 \text{ or } 0 | X_{ht}, Y_{ht}, Z_t) \quad (4.18)$$

The odd ratio of this variable (*OR*) being:

$$Odd \text{ Ratio} = \frac{Pr(H_h = 1 | X_{ht}, Y_{ht}, Z_t)}{1 - Pr(H_h = 0 | X_{ht}, Y_{ht}, Z_t)} \quad (4.19)$$

where X_{ht} , Y_{ht} , and Z_t are vector of independent variables.

Hence, Equation (4.19) show how frequent the household members experiences illness or seek healthcare services, relative to how often it does not under a certain circumstance.

By taking logit transformation of equation (4.19), the linear model for the thesis is written as:

$$\ln \left[\frac{Pr(H_h = 1 | X_{ht}, Y_{ht}, Z_t)}{1 - Pr(H_h = 0 | X_{ht}, Y_{ht}, Z_t)} \right] = X \theta \quad (4.20)$$

where θ is vector of parameters.

The logistic panel regression equation from which the prob. of H_h is predicted is expressed as:

$$Pr(H_{ht} = 1 \text{ or } 0) = \frac{1}{1 + e^{-(a_i + X_{it}\beta + \mu_{it})}} \quad (4.21)$$

where $Pr(H_{ht} = 1 \text{ or } 0)$ is the probability of health issues of household h , e is the base of natural logarithm, and the $a_i + X_{it}\beta + \mu_{it}$ are the coefficients form of linear combination.

By taking logit transformation of equation (4.21), the linear logistic panel model is:

$$\ln[Pr(H_{ht} = 1 \text{ or } 0)] = \ln \left[\frac{Pr(H_h = 1 | X_{ht}, Y_{ht}, Z_t)}{1 - Pr(H_h = 0 | X_{ht}, Y_{ht}, Z_t)} \right] = a_i + X_{it}\beta + \mu_{it} \quad (4.22)$$

$$\ln[Pr(H_{ht} = 1 \text{ or } 0)] = a_i + X_{ht}\beta + Y_{ht}\delta + Z_t\gamma + \mu_{it} \quad (4.23)$$

4.4.5 Test for Significance of Model Parameters

In logit models, to better explain the significance of the independent variables, Wald or Likelihood test of significance could be use. Although, some studies employed Wald test, while several others use the likelihood ratio test (see Adjaye-Gbewonjo *et al.* 2018). However, this study employed both. The Wald test is a method to test whether the coefficients are significantly different from zero. It is often used to test the statistical significance of each coefficient (β) of the variables in the model.

Like the t-statistics in panel regression model, a Wald test calculates a Z-statistics as:

$$Z = \frac{\beta_i}{s.e \beta_i} \quad (4.24)$$

This Z-value is then squared yielding Wald statistics with a chi-square distribution. Unlike this, the likelihood-ratio test uses the ratio of the maximized value of the likelihood function for the full model (L_1) over the maximized value of the likelihood function for the simpler model (L_0).

The likelihood-ratio test statistic equals:

$$Z = \frac{\beta_i}{s.e \beta_i} - 2\text{Log} \left(\frac{L_0}{L_1} \right) \quad (4.25)$$

$$Z = \frac{\beta_i}{s.e \beta_i} - 2[\text{Log} (L_0) - \text{Log} (L_1)] \quad (4.26)$$

$$Z = \frac{\beta_i}{s.e \beta_i} - 2[L_0 - L_1] \quad (4.27)$$

This log transformation of the likelihood functions yields a chi-square statistic.

4.5 Data Issues

The data for the study was collected from National Bureau of Statistics (NBS). These was based on the Nigerian General Household Panel Survey (NGHPS) that was carried out across all the 36 states and FCT Abuja. NGHPS is implemented in collaboration with the World Bank Living Standards Measurement Study (LSMS). Thus far, four waves of the NGHPS have been conducted: Wave 1 (in 2010), Wave 2 (2013), Wave 3 (2016) and Wave 4 (2019). The objectives of the survey include comprehensive analysis of welfare indicators and socio-economic characteristics.

4.5.1 Sampling

The NGHPS is based on the Master Sample frame of the 2006 Housing and Population Census conducted by the National Population Commission. The sample frame includes all the thirty-six (36) states and FCT Abuja. A multi-stage stratified sample design was employed for the NGHPS. The sample is comprised of 60 Primary Sampling Units or Enumeration Areas (EAs) chosen from each of the 36 states and FCT (Abuja) in Nigeria. A total of 2,220 EAs nationally, and each EA contributes at least 10 households to the NGHPS sample.

Households were selected without replacement. Thus, 27,588 (post-planting) and 28,292 (post-harvest) individuals were interviewed in Wave 1. A total of 27,533 and 27,993 individuals were interviewed in post-planting and post-harvest for Wave 2, respectively. For Wave 3, the figures slightly reduce to 26,735 for post-planting, and 26,871 for post-harvest. Thus, given the panel nature of the survey, some households had moved from their location and were not able to be located by the time of the Wave 4 visit, resulting in a slightly smaller sample for Wave 3.

4.5.2 NGHPS Questionnaires

The NGHPS consists of three questionnaires – household, agriculture and community. Household questionnaire provides detail information on demographics, education, health, labour, household non-farm income-generating activities, food security and shocks, safety nets, housing conditions, assets and other sources of household income. The agriculture questionnaire solicits information on land ownership and use, farm labour, inputs use, agricultural capital, irrigation, crop harvest, animal holdings, and fishing activities. While community questionnaire provides information on access to infrastructure, community organizations, resource management, key events, changes in the community, community needs, actions/achievements, and local retail price information. The summary of the questionnaire context is indicated in Table 4.3.

Table 4.3: Summary of Questionnaire Context of NGHS waves

<i>Topic</i>	<i>Information</i>
Household Composition	Name, age, sex, marital status, family size, religion, occupation,
Education	School attendance and attainment, literacy level, scholarship
Labour	Nature of occupation, working hours, who/where the job, how long, salary/wages/incomes from the activities
Health	Suffering from illness/injury, healthcare consultation and where, payment for healthcare services, weight/length/height of children
Child Development	Ability to read, communicate, smile, play, walk, and dress
Housing	Dwelling nature, rent/owned, access to water, electricity, toilet
Remittances	Monetary/in-kind gift from abroad, amount/purpose
Behavior	Depression, sleep restless, loneliness, feeling happy, afraid or disturbed and on what
Household Assets	Assets of the households
Household Income	Loans, profit, salaries and wages, interest from investment, income from rental of property, sort of property, and others
Safety Nets	Cash, food and other assistance received,

Source: Compiled from NBS for various waves

4.5.3 Data Quality

Generally, ill-health issues among households often faced with data limitations, particularly in developing countries like Nigeria where poor health outcomes are regarded as a sad event that respondents do not want to recall (Adedini, 2013). The study draws on a cross-sectional secondary dataset; as a result, there is tendency for ill-health to be under-reported. Nonetheless, this will not pose a serious challenge to this study, because the data quality assessment was done for NGHPS

(Wave 1, 2, 3 and 4). It indicated that the dataset yielded far more reliable database for household welfare in Nigeria (Aigbohkan, 2017).

It is pertinent to note that, health system characteristics, such as efficiency of medical-care services and the degree of private provision of the services are also important in predicting health outcomes, but these would not be included due to unavailability of data. More so, it is impossible to compute income inequality for each of the sampled households individually. Thus, the study compute Gini-coefficient for each of the 36 states (and FCT). Overall, the NGHPS dataset is reliable for the kind of analysis needed to cover in this study. For example, the data have the widest coverage across the six geo-political zones in Nigeria. Secondly, it provides detail statistical information on welfare trends of households in all the 36 states and FCT.

Therefore, in line with the studies of Tumen and Zeydanli (2014), Jabeen and Khan (2016), Bakkeli (2016), and de-Roiste, Fasianos and Yao (2019), this study pooled NGHPS waves. These waves are Wave 1 (2010), Wave 2 (2013), Wave 3 (2016), and Wave 4 (2019), which covered almost 82,429 observations.

4.6 Measurement of Income Inequality

The level and magnitude of income inequality across states was estimated using Gini-coefficient and Generalized Entropy methods (other methods were presented in Bayar, 2016). This was done to achieve objective two of the study.

4.6.1 Gini-Coefficient Method

Following the methodology of Aigbokhan (2017:19-20) on Gini-Coefficient, this study computed the Gini estimates for 2010, 2013, 2016 and 2019 from NBS Nigeria-General Household Panel Survey dataset waves respectively (see Appendix B). The key advantages of Gini coefficient are that it measures inequality, but not average income. For instance, if the income distribution of a state is completely equal (unequal), the Gini-Coefficient will be the same as 0 (1).

Gini estimates is computed as:

$$Gini_{ik} = \frac{2 \sum_{i=1}^n [i Y_{ik}]}{n \sum_{i=1}^n Y_{ik}} + \frac{n+1}{n} \quad (4.28)$$

where n denotes the sample household in state (k) while $k \in (1,2,3, \dots, 37)$.

\bar{Y} indicates the arithmetic mean income of households' incomes from all sources.

Y_{ik} is the income of i^{th} household in k^{th} state, $i \in (1,2,3, \dots, N)$.

4.6.2 Generalized Entropy (GE) Method

The GE method measures often differ Gini-coefficient with respect to the weight given to distances between incomes at different parts of the income distribution (α). If $\alpha = 0$, GE is known as Theil's L Index or Mean Log Deviation (MLD). But when $\alpha = 1$, it is called Theil's T index (see Bayar 2016). Generally, GE is given as:

$$I_{\alpha} = \frac{1}{\alpha(1-\alpha)} \left[\frac{1}{n} \sum_{i=1}^n \left(\left(\frac{Y_i}{\bar{Y}} \right)^{\alpha} - 1 \right) \right] \quad (4.30)$$

where α denotes weight given to distances between incomes at different parts of the distribution.

4.7 Robustness Checks

To check the robustness of the results, the thesis employed alternative econometric techniques as well as use of sub-samples. The study validated the findings. That is, whether the results were sensitive to panel logistic regression employed. Thus, as a robustness check, due to the cross-sectional nature and different levels of the data collection, a Multilevel Logistic regression model was employed (see Rabe-Hesketh and Skrondal, 2006). This is important because subjective health outcomes are often determined by factors on different levels, ranging from the individual level to the state level. Thus, a single-level analysis may be flawed. Different analysis was also done for each of the waves separately.

In addition, much of the debate on income inequality generally focus on the differences between sub-groups (Kragten and Rozer, 2017). Therefore, separate estimations were conducted on the sub-sample of households – those households below average incomes for the states, and those with greater incomes.

CHAPTER FIVE

RESULTS AND DISCUSSION OF FINDINGS

5.1 Introduction

Detailed presentation and discussion of empirical results are presented in four sections. First, are the findings from descriptive statistics. This followed by the exploration of socio-economic and demographic characteristics of households. Income inequality indices of households across states and geo-political zones in Nigeria were presented in next. Finally, the findings from panel logistic regression were clearly explored.

5.2 Descriptive Statistics

Table 5.1 shows the descriptive statistics of the variables used. Respective columns show findings from Wave I (2010), Wave II (2013), Wave 3 (2016), Wave 4 (2019) and the aggregate averages from all waves, respectively. The average reported illness in the four weeks preceding the survey increased from 1.72 in Wave I to 1.81 (Wave 2). The statistics further increased steadily to 1.91 in Wave 4, compare to 1.86 in Wave 3. However, the aggregate average for all the waves was 1.83. These results suggest that poor health outcomes from chronic ailments such as dementia (loss of memory), stroke, hypertension, and heart diseases are increasing in Nigeria. This is not surprising as it is consistent with WHO's report that documented an increase in the prevalence of various NCDs in recent years (WHO, 2018b). Data from the recent NGHPS (2019) also indicated that 23% and 25% of men and women, respectively, reported having an illness in the four weeks preceding the NGHPS Wave 4 survey, compared to 14% and 15% in Wave 3, respectively.

The table further indicates that the mean of households' responds to appropriate medical-care consultation declines over time. The statistics decrease from 5.03 (Wave I), to 5.01 (Wave 2), and persistently reduce from 4.95 in Wave 3 to 3.54 in Wave 4. Compared to all the wave's means of 4.63, Wave 4 recorded the least average. Its then implies that less than average respondents have appropriate healthcare-seeking in recent periods. This is alarming because despite the prevalence of illness in Nigeria, households are probably utilizing inappropriate healthcare from traditional and herbal alternatives, self-medication and other health service providers. These relates strongly with demand-side factors (price, distance and income) and supply-side/healthcare service delivery. It might also be attributed to the products of 'political and opportunity-capture' from rising income inequality (Fuentes-Nieva and Galasso, 2014:2; Rochelle, 2019).

Table 5.1: Descriptive Statistics Table (NGHPS, 2010-2019)

VARIABLES	WAVE 1 – 2010				WAVE 2 – 2013		WAVE 3 – 2016		WAVE 4 – 2019		ALL WAVES	
	Mean	Min.	Max.	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.
Illness in past four weeks	1.72	1	2	27,238	1.81	27,126	1.86	26,176	1.91	22,171	1.83	102,711
Medical-care Consultation	5.03	1	13	13,327	5.01	13,234	4.95	13,754	3.54	26,556	4.63	66,871
Family Size	4.24	1	31	28,292	4.54	30,234	4.98	32,827	4.71	30,346	4.62	121,699
Gender (1=Male, 2=Female)	1.50	1	2	28,270	1.51	30,234	1.51	32,827	1.50	27,607	1.51	118,938
Marital Status	5.10	1	7	28,270	5.18	29,000	5.18	26,176	4.16	17,943	4.91	101,389
Education (in highest qualification)	19.74	0	52	18,589	15.53	13,319	22.65	17,687	21.61	13,304	19.88	62,899
Hunger (in the last months) *	1.10	1	2	27,068	2.32	14,664	1.81	14,582	1.48	27,528	1.68	83,842
Gari Consumption (within the past 7 days)	1.76	1	2	27,573	0.92	27,363	1.20	14,588	1.17	14,178	1.26	83,702
Rice Consumption (within the past 7 days)	1.67	1	2	26,562	0.89	27,363	1.03	13,675	1.66	13,307	1.31	80,907
Yam/Cassava/Maize Flour (in past days)	1.81	1	2	26,490	0.42	27,363	1.30	13,280	1.44	27,312	1.24	94,445
Beans (basic protein within 7 days)	0.85	1	2	27,032	0.03	16,001	1.69	12,430	1.22	19,811	0.95	75,274
Meat or Fish (basic protein within 7 days)	1.18	1	2	28,273	0.94	27,363	1.45	7,500	1.82	15,273	1.35	78,409
Mosquito Net (purchase within 1 year)	1.01	1	2	27,075	0.92	27,363	1.71	24,590	1.50	12,029	1.29	91,057
Electricity? ** (1=Yes, 2=No)	1.51	1	2	14,898	1.48	14,753	1.47	14,590	1.45	5,047	1.48	49,288
Sources of drinking water [^]	4.26	1	10	14,879	4.12	14,754	4.17	14,587	1.43	5,047	3.5	49,267
Kind of toilet facility used by households**	4.93	1	9	14,879	4.57	14,754	4.11	14,586	7.03	14,417	5.16	58,636
Alcoholic drinks (in past 7 days)	0.88	1	2	27,573	0.65	16,009	1.60	12,299	1.22	11,918	1.09	67,799
Seeking Healthcare (in past 4 weeks)	5.03	1	13	13,327	5.01	27,126	5.55	13,754	1.94	31,414	4.38	85,621
Incomes from wages and salaries	1.93	1	2	22,971	1.94	23,765	1.94	23,183	3.54	26,556	2.34	96,475
Incomes from enterprises, business/trade	1.79	1	2	22,936	1.80	23,762	1.81	23,183	1.97	15,034	1.84	84,915
Crop and Livestock incomes	1.75	1	2	22,920	1.78	23,764	1.78	23,183	1.45	15,047	1.69	84,914
Remittances from abroad (in last 1 year)	1.99	1	2	18,710	1.55	19,713	1.97	19,183	1.18	14,862	1.67	72,468
Monetary gift or Assistance (in last 1 year)	1.82	1	2	4,346	1.97	14,009	1.84	12,005	1.50	27,607	1.78	57,967
Pensions and grants (in last 1 year)	1.96	1	2	12,545	1.59	23,762	1.95	4,582	1.03	8,644	1.63	49,533
Interest and Dividend from Investment	1.98	1	2	14,836	1.63	23,363	1.98	14,582	1.77	8,337	1.84	61,118
Rental's income (in past 1 year)	1.81	1	2	10,579	1.81	19,717	1.95	14,582	1.35	8,331	1.73	53,209
Gini-Coefficient	0.378	0	1	21,612	0.386	24,123	0.421	24,506	0.467	30,346	0.413	100,587

Note: *This was based on the question: *during the last months, was there a time when the household had to skip meal because of lack of money or other resources.*

The respondents choose, 1=yes and 2=no. **For electricity, the question is: *Is the dwelling connected to electricity?.*

[^]What was your main source of drinking water? 1=Pipe-Borne Water treated, 2=Pipe Borne Water Untreated, 3=Borehole or hand pump, 4=Well or spring protected, 5=Well and Spring unprotected, 6=River/Spring, 7=Lake or Reservoir, 8=Rain Water, 9=Tanker/truck/vendor, and 10=other specified by respondents.

**1=None, 2=Toilet o Water, 3=Flush to sewage, 4=Flush to septic tank, 5=Pail/Bucket, 6=Covered Pit Latrine, 7=Uncovered Pit latrine, 8=V.I.P. Latrine, and 9=Others.

Source: Compiled from NGHPS for various years

Family size also rose from an average of 4.24 to 4.98 between 2010 and 2013, but steadily decline to 4.71 in Wave 4 (2019). Compared to the aggregate mean of 4.62, the average household's size for the respondents has increased in recent periods. This highlights the need for more resources to meet the welfare and health needs of larger family size. In terms of hunger, the average numbers of households without food rose from 1.1 to 1.5 between 2010 and 2019. Likewise, the proportion of those with balance diets – carbohydrates (rice, flour, and garri), basic protein (beans), and fats and oil (meat and fish) fell across the waves. This is not surprising because, rising income disparity can reduce the purchasing power of citizens' incomes, and this mostly affects their consumption.

More households possess additional mosquito-nets based on their response and this rose by 32% between 2010 and 2019. This has helped to reduce the incidence of malaria in households, as less cases are reported in the clinics than previously (WHO, 2018a). However, in terms of households' dwelling connected to electricity, the mean responses fell slightly from 1.51 to 1.43 between Wave I and Wave 4. This suggest that less households now have access to electricity supply. This is quite surprising given the numbers of electricity generating companies in Nigeria.

Again, the mean response of those with access to drinkable water increased from 4.3 in 2010 to 7.04 in 2019. This perhaps suggest that more people gain access to water over the periods. However, households with quality toilet facility fell to 4.1 (2019) from 4.93 (2010). These could have many implications on household's health, because contaminated water and poor sanitation expose people to various health risks. It is also worthy of note that access to drinkable water is essential to maintain balance of body fluids, transportation of nutrients, and maintenance of body temperature.

The average values of households' incomes from various sources, such as, wages and salaries, trade and other enterprises, crop and livestock, remittance from abroad, monetary assistance, pensions, interest, dividend and rental's incomes does not change significantly over the periods. For instance the mean incomes from wages/salaries, crop and livestock, cash transfers and rental income only rose marginally, while those from interest and dividend remained unchanged. This may be explained by the fact that additional members of households gained employment during the review periods. Again, the index of households' income disparity rose from 0.37 in 2010 to 0.38 in 2013, and to 0.47 in 2019 from 0.42 for 2016. These results imply that the income-gap among households greatly rose over the survey periods (2010-2019) in Nigeria by 21%. This also correspond with the previous studies of Isah (2011), Usman (2016), and Aigbokhan (2017:6).

5.3 Demographic and Socio-Economic Characteristics of Households

An understanding of household's profiles better understanding of the findings. The household-level characteristics are based on household's head as well as the attributes of their members. The selection of these key characteristics was guided by the literature (See Becker, 1976; Pollak, 2002; and Adedini, 2013). These variables include, gender of respondents, relationship with the head, family size, literacy, and marital status, source of drinking water for household, type of household toilet facilities, and access to electricity.

5.3.1 Gender of the Respondents

Table 5.2 presented the percentage distribution of respondents according to their gender. The distribution revealed that pre-dominantly high proportion of the households (more than half) were female. That is, the percent of female respondent increased from 50.26% in Wave 1 to 50.67% in Wave 2. Though the statistics slightly decline to 50.36% in Wave 4 from 50.97% in Wave 3, still the numbers of female respondents is higher. This is against the male respondent that decline from 49.7% in Wave I to 49.3% (Wave 2), but rose trivially to 49.6% in Wave 4. Perhaps this is true for the Nigeria's population, as the pattern is in line with NPC (2017), that the sex ratio of individuals is slightly in favour of female citizens in Nigeria.

Table 5.2: Distribution of Respondents According to their Gender (NGHPS, 2010-2019)

Gender	WAVE 1 (2010)		WAVE 2 (2013)		WAVE 3 (2016)		WAVE 4 (2019)	
	Observations	%	Observations	%	Observations	%	Observations	%
Male	14,062	49.74	14,913	49.33	16,095	49.03	13,705	49.64
Female	14,208	50.26	15,321	50.67	16,732	50.97	13,902	50.36
	28,270		30,234		32,827		27,607	

Source: NGHPS, National Bureau of Statistics (various years)

5.3.2 Relationship with Head of Households

In any family setting, the relationship with household head is key to determining the type of welfare particularly the healthcare received when confronted with an ill-health. Table 5.3 then presents the relationship of households' members with the household head. Slightly more than one-sixth of the respondents were heads of household (16% in 2010, 17.5% in 2013, and 18.3% in 2019). More than halve of the respondents were children that receive parental care, education, and health-care, from household head. About 57.7% in 2013, 57.3% in 2016 and 56% (2019) were direct children to the head. In addition, slightly one-sixth of the respondents were mothers. The statistics decline very slightly from 16.2% to 16.1% between 2010 and 2019.

Table 5.3: Distribution of Relationship with Households' Head (NGHPS, 2010-2019)

	WAVE 1 (2010)		WAVE 2 (2013)		WAVE 3 (2016)		WAVE 4 (2019)	
	<i>Obs.</i>	%	<i>Obs.</i>	%	<i>Obs.</i>	%	<i>Obs.</i>	%
Head	4,323	16.02	4,724	17.50	4,471	16.56	5,050	18.29
Spouse	4,383	16.24	4,628	17.15	3,914	14.50	4,432	16.05
Own Child	15,569	57.70	15,467	57.31	15,367	56.98	15,384	55.72
Step Child	139	0.52	104	0.39	223	0.83	230	0.83
Adopted Child	33	0.12	18	0.07	43	0.16	103	0.37
Grand-Child	1,089	4.04	847	3.14	1,296	4.80	1,033	3.70
Brother and Sister	351	1.30	318	1.18	532	1.97	466	1.69
Niece and Nephew	302	1.12	227	0.84	380	1.41	238	0.86
Brother/Sister-in-law	195	0.72	128	0.47	235	0.87	153	0.55
Parent	306	1.13	316	1.17	336	1.24	285	1.03
Parent-in-Law	26	0.10	19	0.07	34	0.13	18	0.07
Domestic Help	124	0.46	94	0.35	159	0.59	196	0.82
Total	26,840		26,890		26,990		27,607	

Source: NGHPS, National Bureau of Statistics (for various years)

5.3.3 Household Size

Family size is a matter of great importance not only for the nation as a whole but also for welfare and health of all family members. Table 5.4 presented the % of households with less than 5 sizes. This statistics declines from 61.2% to 43% between 2010 and 2016, but surged to 57.5% in 2019.

Table 5.4: Distribution of Respondents According to Family Sizes – NGHPS (2010-2019)

Household Size	WAVE 1 (2010)		WAVE 2 (2013)		WAVE 3 (2016)		WAVE 4 (2019)	
	<i>Obs.</i>	%	<i>Obs.</i>	%	<i>Obs.</i>	%	<i>Obs.</i>	%
Less than 5	17,305	61.17	17,126	56.64	14,104	42.96	17,456	57.52
5 – 8	8,559	30.25	9,284	30.71	11,971	36.47	8,993	29.63
9 – 12	2,118	7.48	3,450	11.40	6,037	18.39	2,826	18.02
13 – 16	200	0.71	240	0.79	481	1.47	778	2.57
17 – 20	84	0.30	91	0.31	138	0.42	206	0.67
21 – 24	19	0.07	27	0.10	53	0.16	57	0.19
25 – 28	4	0.01	13	0.04	26	0.08	21	0.07
29 – 32	3	0.01	3	0.01	12	0.03	5	0.01
Greater than 32	0	0	0	0	5	0.02	3	0.01
Total	28,292		30,234		32,827		30,346	

Source: NGHPS, National Bureau of Statistics (various years)

The family with 5-8 sizes rose from 30.3% to 30.7% between 2010 and 2013, and to 37% in 2016, however the statistics reduce to 29.6% in 2019. Again, families with 9-12 numbers rose from 2,118 in 2010 to 2,826 in 2019. This distribution thus suggest that Nigeria is characterized by large family size between 2010 and 2019. It is pertinent to note that, large family size could stretch available

resources and thus move them into poverty. Notably, most emerging nations, such as, Nigeria are characterized by high birth rates with low welfare. This may be traced to low level of knowledge about family planning, and the belief that large size provide social security in the old age (Dasgupta and Solomon, 2017). Cultural and religious factors also explain these differences.

5.3.4 Educational Attainment of Respondents

Education is key to any development and welfare. Figure 5.1 indicated the level of education of respondents. It was found that larger numbers of respondents had no formal education. The figures rose progressively between 2010 and 2019 from 6,569 to 7,628. This suggest that the numbers of citizens in Nigeria with no education is rising over the recent years.

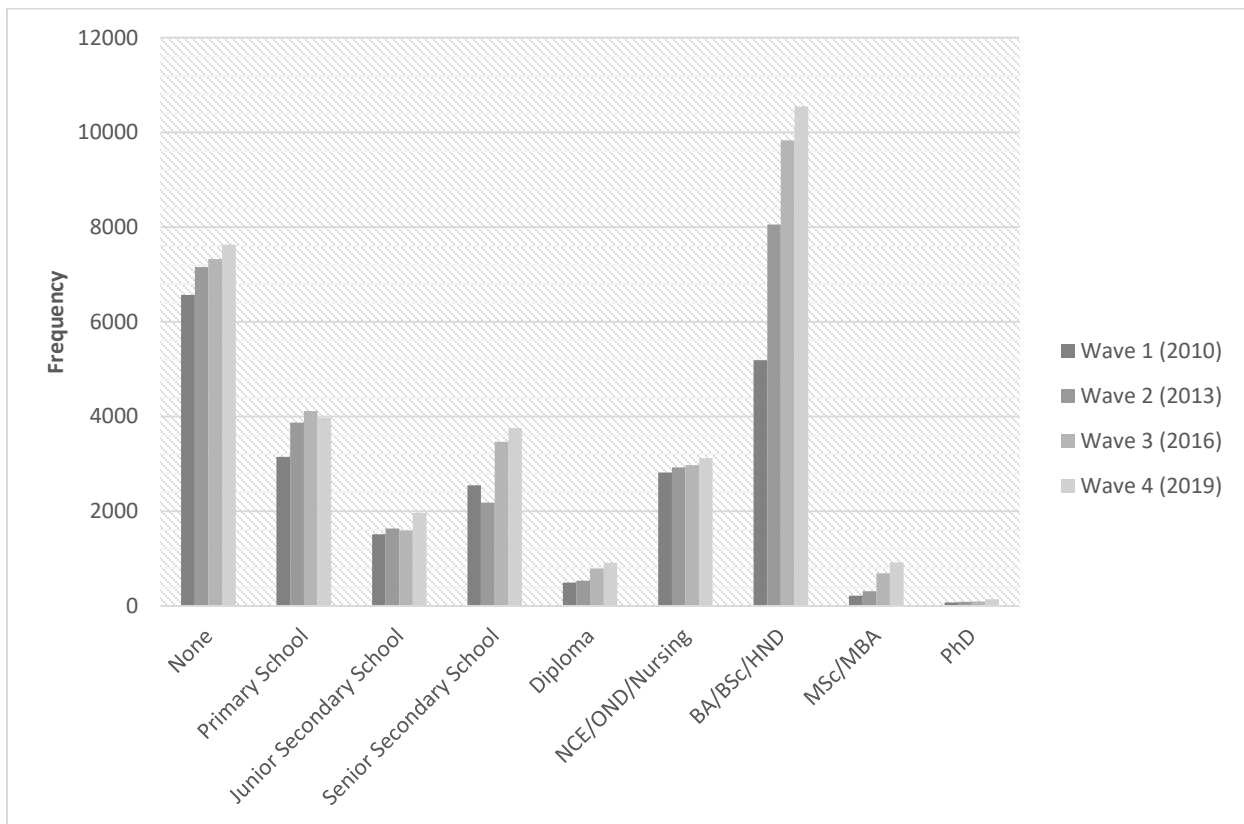


Figure 5.1: Frequency Distribution of Respondents by Education Level

Similar results was obtained for those with bachelor degrees, where more than one in four responds had first degree. The figure which doubled between 2010 and 2019 from 5,189 to 10,551, suggest increase in unemployment rate in Nigeria. This could pose a host of cumulative long-term issues ranging from income disparity, insecurity, reduce consumption that weaken health outcomes. This is in harmony with Galama *et al.* (2018) that higher educational attainment related to long lives.

5.3.5 Marital Status

One major factor that influences the income, health and welfare of citizens is their marital status. Table 5.5 presented the marital status of the respondents. It was revealed that the percentages of single (never married) is more than two out of every five respondents. This might largely be as a result of rising unemployment and income inequality that can put downward pressure on marital decisions. On the other hand, the percentage of respondents currently married to one wife is more than one in every five respondents. This increase from 23% to 34% between 2010 and 2019. Similar trend was observed for those who are presently married (polygamous) from 9.3% to 13.4% over the same periods.

Table 5.5: Distribution of Respondents According to Marital Status (NGHPS, 2010-2019)

Marital Status	WAVE 1 (2010)		WAVE 2 (2013)		WAVE 3 (2016)		WAVE 4 (2019)	
	Obs.	%	Obs.	%	Obs.	%	Obs.	%
Married (Monogamous)	6,510	23.04	6,021	20.74	5,869	22.42	6,001	34.58
Married (Polygamous)	2,614	9.25	2,956	10.19	3,253	12.43	2,328	13.42
Informal Union	37	0.13	22	0.08	25	0.01	49	0.28
Divorced	76	0.27	92	0.32	148	0.57	114	0.66
Separated	151	0.53	175	0.60	252	0.96	220	1.27
Widowed	915	3.24	1,054	3.63	1,156	4.42	1,173	6.76
Never Married	17,967	63.56	18,680	64.41	15,473	59.19	7,467	43.03
Total	28,270		29,000		26,176		17,352	

Source: Nigeria-General Panel Household Survey, National Bureau of Statistics (various years)

5.3.6 Households' Sources of Water

Safe and drinkable water is paramount to healthy living and other domestic uses. The household's main source of drinking water is presented in Figure 5.2. The results indicate that the percentages of respondents that had access to pipe borne (treated) water decreased greatly from 8.9% to 5.08% between 2010 and 2019. This suggests that the proportion of population using improved safe water source is declining in Nigeria.

Critically, more than one-seventh of the respondents had access to river and spring as the major source of their drinking water. The statistics stood at 12.1% in 2019 from merely 11.4% in 2010 for river and spring source. Improved water access was still a challenge among households: 7.7% of respondents depend on tanker, truck or vendor as their main source of water.

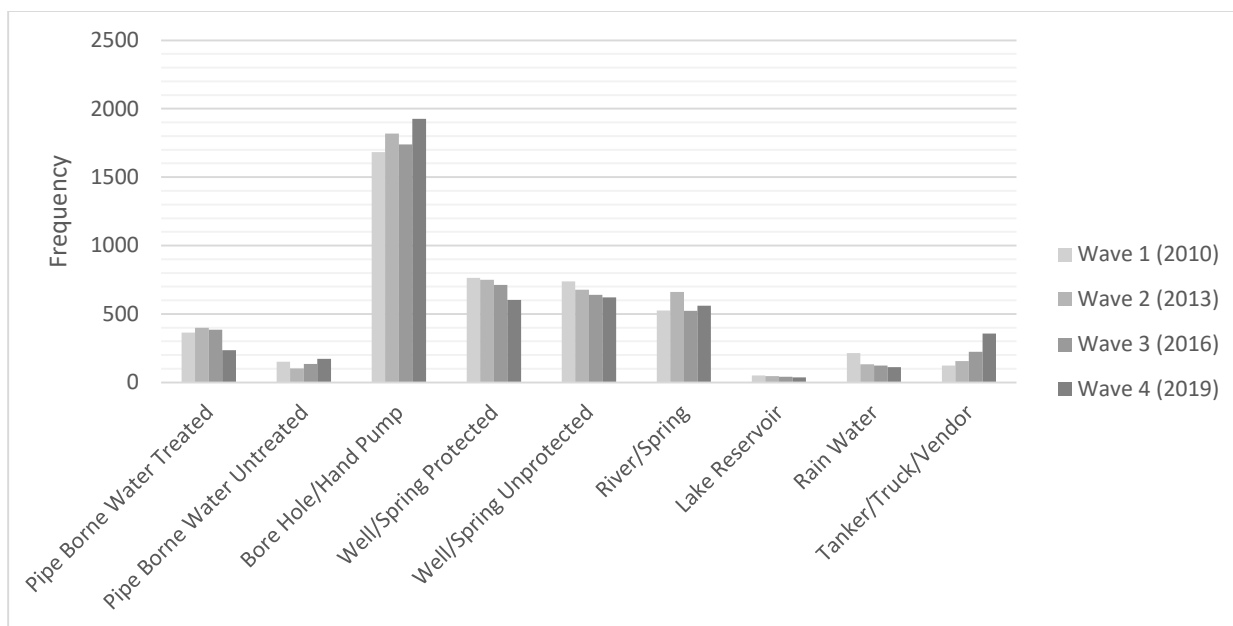


Figure 5.2: Frequency Distribution of Respondents by Households' Access to Safe Water

5.3.7 Access to Electricity

Access to electricity supply is essential to health and economic development. However, access to adequate electricity is extremely low in Nigeria. Figure 5.3 depicts the distribution of respondents based on their access to electricity supply. Though the percentage of respondent with access to electricity increased from 31% to 54.6% between 2010 and 2019; more households still experience inadequate supply and high prices.

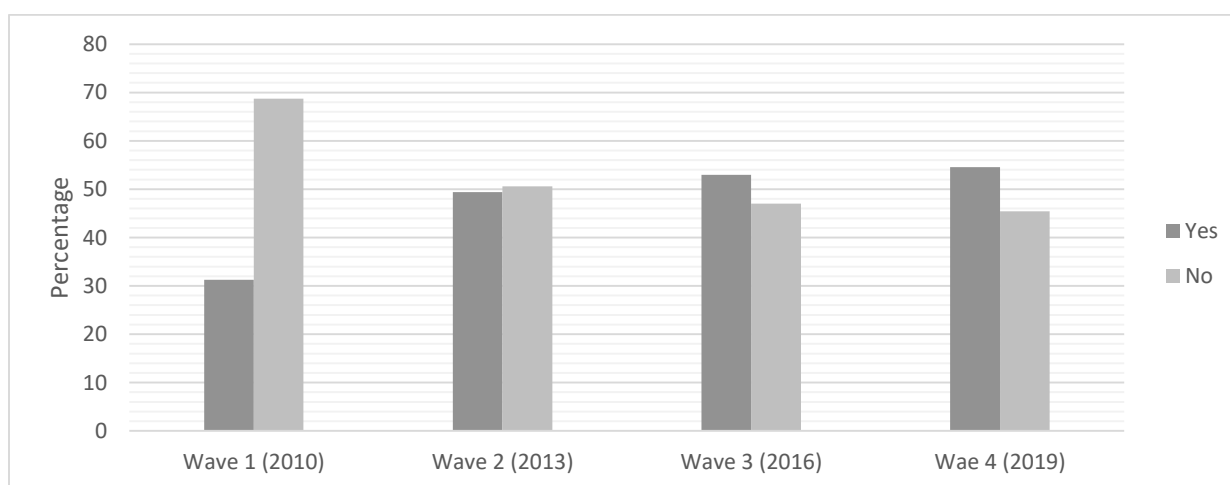


Figure 5.3: Percentage Distribution of Respondents by Households' Access to Electricity

5.3.8 Type of Toilet Facility

Access to quality toilet and sanitation are primary drivers of positive health outcomes particularly in emerging nation such as, Nigeria. Figure 5.4 indicated the percentages of respondents by their

kind of toilet facility that they used between 2010 and 2019. Improved toilet and sanitation was still a challenge particularly among poor household, as the percentage share of households without toilet facility rose from 21% in 2010 to 26% in 2013. Between 2016 and 2019, the statistics further increased from 28% to 28.13%, respectively.

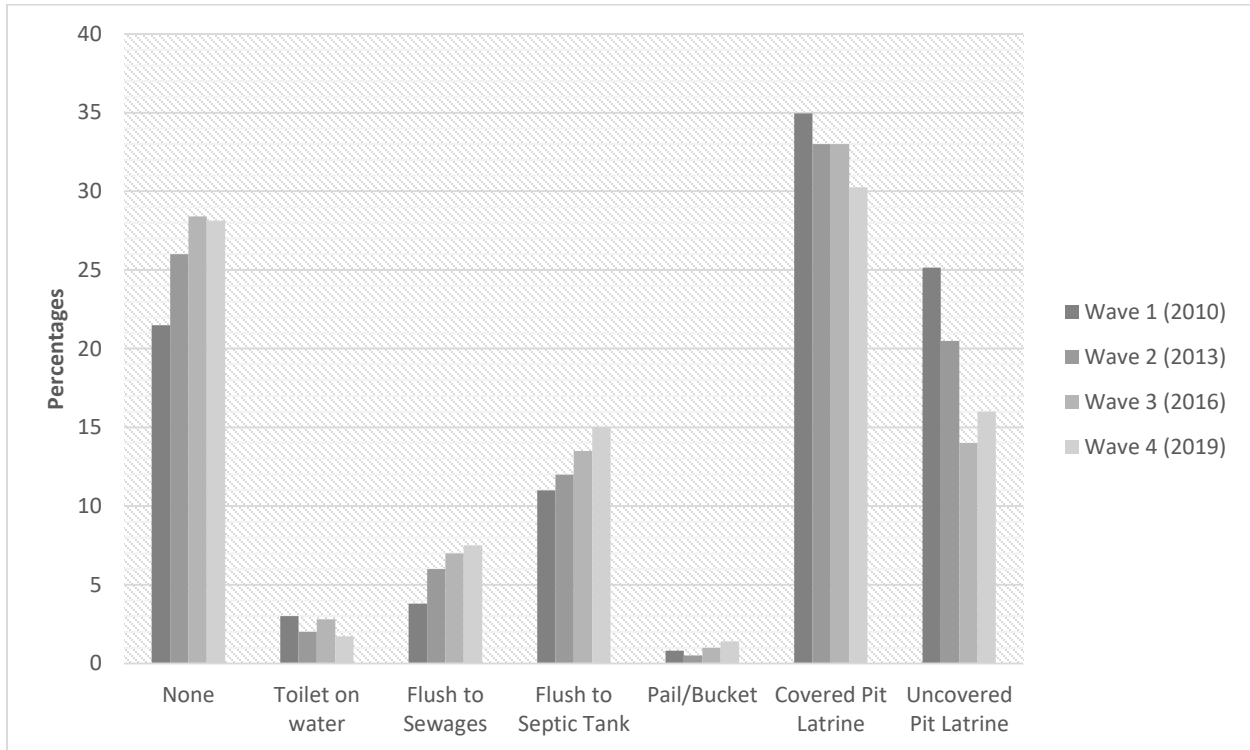


Figure 5.4: Percentage Distribution of Respondents by Households’ Kind of Toilet Facility

It was further revealed that, approximately one-fourth of all respondents used uncovered pit latrine in 2010. This slightly reduced to 20.5% in 2013, however, the figure rose sharply to 16% in 2019 from 14% in 2016. It is worth of note that the type of toilet facility vis-à-vis sanitation practice and safe water in a household often predict the health status of people. Unimproved toilet facility and poor sanitation strongly relate with transmission of infectious diseases, such as cholera, diarrhea, hepatitis, typhoid and polio (WHO, 2018). These increase the illnesses and deaths.

From the overall analysis in this section, many socio-economic characteristics of households have worsened. Furthermore, it is was also evidenced that these is likely predicts the healthiness of household’s members; and at the same time relate with income inequality (Benzeval *et al.*, 2014; Hill *et al*, 2019). Hence, the next section presented the level and magnitude of income inequality across the 36 states (including FCT) in Nigeria.

5.4 Level and Magnitude of Income Inequality in Nigeria

The increasing level of income inequality has been a major concern among economists and policy makers, because it is major issue hindering the development (Omotola and Kabir, 2015:33). This is because income disparity has been rising quickly and has adversely affected poverty reduction. Table 5.6 profiles the level and degree of income inequality for North-East region between 2010 and 2019. The Gini Coefficient figures computed from the NGHPS data using survey-to-survey techniques supported the Wilkinson’s hypothesis that income inequality in North-East rose over time significantly. At the regional level, the index increased from 0.352 in 2010 to 0.412 in 2013 and 0.446 in 2019. Perhaps, the economic growth in the North-East was completely offset by rising income inequality.

Table 5.6: Gini-Coefficients of Households in North-East Zone (2010 – 2019)

	WAVE 1 (2010)	WAVE 2 (2013)	WAVE 3 (2016)	WAVE 4 (2019)
<i>North-East Average</i>	0.3527	0.3643	0.4125	0.4463
<i>Adamawa</i>	0.4069	0.4102	0.4540	0.4552
<i>Bauchi</i>	0.3304	0.3492	0.3733	0.4497
<i>Borno</i>	0.3811	0.3978	0.4420	0.4514
<i>Gombe</i>	0.3230	0.3427	0.4154	0.4488
<i>Taraba</i>	0.3516	0.3647	0.3931	0.4401
<i>Yobe</i>	0.3212	0.3213	0.3972	0.4338

Source: Researcher’s Computations (from NBS NGHPS Waves)

A break-down of income disparity among household by states in North-Eastern zone reveals that Yobe State recorded the lowest index in the North-East zone with 0.434, compared to Adamawa State with 0.455 in NGHPS Wave 4 (Table 5.6). The result is not also surprising as World Bank’s calculations based on 2003/2004 NLSS and 2012/2013 NGHPS also revealed that, Gini estimate increased in the region by almost 0.04 points from 0.332 in 2003 to 0.37 in 2013 (World Bank, 2016:33). This implies that every effort targeting at reducing poverty in the region, nonetheless, could not have been more different.

Table 5.7 shown the estimates for North-West zone of Nigeria. The regional average was estimated as 0.336 in Wave I (2010). This rose slightly to 0.414 in Wave 2 (2016), and further raised to 0.451 in Wave 4 (2019). Like North-East, there is a rising income inequality in North-West region over time in Nigeria. By comparison with North-East, the Gini that maybe attributable to income growth though the figure is greater than the North East average by 0.005 points in 2019. At the state level, Kano State recorded the highest Gini index with 0.45 in Wave 4 (2019). While the computed index

for Zamfara State (0.437) is the lowest in the same period. This result is also similar to World Bank's calculation that Gini estimate rose by almost 0.013 points in the region from 0.33 in 2003 to 0.35 in 2013 (World Bank, 2016:33).

Table 5.7: Gini-Coefficients of Households in North-West Zone

	WAVE 1 (2010)	WAVE 2 (2013)	WAVE 3 (2016)	WAVE 4 (2019)
<i>North-West Average</i>	0.3363	0.3391	0.4114	0.4513
<i>Jigawa</i>	0.3441	0.3531	0.3989	0.4471
<i>Kano</i>	0.3704	0.3783	0.4514	0.4690
<i>Katsina</i>	0.3176	0.3271	0.4115	0.4502
<i>Kaduna</i>	0.3499	0.3583	0.4353	0.4631
<i>Kebbi</i>	0.3500	0.3572	0.4051	0.4492
<i>Sokoto</i>	0.3187	0.3243	0.3964	0.4436
<i>Zamfara</i>	0.3031	0.2752	0.3813	0.4371

Source: Researcher's Computation (from NBS NGHS Wave 1, 2 and 3)

The indexes for North-Central zone is presented in Table 5.8. Its regional average (like North-East and North-West) also rose slightly from 0.377 in 2010 to 0.407 in 2016, and a further to 0.4546 in 2019. This is not surprising as the World Bank calculation show that the Gini for the region rose by almost 0.018 points from 0.336 in 2003 to 0.354 in 2013 (World Bank, 2016). The statistics for states indicated that the entire sub-national governments in the region experience increase in income disparity among their households. For instance, the Gini estimates was found to be lowest in Benue State with 0.441 for Wave 4 (2019), compared to FCT Abuja (0.478), the highest index in the region in 2019.

Table 5.8: Gini-Coefficients of Households in North-Central Zone

	WAVE 1 (2010)	WAVE 2 (2013)	WAVE 3 (2016)	WAVE 4 (2019)
<i>North-Central Average</i>	0.3766	0.3786	0.4067	0.4546
<i>Benue</i>	0.3272	0.3015	0.3915	0.4410
<i>FCT Abuja</i>	0.4117	0.4261	0.4519	0.4779
<i>Kogi</i>	0.3500	0.3574	0.3916	0.4583
<i>Kwara</i>	0.3733	0.3841	0.3905	0.4499
<i>Nasarawa</i>	0.3987	0.4024	0.4132	0.4572
<i>Niger</i>	0.3901	0.3966	0.4041	0.4476
<i>Plateau</i>	0.3852	0.3820	0.4032	0.4489

Source: Researcher's Computations (from NBS NGHS Wave 1, 2 and 3)

Table 5.9 shown that the level of income disparity among households is rising in South-South zone. The indexes rose slightly from 0.42 in 2010 by 0.7% to 0.425 in 2013, but rapidly increased by 7% to 0.45 in 2016, and 0.4652 in 2019. This finding is also consistent with the World Bank's study. Their study found that the biggest contributor to the rapid widening in income inequality among household nationwide between 2003 and 2013 was the South-South (World Bank, 2016).

The analysis showed that, Akwa-Ibom State has the highest income inequality with 0.485 in Wave 4 (2019) among the states in the region. However, Edo State had the lowest estimate of 0.452. The zone witnessed a rise in income inequality that was greater than the nation's average. This means that every effort targeting at reducing poverty or improving welfare in the region could be difficult in the absence of steps for addressing income disparity.

Table 5.9: Gini-Coefficients of Households in South-South Zone

	WAVE 1 (2010)	WAVE 2 (2013)	WAVE 3 (2016)	WAVE 4 (2019)
<i>South-South Average</i>	0.4221	0.4246	0.4505	0.4652
<i>Akwa-Ibom</i>	0.4522	0.4329	0.4763	0.4854
<i>Cross Rivers</i>	0.4311	0.4261	0.4632	0.4488
<i>Bayelsa</i>	0.4147	0.4257	0.4561	0.4737
<i>Rivers</i>	0.4332	0.4526	0.4345	0.4801
<i>Delta</i>	0.4199	0.4361	0.4427	0.4514
<i>Edo</i>	0.3814	0.3743	0.4304	0.4523

Source: Researcher's Computations (from NBS NGHS Wave 1, 2 and 3)

On the other hand, Table 5.10 indicated the Gini estimates for South-East region. It was found that the regional averages for the zone was 0.39 in 2010. This estimate rose to 0.435 in 2016. The index further increased to 0.454 in 2019. This is also in harmony with World Bank's findings (2016:34) that income disparity is rising in South-East region. Their study revealed that, South-Eastern zone of Nigeria also witnessed a rise in income inequality from 0.334 to 0.39 between 2003 and 2013 (World Bank, 2016). From Wave 4 (2019), this study found that, Anambra State has the highest Gini estimate of 0.462, whereas Imo State in the same region was found to have the lowest estimate of 0.443 in 2019.

Table 5.10: Gini-Coefficients of Households in South-East Zone

	WAVE 1 (2010)	WAVE 2 (2013)	WAVE 3 (2016)	WAVE 4 (2019)
<i>South-East Average</i>	0.3904	0.4046	0.4350	0.4542
<i>Abia</i>	0.3753	0.3864	0.4538	0.4561
<i>Imo</i>	0.3414	0.3572	0.4114	0.4434
<i>Enugu</i>	0.4583	0.4735	0.4730	0.4593
<i>Ebonyi</i>	0.4201	0.4362	0.4326	0.4503
<i>Anambra</i>	0.3569	0.3697	0.4042	0.4618

Source: Researcher's Computations (from NBS NGHS Wave 1, 2 and 3)

For South-West zone, the regional average was 0.387 in 2010, 0.403 (2016) and 0.456 in 2019 as shown in Table 5.11. Like other regions, the estimates also revealed that income inequality is rising in the South-West region. Although, this finding contradicts the result of World Bank’s estimate, that found Gini-estimate decline in South-West by 2-point between 2003 and 2013 (see World Bank, 2016).

This study also found that Lagos and Ekiti States have the highest and lowest figures at 0.41 and 0.36 in 2010, respectively. The Gini index rose rapidly to 0.479 and 0.432, respectively in Wave 4 (2019). The indexes imply that, there is hardly any effective welfare and health policies, as the modest increase in income disparity could completely eroded the gains from economic growth over time.

Table 5.11: Gini-Coefficients of Households in South-West Region

	WAVE 1 (2010)	WAVE 2 (2013)	WAVE 3 (2016)	WAVE 4 (2019)
<i>South-West Average</i>	0.3866	0.4016	0.4091	0.4564
<i>Ekiti</i>	0.3748	0.3842	0.3984	0.4317
<i>Ondo</i>	0.3835	0.3997	0.4011	0.4622
<i>Osun</i>	0.3679	0.3745	0.3990	0.4388
<i>Oyo</i>	0.4002	0.4038	0.4064	0.4625
<i>Ogun</i>	0.3814	0.3891	0.3919	0.4634
<i>Lagos</i>	0.4118	0.4481	0.4580	0.4798

Source: Researcher’s Computations (from NBS NGHS Wave 1, 2 and 3)

Based on the NGHPS data, this study found strong evidence for rising income inequality across the 36 states and FCT Abuja except Enugu and Cross Rivers States (see Figure 5.5). By comparison, Akwa-Ibom State recorded the highest Gini-estimate of 0.4854 in 2019.

This is quite surprising because the state is an oil producing state in Nigeria. Though the state is also reported to have the highest rate of unemployment (38%) in 2018 quarter 3 (NBS, 2019). By comparison, Ekiti State has the lowest Gini estimate of 0.432 in 2019 Wave 4.

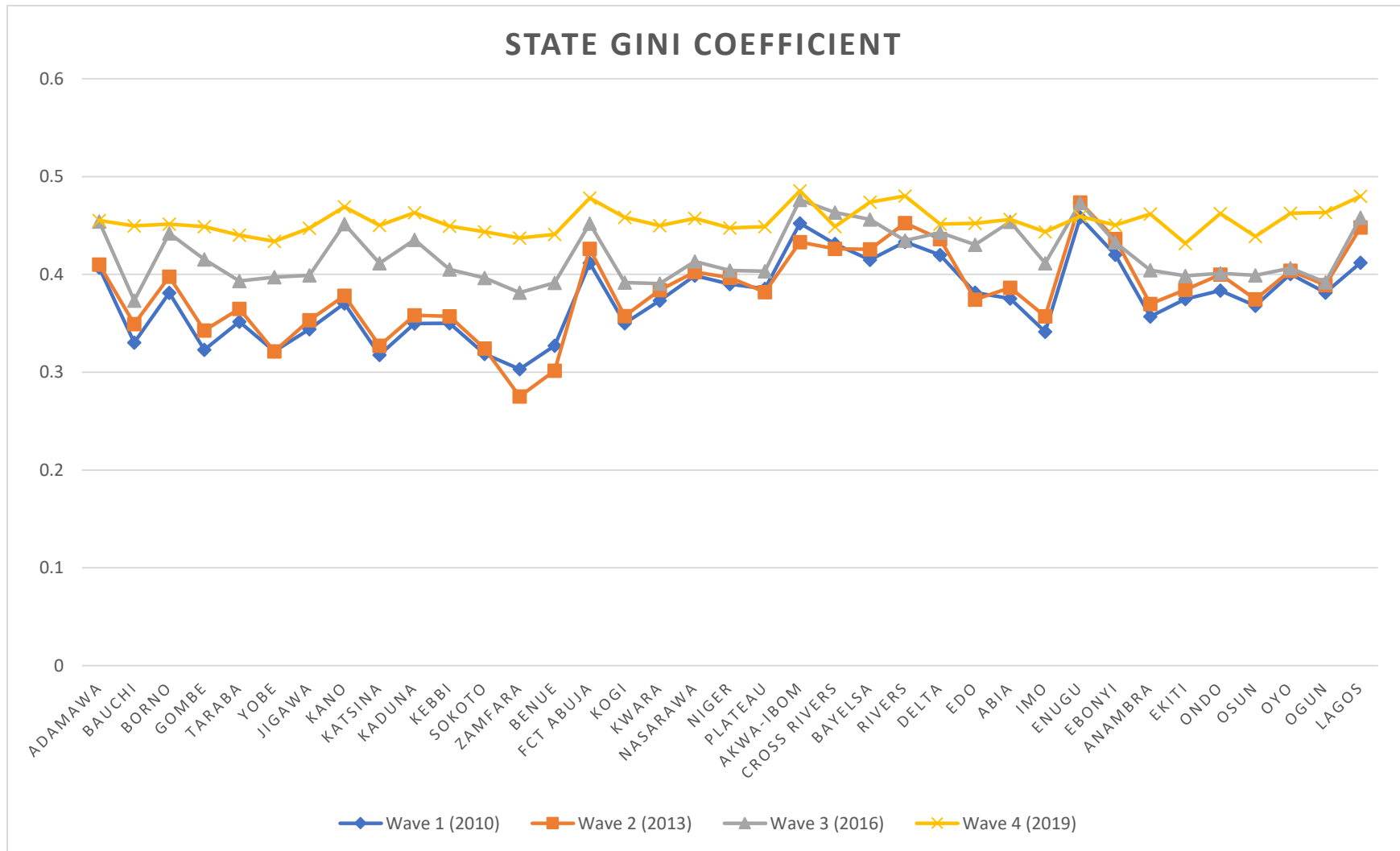


Figure 5.5: Gini Estimates for all the 36 States and FCT Abuja in Nigeria (2010-2019)

Source: Computed from NGHPS – Waves (2010-2019)

At the regional level in Nigeria, South-South region have the highest Gini index of 0.4652 in 2019 (Wave 4), followed by South-East zone of 0.454, while North-East with 0.446 the lowest (Figure 5.6). The same South-South region in Q4 2018 had the highest unemployed persons (5,385,608 people) in Nigeria (NBS, 2019). The findings is in consistent with World Bank’s estimates for 2003 to 2013, except the South-West, where the Gini index fell by almost 2 basis points. (World Bank, 2016). This result also suggest that income disparity rose in all the regions of Nigeria between 2010 and 2019. With high unemployment rate and rising rent-seeking in Nigeria (NBS, 2019), it then implies that economic growth has no trickle-down effect (Lawson and Mariotti, 2018).

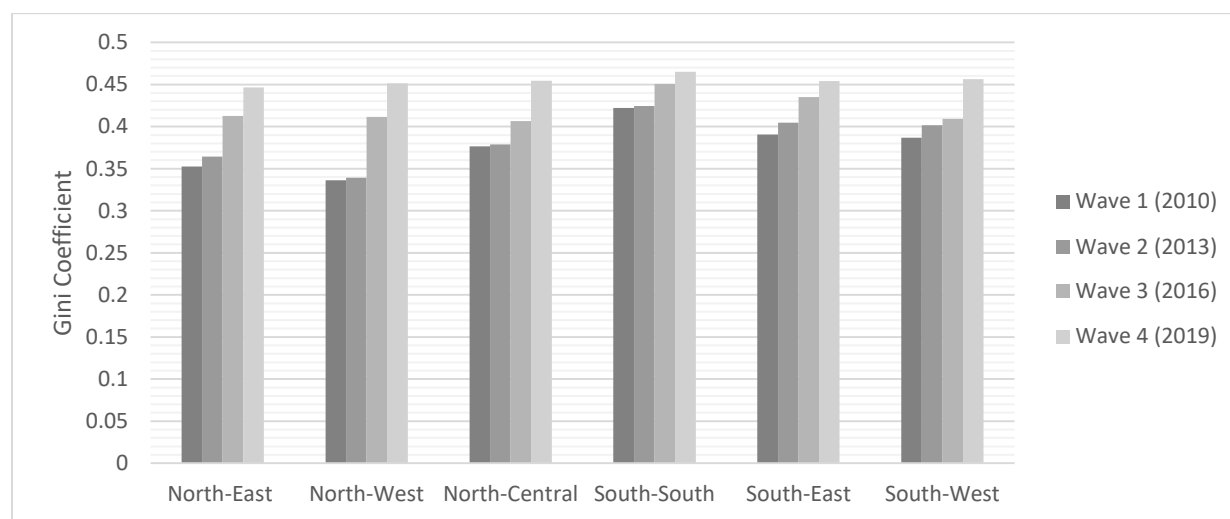


Figure 5.6: Gini Estimates across Geo-political zones in Nigeria

Source: NBS-NGHPS, Waves

At the aggregate level for Nigeria, the magnitude of Gini estimates grew rapidly at 0.455 in 2019 compared to 0.378 in 2010 (Table 5.12). The figures were consistent with previous evidences. For instance, from Gini indices computed from National Living Standard Survey on 18,977 households, Oyekale (2006:25) found that Gini indices rose in all the six geo-political zones between 1998 and 2004. Similar pattern was also observed for both rural and urban sectors in Nigeria.

Table 5.12: Magnitude of Income Inequality in Nigeria (2010-2019)

	Wave 1 (2010)	Wave 2 (2013)	Wave 3 (2016)	Wave 4 (2019)
Gini-estimate	0.378	0.385	0.372	0.455

Source: Computed from NBS-NGHPS Waves

Aigbokhan (2017:4-5) also found that the Gini estimates increased from 0.36 to 0.39 between 2013 and 2016. This was computed from NGHPS data on 5,000 households. These then suggest that income inequality in Nigeria was significantly risen between 2010 and 2019.

5.5 Effect of Income Inequality on Health Outcomes (Illness)

5.5.1 Preliminary Results for NGHPS (All Waves)

A common property of any survey data (including NGHPS) is that every answer to questions from respondents is critical to the quality of results. Hence, the study conducted reliability test. The approach was first developed by Cronbach (1951), and popularly known as Cronbach's Alpha (α). The reliability¹³ tests for validity and strength of all responses are of utmost importance because failure to test this may limit the trustworthiness and consistency of the estimates obtained from the survey and render them biased. It also signifies whether the scales used in the questionnaire are representative and stable over time.

The study's test scale for the reliability coefficient for all variables was fairly high – 0.8439 out of 1 (see Appendix Table G1). This shows that the set of variables as a group are highly consistent, stable and reliable at 84% statistically, as reliability coefficients above 80% are considered reliable (Sarker *et al.* 2018:7). On this basis, related statistical analysis was permissible.

5.5.2 Regression Results for NGHPS Waves

The results of various panel logistic regression analysis – POLS, FE and RE – were shown in Table 5.13, 5.14 and 5.15, respectively. These were from NGHPS Waves. Table 5.13 presents the Pooled OLS estimates, where several of the households' characteristics variables have the expected signs and significant.

The family size has a statistically significant effect on illness – it is positively related to illness, the measure of health outcomes at 1% level. This result show that, for every increase in household membership amidst rising income inequality, the odds¹⁴ of illness increases by 4% for all members. Intuitively, widening income disparity lead to shifts in priorities as family size increases, inhibits purchasing-power of their resources to meet basic needs of each members, and results to more illness. This is because each addition to a family size often requires adjustments and sacrifices by all members, which can lead to health issues (Dasgupta and Solomon, 2017). This finding confirms that members of larger family size had poorer health than those from smaller size (Owoo, 2018:121)

¹³ Cronbach (1951) presents 1 as a perfect reliability, while 0 implies no reliability

¹⁴ The odd ratio (OR) in logistic model is $\frac{p}{1-p}$ where p is the probability of the event occurrence. $Exp(beta)$ or e^{coef} . $(OR - 1) \times 100\% = (\% \text{ changes})$

Table 5.13 POOLED OLS Regression

<i>Dependent Variable: Ill-Health in past four weeks (proxy for Health Outcomes)</i>			
VARIABLES	<i>Coefficient</i>	<i>Odd Ratios</i>	<i>Wald Test (z)</i>
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	0.0381*** (0.0105)	1.0388	3.62
<i>Food, Diet and Calories</i>			
Hunger or No Food	0.3432*** (0.0285)	1.4095	12.06
Gari	-0.0627* (0.0370)	0.9392	-1.69
Rice	-0.2722*** (0.0296)	0.7617	-9.18
Yam, Cassava or Maize Flour	-1.4488*** (0.0287)	0.2348	-50.48
Beans	-0.0136 (0.0327)	0.9865	-0.41
Meat or Fish	-0.0007 (0.0009)	0.9993	-0.77
<i>Highest Education</i>			
None	0.9419*** (0.0262)	2.5648	35.94
Primary Education	-0.0172* (0.0103)	1.0173	-1.67
Secondary Education	-0.1973*** (0.0286)	0.8210	-6.87
Tertiary	-0.6530*** (0.0450)	0.5205	-14.50
<i>Material</i>			
Mosquito Net Possession	-0.4029*** (0.0380)	0.6684	-10.59
<i>Access to Electricity</i>			
Yes	-0.1036*** (0.0237)	0.9015	-4.37
No	0.0265 (0.0181)	1.0269	1.46
<i>Drinkable Water Access</i>			
None	0.1391** (0.0466)	1.1493	2.98
Pipe Borne Water	-0.2498*** (0.0090)	0.7789	-27.86
Borehole or Well Water	-0.0406*** (0.0091)	0.9602	-4.48
River or Spring	1.0729*** (0.0320)	2.9241	33.53
<i>Toilet and Sanitation</i>			
None	0.1658*** (0.0274)	1.1803	6.06
Water or Modern Toilet	-0.2379*** (0.0310)	0.7882	-7.68
Pit or Latrine	0.0035 (0.0039)	1.0036	0.90
<i>Unhealthy Lifestyle</i>			
Alcoholic Consumption	-0.0017 (0.0012)	0.9982	-1.50
Self-Medication during illness	0.2970*** (0.0393)	1.3458	7.57
<i>Health-Seeking Behaviour</i>			
Seeking Healthcare	-0.1665*** (0.0230)	0.8466	-7.23
Others	-0.0023 (0.0132)	0.9977	-0.17
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	-0.0701*** (0.0084)	0.9323	-8.36
Business Enterprises or Trades	-0.0172** (0.0067)	0.9829	-2.58
Farming or Livestock Incomes	-0.3442*** (0.0355)	0.7087	-9.69
Remittances	-0.0185 (0.0183)	0.9817	-1.01
Monetary Transfer/Assistance	-0.2039*** (0.0475)	0.8156	-4.30
Pensions and Grants	0.0122 (0.0380)	1.0122	0.32
Dividend from Investment	0.1129 (0.0707)	1.1195	1.60
Income from Properties Owned	-0.0118 (0.0078)	0.9883	-1.51
INCOME INEQUALITY			
Gini-Coefficient	0.0999*** (0.0277)	1.1051	3.61
Constant (α)	0.4980*** (0.1383)	1.6454	3.60
Pseudo R ²	0.1107		
LR chi ² (34)	6469.49		
Prob >chi ²	0.0000		
Observations	71,410		

NOTE: 1. *Significant at 10%, ** significant at 5% and *** significant at 1%

2. The parentheses denotes the robust standard errors for the estimates

Source: Researcher's Computation using Stata 13

With rising income disparity, the likelihood of being ill also rise significantly by 41% for those households with more hunger at 1% level. A reason for this result may be that widening inequality in income drags-down the ability of household's incomes and creates hunger. Both hunger and mal-nutrition are the underlying causes of weakness, exhaustion, and many chronic health issues, such as, diabetes, ulcer, and cancers (Eckstein *et al.* 2018:9).

However, the effect of carbohydrate, such as, rice, flour (yam, maize or cassava) was found to significantly reduce illness. But, consumption of garri was found to be significant at the 10% level. Basic proteins (beans and meat/fish) were inversely related with ill-health issues. These suggest that availability of these food in a household level is important for well-being. This is not farfetched since foods rich in protein are vital for improved health. But their deficiencies can lead to a variety of health problems, such as, digestion problems, skill disorders, stunted or defective bone growth and dementia – loss of memory (WHO, 2017c).

The results in Table 5.13 further shown that, in the presence of widening income disparity among households, absence of basic education of the household's head is positive and significant with ill-health issues. The study further obtains the odd of illness increase by 0.942 and 0.017 times for those household's head with no basic and primary education, respectively. While those with secondary and tertiary education is negatively related with illness. These are indications that as the income inequality is rising, there may be positive effects of illiteracy on ill-health.

River/spring as the main sources of drinking water, and lack of toilet facility, the use of pit/latrine were all positive and significant to increase illness. Whereas, access to electricity, borehole, pipe-borne water, water or modern toilet, and seeking appropriate healthcare services were negatively and significantly associated with health issues. For example, the likelihood of ill-health issues arising was 7.2%, 83%, 35%, and 70% for households with river or spring as the main sources of drinking water, lack of toilet facility, the use of pit/latrine, and self-medication, respectively. These supports the neo-material argument and some studies (Lundberg *et al.* 2010; Hill *et al.* 2019), that every household needs certain and indispensable goods for healthy lives.

It was also found that alcoholic consumption and accessing non-orthodox healthcare providers (traditionalist or chemist) reduces the possibility of ill-health. Nevertheless, they were found to be insignificant. One explanation for this is partly due to rising income disparity that cause frustration, depression, and chronic stress and in turn, the consumption of excess alcohol and smoking. These

are main determinant of heart diseases, and lung cancers (WHO, 2017c). Whereas rising supply of modern traditional medicines in recent years probably reduces illness. However, lack of adequate regulation and standardization of traditional-care practices have great health consequences on households.

The Table 5.13 further indicates that the various sources of income except pensions and dividend significantly reduce ill-health issues. This result suggests that the current pension reforms in Nigeria is not providing a decent income to present ageing cohorts. Perhaps the fear and stress associated with pension process might result to high blood pressure, heart failure and stroke. Also, part of income that is related to high income class is dominant in dividend. Result further show that for increase in wages and salaries, business, enterprises and trade of households' heads related with illness reduction.

Another important finding is that the odd ratio of illness increases by 11% from rising income inequality at the 1% significance level. The result show that the effect of income inequality on health outcomes is positive and significant statistically. Widening income disparities are said to have a range of detrimental effects. As such, it can hinder improved health outcomes, through frustration, depression and chronic stress. This is also consistent with the income inequality-health hypothesis that rising income inequality is detrimental to chronic illness

The overall probability-value of the model is highly significant with lowest value of 0.0000, and high LR chi-square of 6,470. In spite of this, these findings may be explained by the fact that the POLS model estimators assume that all poor and non-poor households are homogenous across Nigeria.

The fixed effect model overcomes this limitation and the estimation output is presented in Table 5.14. Similar to the POLS regression result, the results conform to *apriori*, except primary education, river/spring as the main source of drinking water, pensions, interest and dividends. The result also shows a positive and significant effect of higher family size on illness. In another words, in the presence of rising income disparity, any addition to the family size would worsen illness by 0.39%. This finding is alike to what was obtained in POL regression model. It suggests that in the presence of widening income disparity, any new addition to family size have high likelihood to worsen ill-health.

Table 5.14 FIXED EFFECT ESTIMATION

<i>Dependent Variable: Ill-Health in past four weeks</i>			
VARIABLES	<i>Coefficient</i>	<i>Odd Ratios</i>	<i>Wald Test (z)</i>
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	0.0039** (0.0012)	1.0039	3.14
<i>Food, Diet and Calories</i>			
Hunger or No Food	0.0459*** (0.0037)	1.0469	12.50
Gari	-0.0078* (0.0041)	0.9922	-1.89
Rice	-0.0469*** (0.0036)	0.9542	-13.21
Yam, Cassava or Maize Flour	-0.1829*** (0.0033)	0.8329	-55.51
Beans	-0.0149*** (0.0039)	0.9852	-3.81
Meat or Fish	-0.0001 (0.0012)	0.9999	-1.45
<i>Highest Education</i>			
None	0.1445*** (0.0034)	1.1555	43.14
Primary Education	0.0002 (0.0011)	1.0002	0.16
Secondary Education	-0.0259*** (0.0033)	0.9744	-7.81
Tertiary	-0.0914*** (0.0054)	0.9127	-16.82
<i>Material</i>			
Mosquito Net Possession	-0.0606*** (0.0047)	0.9412	-12.94
<i>Access to Electricity</i>			
Yes	-0.0085*** (0.0023)	0.9915	-3.76
No	0.0038 (0.0020)	1.0038	1.91
<i>Drinkable Water Access</i>			
None	0.0287*** (0.0051)	1.0291	5.64
Pipe Borne Water	-0.0295*** (0.0011)	0.9709	-27.70
Borehole or Well Water	-0.0041*** (0.0010)	0.9959	-3.99
River or Spring	0.1406*** (0.0036)	1.1510	38.85
<i>Toilet and Sanitation</i>			
None	0.0277*** (0.0034)	1.0281	8.16
Water or Modern Toilet	-0.0282*** (0.0033)	0.9722	-8.65
Pit or Latrine	-0.0005 (0.0004)	0.9995	-1.23
<i>Unhealthy Lifestyle</i>			
Alcoholic Consumption	-0.0003 (0.0001)	0.9997	-0.21
Self-Medication during illness	0.0364*** (0.0047)	1.0371	7.74
<i>Health-Seeking Behaviour</i>			
Seeking Healthcare	-0.0187*** (0.0025)	0.9815	-7.38
Others	-0.0004 (0.0013)	0.9996	-0.34
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	-0.0124*** (0.0009)	0.9877	-13.25
Business Enterprises or Trades	-0.0024** (0.0007)	0.9976	-3.33
Farming or Livestock Incomes	-0.0415*** (0.0039)	0.9593	-10.53
Remittances	-0.0031 (0.0021)	0.9969	-1.48
Monetary Transfer/Assistance	-0.0208*** (0.0045)	0.9794	-4.60
Pensions and Grants	0.0011 (0.0041)	1.0011	0.27
Dividend from Investment	0.0142* (0.0078)	1.0143	1.83
Income from Properties Owned	-0.0014* (0.0009)	0.9986	-1.68
INCOME INEQUALITY			
Gini-Coefficient	0.0144*** (0.0032)	1.0145	4.43
Constant (α)	0.4601*** (0.0159)	1.5842	28.88
Pseudo R ²	0.1040		
F (34, 71,339)	232.65		
Prob >F	0.0000		
Number of groups	37		
Observations	71,410		

NOTE: 1. *Significant at 10%, ** significant at 5% and *** significant at 1%

2. The parentheses denotes the robust standard errors for the estimates

Source: Researcher's Computation using Stata 13

Another important finding is that as hunger and malnutrition intensifies, the likelihood of people to experience health issues rise significantly. This is not farfetched as it is consistent with POL model. In terms of nutritional intake, carbohydrate foods, such as, rice, and flour (yam, cassava or maize) significantly reduce illness. Nevertheless, contrary to POL result, basic protein from beans in FE model associated with decline in illness. This is not surprising, as nutritional value from beans is connected with body growth, supply of blood, and vitamins. Probably, the main nutrient gains from beans may reduce ill-health. Though the nutritional value from meat and fish contradict the expect sign, the coefficient is negative but statistically non-significant. The main conclusion that can be drawn from this result is that there is an indication that eating much of meat have a significant role to worsen the health of people above the age 45 years.

Turning to the effect of education, the estimate of no basic education shows positive and significant coefficient. This mean that household without basic education may experience more health issues. This is consistent with POL regression, however, unlike POL model, primary education indicates positive but statistically non-significant. It probably implies that; primary educational qualification is not enough to reduce illness. In opposite direction, both secondary and tertiary education were negative and significant. This is an indication that quality education is paramount to health.

In line with neo-material theory and POL regression, mosquito-net possession, dwelling connected to electricity, pipe-borne water, and water toilet reduce illness significantly. This result show that access to quality and quantity health-producing goods and services can reduce ill-health. Whereas, no availability of these goods and services worsen illness. Similarly, seeking appropriate medical-care services was negatively and statistically related to ill-health, meaning access to healthcare improves health status. In opposition, self-medication during illness increase the chance of poor health outcomes.

Like POL results, all the income sources had the expected negative signs excluding pension and dividend from investment which turned out to be positive. Wages and salaries, business and trade income, farming and monetary transfer were found to reduce illness significantly. However, pension, and dividend from investment worsen illness. Dividend was significant and negative at 10% significance level and this may be explained by the fact that it is a sort of transitory income as firm losses may not result to dividend payout.

The effect of Gini coefficient on illness is positive and statistically significant at 1% level. The estimation results show that as income disparity is widening, chronic illness rises. Specifically, for every 1% rise in income inequality among households, the likelihood of ill-health increases by 1.45%. Again, this result is consistent with POLS model and Wilkinson's income inequality-health hypothesis. This suggests that widening income inequality is detrimental to health outcomes in Nigeria. The model also performed satisfactorily as indicated by the diagnostic tests, where the p-value is as low as 0.0000 with high F-statistics of 232.65.

The third model is the Random Effect (RE) estimation and the results are presented in Table 5.14. Like POLS and FE models, findings also show that the coefficient of family size is positive and significant. That is, for every addition to the households' size, illness increases by 0.4%. This means that lesser resources are available to cater for family members as the number of individuals in the households rise. This is not surprising because, rising household size implies higher needs and constrained budget as income disparity is increasing. This tends to worsen welfare and reduces ability to obtain health-promoting goods and services. This concurs to the hypothesis by Becker and Lewis (1973) that households with lower family size are more likely to have better health outcomes.

The result also shows that hunger and lack of adequate nutritional intake have a higher likelihood causing poorer health outcomes. For instance, an increase in hunger by 1% increases ill-health by 47%. This is an indication that, hunger causes nutritional deficiency; a situation where body does not adequately absorb or derive requisite nutrients from food consumed. Hunger also leads to variety of health issues, such as skin disorders, stunted bone growth, and dementia –loss of memory (WHO, 2018a). The study presents evidence showing that consumption of food rich in carbohydrate and proteins are important for health status. These results are consistent with Rozer and Kraaykamp (2012), Wright *et al.* (2017) who find that healthy diet helps to fight against type II diabetes and cancer. Also, Food Research and Action (2018) note that healthy diets provide requisite energy and protein that reduce vulnerability to chronic ailments.

The estimate of households that possess treated mosquito-net experience healthy outcomes with the likelihood of 6%. This result is in line with the findings of Nuwamanya *et al.* (2018) who found that ownership and utilization of long-lasting treated nets significantly reduce the chances of malaria infection in Mbarara Municipality, Uganda.

Table 5.15 RANDOM EFFECT ESTIMATION

<i>Dependent Variable: Ill-Health in past four weeks</i>			
VARIABLES	<i>Coefficient</i>	<i>Odd Ratios</i>	<i>Wald Test (z)</i>
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	0.0040** (0.0012)	1.0040	3.21
<i>Food, Diet and Calories</i>			
Hunger or No Food	0.0457*** (0.0037)	1.0468	12.52
Gari	-0.0081** (0.0041)	0.9919	-1.97
Rice	-0.0464*** (0.0035)	0.9547	-13.11
Yam, Cassava or Maize Flour	-0.1836*** (0.0033)	0.8323	-55.72
Beans	-0.0149*** (0.0039)	0.9852	-3.82
Meat or Fish	-0.0001 (0.0001)	0.9999	-1.30
<i>Highest Education</i>			
None	0.1456*** (0.0034)	1.1567	43.43
Primary Education	0.0005 (0.0012)	1.0005	0.42
Secondary Education	-0.0257*** (0.0033)	0.9746	-7.74
Tertiary	-0.0913*** (0.0054)	0.9127	-16.79
<i>Material</i>			
Mosquito Net Possession	-0.0609*** (0.0047)	0.9409	-13.00
<i>Access to Electricity</i>			
Yes	-0.0084*** (0.0023)	0.9916	-3.73
No	0.0036 (0.0020)	1.0036	1.82
<i>Drinkable Water Access</i>			
None	0.0282*** (0.0051)	1.0286	5.56
Pipe Borne Water	-0.0299*** (0.0011)	0.9705	-28.24
Borehole or Well Water	-0.0040*** (0.0010)	0.9960	-3.96
River or Spring	0.1413*** (0.0036)	1.1518	38.99
<i>Toilet and Sanitation</i>			
None	0.0275*** (0.0034)	1.0279	8.09
Water or Modern Toilet	-0.0284*** (0.0033)	0.9720	-8.73
Pit or Latrine	-0.0005 (0.0004)	0.9995	-1.03
<i>Unhealthy Lifestyle</i>			
Alcoholic Consumption	-0.0003 (0.0001)	0.9997	-0.33
Self-Medication during illness	0.0372*** (0.0047)	1.0379	7.92
<i>Health-Seeking Behaviour</i>			
Seeking Healthcare	-0.0188*** (0.0025)	0.9814	-7.42
Others	-0.0004 (0.0013)	0.9996	-0.31
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	-0.0124*** (0.0009)	0.9877	-13.25
Business Enterprises or Trades	-0.0024** (0.0007)	0.9976	-3.34
Farming or Livestock Incomes	-0.0425*** (0.0039)	0.9584	-10.78
Remittances	-0.0027 (0.0021)	0.9973	-1.29
Monetary Transfer/Assistance	-0.0219*** (0.0045)	0.9783	-4.86
Pensions and Grants	0.0009 (0.0041)	1.0001	0.21
Dividend from Investment	0.0142* (0.0078)	1.0143	1.83
Income from Properties Owned	-0.0014* (0.0009)	0.9986	-1.64
INCOME INEQUALITY			
Gini-Coefficient	0.0136*** (0.0032)	1.0137	4.18
Constant (α)	0.4612*** (0.0160)	1.5860	28.80
Pseudo R ²	0.1041		
Wald chi ² (34)	7,996		
Prob >Chi ²	0.0000		
Number of groups	37		
Observations	71,410		

NOTE: 1. *Significant at 10%, ** significant at 5% and *** significant at 1%

2. The parentheses denotes the robust standard errors for the estimates

Source: Researcher's Computation using Stata 13

Table 5.15 further show the likelihood of household's head without basic education magnifies proneness to illness in his/her household is 16%. This implies that low literacy level in unequal societies is detrimental to health outcomes. On the other hand, secondary and tertiary education of the household heads is negatively and significantly related with ill-health, recording declines of 3% and 9%, respectively. It shows that, better health outcomes are more likely to be related with higher educational attainment (Liu, 2017:7). This conforms with previous studies such as Zajacova and Lawrence (2018) who found that adults with higher education live healthier lives compared with their less educated peers in United States.

The result also shows that access to electricity reduces illness significantly. This suggest that having access to electricity could contribute positively to health outcomes, as it provide lighting, and used to power domestic appliances like television, radio, fans and more. These are key to reducing daily stress, depression, frustration and status anxiety resulting from widening income inequality. It also provides comfort that improves health outcomes. In opposition, dwellings without electricity is positively related with illness, but statistically non-significant. This further allude that rising income inequality is an indicative of higher cost that low income households have to pay to access healthy goods and services due to the hike in electricity tariffs. This imply that access to electricity is paramount to healthy lives among households, which was also in consistent with the studies of Abokyi (2018) and Faisal (2018) who noted that the use of electricity has significantly improved the health of citizens in Ghana and Iceland, respectively.

The RE results further shows that better access to safe water led to a 3% decline in health outcomes. Whereas 1% rise in river/spring as main source of water worse ill-health by 15%. The estimate for borehole/well water, and water/modern toilet show an inverse and significant effect on illness, where those households with access to modern toilet, the possibility of their members to experience healthy outcomes was 2.8%. This show that none availability of safe water, no toilet/sanitation, and river/spring as the main source of water, worsen illness significantly. It then implies that access to safe and drinkable water is an important infrastructure that can help reduce the prevalence and incidence of infectious diseases that could result to illness. The results also confirm that greater access to basic services, such as, clean water and sanitary toilet facilities is correlated with better health outcomes. This is in line with POLS and FE models, and Ribeiro (2018) who found access to safe and improve water reduces infant deaths in Brazil significantly.

Self-medication was found to be positive and significantly related with illness by 4% likelihood. But the estimate of alcoholic consumption was statistically non-significant to reduce ill-health. In specific terms, a percentage rise in self-medication results to health complications by 4%. This is an indication that the harms caused by alcohol and self-medication are mediated by inequality in income. Perhaps, income disparity produces a kind of ‘economic or status envy’, chronic stress, frustration, and depression, and then could possibly leads to more alcohol-drinking or other drug consumption that worsen health status. It then implies that income inequality enforces households to anti-health behavior that affect their health status. This is in line with both POLS and FE model, and Cerda *et al.* (2011) that found the Gini-coefficient of above 0.24 lead to hard drugs or alcohol consumption significantly, and this negatively impact health status in Australia.

Another important variable that affects health outcome in RE model is income. This has been well documented in the literature (see Bourguignon, 2004; Benzeval *et al.*, 2014; and Goodman, 2015). They noted that increased income disparity related with high unemployment and lack of investment in education that can generate future incomes. This thesis lends support to extant studies that income from wages and salaries, entrepreneurship or trading, farming or livestock, and conditional transfers have strong likelihood to reduce illness. Furthermore, dividend/interest from investment were found to exert a positive and significant impact on ill-health. This may be explained by the fact that dividend/returns from investment are often characterized by uncertainty and are susceptible to shocks. This may dampen constrain household health budget. The result then shows that wider disparities in income maybe related with low or no income for some quintile of the society, leading to social isolation, stress and, ultimately health issues. This result is consistent with Novignon *et al.* (2017) who observed that conditional cash transfer is key to improving health outcomes.

The most important revelation of the RE model is that the effect of income disparity worsen illness at 1% significant level. The study found that an increase in income inequality by a percentage basis point increases the likelihood of household ill-health by 1.4%. This implies that income inequality has severe health implications. It may lead to more stress, frustration, depression, anxiety, and then proneness to illness. Also, increase social dysfunctions, such as, theft, low trust, and kidnapping issues. Consequently, this leads to fear and shock that relate to stroke, heart-failure and high-blood pressure. These results not only correspond with Wilkinson’s hypothesis, but also the finding by Hill *et al.* (2019) who observed that income disparity reduces health outcome in United States.

Finally, the constant estimate was also significant at 1% level. The likelihood ratio statistics as indicated by Wald chi-squared was 7,996. This was highly significant at probability ($p < 0.0001$) suggesting the model has a strong explaining power. Now the paramount question is, which of these regression models (POLS, FE and RE) is most appropriate. This led to heterogeneity (the Breusch-Pagan Lagrange Multiplier) and Hausman specification tests.

5.5.3 Heterogeneity Test: Breusch-Pagan Lagrange Multiplier

The POLS model assumed every household in 36 states and FCT Abuja are the same.¹⁵ However, severe biases can arise from this, because it suggests that there are *no* unique attributes of individual states within the geo-political zones in Nigeria. Such assumption is highly restrictive in a panel with heterogeneous households (Sarker *et al.*, 2018). Hence to check the homogeneity or heterogeneity of NGHPS Waves, the Breusch-Pagan LM was employed (see Molla *et al.*, 2017). The null hypothesis (H_0) of the test is homoskedasticity of households and states in Nigeria, that is, POL might be the appropriate model (as Table 5.16 presented).

Table 5.16: Homogeneity Test Results for NGHPS Waves

<i>Homogeneity Test</i>	<i>Chi²</i>	<i>Probability</i>	<i>Remark</i>
Breusch-Pagan	21,144.93	0.0000	Since the p-values of Breusch-Pagan test is below 0.01 level, the model is heterogenous

Source: Researcher's Computation using Stata 13

The BP test statistic has a significant p-values and this suggest that the model does *not* suffer from heteroskedasticity problem. Thus, we conclude that there is considerable heterogeneity across the 36 states of the federation and thus the POL model may not be appropriate in explaining poor health outcomes in Nigeria. This was consistent with the studies of Anyamele *et al.* (2015:7) who observed that households across the 36 states and FCT Abuja are not the same.

5.5.4 Hausman Specification Test

The Fixed Effect (FE) model assumes that there are unique attributes of individual states to predict their level of income inequality and health outcomes. On the contrary, the RE model assumes that there are unique time constant attributes of states that are not correlated. Thus, to specify the appropriate model between FE and RE, Hausman specification test was applied.

¹⁵ POLS model is simply an OLS technique run on panel data. Thus, all individually specific effects are completely ignored in this model; and due to that a lot of basic assumptions of FE and RE models like orthogonality of error term are violated.

The null hypotheses (H_0) for Hausman test is that RE model is appropriate and consistent when the p-value is high. This is against the alternate (H_1) of FE model is appropriate when the p-value is close to 0. Table 5.17 then presents the Hausman test from the NBS-NGHPS waves.

Table 5.17: Hausman Test Results from NGHPS Waves

	<i>Chi-squared Statistics</i>	<i>Probability</i>	<i>Model Indicated</i>
Regressions	6.18	1.0000	RE Model

Source: Researcher's Estimation from Stata 13

It was revealed that the probability value of the Hausman's estimation is as high as 1.0000, with low chi-squared statistics of 6.18. Therefore, since the p-value of the Hausman specification test is 1, the study concluded that the RE model is more appropriate for analyzing the direct and indirect effect of income inequality on household health outcomes (illness) in Nigeria.

5.5.5 Robustness Checks for Income Inequality-Health Outcomes Effect

The estimated RE estimation, the preferred model based on the Hausman test was then checked if its findings were sensitive to estimation techniques used. Thus, the datasets were re-estimated using multi-level approach (see Rabe-Hesketh and Skrondal, 2006; Beck, 2019; Argurs-Collins, 2019). This is important because the effect of income disparity on health is indirectly associated with different level-factors – from individual, household to state factors. Unlike the traditional panel logistic technique, multilevel approach may not have a time dimension (Beck, 2019). However, using this approach for robustness check makes it possible to differentiate the main effects of households- and state-level factors on health through the income disparity channel.

The results from multilevel model (see Table 5.18) are almost identical and confirm all the major findings (RE model). The results reveal that family size, hunger, absence of basic education for household heads, lack of access to water, lack of toilet facility, and self-medication were significantly positively correlated with the self-reported health outcome (illness). These findings were also obtained in RE model.

These results provide strong support for the indirect effect of income inequality through these households' characteristics on health outcomes (illness). This suggests that larger family size, hunger/malnutrition, household head's absence of basic education, lack of clean water, lack of toilet facility, and self-medication are the significant links in the transmission of the effects of income inequality on health outcomes in Nigeria.

Table 5.18: Robustness Check: Multilevel Logistic Regression

<i>MULTILEVEL LOGISTIC REGRESSION – NGHPS WAVES</i>		
	<i>Coefficient</i>	<i>Wald Test</i>
LEVEL 1:		
Family Size	0.03714*** (0.0105)	3.52
Food, Diet and Calories		
Hunger or No Food	0.3414*** (0.0285)	11.99
Gari	-0.0612* (0.0370)	-1.66
Rice	-0.2721*** (0.0296)	-9.18
Yam, Cassava or Maize Flour	-1.4512*** (0.02872)	-50.51
Beans	-0.0189 (0.0327)	-0.53
Meat or Fish	-0.0008 (0.0009)	-0.83
Highest Education		
None	0.9422*** (0.0262)	35.93
Primary Education	0.0160 (0.0103)	1.56
Secondary Education	-0.1960*** (0.0288)	-6.80
Tertiary	-0.6792*** (0.0464)	-14.64
Material		
Mosquito Net Possession	-0.3969*** (0.0381)	-10.41
Access to Electricity		
Yes	-0.1018*** (0.0238)	-4.28
No	0.0297 (0.0181)	1.64
Drinkable Water Access		
None	0.1403** (0.0467)	3.01
Pipe Borne Water	-0.2501*** (0.0090)	-27.87
Borehole or Well Water	-0.0393*** (0.0091)	-4.33
River or Spring	1.0735*** (0.0320)	33.53
Toilet and Sanitation		
None	0.1573*** (0.0276)	5.70
Water or Modern Toilet	-0.2364*** (0.0309)	-7.64
Pit or Latrine	0.0035* (0.0039)	0.88
Unhealthy Lifestyle		
Alcoholic Consumption	-0.0017 (0.0012)	-1.49
Self-Medication during illness	0.2750*** (0.0405)	6.79
Health-Seeking Behaviour		
Seeking Healthcare	-0.1568*** (0.0233)	-6.72
Others	-0.0021 (0.0131)	-0.16
HOUSEHOLDS' TOTAL INCOME		
Wages and Salaries Incomes	-0.0686*** (0.0084)	-8.17
Business Enterprises or Trades	-0.0192** (0.0067)	-2.86
Farming or Livestock Incomes	-0.3507*** (0.0356)	-9.85
Remittances	-0.0202 (0.0183)	-1.10
Monetary Transfer/Assistance	-0.2145*** (0.0478)	-4.49
Pensions and Grants	0.0156 (0.0380)	0.41
Dividend from Investment	0.1127 (0.0706)	1.60
Income from Properties Owned	-0.0122 (0.0079)	-1.55
Constant	0.6499*** (0.1836)	3.54
LEVEL 2:		
Gini coefficient (σ^2)	0.0582* (0.0560)	1.04
Observations	71,410	
Wald chi ² (33)	5,558.01	
Probability	0.0000	

*, **, and *** significant at 10%, 5% and 1%, and
 The parentheses denote the robust standard errors for the estimates
 Source: Researcher's Computation using Stata 13

The Multi-level estimates further shows that consumption of carbohydrate, possession of mosquito net, secondary and higher education, dwelling connectivity to electricity, pipe borne, borehole/well water, and seeking medication led to a significant reduction in illness. These also provide supports for RE model's findings.

The most important result of the analysis is the effect of income inequality. In multilevel model, the influence of income disparity on poor health outcome (illness) is also significant and positive. It was revealed that an increase in income inequality by 1% increases the illness by 1.06%. This magnitude is slightly smaller than 1.4% obtained in RE model. Nevertheless, both Multi-level and RE results are positive and statistically significant, meaning that higher income disparity among households have a range of detrimental health effects. These findings also support Wilkinson's hypothesis that income inequality can hinder better health outcomes and health policies.

5.5.6 Evidence from Individual Wave Estimations

Furthermore, evidence from individual waves (2010, 2013, 2016, and 2019) also show that rising income disparity is detrimental to illness in Nigeria. For instance, Wave I (2010) data as presented in Appendix Table H4, indicates that an increase in family size has the likelihood of worsening illness by 15%. Hunger and lack of nutrient have the odds of increasing ill-health by 19%. The findings indicate that 1% rise in access to rice and beans decline ill-health significantly by 51% and 38%, respectively. But the effect of meat/fish was marginally 0.03% to reduce illness significantly. This is in opposition to RE estimate. The odd of Garri consumption increasing ill-health is 0.9453 (5.5%) as income disparity rises. The result suggests that members of households having quality and more meals per day are less malnourished, but the intake of meat does not seem to matter.

The likelihood of household head without basic education intensifies proneness to illness in his or her household by 33%. While the odd of illness reduces by 0.9 times (0.92%) significantly for household's head with tertiary education. As expected in a setting with rising income inequality, household's head with a quality education is an important determinant of positive health outcomes. This finding is in line with previous RE model.

Similarly, from 2010/2011 dataset, no electricity supply, heads' alcoholic drinking, and healthcare seeking from inappropriate associated with more illness but insignificantly. In terms of lack of water, the odd of households' members experiencing more illness is 1.2410 (24%). As the use of

pit and latrine increase by 1%, health outcome was found to worsen by 30.5%. The odd of ill-health for households' dwelling without connectivity to electricity is 1 time. On the other hand, as income inequality rises by 1%, ill-health issues increases by 4.6% for those household's heads with alcoholic drinking significantly.

Mosquito-net possession, access to electricity, and pipe-borne water indicates an inverse and significant effect on ill-health. The odd of illness reduce by 0.66 and 0.62 for electricity access and pipe-borne water, respectively. For households with access to water/modern toilet, the likelihood of their members to experience illness is significant and negative at the 10% significance level. In other words, as access to water and modern toilet facilities improve by a percentage basis point, possibility of illness reduces by 13%. This also provide support for the estimate in RE model.

Incomes from wages and salaries, business and trade, farming, pensions and monetary transfer were found to significantly reduce illness. For instance, a percentage increase in wage and salaries, business and trade, and farm earnings reduce illness by 23%, 16.5%, and 26%, respectively while the odd of illness reduces by 0.95 (5%) and 0.93 (7.4%) for pension and monetary transfer. But for every 1% rise in returns to investment and remittance, illness falls by 18% and 27%, respectively. This means that better incomes provide ample opportunity to access good health services.

The effect of income inequality on illness is positive and significant at 1% level, meaning that for every 1% rise in income inequality among households, the likelihood of ill-health increases by about 2.8%. A positive income inequality-health is also compatible with ideas of Wilkinson (1996) who suggest that income disparity could exert a positive influence on poor health outcomes (illness). The likelihood ratio statistics as indicated by chi-squared value of 3,224 was highly significant at 5% significance level indicating the model has a strong explanatory power.

Additionally, evidence from Wave 2 (2013) data as presented in Appendix I4 show that, the likelihood of members experiencing illness is as high as 83%, for any new addition to the household. This thesis also found that hunger and lack of nutrient have more likelihood of increasing poor health outcomes by about 75%. But treated mosquito-net possession leads to a decrease in ill-health, recording 48%. The use of inappropriate health-care services is related with ill-health by 17% likelihood positively. Also, the likelihood of household's members with her head

without basic education experiencing illness is 0.81%. On the contrary, access to electricity improve health outcome by 6%. Better access to pipe-borne drinkable water was found to reduce illness by 13%.

Incomes from wages and salaries, business enterprises and trade, crop and livestock, conditional transfers, and pensions have strong likelihood to reduce illness. Notwithstanding, dividend from investments is significant but positively correlated with ill-health. Importantly, the probability of income inequality worsens illness is 2.96%.

Evidence from Wave 3 (2016) data (see Appendix J3) indicates that the likelihood of households' members experiencing illness is 4.6%, for any new addition to the family size. It was found that hunger and lack of nutrient increase poor health outcomes by about 31%. On the other hand, the probability of treated mosquito-net possession declines illness is 9% significantly. The uses of inappropriate health-care services are associated with illness by 0.51%. It was also found that the likelihood of a household headed by an individual without basic education experiencing illness is 57%. But, the head's possession of primary, secondary and tertiary educational qualifications declines illness.

Like the RE estimates, the probability of dwellings connected to electricity deteriorate ill-health by 0.12%. Access to pipe-borne safe water was also related with a declining illness by 15%. Also, incomes from wages and salaries, business enterprises and trade, crop and livestock, conditional transfers, and pensions have strong likelihood to reduce illness. Finally, the probability of income inequality worsens illness is 3%. Though this is higher than the estimates obtained in RE model, however, both have the same signs and statistically significant. The diagnostic tests for all the models were satisfactory and thus validate the potency of the models.

From the foregoing, all estimates from the Panel logistic on all NGHPS data, Multi-level technique and individual waves' estimations show that it is apparent that the drive towards promoting healthy society in Nigeria may be stifled by widening income disparity both directly and indirectly. Income inequality could have a *direct effect* on poor health outcome (illness) by affecting Nigerian's psychosocial wellbeing. This is because the perceptions of relative inequality in status differentials due to income inequality could lead to negative emotions that translate into poor health outcomes. This suggest that, as income disparity increases, psychosocial stress would rise, which reduces the state of health.

The result also implies that the widening income inequality in Nigeria show greater differences between citizens, produces higher level of competition, and competition are thought to increase frustration and stress among households. This is not surprising as a growing body of evidence has also demonstrated that income inequality is associated with several chronic health problems (see for example, Wilkinson, 1992, 1996; Liu, 2017; Patel, 2018; and Kim, 2019). These findings are also in line with Wilkinson's perspective, that income inequality is detrimental poorer health outcomes (illness).

Again, this study further shows that the direct effect of income inequality could be through increased social dysfunction, and reduced social trust and social cohesion, such as, theft, kidnapping issues, high homicide and crime rates. These intensify fear, shock and insecurity for all citizens. All these worsen their health status. This then imply that widening income inequality has negative health-consequences for the richest as well as the poorest people. Some studies carried out in Canada and South Africa by Liu (2017) and Adjaye-Gbewonjo (2018), respectively, show that income inequality hurts everyone, while the non-rich individuals suffer most. They receive little protection from the police or legal systems and cannot afford to pay for private security measures. The fear and shock related with rising income inequality results to high-blood pressure, stroke and heart failure.

On the other hand, the results also shown that household's characteristics mediate the association between income disparity and health. This is the income inequality-health *indirect* links. The study's results indicated that the indirect effects of rising income inequality pass-through households' characteristics. This could be explained by the fact that people may try to cope with psychosocial stress by seeking rewards from other sources, but as they become more susceptible to unhealthy food or additions, which results in more health-related problems, such as, diabetes and lung diseases. It suggests that energy-supplied from carbohydrates – rice and flour – and basic protein from meat/fish would improve health status, however, households without these healthy foods due to rising income disparity that reduce their purchasing-power of their incomes will experience poor health outcomes.

Other mechanisms mediating the effect of income disparity on health outcome are more education, possession of treated-mosquito net, access to pipe-borne drinking water, borehole or well water, water or modern toilet and seeking appropriate healthcare. However, with income inequality, the risk of ill-health increased in households that lack such facilities. These are in consistent with Hill *et al.* (2019) that pollution mediate income inequality-health effect in United States.

5.6 Estimates of the Effect of Income Inequality on Health-Seeking Behaviour

5.6.1 Preliminary Results for NGHPS (All Waves)

The reliability coefficients from the Cronbach's Alpha tests for all NGHPS Waves was 0.861 (see Appendix Table K1). This result implies that the variables used for estimations by wave and as a group are consistent. It also means that the responses are highly reliable for estimation.

5.6.2 Regression Results for NGHPS Waves

The study then presents the estimates of the effect of income inequality on HSB among households in Nigeria. The estimations from the panel logistic regressions – pool OLS, FE and RE models – are presented in Tables 5.19, 5.20, and 5.21, respectively. For each of the models, column 1 shows the explanatory variables, column 2 presents the coefficient of the estimates, while column 3 and 4 indicate the odd ratio and Wald tests, respectively.

From the Pooled OLS estimates as presented in Table 5.19 (see Appendix Table K2), households' size is negatively related with appropriate healthcare consultation. From the estimations, it was found that anytime income disparity rises, increase in household's size has more likelihood of leading to seeking inappropriate healthcare services. Specifically, for any new additional member to the family size, the possibility of seeking healthcare from traditionalist or self-medication increased by 52% significantly. The negative effect of income inequality on appropriate HSB meets *a priori* expectation. The findings suggest that rising income disparity is likely to weaken the purchasing-power of household's income to meet the timely health needs of its member, especially in times of ill-health. These findings confirm to Grossman's theory that high purchasing-power of income would lead to more demand of medical-care services.

Table 5.19 further show that, literacy level explains medical consultation in times of illnesses for households' members. It was found that, household's heads with no basic education will likely seek inappropriate healthcare services, as income disparity is rising. But, for those with primary, secondary and higher degrees, it was found that they will seek appropriate medical-care. That is, educational level is statistically significant and positively related with appropriate HSB. This implies that as the family head becomes more educated, even in the presence of income disparities, there is higher chances of members consulting appropriate healthcare services. This shows that higher educational achievement of household head remains one of the mediator between income disparity and HSB that cannot be avoided. This finding is corroborated with a study carried out in

South-Western China which found evidence to support quality education for better healthcare seeking (Rochelle, 2017).

Table 5.19 POLS Model (NGHPS Waves)

<i>Dependent Variable: Appropriate Medical-care Consultations (in times of illnesses)</i>			
VARIABLES	<i>Coefficient</i>	<i>Odd Ratios</i>	<i>Wald Test (z)</i>
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	-0.7294*** (0.0390)	0.4822	-18.69
<i>Literacy Level</i>			
None	-0.0272 (0.0211)	0.9732	-1.29
Primary Education	1.6877*** (0.0657)	5.4070	25.69
Secondary Education	0.8328*** (0.0290)	2.3229	28.67
Tertiary	0.8412*** (0.0279)	2.3191	30.15
<i>Gender</i>			
Male	-0.1117 (0.0564)	0.8943	-1.98
Female	0.1782*** (0.0460)	1.1951	3.87
<i>Marital Status</i>			
Married	0.2822*** (0.0137)	1.3260	20.55
Single Parent	-0.2359*** (0.0458)	0.7899	-5.15
Widowed	-0.0444*** (0.0089)	0.9566	-5.02
Never Married	-0.1296*** (0.0608)	0.8784	-2.13
Does your spouse live with you?			
Yes	0.1121*** (0.0481)	1.1186	2.33
No	-2.0865*** (0.0445)	0.1241	-46.86
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	0.7286*** (0.0439)	2.0722	16.60
Business Enterprises or Trades	0.0166*** (0.0019)	1.0169	8.81
Farming or Livestock Incomes	1.5200** (0.0366)	4.5722	41.55
Remittances	0.4131*** (0.0301)	1.5115	13.71
Pensions and Grants	0.4356*** (0.0510)	1.5459	8.53
Dividend from Investment	-1.8083*** (0.0552)	0.1639	-32.76
Income from Properties Owned	0.5374*** (0.0419)	1.7116	12.82
INCOME INEQUALITY			
Gini-Coefficient	-0.0446*** (0.1570)	0.9564	-4.82
Constant	-2.5823*** (0.1018)	0.0756	-25.36
Number of Observations	71,942		
LR chi ² (21)	56,829.85		
Probability	0.0000		
Pseudo R ²	0.6247		

NOTE: 1. *Significant at 10%, ** significant at 5% and *** significant at 1%

2. The parentheses denotes the robust standard errors for the estimates

Source: Researcher's Computation using Stata 13

In the estimation, gender and marital status of respondents were good control variables. For gender, female was signed positive as expected. The result shows that female uses appropriate healthcare services during illness significantly. However, the estimate for male was inverse and insignificant. This implies that females tend to use orthodox healthcare, compared to their male counterpart. In

addition, it means male often seek inappropriate medical-care services in times of illness. This is counter-intuitive to the expectation that both male and female seek medical-care services in times of ill-health. This could be explained by the characteristic of the traditional Nigerian society where males are the major bread winners for their entire household. This factor perhaps may contribute to their inability to seek timely medical-care.

From the same Table 5.19, the effects of being married was found to be positive and significantly related to appropriate healthcare services (even in the presence of rising income disparity). The estimation shows that being married associated with seeking appropriate healthcare by 33%. But, being a single parent is significantly associated with inappropriate medical-care. The estimates for being widowed/widower and never married also relate with inappropriate HSB positively. The results also show that if couple live together, they seek appropriate healthcare compared to when they are living apart. This is justified by the fact that married or cohabiting couples make decisions together (sometimes pool resources together) in several domains of life, often including healthcare.

For the effect of various household's incomes, wages and salaries, enterprises/trading, farming or livestock incomes, pension, remittances, and incomes from properties owned were all positive and significant with seeking appropriate healthcare services. The positive and significant income-effect on appropriate HSB as income inequality is widening was as expected, and hence not surprising. The findings suggest that households with more purchasing-power are likely to consult medical doctors and nurses for healthcare services. A similar income-effect was established in existing empirical literature such as, Bayar (2016) and Nonvignon *et al.* (2017). However, dividend from investments was found inverse and significant. The reason for this was not clearly known as it is counter-intuitive to the study's expectation. Perhaps capital gain/dividends are the biggest drivers of income inequality.

The effects of Gini-coefficient's estimate on healthcare seeking is negative and significant at 1% level, in line with *a priori*. In specific terms, a percentage-point increase in income inequality have the likelihood to reduce access to appropriate medical-care utilization by 4.36% points. This may be attributed to the fact that when those at the top of income quintile buy their health services individually and privately, they have less of a stake in the public provision of these services to the wider population. In this way the richest capture opportunities, which then become closed off from those who do not have the means to pay. All these could threaten the efficiency and sustainability

of the public health facilities, while the majority with lower incomes cannot afford to pay for private medical costs. This in turn, encourage self-medication and seeking healthcare from inappropriate sources, such as, traditional healer, patent vendor, and spiritualist. There is also a growing evidence (see, for example, Fagbemigbe, 2015; Abiola *et al.*, 2018:381) that citizens are more likely to seek treatment from low-cost public providers in Nigeria. This reinforces the important role of efficient and accessible public health facilities.

Similar result was found for constant variable. The negative sign of constant value is significant. This however suggests that there may be other factors that threatens appropriate HSB of citizens. These may include, corruption and inefficiency. In overall, the model is highly significant at $p < 0.0001$, with 62% for Pseudo R^2 . These suggest that the POLS model has a strong explaining power.

The second model is Fixed Effect (FE) estimation as presented in Table 5.20. Like POL regression, the signs of several of the explanatory variables are as expected, though some are not. For household's size, the estimate shows an inverse and significant effect of rising household's membership on appropriate HSB. In another words, in the presence of rising income disparity, any addition in family size will lead to inappropriate HSB by 7.5%. This result is not surprising as it is consistent with the POLS finding, *a priori* expectation and Grossman's ideas that largest family sizes, and fewest resources associated with seeking inappropriate medical-care.

A close inspection of Table 5.20 further shows that household heads with no basic education relate inversely and significantly with seeking appropriate healthcare services in FE model. This result is contrary to POLS finding, however, it is in line with the study's *a priori* expectation. On the other hand, those heads with primary, secondary and higher educational qualifications were mostly statistically significant and positively related. This reinforce the POLS result that, as the head of household become more educated, the household might consult orthodox healthcare services. The likelihood of using appropriate medical-care is 9% for those with higher educational qualifications.

In terms of gender, the estimate shows that female seek more appropriate healthcare services than male significantly. Contrary to POLS, the male estimate is negative and significant, supporting the results in Umuna (2012) that the clinics are not man-friendly and there are barely any men who come to seek care. Nevertheless, the effects of being married is positive and statistically significant with healthcare consultation. It was revealed that the likelihood of seeking medical-care by married couple is 2%. A possible explanation for this is, if rising income disparity means less purchasing-

power, couple could pool their resources together to seek more orthodoxy healthcare services. Being a single parent is significant but inversely related with seeking appropriate medical-care. The results for being widowed/widower connect with orthodox healthcare seeking positively and significantly. The finding also indicates negative income inequality-effect on healthcare seeking for singles but non-significant. Furthermore, the estimates show that when couple live together, the probability of seeking appropriate healthcare is 1.4%.

Table 5.20 Fixed Effect Model (NGHPS Waves)

<i>Dependent Variable: Appropriate Medical-care Consultations (in times of illnesses)</i>			
VARIABLES	<i>Coefficient</i>	<i>Odd Ratios</i>	<i>Wald Test (z)</i>
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	-0.0784*** (0.0028)	0.9246	-28.21
<i>Literacy Level</i>			
None	-0.0082*** (0.0016)	0.9918	-5.09
Primary Education	0.1249*** (0.0041)	1.1330	30.68
Secondary Education	0.1091*** (0.0027)	1.1153	40.02
Tertiary	0.0840*** (0.0025)	1.0876	33.01
<i>Gender</i>			
Male	-0.0256*** (0.0050)	0.9747	-5.14
Female	0.0124** (0.0038)	1.0125	3.25
<i>Marital Status</i>			
Married	0.0216*** (0.0010)	1.0218	21.64
Single Parent	-0.0193*** (0.0035)	0.9809	-5.57
Widowed	-0.0031*** (0.0006)	0.9969	-4.87
Never Married	0.0056 (0.0038)	1.0056	0.14
Does your spouse live with you?			
Yes	0.0137** (0.0040)	1.0138	3.45
No	-0.2356*** (0.0037)	0.7901	-62.97
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	0.0707*** (0.0033)	1.0733	21.35
Business Enterprises or Trades	0.0019*** (0.0001)	1.0019	14.10
Farming or Livestock Incomes	0.1818*** (0.0031)	1.1994	58.54
Remittances	0.0292*** (0.0022)	1.0296	12.99
Pensions and Grants	0.0277*** (0.0041)	1.0281	6.69
Dividend from Investment	-0.1165*** (0.0047)	0.8900	-25.02
Income from Properties Owned	0.0372*** (0.0031)	1.0379	11.82
INCOME INEQUALITY			
Gini-Coefficient	-0.0031*** (0.0006)	0.9969	-5.24
Constant	0.1856*** (0.0095)	1.2039	19.58
Number of Observations	71,942		
Wald Chi ²	1,311.37		
Probability	0.0000		
Pseudo R ²	0.6747		
Number of States	37		

NOTE: 1. *Significant at 10%, ** significant at 5% and *** significant at 1%

2. The parentheses denotes the robust standard errors for the estimates

Source: Researcher's Computation using Stata 13

Income level from all sources were found to positively and significantly associated with seeking orthodox healthcare services. This highlights the consequences of rising income inequality, where the more affluent in society have better access to health care. Similar results were obtained in POLS model. Like the findings of the current study, most of the studies found a positive and significant impact of income-effect on seeking appropriate health (see Qin, Hone and Lee, 2019).

However, dividend-incomes was negative and significant. The result suggests that income from dividend could more likely lead to inappropriate health care seeking. This is counter-intuitive to the expectation that interest from investment encourages seeking appropriate care. Perhaps the massive lobbying for contracts of few and bending of rules in their favour could be that more dividend is likely to reduce aggregate health care seeking. This is justified by the highly corrupt system that exist in countries such as Nigeria, where this act will not only increase dividend on their 'investment', but also widening income inequality. Consequently, undermines the efficiency of such facilities such as, road, healthcare and education, that discourages medical-care seeking.

Another finding worth of discussing is the negative effect of Gini-coefficient on appropriate health care seeking. This implies that the effect of rising income inequality is inverse on seeking orthodox health care at 1% significance level. The result was also found in POLS. This could be explained by the heightened political influence to curry government favours – including tax exemptions, and sweetheart contracts – for few citizens while blocking policies that strengthen the rights of majority including access to healthcare facilities. Overall, the probability value of FE model was largely low, where the p-value is less than 0.0001. The high Pseudo R² of 67% further indicates that the FE model has a strong explanatory power.

Again, several of the estimates of Random Effect (RE) model as presented in Table 5.21 meet the *a priori* expectation of the study, on households' healthcare consultation, in times of illness. It was observed that some of the exogenous variables carried the expected signs while others did not. The influence of an increase in family size, as income inequality rises related negatively with seeking orthodox healthcare. The results show that the possibility of households utilizing inappropriate HSB for any new addition to the family size is 55%. This is quite large compare to POLS and FE models. The results also support the call for effective policies that seek to reduce population growth through family planning and other birth-rate controls. This is important considering the long-term implications of large household size on their decision to seek appropriate health care.

Table 5.21 Random Effect Model (NGHPS Waves)

<i>Dependent Variable: Appropriate Medical-care Consultations (in times of illnesses)</i>			
VARIABLES	<i>Coefficient</i>	<i>Odd Ratios</i>	<i>Wald Test (z)</i>
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	-0.8048*** (0.0401)	0.4472	-20.05
<i>Literacy Level</i>			
None	-0.0603** (0.0212)	0.9415	-2.84
Primary Education	1.4856*** (0.0663)	4.4176	22.41
Secondary Education	0.8063*** (0.0299)	2.2396	26.96
Tertiary	0.6376*** (0.0294)	1.8919	21.71
<i>Gender</i>			
Male	-0.0165 (0.0609)	0.9836	-0.27
Female	0.1118** (0.0473)	1.1183	2.37
<i>Marital Status</i>			
Married	0.2598*** (0.0138)	1.2967	18.77
Single Parent	-0.2498*** (0.0472)	0.9794	-5.29
Widowed	-0.0208*** (0.0091)	0.9794	-2.30
Never Married	-0.1218** (0.0609)	0.8853	-2.00
Does your spouse live with you?			
Yes	0.1262** (0.0478)	1.1345	2.64
No	-2.2384*** (0.0464)	0.1066	-48.28
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	0.6467*** (0.0451)	1.9092	14.34
Business Enterprises or Trades	0.0143*** (0.0018)	1.0144	7.75
Farming or Livestock Incomes	1.3519*** (0.0316)	3.8648	35.98
Remittances	0.2707*** (0.0316)	1.3109	8.55
Pensions and Grants	0.3010*** (0.0525)	1.3512	5.74
Dividend from Investment	-1.0900*** (0.0651)	0.3362	-16.74
Income from Properties Owned	0.3197*** (0.0436)	1.3767	7.33
INCOME INEQUALITY			
Gini-Coefficient	-0.0399*** (0.0094)	0.9609	-4.26
Constant	-2.1587*** (0.1475)	0.1155	-14.64
Number of Observations	71,942		
Wald Chi ² (21)	9,362.98		
Probability	0.0000		
Pseudo R ²	0.6747		
Number of States	37		

NOTE: 1. *Significant at 10%, ** significant at 5% and *** significant at 1%

2. The parentheses denotes the robust standard errors for the estimates

Source: Researcher's Computation using Stata 13

The findings of RE model also conform with POLS and FE models in terms of the effect of income inequality on appropriate medical-care seeking mediated by education. It was found that household heads without basic education seeks inappropriate healthcare services significantly. The study shows that, the likelihood of family's members whose heads had no education relying on self-medication, patent vendors, traditionalist and spiritualist is 9%. This is similar to the results obtained in the POLS and FE estimations. Whereas, those with primary, secondary and tertiary qualifications were

statistically significant and positively associated with orthodox medical-care. The estimates further show that the likelihood of using appropriate medical-care is 89% for household heads with higher education. This implies that the more educational qualification of household's heads, the higher likelihood that their members will consult orthodoxy medical-care in times of ill-health. This is in line with the empirical results of Zajacova and Lawrence (2018) that, education is key to healthy-seeking behavior in developing countries.

The estimates for gender reveal that female seek more of appropriate healthcare services than male significantly. It is also in line with Matheson (2014), that female uses more of orthodox medical services to male in developed countries. In terms of marital status, being a single parent, never married and widow were significant but inversely related with seeking appropriate medical-care. These results suggest that, with widening income inequality, these categories of individual will seek more of inappropriate health care services.

However, there is a positive and significant rising income inequality-effect on seeking appropriate medical-care mediated by marriage. In particular, the likelihood of married consulting orthodoxy healthcare is 30%. Similar results were obtained in both POLS and FE estimations. The reasons could be that cohabiting couples (compare to others) make joint decisions and pool their resources together to access health care services. Couples often pay for their children to attend medical-care. The results further indicate that the likelihood of seeking appropriate healthcare services when couple live together is significant whereas living apart is related with inappropriate healthcare seeking. These findings correspond with Vespa and Painter (2011) that found that marriage increases the frequent use of medical services.

The estimates of RE model (like POLS and FE) reveals that income-effect from various sources, such as, wages and salaries, business enterprises/trading, farming/livestock, monetary assistance, pension, and properties owned were all key in predicting households' orthodox healthcare seeking significantly. The result also corroborated with a study carried out in Kenya, Malawi, Zambia and Zimbabwe which found that unconditional cash transfers was significant to explaining appropriate healthcare utilization (see Novignon *et al.*, 2017). However, like POLS and FE models, dividend-incomes was inverse and significant.

This thesis further demonstrates that the effect of income inequality on health-seeking behavior in times of illness is inverse and significant at the 5% level. This result implies that as income

inequality is increasing, the likelihood that members of households will employ less of orthodoxy healthcare services is 1.25%. This is consistent with Wilkinson explanations of 1990s, that income inequality is detrimental to health-seeking decisions. Finally, with the p-value of $p < 0.0001$, the model has a strong explaining power for HSB during the time of illness in Nigeria.

5.6.3 Breusch-Pagan LM for Heterogeneity Test

The preceding section presented the estimations from three models – the Pooled OLS, Fixed Effect and Random Effect – on the effects of income inequality on health-seeking behaviour in Nigeria. In order to determine the best, most consistent and efficient model, Deaton (2018) noted that the heterogeneity between households and societies is an important consideration when conducting analysis with panel data. That is, POLS assumed all households (both rich and poor) are the same across the 36 states and FCT. This implies that there is no difference between the income of the poor and non-poor households. Thus, this study employed the Breusch-Pagan Lagrange Multiplier (BPLM) to address this type of heterogeneity. The full results of heterogeneity from BPLM test is presented in Table 5.22 (see Appendix Table K5).

Table 5.22 Homogeneity Test Results

<i>Chi²</i>	<i>Probability</i>	<i>Remark</i>
35,591.73	0.0000	Since $p < 0.0000$ is below the threshold of 1% level. Rejects H_0 .

Source: Computed from Stata 13

From the BPLM results, since the p-value is as low as 0.0000 ($p < 0.000$), with high χ^2 of 35,591.73, the thesis rejects the null hypothesis (H_0) of homoskedasticity of the model. This implies that, POLS is statistically non-significant to explain the effects of income disparity on health-seeking behavior in Nigeria. Therefore, there is need to specify the consistent and efficient model between FE and RE estimations using the Hausman test.

5.6.4 Hausman Specification Test

Both FE and RE model enabled to control for unobserved heterogeneity. While FE model controls for time-invariant and subject-specific characteristics of the estimates, RE consider the time-variant effects of income inequality on HSB. Hence, Hausman test as presented in Table 5.23 specify the appropriate model between FE and RE. From the results, the p-value is as low as 0.0000 with χ^2 of 366.32 (see Appendix Table K6). Since the p-value of Hausman test results is less than the threshold of 1%. It implies that FE model is a more appropriate statistically, efficient and consistent model compared with the RE.

Table 5.23: Hausman Test Results from NGHPS Waves

<i>Chi-squared Statistics</i>	<i>Probability>Chi²</i>	<i>Model Indicated</i>
366.32	0.0000	FE Model

Source: Computed from Stata 13

5.6.5 Robustness of findings for the Income Inequality-HSB Effect

The study further re-estimates the effect of income inequality on HSB from individual NGHPS Waves – 2010/2011 Wave I, 2012/2013 Wave II, and 2015/2016 Wave III. The findings in Table 5.24 presented the summary of panel logistic estimations from Wave I. It is worthy of note that Column 1, 2 and 3 shown the POLS, FE and RE models, respectively, where several of the estimates were in line with the full estimations.

The finding indicated that the estimate of household’s size is inversely related with appropriate healthcare utilization. In particular, it was found that as family size increases, the likelihood that household will demonstrate appropriate HSB rises by 2.5% (for POLS), 0.12% (for FE), and 1.9% (for RE), respectively. This, not only justified the earlier results, but also consistent with theoretical expectation, as well as the results of Senbeto *et al.* (2013) and Huang *et al.* (2017) that increasing family size is related to rising health needs.

Literacy level is also one of the key determinants of medical consultation in times of illness. The household’s heads with no basic education related inversely with appropriate healthcare services. This is statistically significant in all model. Those with primary, secondary and higher educational levels were mostly statistically significant and positively associated. These are indications that as the household’s head becomes more educated, they may consult appropriate healthcare services. The probability of household’s members that often use appropriate healthcare is 12.7% for POLS, 1.1% and 12% for FE and RE models, respectively. This further implies that educated heads might appreciate the important of accessing appropriate healthcare services. This is in line with Zajacova and Lawrence (2018) that education is paramount to health-seeking behavior most especially in developing nations.

Although gender was signed as expected, the variable for male is insignificant in all the models. The findings indicate that females use appropriate healthcare services during illness. Specifically, the likelihood of female seeking appropriate healthcare is 6%, 0.7% and 8% for POLS, FE and RE respectively. This result is also consistent with the main findings. Perhaps, female often have the greatest interest in households’ health and their survival.

Table 5.24: Panel Logistic Estimations from NGHPS Wave I

	POLS	FIXED EFFECTS	RANDOM EFFECTS
<i>Dependent Variable: Appropriate Medical-care Consultation in times of illnesses</i>			
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	-0.0258* (0.1457)	-0.0012* (0.0010)	-0.0189* (0.0153)
<i>Literacy Level</i>			
None	-0.0238 (0.0747)	-0.0030 (0.0056)	-0.0414 (0.0770)
Primary Education	2.2447* (1.3549)	0.0885* (0.0810)	1.9585* (1.3885)
Secondary Education	0.4936*** (0.0473)	0.0569*** (0.0630)	0.4581*** (0.0486)
Higher Degrees	0.1198*** (0.0365)	0.0105*** (0.0030)	0.1141*** (0.0371)
<i>Gender</i>			
Male	0.0941 (0.1110)	0.0032 (0.0073)	0.0486 (0.1137)
Female	0.0623* (0.0603)	0.0067* (0.0049)	0.0771* (0.0617)
<i>Marital Status</i>			
Married	0.4440** (0.2289)	0.0187* (0.0135)	0.3931* (0.2346)
Single Parent	1.6743* (1.1268)	0.0661 (0.0676)	1.4928* (1.1550)
Widowed	0.3868 (0.2965)	0.0128 (0.0188)	0.3018 (0.3044)
Never Married	-0.7196*** (0.0516)	-0.0610*** (0.0039)	-0.8630*** (0.0563)
<i>Does your spouse live with you?</i>			
Yes	0.3830** (0.2176)	0.0196* (0.0144)	0.3369* (0.2247)
No	-2.8231*** (0.0525)	-0.3631*** (0.0046)	-2.8928*** (0.0553)
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	0.3737** (0.1477)	0.0583*** (0.0131)	0.3803** (0.1509)
Business Enterprises or Trades	0.0019* (0.0024)	0.0003* (0.0015)	0.0007* (0.0024)
Farming or Livestock Incomes	0.5176** (0.2913)	0.0321* (0.0227)	0.4861* (0.2991)
Remittances	-0.2027*** (0.0425)	-0.0169*** (0.0227)	-0.2328*** (0.0451)
Monetary Transfer/Assistance	0.7143*** (0.2718)	0.0481** (0.0207)	0.7076*** (0.2687)
Pensions and Grants	-0.0130 (0.0107)	0.0017 (0.0020)	0.0048 (0.0248)
Dividend from Investment	-0.0622 (0.1109)	-0.0040 (0.0067)	-0.0401 (0.1146)
Income from Properties Owned	-0.0469 (0.0564)	-0.0011 (0.0010)	-0.05440 (0.0588)
INCOME INEQUALITY			
Gini-Coefficient	-0.2042** (0.0740)	-0.01625** (0.0051)	-0.1954** (0.0777)
Constant	-1.4915 (1.6619)	0.5559*** (0.1005)	-0.7911 (1.7051)
Number of States	37	37	37
Observations	26,184	26,184	26,184
Probability	0.0000	0.0000	0.0000

*p<0.05 indicates significance at the 5% level; ** p<0.01 at the 1% level; *** p<0.001 at the 1% level

Source: Researcher's Computation using Stata 13

For marital status of households' heads, the effects of being married is positive and statistically significant on HSB in all the models. Like the full result, the estimation for marital status shown that the likelihood married seeking appropriate healthcare is 55% for POLS, 2% for FE, and 48% for RE. Single parent estimate relate with appropriate medical-care significantly in both POLS and RE models, except FE model that was found to be statistically insignificant. The estimate for widow is positively related with appropriate healthcare seeking in all the models, but non-significant. The marital status findings are in consistent with previous results, and the findings of Vespa and Painter (2011) that marriage increase the frequent use of medical-care services statistically. However, the never married relates with medical-care seeking inversely and significantly in all the models. The findings show that if a couple live together, they seek healthcare from appropriate hands significantly in than when they are living apart. All these justified the earlier findings.

For the effect of various household's incomes, wages and salaries, enterprises or trading, farming or livestock incomes, and monetary assistance were significant with seeking appropriate healthcare services. Remittance, pensions and grants, dividend from investments, and income from properties were insignificant and positive. The estimates from all models further indicated that the estimates of Gini-coefficient on healthcare seeking were positive and significant. In specific terms, the probability of income inequality leading to inappropriate health-seeking behavior is 1.6%.

Again, to determine the best, consistent and most efficient model among POLS, FE and RE estimations, BPLM test was used. The underlying assumption of POLS model is homogeneity, that is there is *no* unique attribute of households in Nigeria in terms of medical consultations. It implies that, seeking healthcare is based on individual decisions and households are not the same or heterogeneous in matter related to medical seeking. The null hypothesis (H_0) of BPLM is POLS model might be appropriate. As presented in Table 5.25, the findings of heterogeneity from BPLM indicates that the estimated chi-squared value is very high at 1,467, with lowest p-value of 0.0000. Thus, since the probability value is below the threshold of 1% level statistically, H_0 is rejected. By implication, the POLS model is statistically insignificant in explaining the health-seeking behavior of households in Nigeria.

Table 5.25 Homogeneity Test Results from NGHPS Wave I

<i>Chi²</i>	<i>Probability</i>	<i>Remark</i>
1,466.88	0.0000	Since $p < 0.0000$ is <i>below</i> the threshold of 1% level. Rejects H_0 .

Source: Researcher's Preparation from Stata 13

This then suggest need to specify the most consistent and efficient model between FE and RE estimations using the Hausman test. This is because, both FE and RE model enabled to control for unobserved heterogeneity. The Hausman estimates as presented in Table 5.26 shows a chi-squared of 33.12 with p-value of 0.0602 or 6% (see Appendix Table A5 for full results). Therefore, since this p-value (6%) is less than the threshold of 10%, FE model seems to be more appropriate, efficient and consistent, while RE is inconsistent statistically.

Table 5.26: Hausman Test Results from Wave I (2010/2011)

<i>Chi-squared Statistics</i>	<i>Probability</i>	<i>Model Indicated</i>
33.12	0.0602	FE Model

Source: Researcher's Preparation from Stata 13

On the other hand, the estimation results from NGHPS Wave II were presented in Table 5.27. From the estimates, it was found that household's characteristics, such as, family size estimates related with appropriate health-seeking behavior inversely. The probability that household will utilize inappropriate HSB as their membership rises is 4% for POLS, 0.2% for FE, and 4.3% for RE models, respectively.

In terms of education, those heads with no basic education relate negatively with appropriate health care seeking, as this is true for all the models except POLS. While those with primary, secondary and higher educational levels were mostly statistically significant and positively associated. These estimates reveal that as the heads becomes more educated, they might consult orthodoxy healthcare services. The likelihood of utilizing appropriate health-care is 1.7% (for POLS), 17% (in FE), and 21% (for RE) for those heads with higher educational qualifications.

The result further shows that female relate with seeking appropriate healthcare services significantly, while contrary was found for male. The estimate for married is positive and statistically significant in all the models. This reveal that marriage associated with seeking appropriate healthcare by 29% for POLS, 1.8% for FE, and 27% for RE. Whereas, in all the models, the results for single parent, and widowed/widower connected with orthodoxy healthcare seeking negatively and significantly. However, for the never married, the finding indicates negative effect on medical-care seeking only in FE and RE models significantly, POLS is non-significant. Further, like the main results, the estimates show that when couple live together, the probability of seeking appropriate was 31% (in POLS), 2.5% (in FE), and 52% (in RE). These findings were significant to when the couple are living apart. All these also showed that the estimates of FE model (in Table 5.19) are highly robust.

Table 5.27: Panel Logistic Estimations from NGHS Wave II

	POLS	FIXED EFFECTS	RANDOM EFFECTS
<i>Dependent Variable: Appropriate Medical-care Consultation in times of illnesses</i>			
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	-0.0409* (0.0266)	-0.0025* (0.0022)	-0.0438* (0.0303)
<i>Literacy Level</i>	0.0136 (0.3357)	-0.0002 (0.0026)	-0.0092 (0.0361)
None	0.0542 (0.0862)	0.0013* (0.0070)	0.0575* (0.0881)
Primary Education	0.0311* (0.1214)	0.0003* (0.0103)	-0.0196* (0.1244)
Secondary Education	3.3667** (0.0500)	0.4258*** (0.0042)	3.4083*** (0.0522)
Higher Degrees			
<i>Gender</i>	-0.9022** (0.1326)	-0.0904*** (0.0117)	-0.8218*** (0.1361)
Male	0.0147* (0.0192)	0.0006* (0.0014)	0.0079* (0.0200)
Female			
<i>Marital Status</i>	0.2563*** (0.1326)	0.0176* (0.0043)	0.2395*** (0.0639)
Married	-0.8076*** (0.0940)	-0.0072*** (0.0079)	-0.8031*** (0.0933)
Single Parent	-0.3668** (0.1240)	-0.0249*** (0.0093)	-0.4088** (0.1274)
Widowed	-0.0726 (0.0768)	-0.0072* (0.0058)	-0.0791* (0.0774)
Never Married			
<i>Does your spouse live with you?</i>	0.0628 (0.0919)	0.0032* (0.0070)	0.0558 (0.0929)
Yes	-0.6384*** (0.1367)	-0.08808*** (0.0121)	-0.7388** (0.1403)
No			
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	0.0342* (0.0618)	0.0021* (0.0044)	0.0826* (0.0638)
Business Enterprises or Trades	0.1392* (0.1206)	0.0171* (0.0107)	0.2412* (0.1438)
Farming or Livestock Incomes	0.0029* (0.0020)	0.0003* (0.0002)	0.0041* (0.0022)
Remittances	0.0644 (0.1049)	0.0002 (0.0073)	0.0297 (0.1081)
Monetary Transfer/Assistance	0.6248*** (0.1829)	0.0375** (0.0118)	0.5608** (0.1864)
Pensions and Grants	0.0236 (0.0737)	0.0026 (0.0051)	0.0004 (0.1440)
Dividend from Investment	-0.1225 (0.1387)	0.0008* (0.0090)	-0.0261 (0.0326)
Income from Properties Owned	-0.0496* (0.0307)	-0.0025* (0.0023)	-0.0261 (0.0326)
INCOME INEQUALITY			
Gini-Coefficient	-0.2810** (0.1098)	-0.0325*** (0.0089)	-0.2546** (0.1123)
Constant	-1.6999 (0.2793)	0.2895*** (0.0203)	-1.6208*** (0.2930)
Number of States	37	37	37
Observations	27,363	27,363	27,363
Probability	0.0000	0.0000	0.0000

*p<0.05 indicates significance at the 5% level; ** p<0.01 at the 1% level; *** p<0.001 at the 1% level

Source: Researcher's Computation using Stata 13

For the incomes-effect of household, incomes from enterprises/trading, farming/livestock, and monetary assistance were found positive and significantly related with seeking orthodoxy health care services. These estimates show that as these incomes rises, households' members will seek more of orthodoxy medical-care services in times of health challenges. But remittance, and pensions were non-significant. On the other hand, incomes from investments/properties were negative but insignificant. In term of the effects of Gini-coefficient, the estimated effect of rising income disparity is also inverse on orthodoxy healthcare seeking at 5% significant level. Again, the overall probability value of the model, $p < 0.0001$ indicate that the model has a strong explaining power.

The heterogeneity of the NGHPS Wave II's estimations were also tested with BPLM as reported in Table 5.28. The high chi-squared and low-probability value is an indication that the model is heterogeneous. Thus, the thesis rejects the H_0 of homoskedasticity. That is, POLS is statistically insignificant to explain health-seeking behavior of households in Nigeria.

Table 5.28 Homogeneity Test Results from NGHPS Wave II

<i>Chi²</i>	<i>Probability</i>	<i>Remark</i>
1,704.60	0.0000	Since $p < 0.0000$ is <i>below</i> the threshold of 1% level. Rejects H_0 .

Source: Researcher's Preparation from Stata 13

This led to the Hausman specification test for NGHPS Wave II dataset, to specify the appropriate model between FE and RE. This is reported in Table 5.29. From the results, the high p-value of 0.93 (or 93%), which is greater than the threshold of 10%, is an indication that RE is more efficient, appropriate and consistent, whereas FE model is non-consistent. Clearly, the RE estimates from Wave II supported the full estimations. This further suggest that FE results in Table 5.19 are statistically robust. That is, income disparity is detrimental to seek appropriate health care services in Nigeria.

Table 5.29: Hausman Test Results from NGHPS Wave II

<i>Chi-squared Statistics</i>	<i>Probability</i>	<i>Model Indicated</i>
13.80	0.9310	RE Model

Source: Researcher's Preparation from Stata 13

Another robustness check is the estimates of the NGHPS Wave III as presented in Table 5.30. It was also revealed that various household's characteristics, such as, more family size, low educational qualification, gender differences, never married, in-cohabitation of couples, and low incomes were mediating factors of income inequality-seeking inappropriate medical-care services in Nigeria. The estimate of Gini-coefficient was also found to lead to seeking inappropriate medical-care services statistically.

Table 5.30: Panel Logistic Estimations from NGHS Wave III

	POLS	FIXED EFFECTS	RANDOM EFFECTS
<i>Dependent Variable:</i> Appropriate Medical-care Consultation in times of illnesses			
HOUSEHOLD CHARACTERISTICS			
<i>Family Size</i>	-0.0645*** (0.0183)	-0.0040** (0.0012)	-0.0039** (0.0012)
<i>Literacy Level</i>			
None	-0.0736 (0.0942)	-0.0041 (0.0080)	-0.0030 (0.0080)
Primary Education	0.0018 (0.1363)	0.0074* (0.0117)	0.0056 (0.0118)
Secondary Education	0.0050 (0.0541)	-0.0017 (0.0046)	-0.0020 (0.0046)
Higher Degrees	0.9398*** (0.0828)	0.0665*** (0.0121)	0.0654*** (0.0103)
<i>Gender</i>			
Male	-0.0423 (0.0570)	-0.0036*** (0.0047)	-0.0036 (0.0047)
Female	0.0877* (0.0863)	-0.0006* (0.0074)	0.0002* (0.0074)
<i>Marital Status</i>			
Married	0.0044 (0.0384)	0.0038* (0.0034)	0.0039* (0.0034)
Single Parent	-0.0762* (0.0557)	-0.0052* (0.0054)	-0.0058 (0.0105)
Widowed	-0.1787** (0.0649)	-0.0052 (0.0054)	-0.0094* (0.0054)
Never Married	-0.0762 (0.1220)	-0.0045 (0.0104)	-0.0058* (0.0105)
<i>Does your spouse live with you?</i>			
Yes	-0.0158 (0.0582)	0.0008 (0.0049)	-0.0001 (0.0049)
No	-0.1264* (0.1263)	-0.0111* (0.0103)	-0.0105* (0.0103)
HOUSEHOLDS' TOTAL INCOME			
Wages and Salaries Incomes	-0.3604*** (0.0857)	0.0161* (0.0099)	-0.0025* (0.0090)
Business Enterprises or Trades	-0.6499** (0.3063)	-0.0329* (0.0219)	-0.0345* (0.0220)
Farming or Livestock Incomes	0.6069* (0.0441)	0.0451* (0.0040)	0.0488* (0.0040)
Remittances	0.1380 (0.1439)	0.0059 (0.0128)	0.0057 (0.0128)
Monetary Transfer/Assistance	0.2968*** (0.0438)	0.0221*** (0.0042)	0.0007*** (0.0019)
Pensions and Grants	-0.0161 (0.0214)	0.0018 (0.0018)	0.0254 (0.0041)
Dividend from Investment	-3.0572*** (0.0680)	-0.3735*** (0.0109)	-0.4271*** (0.0103)
Income from Properties Owned	-0.0217** (0.0098)	-0.0007* (0.0008)	-0.0009* (0.0059)
INCOME INEQUALITY			
Gini-Coefficient	-0.0712* (0.0688)	-0.0142*** (0.0059)	-0.0126** (0.0059)
Constant	1.4281 (0.3888)	0.5225*** (0.0311)	-0.5799*** (0.0315)
Number of States	37	37	37
Observations	26,774	26,774	26,774
Probability	0.0000	0.0000	0.0000

*p<0.05 indicates significance at the 5% level; ** p<0.01 at the 1% level; *** p<0.001 at the 1% level

Source: Researcher's Computation using Stata 13

In specific terms, a new addition to the household size, as Table 5.31 reported, related with seeking orthodox healthcare inversely. These show that the likelihood of household utilizing inappropriate HSB as their membership rises is 6.2% for POLS, 0.4% for both FE and RE models. For education, those households' heads with no basic education seek inappropriate healthcare services in all the models, significantly. Though heads with tertiary qualification were mostly statistically significant and positively associated with orthodoxy medical-care. The estimates show that the likelihood of using appropriate medical-care is 6.9% and 6.7% for FE and RE, respectively, for those heads with higher educational qualifications. These findings were also in line with the main results (FE model) in Table 5.19.

For gender, it was revealed that the estimate male also relates with seeking inappropriate healthcare services statistically. Marriage is positive and significant with seeking health care services in all the models. Their chances of seeking appropriate health care is 0.44% for POLS, and 0.38% for both FE and RE models. Unlike the main results (in FE model), the estimates of single parent and widow relates with orthodoxy health-seeking inversely and significantly in both POLS and RE models, but insignificant in FE model. The never married result also seek inappropriate medical-care significantly in RE model, but this insignificant in both POLS and FE model. Again, contrary to the main finding in FE model (see Table 5.19), the Wave III's estimates show that the probability of seeking appropriate when couple co-habit is non-significant. However, in concord with the main results, living apart related with inappropriate healthcare seeking significantly in all the models.

In addition, as literature has established that income inequality-HSB is often mediated by more incomes (see Novignon *et al.* 2017). However, unlike the main results in FE model (see Table 5.19), the robustness checks from Wave III's estimates shows that household's incomes from wages and salaries was positive only in FE model significantly. The estimates of POLS and RE were found negative, which could imply that the chronic stress related with getting wages/salaries in Nigeria (but not the absolute incomes) are more likely to lead to inappropriate medical care utilization. On the other hand, farming/livestock income and monetary transfers were found positive significantly with seeking orthodoxy healthcare in all the models. It suggests that as these incomes increases, people will seek more orthodoxy medical-care services in times of illness. Again, incomes from investments and properties-owned were insignificant and inversely related. This further show that the major results in Table 5.19 is highly robust.

Gini-coefficient estimate also show that the effect of income inequality is negative on orthodoxy medical-care seeking at 1% significant level in all the models except POLS. This might be because POLS model assumed all households are the same. This finding is not surprising, as it is robust against the major results (FE model of Table 5.19). With the overall probability value of $p < 0.0001$ less than the threshold of 1%, the diagnostic tests are also satisfactory and thus validate the potency of the main results. Clearly, the study's findings have a strong explaining power for the effect of income inequality on health-seeking behaviour in Nigeria.

The results for heterogeneity from BPLM test as presented in Table 5.31 also indicated need to reject H_0 of homoskedasticity. Hence, POLS is statistically insignificant to explain HSB in Nigeria.

Table 5.31 Homogeneity Test Results from NGHPS Wave III

<i>Chi²</i>	<i>Probability</i>	<i>Remark</i>
8,741.96	0.0000	Since $p < 0.0000$ is below the threshold of 1% level. Rejects H_0 .

Source: Computed from Stata 13

The next is to specify the most efficient, consistent and appropriate models between FE and RE models. Hence, the Hausman specification model was presented in Table 5.32. The finding shows that the chi-squared is -251.14 and p-value is high, 0.3735 or 37%, which is greater than the highest threshold of 10%.

Table 5.32: Hausman Test Results from Wave III

<i>Chi-squared Statistics</i>	<i>Probability</i>	<i>Model Indicated</i>
-251.14	0.3735	RE Model

Source: Computed from Stata 13

It then implies that RE is efficient, more appropriate and consistent, but FE is statistically non-consistent. From the foregoing, it is apparent that the main results in Table 5.19 (the FE model) is largely robust. In this regard, the drive by policy-makers towards promoting healthy societies in Nigeria, and focus to achieve SDGs 3 before 2030, may be constrained by income inequality, both directly and indirectly. Though income disparity is somehow inevitable as a result of globalization, economic growth, and technological progress. However, this research empirically established how important income equality or fairness is to the better health outcomes and appropriate health-care seeking for all individuals.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter concludes the study. It first highlights the summary of the major findings, followed by the study's conclusion. Furthermore, some policy recommendations were outlined as well as areas of possible future research.

6.2 Summary of Major Findings

The study has addressed four specific objectives. First, it examined the trends of health outcomes and health-seeking behaviour (HSB) among households in Nigeria between 2010 and 2019. Second, it estimated the level and magnitude of income inequality across the 36 states and FCT Abuja. Third, it estimated the direct and indirect effects of income inequality on health outcomes in Nigeria. The fourth and the last, the study also estimated the direct and indirect effects of income inequality on HSB among households in Nigeria.

Trends of Health Outcomes and Health-Seeking Behaviour in Nigeria

The trend analyses from all NGHPS waves indicates some increase in the self-reported illnesses from wave I (2010/2011) to wave IV (2018/2019) among households in Nigeria. The findings suggest that health outcomes in Nigeria is poor. Previous study had also established that Nigeria is not making sufficient progress towards the United Nations' goal of achieving good health for all at all ages (WHO, 2019). It was also found that Nigeria is characterized with weak HSB where the inappropriate HSB from chemists, traditional healers and self-medication increase over the 2010 and 2019 periods. The implication of these findings is that much still needs to be done by the Federal and State Governments if SDG 3 is to be achieved in Nigeria before year 2030. Besides, the efforts of the Non-Governmental Organizations (NGOs) and international organizations need to be re-doubled in order to ensure good health outcomes and appropriate HSB in Nigeria.

Level and Magnitude of Income Inequality across 36 states and FCT Abuja in Nigeria

Results of this study establishes that the gap between the rich and poor households across the 36 states and FCT Abuja is rising. Except for Enugu and Cross Rivers States that experience a slight reduction in their Gini-coefficient indices in 2019, the study's findings indicate that approximately 95% of states in Nigeria had higher income disparity between 2010 and 2019 periods. This implies

that their performance in poverty reduction, nonetheless, could not have been more different. Perhaps, the Enugu Youth Empowerment Scheme (e-YES) with focus on digital economy, and her Human Capital Development Loan Program (HCDLP) for all youths across the state might be the reason for their slight decline in the income disparity in Enugu State in 2019.

The study also found that income inequality rose in all the six geo-political zones between 2010 and 2019 in Nigeria. Similar trend was also found for Nigeria's national between the periods. World Bank (2016) and Aigbokhan (2017) had also established that Nigeria had increasing level of income inequality. The implication of these findings is that every effort by Federal, State and Local Government to improve welfare in Nigeria could be constrained in the absence of steps for addressing income gaps in Nigeria.

Direct and Indirect Effects of Income Inequality on Health Outcomes in Nigeria

The findings of this study further revealed that income inequality has both direct and indirect effect on health outcomes in Nigeria. From the direct effect, the study's finding establishes a positive and significant estimate for income inequality. This suggest that income inequality is detrimental to health outcomes in Nigeria. Previous studies had also showed that rising income inequality increase stress, frustration, insecurity, kidnapping, and anxiety. These intensify fear and shock with frequent ill-health as a result (Wilkinson, 1992, 1994). This suggest needs for strategies to reduce stress, shock, fear, kidnapping and insecurity should be pursued by policy makers.

The results also explains that there is an indirect effect between income inequality and health outcomes mediated by various household characteristics. First, it was found that as income gaps is rising, every addition to family size constrained welfare and worsen health outcomes in Nigeria. Second, the positive and significant estimate for hunger or inadequate of food suggest that income inequality constrained budget and causes nutritional deficiency. This could result to frequent sick-days and death from skin disorders, dementia and ulcer. Third, balanced diet estimates are negative and significant. This imply that though income inequality could limit purchasing power of citizens to obtain rice, gari, beans and flour; however, those with balance diets would experience lower sick-days from type II diabetes, ulcer and cancers. Fourth, the estimate of meat is negative but not significant. This result seem to suggest that while meat is a great source of protein and important nutrient, households particularly rich ones might experience illness from meat consumption. Previous research had also established that red meat have more saturated (bad) fat than chicken

and fish. These fats can raise blood cholesterol with ill-health issues from diabetes, stomach cancer and heart diseases.

Fifth, the study's results further shows that in the presence of income inequality, low educational level is more detrimental to health significantly. Sixth, the possession of treated mosquito net is key to reduce malaria illness. Seventh, the result of the study indicates that access to electricity is important to reducing daily stress, depression and frustration from widening income gaps. Eighth, it was found that in the presence of income inequality, access to safe water and sanitation help to reduce poor health outcomes. However, households without these facilities experience poor health challenges. Ninth, the study also found that the chronic stress from rising income inequality could possibly lead to alcoholic consumption and self-medication. This further lead to poor health issues significantly. Finally and the tenth, the result of the study indicates that rising income inequality negatively affect household earnings, with reduced consumption spending on health goods and services, poor health outcomes intensify. However, the estimates for pension and dividend from investment was directly related to illness. Perhaps the fear and stress associated with pension process in Nigeria might result to high blood pressure, heart failure and stroke. Similarly, dividend are not always guarantee in rising income inequality due to significant tax disadvantages.

Direct and Indirect Effects of Income Inequality on Health-Seeking Behaviour in Nigeria

The inverse and significant of Gini coefficient's estimate of this study further indicates that income inequality is disadvantageous to seeking appropriate health-seeking in times of illness directly in Nigeria. The result suggest that in the presence of rising income disparity, political and opportunity captures leads to inappropriate HSB. The implication of this result is that increased ill-gotten wealth from rent-seeking could reduce the efficiency and effectiveness of public health facilities. This limit access of masses to such services.

The findings also shows that there is an indirect effect between income inequality and HSB. This is mediated by household characteristics. First, in the presence of rising income inequality, any addition to family size would likely lead to drags-down of resources and inappropriate HSB. Second, irrespective of the level of income gaps among households, the chance that household with educated head consult medical-care is high. Third, with rising income inequality, the study found that men might likely have negative attitude toward seeking appropriate healthcare than their female counter-part. Fourth, it was also found that being married associates with seeking

medical-care statistically. Perhaps couples could pool their resources together to access appropriate health-care services. Lastly and the fifth, as incomes from wages and salaries, business enterprise and trading, crop and livestock, monetary transfer, and pension and grants are rising, these are key in predicting orthodox healthcare utilization in Nigeria significantly. However, the result indicates a positive and significant estimate for dividend from investment. This suggest that with widening income inequality, incomes from dividend are not always certain, this might constrain appropriate healthcare-seeking.

6.3 Conclusion

Within the context of the stated research questions and objectives, the study has revealed that the effect of income inequality on health outcomes and health-seeking behavior among households in Nigeria, is not only direct (as Wilkinson's income inequality-health hypothesis proposed and evident by more recent studies, such as, Rebeira *et al.*, 2017; Massa 2018; Matthew 2019 and Kim, 2019), but also, indirect and mediated by household-characteristics.

Three key observations were made from the findings of this study, which are the major contributions to knowledge and literature:

Firstly, Nigeria, the largest economy and biggest oil exporter in Africa, experiences widening household-income gaps across all the six geo-political zones and states (FCT Abuja inclusive) between 2010 and 2019. And these income inequalities are detrimental to health outcomes and constrain appropriate medical-care seeking in Nigeria. This suggest that all health and welfare policies to achieve good health for all citizens (SDG 3) may not be achieved, without targeting effort in reducing income disparity (achieving SDG 10), before the year 2030 (which is a decade ahead). Secondly, the transmission mechanisms through which income inequality affects health is through household characteristics, as it reduces the quantity and quality of healthy goods and services that people buy, consume or have access to. In another words, rising income inequality often causes priorities to change among households. And thirdly, it was evidenced statistically that larger household size, malnutrition, illiteracy level of the head of the households, lack of access to treated mosquito net and drinkable water, and self-medication are important factors informing our understanding of why Nigeria with rising income inequality experiences poor health outcomes (illness) and weak health-seeking behavior.

6.4 Recommendations

6.4.1 Policy Recommendations

Several findings of this thesis have important policy implications and intervention. Therefore, the recommendations emanating from this research work are as follows:

- i. Efforts to reduce income differentials among households should be pursued by Federal and State Governments. For instance, broadening the spread of the ongoing conditional cash transfer as well as promoting other policies that can raise income such as entrepreneurship, farming/livestock, and pensions. Small- and medium-scale enterprises should also be given more attention. In addition, government can also pursue progressive taxation in order to bridge the income gap between the rich and poor. The additional saving can be channeled towards social safety net programmes such as cash transfers and soft loans for productive activities with flexible repayment plans.
- ii. The use of effective health insurance policy and programs, that can meet the needs of low-income households (especially the self-employed and informal workers) could be pursued by both Federal and States' Ministries of Health. This has improved health outcomes in Ghana and other economies significantly. It is also expected to promote universal health coverage to achieve SDG target 3.
- iii. The Federal and States' Ministries of Agriculture, and Central Bank of Nigeria (CBN) policies efforts is needed in terms of increasing food supply, and at lower prices. This will play an important role in increasing access to nutritional intake, reduce hunger and malnutrition, and improve health outcomes in Nigeria.
- iv. Reducing the effect of income inequality on health outcomes also requires renewed effort on its mediators. For example, providing more basic health-promoting goods and services. This should range from treated mosquito-net, education to greater access to drinkable water and sanitation, and to basic infrastructure, such as, electricity.
- v. The thesis further established that unhealthy lifestyles mainly from drug-abuse and self-medication during illness lead to poor health outcomes in Nigeria. Thus, there is need to scale-up campaign against unhealthy lifestyles among citizens by the National Orientation Agency (NOA), especially in local languages. This is also paramount to promote appropriate health-seeking behavior among households in Nigeria.
- vi. It is recommended that strategies towards reducing stress, insecurity, anxiety, kidnapping, frustration and depression be scaled-up by all tiers of government.

- vii. There is also a need for all tiers of government to provide adequate funding to address health facilities inefficiency, reduce political and opportunity captures.
- viii. Finally, the thesis recommends that as part of the NGHPS, the Nigerian government through relevant agencies such as, National Bureau of Statistics and development partners, should strengthen NGHPS data gathering process. This will better capture important health indicators such as, severity of illness and self-rated health that provide an ordinal ranking of perceived health status of respondents. This will aid future research on health and quality of life as more heterogeneous data becomes available.

6.4.2 Recommendations for Further Studies

Further studies obviously need to be much more broadly based, this will better aid health and welfare policy in Nigeria. Therefore, the frontiers for further research can be more fully explored. For instance:

- i. What are the socio-cultural factors mediating the effect of income inequality on severity of ill-health in Nigeria?;
- ii. Income Inequality and Health links in Nigeria: The Mediation Role of Climate Change.

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APPENDICES

APPENDIX A: SUMMARY OF EMPIRICAL STUDIES REVIEWED (Table A1)

PANEL/CROSS-COUNTRY EVIDENCE					
INCOME INEQUALITY IS DETRIMENTAL TO HEALTH OUTCOMES			INCOME DISPARITY RELATED WITH IMPROVED HEALTH STATUS		
<i>Sources</i>	<i>Sample/Study Description</i>	<i>Main Findings</i>	<i>Sources</i>	<i>Sample/Study Description</i>	<i>Main Findings</i>
Neumayer and Plumper (2016)	<i>Sample:</i> 28 Western countries <i>Technique:</i> Panel Analysis	An additional 1% point in income disparity will reduce longevity by 0.03% in the short-run; and by 0.058% in long-run.	Rebeira <i>et al.</i> (2017)	<i>Sample:</i> 10 developed countries <i>Scope:</i> 1950-2008 <i>Technique:</i> Dynamic OLS and Panel Cointegration	For every 1-unit rise in income disparity, mortality risk for both men and women decrease by 0.038% points.
Deurzen <i>et al.</i> (2014)	<i>Sample:</i> 52 Low- and middle- income countries <i>Data:</i> Demography Survey <i>Technique:</i> Multi-level Logistic Regression	One-unit point increase in Household Income Disparity associated with 0.65% children deaths	Herzer (2015)	<i>Sample:</i> 19 developed countries <i>Technique:</i> Dynamic OLS	Income inequality has been responsible for about 2.32% of the annual increase in longevity in these developed countries
Avendano (2012)	<i>Sample:</i> 34 countries members of OECD <i>Technique:</i> Fixed Effect	One-point rise in income inequality was related with 7% rise in infant mortality	Schell <i>et al.</i> (2014)	<i>Sample:</i> 152 developed nations <i>Data:</i> World Bank Indicator <i>Test:</i> Multivariate Regression	A unit increase in income inequality improve children health by 0.51%
Torre and Myrskylä (2011)	<i>Sample:</i> 21 Developed Nations <i>Technique:</i> Panel Analysis	1% increase in income inequality will increase infant deaths by 0.47%	Shkolnikov <i>et al.</i> (2009)	<i>Sample:</i> 17 developed countries <i>Technique:</i> Fixed Panel	1-point increase in income inequality would rises life expectancy by 0.065%.
Other cross-country studies, such as, Berkman <i>et al.</i> (2000), Diez-Roux and Link (2000), Blakely <i>et al.</i> (2000), Leigh and Jencks (2007), Babones, (2008), Shkolnikov <i>et al.</i> (2009) found that income inequality worsen health outcomes.			Lynch <i>et al.</i> (2000), Mellor and Milyo (2001), Shibuya <i>et al.</i> (2002), Gravelle and Wildman (2002), Beckfield (2004), Lynch, Davey-Smith and Hilleneier (2004) found that rising income disparity associated with healthy outcomes.		
COUNTRY-SPECIFIC EVIDENCE (excluding Nigeria)					
<i>Sources</i>	<i>Sample/Study Description</i>	<i>Main Results</i>	<i>Sources</i>	<i>Sample/Study Description</i>	<i>Main Results</i>
Tan <i>et al.</i> (2018)	<i>Sample:</i> Shaanxi China <i>Data:</i> 2008 National Survey <i>Technique:</i> Logistic Regression	One-point rise in income inequality reduce health by 4.8%	Singh <i>et al.</i> (2018)	<i>Sample:</i> 5,165 Australia adults <i>Data:</i> 2013 Dental Survey <i>Technique:</i> Logistic Regression	Adults in states with high Gini had relative odds of 0.8% better health outcome
Massa <i>et al.</i> (2018)	<i>Sample:</i> 27 Brazilian capitals <i>Data:</i> 2013 Health Survey	Poorer health outcomes exist among high income inequality	Adjaye-Gbewonjo <i>et al.</i> (2018)	<i>Sample:</i> South Africa <i>Data:</i> National Income Survey	Income disparity were not significantly related with

	<i>Technique:</i> Logistic Regression	resident at 0.31%		<i>Test:</i> Fixed-Effects Regression	changes in CVD at 5% level
Liu (2017)	<i>Sample:</i> 65,000 Canadians <i>Data:</i> Canadians Census and Community Health Survey <i>Technique:</i> Binary Logistic Regression	About 0.00018% poor mental health outcomes related with income inequality in Canada	Bakkeli (2016)	<i>Sample:</i> China <i>Data:</i> 1989-2011 Health and Nutrition Survey <i>Technique:</i> Panel Regression	One-unit rise in income disparity yields very low poor health outcomes at 0.002.

<i>Sources</i>	<i>Sample/Study Description</i>	<i>Main Results</i>	<i>Sources</i>	<i>Sample/Study Description</i>	<i>Main Results</i>
Pabayo <i>et al.</i> (2015)	<i>Sample:</i> 50 states, United States <i>Data:</i> 2000-2007 Health and Well-being Survey <i>Technique:</i> Cox Regression	There is threshold effect of income disparity on risk for deaths above Gini levels of about 0.20	Herzer and Nunnenkamp (2014)	<i>Sample:</i> 21 developed countries <i>Source:</i> 1981-2005 <i>Technique:</i> Panel Cointegration and Panel Regression	Income inequality in these nations contributed about 0.0079 years to the annual increase in life expectancy
Juan (2013)	<i>Sample:</i> Ecuador <i>Data:</i> 2004, 2014 Maternal and Child Health Survey <i>Technique:</i> Logistic Regression	Maternal and child deaths increases by -4.247% and -11.94% respectively by 1-unit rise in income inequality in Ecuador	Leigh and Jencks (2007)	<i>Sample:</i> 12 developed countries <i>Technique:</i> Panel Cointegration and Panel Regression	A unit increase in income inequality improve health outcomes by 0.043%
Other literature includes, Weich <i>et al.</i> (2001) for Britain; Lynch <i>et al.</i> (2004) for United States; Wilkinson (2008) for Britain. They all evidenced that rising income inequality <i>worsen</i> health outcomes.			While Mellor and Milyo (2001) for United States; Barafi (2012) for Brazil; Bhattacharjee <i>et al.</i> (2014) for Scotland; and Dotollenaere <i>et al.</i> (2018) for Britain found that <i>rising</i> income inequality associated with healthy outcomes.		

AFRICA AND NIGERIA STUDIES

<i>Sources</i>	<i>Sample/Study Description</i>	<i>Results</i>	<i>Sources</i>	<i>Sample/Study Description</i>	<i>Results</i>
Karimo <i>et al.</i> (2017)	<i>Sample:</i> Six Geo-political zones <i>Data:</i> 2010 Harmonized Nigeria Living Standard Survey <i>Technique:</i> Logistic Regression	Income burden relates with adults' illness. Further, 50% of elders have unmet healthcare due to poverty.	Alawode and Lawal (2014)	<i>Sample:</i> 200 households from Akinyele LGA, Oyo State <i>Test:</i> Descriptive Statistics and Multinomial Logistic Analysis	Unequal distribution with Gini-coef. of 0.24 rises the likelihood of having good health status in Oyo State
Lawanson and Opeloyeru (2016)	<i>Sample:</i> 19,158 households <i>Data:</i> 2010 Nigeria Living Standard Survey	Uneven income distribution of 0.4% Gini co-efficient	Orji, Ogbu, and Okechukwu (2013)	<i>Sample:</i> 30,855 households <i>Data:</i> National Demographic and	Income inequality has no significant impact on health

	<i>Technique:</i> Descriptive Analysis	accounted for poor health outcomes in Nigeria		Household Survey for 2008 <i>Technique:</i> Multilevel Logistic	outcomes in Nigeria at 5% significant level
Fatukasi and Ayeomoni (2015)	<i>Data:</i> International Monetary Fund (1980-2014) <i>Technique:</i> Cointegration and Dynamic Ordinary Least Square	1% increase in income inequality will increase mortalities by 0.18% in Nigeria at 1% signif. level	Nilsson and Bergh (2012)	<i>Sample:</i> 19,340 households <i>Data:</i> 2004 Zambia Living Condition Monitoring Survey <i>Technique:</i> OLS, 2SLS	Higher income inequality robustly associated with 0.65% better children health outcomes in Zambia
Fagbemigbe <i>et al.</i> (2015)	<i>Sample:</i> 30,855 households <i>Data:</i> 2012 National HIV/AIDS and Reproductive Survey <i>Technique:</i> Chi-square and ANOVA Analysis	Wealth differences account for lower health outcomes across geo-political zones in Nigeria at 5% significant level	Pulok (2012)	<i>Sample:</i> 31 Developing Nations <i>Data:</i> World Bank Indicator – WDI (2010) <i>Technique:</i> Fixed and Random Regression	Income inequality has been responsible for about 0.14% improvement in health status in developing countries include Nigeria

APPENDIX B: ESTIMATION OF GINI COEFFICIENT

The Gini Coefficient is a measure of inequality of income distribution. This was developed by the Italian statistician Corrado Gini in 1912. It is often defined as a ratio with values between 0 and 1; and used as a gauge of economic inequality.

Gini-index is Gini-coefficient expressed as a percentage and is equal to the Gini-coefficient by 100. That is,

$$Gini\ Index = Gini\ Coefficient \times 100 \dots\dots\dots(1)$$

Anytime the Gini-coefficient is 0, it corresponds to perfect income equality. That is, everyone in the group, society, state or nation has the same level of income. On the other hand, 1 corresponds to perfect income inequality, i.e. one individual has all the income, while everyone has zero income. The Gini Coefficient can also be used to measure wealth inequality. This use requires that no one has a negative net wealth. Hence, using the Gini can help to quantify differences in welfare and compensation policies and philosophies.

Calculation:

For a population with various income composition,

$$Gini\text{-}Coefficient = f(X) \dots\dots\dots(2)$$

Where X denotes cumulated share of proportion population total earnings.

There are different methods to compute Gini-coefficient (See Bayar, 2016). However, this study followed the methodology employed by World Bank (2016) and Aigbokhan (2017:19).

$$Gini\ Coefficient\ for\ k = \frac{2 \sum_{i=1}^n iY_i}{n \sum_{i=1}^n Y_i} + \frac{n + 1}{n} \dots\dots\dots(3)$$

Where, n = population sample size

Y_i = income of i^{th} household in state k (where $k = 1, 2, 3, \dots\dots, 37$)

The Gini coefficient’s main advantage is that it is a measure of income inequality by means of a ratio analysis, rather than a variable unrepresentative of most of the population, such as per capita income or GDP. It can be used to compare income distributions across different population sectors as well as countries.

It often satisfies four important principles:

- i. *Anonymity*: It does not matter who the high and low earners are.
- ii. *Scale independence*: Does not consider the size of the economy.
- iii. *Population independence*: Does not matter how large the population of the country

APPENDIX C

TABLE C1: DESCRIPTION OF VARIABLES AND APRIORI EXPECTATIONS

VARIABLES AND DESCRIPTIONS:			
DEPENDENT VARIABLE: Households' Self-Reported Health Outcomes (Illness)			
Variable	Description	Definition	Justification
Recent Illness/sick days/Poor health	During the past four weeks have you suffered from an illness/sickness or poor health?	1=if the respond is Yes, and 2= if No	This measure is acknowledged as good, and objective indicator of households' health outcomes (see Yiengprugsawan, 2010 and Novignon, 2017).
EXPLANATORY VARIABLES:			
Variable	Description	Definition	Apriori Expectation
Family Size			
Household's Family Size	Number of individuals who normally live and eat together in this households	Numeric	In accordance with Dasgupta and Solomon (2017), the study expect increase in family size to have a <i>positive</i> relationship with frequent illnesses
Food, Diet and Calorie			
<u>Low Calorie</u> *Hunger or No Food	During the last 12 months, was there a time when your household had to skip meal because of lack of money or other resources?	1= if Yes, 2= if No	As income inequality is rising, an <i>indirect</i> low calorie, and malnutrition effect on health outcomes could be hypothesized. Low calorie often results to illnesses and <i>worsen</i> health outcomes; such as, type II diabetes, heart disease, and cancers (Wright et al. 2017). Therefore, low calorie, hunger and eating much of Gari could <i>positively</i> related with illness/sickness. In addition, basic energetic foods (rice, and yam or cassava or maize-flour); and basic proteins (beans and meat/fish) are expected to be <i>negatively</i> associated with illnesses or poor health outcomes. This is necessary because, carbohydrate and protein intakes should generally constitute between 55-75% and 10-35% of daily intake respectively (WHO, 2017c).
*Gari Consumption	Within the past 7 days did the members of this household eat Gari within the household		
<u>Energetic Foods</u> *Rice *Yam or Cassava or Maize-flour	Within the past 7 days did the members of this household eat the following within the household: - Rice - Flour		
<u>Basic Protein:</u> *Beans *Meat/Fish	Within the past 7 days did the members of this household eat the following within the household: - Beans - Meat/Fish?		
Material and Wellbeing			
*Mosquito net	Over the past 1 year did household purchase mosquito net?	1=if Yes, 2 = if No	The level of income inequality often influences the possession of mosquito net, access to clean drinkable water, electricity and toilet facility. Benzeval <i>et al.</i> (2014) posit that healthy housing often promote positive health outcomes. Hence the study expects the availability of mosquito net, access to electricity, quality water supply, and quality toilet facility to <i>reduces</i> illness/sickness.
*Access to Electricity	Is this dwelling connected to electricity?	1=Yes, 2=No	
* Drinkable Water Supply	What is the main source of drinking water?	1=if None;	

		2=if Pipe- Borne; 3=if Borehole/Well 4=if River/Spring	
*Toilet facility	What kind of toilet facility does your household use?	1=if None; 2=if Water-Toilet; 3=if Latrine or Pit	
Behavioral or Health Lifestyle			
Alcoholic drinks and hard-drug consumption	In the past 7 days, did members of this household consume alcoholic drinks and/or hard-drug?	1=if Yes, 2= if No	Citizens with low incomes may likely adopt behaviors/lifestyles like alcohol or hard-drug consumption that can cause chronic illness (Cerda et al. 2011). This could lead illnesses apriorily.
Health-Seeking Behavior			
Seeking Orthodoxy Medical-care	During the past 4 weeks has your household consulted (orthodoxy) health personnel?	1=if Yes, 2=if No	Income inequality could influence who to consult and what healthcare to sought for. Therefore, consulting the right healthcare providers will <i>reduce</i> the illness.
Sources of Households' Incomes			
Wages or/and Salaries	During the past 7 days, has you worked in any private/public firms?	1=for wage and salaries dummy; 0 = if otherwise	In line with previous studies (for example, Nilsson and Bergh, 2012; Kragten and Rozer, 2017), these components of households' income (non-farm, crop and livestock farming, agricultural, transfer, and rental incomes) are expected to associates <i>negatively</i> with illness/sickness (poor health outcomes), as its influence the social comparison and social cohesion of households.
Enterprises and Trading Income	During the past 7 days, has you worked in business/trade belonging to you or someone else?	1=for enterprises/trading/business dummies; 0 = if otherwise	
Crop and livestock farming	During the past 7 days has you worked on a farm owned or rented by a member of this household, either in cultivating crops or in cared for livestock?	1=for agricultural income dummy; 0 = if otherwise	
Remittances	Does any member of this household receive in-kind payment/allowance apart from salary?	1=In-kind payment/allowance dummy, 0 = if otherwise	
Monetary gift or Assistance	Did you receive gift of monetary from abroad in the past 12 months?	1=monetary gift, 0 = if otherwise	
Pensions, and Grants	Did you receive regular payment (like pension) in the past 12 months?	1=pension, 0 = if otherwise	
<u>Rental Incomes:</u> Dividend from investment, and	Did any member of this household receive any income from investment in the past 12 months?	1=savings, interest or other investment income,	

income from savings		0 = if otherwise	
Land and house ownership (proxy for access to formal credit market)	Did any member of your household receive any rental's income from property in last 1 year?	1=having house or receiving rent, 0 = if otherwise	
Income Inequality (Gini-Coefficient)			
Household's Income Disparities	Oyekale (2006:25) calculated Gini-coefficient index for Nigeria from 18,977 households. Isah (2011) estimated Gini and Theil indices for Kaduna State from 600 individuals. While Aigbokhan (2017) calculated Gini and Theil for Nigeria from 5,000 households.		

Source: Compiled from NGHPS questionnaires of various Waves (see NBS 2013, 2016, 2017)

TABLE C2: DESCRIPTION OF VARIABLES AND APRIORI EXPECTATIONS

VARIABLES AND DESCRIPTIONS:			
DEPENDENT VARIABLE: Household's Health-Seeking Behaviour (HSB)			
Variable	Description	Definition	Justification
Health-Seeking Behavior: *Medical-care Consultation	During the past four weeks have you consulted a health workers or traditional healer or patent medicine vendor or visited Health Centre?	1 = if Yes and 2 = if No	Any action (healthcare consultation and from whom?) undertaken by individuals who perceive themselves to have health problems or to be ill for the purpose of finding an appropriate remedy (Evans <i>et al.</i> 2017; and Novignon <i>et al.</i> 2017)
EXPLANATORY VARIABLES			
Variable	Description	Definition	Apriori Expectation
		Family Size	
Household's Size	Number of members who normally live and eat together in this households.	Numeric	In accordance with Senbeto <i>et al.</i> (2013) and Huang <i>et al.</i> (2017), this study expects the households with larger family size living together to likely demonstrate inappropriate health-seeking behaviour than households with smaller size.
		Household's Head Educational Level	
Literacy Level	What is your highest qualification attained?	1=if None 2=Primary Sch Cert 3=Secondary Sch Cert 4=if Higher Degrees	Education is key to appropriate HSB in developing countries, where the two are positively related (Hopkins, 2017). Thus, this study also expects <i>positive</i> effects of education on appropriate HSB in Nigeria.
		Household's Head Gender	
Gender	What is your sex?	1 = if Male, 2 = if Female	Evidence suggest that women seek more appropriate healthcare than man (see Senbeto <i>et al.</i> 2013; and Matheson, 2014).

Household's Head Marital Status			
Marital Status	What is your marital status?	1 = if Married 2 = if Single Parent 3 = if Widowed 4 = if Never Married	Vespa and Painter (2011) opined that marriage frequently increase the use of healthcare services. This suggest that married households will seek more appropriate of healthcare than the unmarried
	Does your spouse live in this household?	1 = if Yes 2 = if No	
Household's Income Sources			
<u>Non-farm Income:</u> -Wage and Salaries	During the past seven days, has you worked for any paid salary?	1 = for wage and salaries dummy; 0 = if otherwise	Evidence from recent studies including Novignon (2017), Huang <i>et al.</i> (2017), and Evans <i>et al.</i> (2017) observed that, in developing countries income levels of citizens often predicts their HSB. In line with these studies, rising income inequality are expected to inversely predict HSB.
-Enterprises and Trading Income	During the past 7 days, has you worked in a business or trade belonging to you/someone else?	1 = if for enterprises/trading/business dummies; 0 = is otherwise	
<u>Farm Incomes</u> Crop and livestock farming	During the past 7 days has you worked on a farm, either in cultivating crops or cared for livestock?	1 = if for agricultural income dummy; 0 = if otherwise	
<u>Transfer Incomes</u> Remittances	Does any member of this household receive in-kind money apart from salary?	1=In-kind payment or allowance dummy, 0 otherwise	
Monetary gift or Assistance	Did you receive a monetary gift from abroad in the past 12 months?	1=monetary gift, 0 = if otherwise	
Pensions, and Grants	Did you receive regular payment (like pension) in the past 12 months?	1=pension and grant 0 = if otherwise	
<u>Rental Incomes</u> Interest and Dividend from Investment	Did any member of this household receive income from investment in the past 12 months?	1=having savings, interest or other investment income, 0 otherwise	
Land and house ownership (proxy for access to formal credit market)	Did member of your household receive any rental's incomes from property in past 1 year	1=having house or receiving rent, 0 = if otherwise	
Households' Income Inequality			
Household's Income Disparities	Oyekale (2006:25) calculated Gini-coefficient index for Nigeria from 18,977 households. Isah (2011) estimated Gini and Theil indices for Kaduna State from 600 individuals. While Aigbokhan (2017) calculated Gini and Theil for Nigeria from 5,000 households.		

Source: Compiled from NGHS various Questionnaires (see NBS 2013, 2016, 2017)

APPENDIX D: DESCRIPTIVE AND SOCIO-ECONOMIC CHARACTERISTICS

TABLE D1: GENDER OF RESPONDENTS (1=MALE, 2=FEMALE) IN WAVE 1

Household Head	Freq.	Percent	Cum.
1	14,062	49.74	49.74
2	14,208	50.26	100.00
Total	28,270	100.00	

TABLE D2: HOUSEHOLD'S SIZE IN WAVE 1

Household Size	Freq.	Percent	Cum.
1	4,915	17.37	17.37
2	4,542	16.05	33.43
3	4,157	14.69	48.12
4	3,691	13.05	61.17
5	3,080	10.89	72.05
6	2,425	8.57	80.62
7	1,788	6.32	86.94
8	1,266	4.47	91.42
9	854	3.02	94.44
10	598	2.11	96.55
11	407	1.44	97.99
12	259	0.92	98.90
13	68	0.24	99.14
14	54	0.19	99.34
15	45	0.16	99.49
16	33	0.12	99.61
17	30	0.11	99.72
18	24	0.08	99.80
19	17	0.06	99.86
20	13	0.05	99.91
21	6	0.02	99.93
22	6	0.02	99.95
23	5	0.02	99.97
24	2	0.01	99.98
25	1	0.00	99.98
26	1	0.00	99.98
27	1	0.00	99.99
28	1	0.00	99.99
29	1	0.00	99.99
30	1	0.00	100.00
31	1	0.00	100.00
Total	28,292	100.00	

TABLE D3: MARITAL STATUS OF HOUSEHOLD'S HEAD IN WAVE 1

(1=married to one wife, 2=married to wives, 3=single parent, 4=divorce, 5=widow, 7=never married)

Marital Status	Freq.	Percent	Cum.
1	6,510	23.03	23.03
2	2,614	9.25	32.27
3	37	0.13	32.41
4	76	0.27	32.67
5	151	0.53	33.21
6	915	3.24	36.44
7	17,967	63.56	100.00
Total	28,270	100.00	

TABLE D4: GENDER OF RESPONDENTS (1=MALE, 2=FEMALE) IN WAVE 2

Household Head	Freq.	Percent	Cum.
1	14,913	49.33	49.33
2	15,321	50.67	100.00
Total	30,234	100.00	

TABLE D5: MARITAL STATUS OF HOUSEHOLD'S HEAD IN WAVE 2

(1=Married to one wife, 2=Married to wives, 3=Single Parent, 4=Divorce, 5=Widow, 7=Never Married)

Marital Status	Freq.	Percent	Cum.
1	6,021	20.76	20.76
2	2,956	10.19	30.96
3	22	0.08	31.03
4	92	0.32	31.35
5	175	0.60	31.95
6	1,054	3.63	35.59
7	18,680	64.41	100.00
Total	29,000	100.00	

TABLE D6: HOUSEHOLD'S SIZE IN WAVE 2

Family Size	Freq.	Percent	Cum.
1	4,743	16.18	16.18
2	4,461	15.22	31.40
3	4,143	14.13	45.53
4	3,779	12.89	58.42
5	3,242	11.06	69.48
6	2,602	8.88	78.36
7	1,997	6.81	85.17
8	1,443	4.92	90.09
9	1,010	3.45	93.54
10	695	2.37	95.91
11	503	1.72	97.62
12	323	1.10	98.72
13	90	0.31	99.03
14	67	0.23	99.26
15	46	0.16	99.42
16	37	0.13	99.54
17	33	0.11	99.66
18	25	0.09	99.74
19	21	0.07	99.81
20	12	0.04	99.85
21	8	0.03	99.88
22	7	0.02	99.90
23	7	0.02	99.93
24	5	0.02	99.95
25	5	0.02	99.96
26	4	0.01	99.98
27	2	0.01	99.98
28	2	0.01	99.99
29	1	0.00	99.99
30	1	0.00	100.00
31	1	0.00	100.00
Total	29,315	100.00	

TABLE D7: GENDER OF RESPONDENTS (1=MALE, 2=FEMALE) IN WAVE 3

s1q2	Freq.	Percent	Cum.
1	16,095	49.03	49.03
2	16,732	50.97	100.00
Total	32,827	100.00	

TABLE D8: HOUSEHOLD'S SIZE IN WAVE 3

Family Size	Freq.	Percent	Cum.
1	4,143	15.50	15.50
2	3,860	14.44	29.93
3	3,018	11.29	41.22
4	3,083	11.53	52.75
5	2,884	10.79	63.54
6	2,494	9.33	72.87
7	2,002	7.49	80.36
8	1,545	5.78	86.14
9	1,142	4.27	90.41
10	808	3.02	93.43
11	604	2.26	95.69
12	437	1.63	97.33
13	179	0.67	98.00
14	138	0.52	98.51
15	95	0.36	98.87
16	69	0.26	99.12
17	50	0.19	99.31
18	36	0.13	99.45
19	27	0.10	99.55
20	25	0.09	99.64
21	20	0.07	99.72
22	15	0.06	99.77
23	10	0.04	99.81
24	8	0.03	99.84
25	8	0.03	99.87
26	6	0.02	99.89
27	6	0.02	99.91
28	6	0.02	99.94
29	3	0.01	99.95
30	3	0.01	99.96
31	3	0.01	99.97
32	3	0.01	99.98
33	3	0.01	99.99
34	1	0.00	100.00
35	1	0.00	100.00
Total	26,735	100.00	

TABLE D9: MARITAL STATUS OF HOUSEHOLD'S HEAD IN WAVE 3
(1=Married to one wife, 2=Married to wives, 3=Single Parent, 4=Divorce, 5=Widow, 7=Never Married)

Marital Status	Freq.	Percent	Cum.
1	4,869	22.11	22.11
2	1,869	8.49	30.60
3	5	0.02	30.62
4	63	0.29	30.91
5	122	0.55	31.46
6	1,006	4.57	36.03
7	14,088	63.97	100.00
Total	22,022	100.00	

APPENDIX E:

TABLE E1: SOURCES OF INCOME DISPARITIES IN NIGERIA

<i>Sources of Incomes</i>	<i>Description</i>
Farm and Livestock Income	The agricultural and livestock incomes include net income (cash as well as in-kind) from all crop production (both cash crops and others), wage earnings from agricultural productions and labour, and traded livestock.
Non-farm Income	Non-agricultural incomes consist of salaries of wage earning from non-farm labour including trading, business, self-employment, government and private sector employment.
Transfer Income	Transfer income relates to both internal and foreign remittances, income earned from migration, pensions and any assistance and/or payments to the poor.
Rental Income	The rental income includes rents received from ownership of assets including land, machinery, investment, and building properties.

Source: NBS for various Waves

APPENDIX F:

TABLE F1: HOUSEHOLD'S TOTAL INCOMES - WAVE I (NAIRA)

Total Household's Incomes (Naira)	Freq.	Percent	Cum.
#0 - #50,000	20,750	96	96
#50,001 - #100,000	525	2.425	98.425
#100,001 - #150,000	157	0.73	99.155
#150,001 - #200,000	65	0.3	99.455
#200,001 - #250,000	32	0.15	99.605
#250,001 - #300,000	25	0.11	99.715
#300,001 - #350,000	15	0.07	99.785
#350,001 - #400,000	2	0.01	99.795
#400,001 - #450,000	10	0.04	99.835
#450,001 - #500,000	6	0.03	99.865
#500,001 - #550,000	5	0.02	99.885
#550,001 - #600,000	2	0.01	99.895
#600,001 - #650,000	0	0	99.895
#650,001 - #700,000	0	0	99.895
#700,001 - #750,000	3	0.014	99.909
#750,001 - #800,000	1	0.005	99.914
#800,001 - #850,000	4	0.018	99.932
#850,001 - #900,000	0	0	99.932
#900,001 - #950,000	0	0	99.932
#950,001 - #1,000,000	1	0.005	99.937
#1,000,001 - #1,050,000	2	0.01	99.947
#1,050,001 - #1,100,000	1	0.005	99.952
#1,100,001 - #1,150,000	0	0	99.952
#1,150,001 - #1,200,000	1	0.005	99.957
#1,200,001 - #1,250,000	0	0	99.957
#1,250,001 - #1,300,000	0	0	99.957
#1,300,001 - #1,350,000	0	0	99.957
#1,350,001 - #1,400,000	0	0	99.957
#1,400,001 - #1,450,000	0	0	99.957
#1,450,001 - #1,500,000	0	0	99.957
#1,500,001 - #1,550,000	0	0	99.957
#1,550,001 - #1,600,000	0	0	99.957
#1,600,001 - #1,650,000	0	0	99.957
#1,650,001 - #1,700,000	0	0	99.957
#1,700,001 - #1,750,000	0	0	99.957
#1,750,001 - #1,800,000	0	0	99.957
#1,800,001 - #1,850,000	0	0	99.957
#1,850,001 - #1,900,000	0	0	99.957

#1,900,001 - #1,950,000	0	0	99.957
#1,950,001 - #2,000,000	0	0	99.957
#2,000,001 - #2,050,000	2	0.01	99.967
#2,050,001 - #2,100,000	2	0.01	99.977
#2,100,001 - #2,150,000	0	0	99.977
#2,150,001 - #2,200,000	0	0	99.977
#2,200,001 - #2,250,000	0	0	99.977
#2,250,001 - #2,300,000	0	0	99.977
#2,300,001 - #2,350,000	0	0	99.977
#2,350,001 - #2,400,000	0	0	99.977
#2,400,001 - #2,450,000	0	0	99.977
#2,450,001 - #2,500,000	0	0	99.977
#2,500,001 - #2,550,000	0	0	99.977
#2,550,001 - #2,600,000	0	0	99.977
#2,600,001 - #2,650,000	0	0	99.977
#2,650,001 - #2,700,000	0	0	99.977
#2,700,001 - #2,750,000	0	0	99.977
#2,750,001 - #2,800,000	0	0	99.977
#2,800,001 - #2,850,000	0	0	99.977
#2,850,001 - #2,900,000	0	0	99.977
#2,900,001 - #2,950,000	0	0	99.977
#2,950,001 - #3,000,000	0	0	99.977
#3,000,001 - #3,050,000	0	0	99.977
#3,050,001 - #3,100,000	0	0	99.977
#3,100,001 - #3,150,000	0	0	99.977
#3,150,001 - #3,200,000	0	0	99.977
#3,200,001 - #3,250,000	0	0	99.977
#3,250,001 - #3,300,000	0	0	99.977
#3,300,001 - #3,350,000	0	0	99.977
#3,350,001 - #3,400,000	0	0	99.977
#3,400,001 - #3,450,000	0	0	99.977
#3,450,001 - #3,500,000	0	0	99.977
#3,500,001 - #3,550,000	0	0	99.977
#3,550,001 - #3,600,000	0	0	99.977
#3,600,001 - #3,650,000	0	0	99.977
#3,650,001 - #3,700,000	0	0	99.977
#3,700,001 - #3,750,000	0	0	99.977
#3,750,001 - #3,800,000	0	0	99.977
#3,800,001 - #3,850,000	0	0	99.977
#3,850,001 - #3,900,000	0	0	99.977
#3,900,001 - #3,950,000	0	0	99.977

#3,950,001 - #4,000,000	0	0	99.977
#4,000,001 - #4,050,000	1	0.005	99.982
#4,050,001 - #4,100,000	0	0	99.982
#4,100,001 - #4,150,000	0	0	99.982
#4,150,001 - #4,200,000	0	0	99.982
#4,200,001 - #4,250,000	0	0	99.982
#4,250,001 - #4,300,000	0	0	99.982
#4,300,001 - #4,350,000	0	0	99.982
#4,350,001 - #4,400,000	0	0	99.982
#4,400,001 - #4,450,000	0	0	99.982
#4,450,001 - #4,500,000	0	0	99.982
#4,500,001 - #4,550,000	0	0	99.982
#4,550,001 - #4,600,000	0	0	99.982
#4,600,001 - #4,650,000	0	0	99.982
#4,650,001 - #4,700,000	0	0	99.982
#4,700,001 - #4,750,000	0	0	99.982
#4,750,001 - #4,800,000	0	0	99.982
#4,800,001 - #4,850,000	0	0	99.982
#4,850,001 - #4,900,000	0	0	99.982
#4,900,001 - #4,950,000	0	0	99.982
#4,950,001 - #5,000,000	0	0	99.982
> #5,000,000	4	0.018	100
TOTAL	21,612	100	

TABLE F2: HOUSEHOLD'S TOTAL INCOMES - WAVE II (NAIRA)

Total Household's Incomes (Naira)	Freq.	Percent	Cum.
#0 - #50,000	21,231	88	88
#50,001 - #100,000	1,627	6.74	94.74
#100,001 - #150,000	801	3.32	98.06
#150,001 - #200,000	159	0.65	98.71
#200,001 - #250,000	61	0.25	98.96
#250,001 - #300,000	34	0.14	99.1
#300,001 - #350,000	19	0.08	99.18
#350,001 - #400,000	11	0.04	99.22
#400,001 - #450,000	8	0.03	99.25
#450,001 - #500,000	9	0.033	99.283
#500,001 - #550,000	4	0.02	99.303
#550,001 - #600,000	2	0.01	99.313
#600,001 - #650,000	0	0	99.313
#650,001 - #700,000	0	0	99.313

#700,001 - #750,000	3	0.012	99.325
#750,001 - #800,000	1	0.005	99.33
#800,001 - #850,000	4	0.02	99.35
#850,001 - #900,000	0	0	99.35
#900,001 - #950,000	0	0	99.35
#950,001 - #1,000,000	1	0.005	99.355
#1,000,001 - #1,050,000	2	0.01	99.365
#1,050,001 - #1,100,000	1	0.005	99.37
#1,100,001 - #1,150,000	10	0.04	99.41
#1,150,001 - #1,200,000	1	0.005	99.415
#1,200,001 - #1,250,000	0	0	99.415
#1,250,001 - #1,300,000	0	0	99.415
#1,300,001 - #1,350,000	0	0	99.415
#1,350,001 - #1,400,000	0	0	99.415
#1,400,001 - #1,450,000	0	0	99.415
#1,450,001 - #1,500,000	0	0	99.415
#1,500,001 - #1,550,000	0	0	99.415
#1,550,001 - #1,600,000	0	0	99.415
#1,600,001 - #1,650,000	0	0	99.415
#1,650,001 - #1,700,000	1	0.005	99.42
#1,700,001 - #1,750,000	1	0.005	99.425
#1,750,001 - #1,800,000	1	0.005	99.43
#1,800,001 - #1,850,000	12	0.05	99.48
#1,850,001 - #1,900,000	1	0.005	99.485
#1,900,001 - #1,950,000	0	0	99.485
#1,950,001 - #2,000,000	1	0.005	99.485
#2,000,001 - #2,050,000	2	0.01	99.49
#2,050,001 - #2,100,000	14	0.058	99.548
#2,100,001 - #2,150,000	1	0.005	99.553
#2,150,001 - #2,200,000	2	0.01	99.563
#2,200,001 - #2,250,000	1	0.005	99.568
#2,250,001 - #2,300,000	1	0.01	99.578
#2,300,001 - #2,350,000	4	0.02	99.598
#2,350,001 - #2,400,000	1	0.005	99.603
#2,400,001 - #2,450,000	1	0.005	99.608
#2,450,001 - #2,500,000	2	0.01	99.618
#2,500,001 - #2,550,000	1	0.005	99.623
#2,550,001 - #2,600,000	1	0.005	99.628
#2,600,001 - #2,650,000	0	0	99.628
#2,650,001 - #2,700,000	11	0.045	99.673
#2,700,001 - #2,750,000	0	0	99.673

#2,750,001 - #2,800,000	0	0	99.673
#2,800,001 - #2,850,000	0	0	99.673
#2,850,001 - #2,900,000	0	0	99.673
#2,900,001 - #2,950,000	1	0.005	99.678
#2,950,001 - #3,000,000	9	0.037	99.715
#3,000,001 - #3,050,000	5	0.02	99.735
#3,050,001 - #3,100,000	1	0.005	99.74
#3,100,001 - #3,150,000	0	0	99.74
#3,150,001 - #3,200,000	0	0	99.74
#3,200,001 - #3,250,000	0	0	99.74
#3,250,001 - #3,300,000	1	0.005	99.745
#3,300,001 - #3,350,000	0	0	99.745
#3,350,001 - #3,400,000	3	0.012	99.757
#3,400,001 - #3,450,000	0	0	99.757
#3,450,001 - #3,500,000	1	0.005	99.762
#3,500,001 - #3,550,000	0	0	99.762
#3,550,001 - #3,600,000	1	0.005	99.767
#3,600,001 - #3,650,000	0	0	99.767
#3,650,001 - #3,700,000	1	0.005	99.772
#3,700,001 - #3,750,000	9	0.037	99.809
#3,750,001 - #3,800,000	0	0	99.809
#3,800,001 - #3,850,000	1	0.005	99.814
#3,850,001 - #3,900,000	1	0.005	99.819
#3,900,001 - #3,950,000	0	0	99.819
#3,950,001 - #4,000,000	1	0.005	99.824
#4,000,001 - #4,050,000	1	0.005	99.829
#4,050,001 - #4,100,000	1	0.005	99.834
#4,100,001 - #4,150,000	1	0.005	99.839
#4,150,001 - #4,200,000	0	0	99.839
#4,200,001 - #4,250,000	0	0	99.839
#4,250,001 - #4,300,000	11	0.045	99.884
#4,300,001 - #4,350,000	0	0	99.884
#4,350,001 - #4,400,000	3	0.012	99.896
#4,400,001 - #4,450,000	0	0	99.896
#4,450,001 - #4,500,000	0	0	99.896
#4,500,001 - #4,550,000	1	0.005	99.901
#4,550,001 - #4,600,000	0	0	99.901
#4,600,001 - #4,650,000	0	0	99.901
#4,650,001 - #4,700,000	1	0.005	99.906
#4,700,001 - #4,750,000	0	0	99.906
#4,750,001 - #4,800,000	0	0	99.906

#4,800,001 - #4,850,000	2	0.01	99.916
#4,850,001 - #4,900,000	0	0	99.916
#4,900,001 - #4,950,000	0	0	99.916
#4,950,001 - #5,000,000	0	0	99.916
> #5,000,000	19	0.074	100
TOTAL	24,123	100	

TABLE F3: HOUSEHOLD'S TOTAL INCOMES - WAVE III (NAIRA)

Total Household's Incomes (Naira)	Freq.	Percent	Cum.
#0 - #50,000	19,983	81.54	81.54
#50,001 - #100,000	2,769	11.3	92.84
#100,001 - #150,000	721	2.95	95.79
#150,001 - #200,000	111	0.453	96.243
#200,001 - #250,000	25	0.11	96.353
#250,001 - #300,000	39	0.16	96.513
#300,001 - #350,000	12	0.05	96.563
#350,001 - #400,000	9	0.036	96.599
#400,001 - #450,000	7	0.029	96.623
#450,001 - #500,000	6	0.024	96.647
#500,001 - #550,000	4	0.016	96.663
#550,001 - #600,000	2	0.008	96.671
#600,001 - #650,000	0	0	96.671
#650,001 - #700,000	0	0	96.671
#700,001 - #750,000	13	0.054	96.725
#750,001 - #800,000	1	0.004	96.729
#800,001 - #850,000	4	0.016	96.745
#850,001 - #900,000	0	0	96.745
#900,001 - #950,000	0	0	96.745
#950,001 - #1,000,000	1	0.004	96.749
#1,000,001 - #1,050,000	2	0.008	96.757
#1,050,001 - #1,100,000	1	0.004	96.761
#1,100,001 - #1,150,000	100	0.411	97.172
#1,150,001 - #1,200,000	18	0.074	97.246
#1,200,001 - #1,250,000	11	0.045	97.291
#1,250,001 - #1,300,000	9	0.037	97.328
#1,300,001 - #1,350,000	7	0.028	97.356
#1,350,001 - #1,400,000	0	0	97.356
#1,400,001 - #1,450,000	12	0.05	97.406
#1,450,001 - #1,500,000	0	0	97.406
#1,500,001 - #1,550,000	7	0.028	97.434

#1,550,001 - #1,600,000	0	0	97.434
#1,600,001 - #1,650,000	0	0	97.434
#1,650,001 - #1,700,000	11	0.045	97.479
#1,700,001 - #1,750,000	8	0.032	97.511
#1,750,001 - #1,800,000	13	0.053	97.564
#1,800,001 - #1,850,000	16	0.07	97.634
#1,850,001 - #1,900,000	11	0.044	97.678
#1,900,001 - #1,950,000	9	0.003	97.681
#1,950,001 - #2,000,000	13	0.053	97.734
#2,000,001 - #2,050,000	76	0.31	98.044
#2,050,001 - #2,100,000	111	0.453	98.497
#2,100,001 - #2,150,000	87	0.355	98.852
#2,150,001 - #2,200,000	12	0.05	98.902
#2,200,001 - #2,250,000	1	0.004	98.906
#2,250,001 - #2,300,000	1	0.004	98.91
#2,300,001 - #2,350,000	4	0.016	98.926
#2,350,001 - #2,400,000	1	0.004	98.93
#2,400,001 - #2,450,000	1	0.004	98.934
#2,450,001 - #2,500,000	2	0.008	98.942
#2,500,001 - #2,550,000	1	0.004	98.946
#2,550,001 - #2,600,000	1	0.004	98.95
#2,600,001 - #2,650,000	0	0	98.95
#2,650,001 - #2,700,000	11	0.045	98.995
#2,700,001 - #2,750,000	0	0	98.995
#2,750,001 - #2,800,000	0	0	98.995
#2,800,001 - #2,850,000	0	0	98.995
#2,850,001 - #2,900,000	0	0	98.995
#2,900,001 - #2,950,000	11	0.045	99.04
#2,950,001 - #3,000,000	19	0.08	99.12
#3,000,001 - #3,050,000	15	0.061	99.181
#3,050,001 - #3,100,000	11	0.045	99.226
#3,100,001 - #3,150,000	9	0.037	99.263
#3,150,001 - #3,200,000	7	0.028	99.291
#3,200,001 - #3,250,000	0	0	99.291
#3,250,001 - #3,300,000	11	0.044	99.335
#3,300,001 - #3,350,000	12	0.05	99.385
#3,350,001 - #3,400,000	3	0.012	99.397
#3,400,001 - #3,450,000	0	0	99.397
#3,450,001 - #3,500,000	1	0.004	99.401
#3,500,001 - #3,550,000	0	0	99.401
#3,550,001 - #3,600,000	1	0.004	99.405

#3,600,001 - #3,650,000	1	0.004	99.409
#3,650,001 - #3,700,000	1	0.004	99.413
#3,700,001 - #3,750,000	9	0.037	99.45
#3,750,001 - #3,800,000	0	0	99.45
#3,800,001 - #3,850,000	3	0.012	99.462
#3,850,001 - #3,900,000	1	0.004	99.466
#3,900,001 - #3,950,000	0	0	99.466
#3,950,001 - #4,000,000	1	0.004	99.47
#4,000,001 - #4,050,000	11	0.045	99.515
#4,050,001 - #4,100,000	1	0.004	99.519
#4,100,001 - #4,150,000	17	0.072	99.591
#4,150,001 - #4,200,000	0	0	99.591
#4,200,001 - #4,250,000	0	0	99.591
#4,250,001 - #4,300,000	11	0.045	99.636
#4,300,001 - #4,350,000	0	0	99.636
#4,350,001 - #4,400,000	4	0.016	99.652
#4,400,001 - #4,450,000	8	0.032	99.657
#4,450,001 - #4,500,000	0	0	99.657
#4,500,001 - #4,550,000	3	0.012	99.689
#4,550,001 - #4,600,000	0	0	99.701
#4,600,001 - #4,650,000	9	0.037	99.701
#4,650,001 - #4,700,000	1	0.004	99.738
#4,700,001 - #4,750,000	12	0.059	99.742
#4,750,001 - #4,800,000	0	0	99.906
#4,800,001 - #4,850,000	8	0.032	99.801
#4,850,001 - #4,900,000	0	0	99.801
#4,900,001 - #4,950,000	7	0.028	99.833
#4,950,001 - #5,000,000	0	0	99.861
> #5,000,000	34	0.139	100
TOTAL	24,506	100	

TABLE F4: HOUSEHOLD'S TOTAL INCOMES – ALL WAVES (NAIRA)

Total Household's Incomes (Naira)	Frequency	Percentage	Cum.
#0 - #50,000	61,964	77.16	77.12
#50,001 - #100,000	15,021	18.72	95.88
#100,001 - #150,000	1,679	2.09	97.97
#150,001 - #200,000	335	0.4161	98.3861
#200,001 - #250,000	118	0.1501	98.5362
#250,001 - #300,000	98	0.12	98.6562
#300,001 - #350,000	46	0.06	98.7162
#350,001 - #400,000	22	0.02	98.7362
#400,001 - #450,000	25	0.03	98.7662
#450,001 - #500,000	21	0.02	98.7862
#500,001 - #550,000	12	0.01	98.7962
#550,001 - #600,000	6	0.007	98.8032
#600,001 - #650,000	0	0	98.8032
#650,001 - #700,000	0	0	98.8032
#700,001 - #750,000	19	0.023	98.8032
#750,001 - #800,000	3	0.003	98.8262
#800,001 - #850,000	12	0.01	98.8292
#850,001 - #900,000	0	0	98.8392
#900,001 - #950,000	0	0	98.8392
#950,001 - #1,000,000	3	0.003	98.8392
#1,000,001 - #1,050,000	6	0.007	98.8422
#1,050,001 - #1,100,000	3	0.003	98.8492
#1,100,001 - #1,150,000	110	0.14	98.8522
#1,150,001 - #1,200,000	20	0.024	98.9922
#1,200,001 - #1,250,000	11	0.014	99.0162
#1,250,001 - #1,300,000	9	0.011	99.0302
#1,300,001 - #1,350,000	7	0.009	99.0412
#1,350,001 - #1,400,000	0	0	99.0502
#1,400,001 - #1,450,000	12	0.01	99.0502
#1,450,001 - #1,500,000	0	0	99.0602
#1,500,001 - #1,550,000	7	0.009	99.0602
#1,550,001 - #1,600,000	0	0	99.0692
#1,600,001 - #1,650,000	0	0	99.0692
#1,650,001 - #1,700,000	12	0.01	99.0692
#1,700,001 - #1,750,000	9	0.011	99.0792
#1,750,001 - #1,800,000	14	0.017	99.0902
#1,800,001 - #1,850,000	28	0.034	99.1072
#1,850,001 - #1,900,000	12	0.01	99.1412
#1,900,001 - #1,950,000	9	0.011	99.1512

#1,950,001 - #2,000,000	14	0.017	99.1622
#2,000,001 - #2,050,000	80	0.1	99.1792
#2,050,001 - #2,100,000	127	0.16	99.2792
#2,100,001 - #2,150,000	88	0.11	99.4392
#2,150,001 - #2,200,000	14	0.017	99.5492
#2,200,001 - #2,250,000	2	0.0024	99.5662
#2,250,001 - #2,300,000	2	0.0024	99.5686
#2,300,001 - #2,350,000	8	0.01	99.5686
#2,350,001 - #2,400,000	2	0.0024	99.581
#2,400,001 - #2,450,000	2	0.0024	99.5834
#2,450,001 - #2,500,000	4	0.005	99.5858
#2,500,001 - #2,550,000	2	0.0024	99.5908
#2,550,001 - #2,600,000	2	0.0024	99.5932
#2,600,001 - #2,650,000	0	0	99.5956
#2,650,001 - #2,700,000	22	0.027	99.5956
#2,700,001 - #2,750,000	0	0	99.6226
#2,750,001 - #2,800,000	0	0	99.6226
#2,800,001 - #2,850,000	0	0	99.6226
#2,850,001 - #2,900,000	0	0	99.6226
#2,900,001 - #2,950,000	12	0.01	99.6226
#2,950,001 - #3,000,000	28	0.035	99.6326
#3,000,001 - #3,050,000	20	0.024	99.6676
#3,050,001 - #3,100,000	12	0.01	99.6916
#3,100,001 - #3,150,000	9	0.011	99.7016
#3,150,001 - #3,200,000	7	0.009	99.7126
#3,200,001 - #3,250,000	0	0	99.7216
#3,250,001 - #3,300,000	12	0.01	99.7216
#3,300,001 - #3,350,000	12	0.01	99.7316
#3,350,001 - #3,400,000	6	0.0074	99.7416
#3,400,001 - #3,450,000	0	0	99.749
#3,450,001 - #3,500,000	2	0.0024	99.749
#3,500,001 - #3,550,000	0	0	99.7514
#3,550,001 - #3,600,000	2	0.0024	99.7514
#3,600,001 - #3,650,000	1	0.0012	99.7538
#3,650,001 - #3,700,000	2	0.0024	99.755
#3,700,001 - #3,750,000	18	0.022	99.7574
#3,750,001 - #3,800,000	0	0	99.7794
#3,800,001 - #3,850,000	4	0.005	99.7794
#3,850,001 - #3,900,000	2	0.0024	99.7844
#3,900,001 - #3,950,000	0	0	99.7868
#3,950,001 - #4,000,000	2	0.0024	99.7868

#4,000,001 - #4,050,000	13	0.016	99.7892
#4,050,001 - #4,100,000	2	0.0024	99.8052
#4,100,001 - #4,150,000	18	0.022	99.8076
#4,150,001 - #4,200,000	0	0	99.8296
#4,200,001 - #4,250,000	0	0	99.8296
#4,250,001 - #4,300,000	22	0.027	99.8296
#4,300,001 - #4,350,000	0	0	99.8566
#4,350,001 - #4,400,000	7	0.009	99.8566
#4,400,001 - #4,450,000	8	0.01	99.8656
#4,450,001 - #4,500,000	0	0	99.8756
#4,500,001 - #4,550,000	4	0.005	99.8756
#4,550,001 - #4,600,000	0	0	99.8806
#4,600,001 - #4,650,000	9	0.011	99.8806
#4,650,001 - #4,700,000	2	0.0024	99.8916
#4,700,001 - #4,750,000	12	0.01	99.894
#4,750,001 - #4,800,000	0	0	99.904
#4,800,001 - #4,850,000	10	0.013	99.904
#4,850,001 - #4,900,000	0	0	99.917
#4,900,001 - #4,950,000	7	0.009	99.917
#4,950,001 - #5,000,000	0	0	99.926
Greater than #5,000,000	57	0.074	100
TOTAL	80,344	100	

APPENDIX G: ESTIMATION RESULTS FOR NGHPS WAVES

TABLE G1: RELIABILITY TEST FOR NGHPS WAVES

Item	alpha
illness	0.7813
familysize	0.8342
hungerandfood	0.8611
gari	0.8532
rice	0.8512
yamorcassavaormaizeflour	0.8425
beans	0.8803
mosquitonetpossession	0.8125
primaryeducation	0.8106
secondaryeducation	0.7424
higherdegree	0.8322
nobasiceducation	0.7899
hadelectricity	0.8327
noelectricity	0.8111
pipebornewater	0.8444
boreholeandwell	0.8067
riverandspring	0.8442
noacesstowater	0.8308
waterormodernlatrine	0.7942
pitorlatrine	0.8621
noiletfacility	0.8598
selfmedication	0.8443
seekingmedicalcare	0.8471
otherhealthcare	0.8767
wageandsalaries	0.8795
entreprisesandbusiness	0.8246
farmingcropandlivestock	0.8992
remittances	0.8861
monetaryandconditionaltransfers	0.8912
pensionsandgrants	0.8655
dividendandinterestfrominvestment	0.8889
incomesfromlandandpropertiesowned	0.9113
ginicoefficient	0.8582
Testscale	0.8439

TABLE G4: BREUSCH AND PAGAN LAGRANGIAN MULTIPLIER TEST

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{illness}[\text{state},t] = Xb + u[\text{state}] + e[\text{state},t]$$

Estimated results:

	Var	sd = sqrt(Var)
illness	.1220259	.3493221
e	.1074952	.3278645
u	.0001953	.0139765

Test: Var(u) = 0

chibar2(01) = 21144.93
 Prob > chibar2 = 0.0000

TABLE G5: HAUSMAN SPECIFICATION TEST FROM NGHPS WAVES

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
familysize	.0039184	.003998	-.0000795	.
hungerandn~d	.045932	.0457048	.0002272	.0004047
gari	-.0078191	-.0081162	.000297	.0001522
rice	-.0469344	-.0464224	-.000512	.0002818
yamorcassa~r	-.1829267	-.1835649	.0006381	.0000789
beans	-.0148558	-.0148825	.0000267	.0002908
meatorfish	-.0001301	-.0001169	-.0000132	.
mosquitone~n	-.0605506	-.0608625	.0003118	.
nobasicedu~n	.1445293	.1455923	-.001063	.
primarycer~e	.0001904	.000502	-.0003117	.0000194
secondaryc~e	-.0258914	-.0257013	-.0001901	.
higherdegree	-.0913771	-.0913068	-.0000703	.
hadelectri~y	-.0085172	-.0084421	-.0000751	.
noelectric~y	.0038081	.0036356	.0001725	.
pipebornew~r	-.0295207	-.0299119	.0003911	.0001188
boreholean~l	-.004076	-.0040421	-.0000339	.0000291
riverandsp~g	.1406367	.1412909	-.0006542	.
noaccesssto~r	.0286839	.0281756	.0005083	.0003528
waterormod~e	-.0281634	-.028445	.0002816	.
pitorlatrine	-.0005467	-.0004515	-.0000952	.0000471
notoiletfa~y	.027668	.0274538	.0002142	.
alcoholicd~s	-.0000301	-.0000454	.0000153	.0000338
selfmedica~n	.0363698	.0371842	-.0008145	.0000885
seekingmed~e	-.0187611	-.0188258	.0000647	.0001616
otherhealt~e	-.0004229	-.0003851	-.0000379	.
wagesandsa~s	-.0124347	-.012401	-.0000338	.000071
entreprise~s	-.0023993	-.0024031	3.81e-06	.0000111
farmingcro~k	-.0414946	-.042475	.0009804	.0001398
remittances	-.0031222	-.0026962	-.000426	.0002829
monetaryan~s	-.0207743	-.0218835	.0011092	.0002834
pensionsan~s	.0011295	.0008577	.0002718	.0002768
dividendan~n	.0142808	.0142443	.0000365	.0005927
incomesfro~p	-.0014322	-.0013987	-.0000334	.
ginicoeffi~t	.0144032	.013586	.0008172	.

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(34) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 6.18
 Prob>chi2 = 1.0000

TABLE G6: MULTILEVEL LOGIT ESTIMATIONS FROM NGHPS WAVES

```

Mixed-effects logistic regression          Number of obs   =    71410
Group variable: ginicoeffi~t             Number of groups =     10

                                           Obs per group: min =      1
                                           avg =             7141.0
                                           max =            37614

Integration points = 7                    Wald chi2(33)   =   5558.01
Log likelihood = -25974.425               Prob > chi2     =    0.0000
    
```

illness	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	.0371356	.0105634	3.52	0.000	.0164317	.0578394
hungerandnofood	.3414397	.0284712	11.99	0.000	.2856372	.3972422
gari	-.0613303	.0369599	-1.66	0.097	-.1337705	.0111098
rice	-.2720791	.0296484	-9.18	0.000	-.3301889	-.2139694
yamorcassavaormaizeflour	-1.451219	.0287289	-50.51	0.000	-1.507527	-1.394912
beans	-.0189492	.032752	-0.58	0.563	-.0831419	.0452434
meatorfish	-.0007681	.000928	-0.83	0.408	-.002587	.0010507
mosquitonetpossession	-.3968577	.038137	-10.41	0.000	-.4716048	-.3221107
nobasiceducation	.9421984	.0262215	35.93	0.000	.8908052	.9935917
primarycertificate	.0160469	.0102927	1.56	0.119	-.0041265	.0362202
secondarycertificate	-.1960292	.028821	-6.80	0.000	-.2525174	-.1395411
higherdegree	-.67919	.0464025	-14.64	0.000	-.7701372	-.5882427
hadelectricity	-.1018394	.0237728	-4.28	0.000	-.1484332	-.0552455
noelectricity	.0297033	.0181098	1.64	0.101	-.0057912	.0651978
pipebornewater	-.250116	.0089745	-27.87	0.000	-.2677058	-.2325262
boreholeandwell	-.0393466	.0090905	-4.33	0.000	-.0571635	-.0215296
riverandspring	1.073542	.0320197	33.53	0.000	1.010785	1.1363
noaccesstowater	.1402893	.0466779	3.01	0.003	.0488023	.2317763
waterormodernlatrine	-.2364047	.0309295	-7.64	0.000	-.2970253	-.1757841
pitorlatrine	.0034666	.0039216	0.88	0.377	-.0042195	.0111527
notoiletfacility	.1573051	.02761	5.70	0.000	.1031905	.2114196
alcoholicdrinks	-.0017468	.0011709	-1.49	0.136	-.0040418	.0005482
selfmedication	.2749626	.0404763	6.79	0.000	.1956305	.3542948
seekingmedicalcare	-.1567757	.023328	-6.72	0.000	-.2024977	-.1110537
otherhealthcare	-.0021102	.0131458	-0.16	0.872	-.0278754	.0236551
wagesandsalaries	-.0686237	.0084009	-8.17	0.000	-.0850892	-.0521582
enterprisesandbusiness	-.0192362	.0067259	-2.86	0.004	-.0324186	-.0060537
farmingcropandlivestock	-.3506631	.0356147	-9.85	0.000	-.4204666	-.2808596
remittances	-.0201506	.0183145	-1.10	0.271	-.0560463	.0157451
monetaryandconditionaltransfers	-.2144832	.0478031	-4.49	0.000	-.3081755	-.1207909
pensionsandgrants	.0155732	.0379775	0.41	0.682	-.0588613	.0900077
dividendandinterestfrominvestmen	.1126605	.0705516	1.60	0.110	-.025618	.2509391
incomesfromlandandhouseownership	-.0122166	.0078728	-1.55	0.121	-.0276469	.0032138
_cons	.6498914	.1835794	3.54	0.000	.2900825	1.0097

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
ginicoeffi~t: Identity				
var(_cons)	.0581504	.0560376	.0087958	.3844391

LR test vs. logistic regression: chibar2(01) = 14.78 Prob>=chibar2 = 0.0001

TABLE G8: SUB-SAMPLE ESTIMATION (HOUSEHOLDS WITH >#68,648.56)

```

Random-effects logistic regression      Number of obs      =      12733
Group variable: state                 Number of groups   =         37

Random effects u_i ~ Gaussian          Obs per group: min =         60
                                       avg =       344.1
                                       max =       1307

Integration method: mvaghermite       Integration points =         12

Wald chi2(34)                         =       854.93
Prob > chi2                            =       0.0000

Log likelihood = -4751.6023

```

illness	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	.7288192	.1451205	5.02	0.000	.4443883	1.01325
hungerornofood	2.156948	.1260258	17.12	0.000	1.909942	2.403954
gari	-.0135969	.080197	-0.17	0.865	-.1707803	.1435864
rice	-.1392435	.1932999	-0.72	0.471	-.5181044	.2396173
yamorcassavaormaizeflour	-.2788766	.0760107	-3.67	0.000	-.4278548	-.1298983
beans	-.1312671	.0689421	-1.90	0.057	-.2663912	.0038569
meatorfish	-.2100755	.177381	-1.18	0.236	-.5577358	.1375848
mosquitonetpossession	-.6762671	.1804369	-3.75	0.000	-1.029917	-.3226173
primaryeducation	.0003997	.0330398	0.01	0.990	-.0643571	.0651565
secondaryeducation	-.1627274	.1118379	-1.46	0.146	-.3819256	.0564709
highercertificate	-.6447872	.1789288	-3.60	0.000	-.9954812	-.2940932
nobasiceducation	.0774559	.0932046	0.83	0.406	-.1052216	.2601335
hadelectricity	-.0929285	.1262581	-0.74	0.462	-.3403898	.1545327
noelectricity	.0777631	.2703997	0.29	0.774	-.4522105	.6077367
pipebornewater	-.1482242	.018185	-8.15	0.000	-.1838662	-.1125821
boreholeandwell	-.0017053	.018058	-0.09	0.925	-.0370984	.0336878
riverandspring	.3147395	.0738233	4.26	0.000	.1700485	.4594305
noaccesswater	.005464	.0149261	0.37	0.714	-.0237906	.0347186
waterormoderntoilet	-.2017545	.1115749	-1.81	0.071	-.4204372	.0169282
pitorlatrinetoilet	.0000789	.0017164	0.05	0.963	-.0032852	.003443
notoiletfacility	.0031351	.05786	0.05	0.957	-.1102684	.1165387
alcoholic	.0944091	.0556121	1.70	0.090	-.0145886	.2034068
selfmedication	-.6094503	.2994438	-2.04	0.042	-1.196349	-.0225512
seekingorthodoxhealthcare	-.138377	.0613277	-2.26	0.024	-.258577	-.0181769
otherhealthcareservices	.2954139	.0938669	3.15	0.002	.1114382	.4793896
wagesandsalaries	-.0048209	.0321137	-0.15	0.881	-.0677626	.0581207
enterprisesandbusiness	-.0322969	.1155695	-0.28	0.780	-.258809	.1942152
cropandlivestockincomes	-.0462084	.0248193	-1.86	0.063	-.0948533	.0024366
remittances	-.2920633	.1611943	-1.81	0.070	-.6079983	.0238717
monetaryandconditionaltransfers	-.3108454	.120601	-2.58	0.010	-.547219	-.0744718
pensionsandgrants	-.1167654	.1634786	-0.71	0.475	-.4371776	.2036468
dividendandinterestfrominvestmen	.2222396	.2484684	0.89	0.371	-.2647495	.7092286
incomesfromlandandhouseownership	.1558036	.0585837	2.66	0.008	.0409815	.2706256
ginicoefficient	.0027848	.022592	0.12	0.902	-.0414947	.0470643
_cons	.0180391	.6014795	0.03	0.976	-1.160839	1.196917
/lnsig2u	-1.281047	.2881659			-1.845842	-.7162524
sigma_u	.5270164	.0759341			.3973567	.6989849
rho	.0778521	.0206878			.0457956	.129307

Likelihood-ratio test of rho=0: chibar2(01) = 206.11 Prob >= chibar2 = 0.000

APPENDIX H: ESTIMATION RESULTS FOR WAVE I

TABLE H1: RELIABILITY TEST TABLE FOR WAVE I ESTIMATIONS

Item	alpha
illness	0.7742
familysize	0.8521
hungerandfood	0.8597
gari	0.8441
rice	0.8473
yamorcassavaormaizeflour	0.8355
beans	0.8496
meatorfish	0.8524
mosquitonetpossession	0.8803
primaryeducation	0.7225
secondarycertificate	0.7306
higherdegree	0.8767
nobasiceeducation	0.8208
hadelectricity	0.8695
noelectricity	0.7193
pipebornewater	0.8446
boreholeandwell	0.782
riverandspring	0.8003
noaccesstowater	0.8271
waterormodernlatrine	0.8039
pitorlatrine	0.9009
notoiletfacility	0.8221
alcoholicdrinks	0.8267
selfmedication	0.8513
seekingmedicalcare	0.8165
otherhealthcare	0.8542
wagesandsalaries	0.7026
enterprisesandbusiness	0.8992
farmingcropandlivestock	0.9071
remittances	0.8314
monetaryandconditionaltransfers	0.8112
pensionsandgrants	0.8653
dividendandinterestfrominvestment	0.8772
incomesfromlandandpropertiesowned	0.7998
ginicoefficient	0.8212
Test scale	0.8279

TABLE H2: POOLED OLS REGRESSION – WAVE I

Logistic regression
 Number of obs = 19261
 LR chi2(34) = 4121.89
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.2557
 Log likelihood = -5998.6159

illness	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	.0274107	.0163349	1.68	0.093	-.0046052	.0594265
hungerandnofood	.1153272	.0464367	2.48	0.013	.024313	.2063414
gari	-.0146004	.1105876	-0.13	0.895	-.2313482	.2021473
rice	-.4651966	.0512272	-9.08	0.000	-.5656001	-.3647932
yamorcassavaormaizeflour	-2.477608	.0520023	-47.64	0.000	-2.579531	-2.375685
beans	-.4359361	.0930939	-4.68	0.000	-.6183967	-.2534754
meatorfish	.0000183	.0010564	0.02	0.986	-.0020521	.0020888
mosquitonetpossession	-.1132553	.1096829	-1.03	0.302	-.3282298	.1017193
primaryeducation	-.0048859	.0855122	-0.06	0.954	-.1724866	.1627148
secondarycertificate	.0120195	.0150796	0.80	0.425	-.017536	.041575
higherdegree	-.0214409	.0351395	-0.61	0.542	-.0903131	.0474312
nobasiceducation	.3575276	.0748373	4.78	0.000	.2108492	.504206
hadelectricity	-.4674526	.1780092	-2.63	0.009	-.8163442	-.118561
noelectricity	.007249	.0106667	0.68	0.497	-.0136573	.0281553
pipebornewater	-.375227	.1103001	-3.40	0.001	-.5914111	-.1590428
boreholeandwell	.3506021	.0934759	3.75	0.000	.1673927	.5338115
riverandspring	.4142911	.09998	4.14	0.000	.2183339	.6102482
noaccesstowater	-.7518714	.3363248	-2.24	0.025	-1.411056	-.0926869
waterormodernlatrine	-.2160954	.0567444	-3.81	0.000	-.3273124	-.1048785
pitorlatrine	.3392486	.1333248	2.54	0.011	.0779367	.6005605
notoiletfacility	.3839556	.1082935	3.55	0.000	.1717042	.5962069
alcoholicdrinks	.0503993	.0588731	0.86	0.392	-.0649899	.1657886
selfmedication	.1520142	.0648295	2.34	0.019	.0249507	.2790777
seekingmedicalcare	-.0946201	.0858654	-1.10	0.270	-.2629132	.073673
otherhealthcare	.0058876	.0145432	0.40	0.686	-.0226166	.0343919
wagesandsalaries	-.0167458	.1405038	-0.12	0.905	-.2921281	.2586365
entreprisesandbusiness	-.3829247	.0733213	-5.22	0.000	-.5266317	-.2392177
farmingcropandlivestock	.1088361	.2745091	0.40	0.692	-.4291918	.646864
remittances	-.1114508	.0700782	-1.59	0.112	-.2488015	.0258999
monetaryandconditionaltransfers	.2686559	.2588591	1.04	0.299	-.2386987	.7760105
pensionsandgrants	-.1944056	.3163331	-0.61	0.539	-.8144071	.4255958
dividendandinterestfrominvestmen	.1415338	.2212144	0.64	0.522	-.2920385	.5751061
incomesfromlandandpropertiesowne	-.1762752	.1311218	-1.34	0.179	-.4332692	.0807189
ginicoefficient	.016695	.0069267	2.41	0.016	.0031189	.030271
_cons	3.128261	.8133999	3.85	0.000	1.534027	4.722496

TABLE H3: FIXED EFFECT MODEL– WAVE I

> mlandandpropertiesowne ginicoefficient, fe

```

Fixed-effects (within) regression      Number of obs   =   19261
Group variable: state                  Number of groups =    37

R-sq:  within = 0.2619                  Obs per group:  min =    179
      between = 0.1242                    avg =           520.6
      overall  = 0.2590                    max =           905

corr(u_i, Xb) = -0.0399                  F(34,19190)    =   200.32
                                          Prob > F        =    0.0000
    
```

illness	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
familsize	.0205004	.0080311	2.55	0.011	.0047586	.0362421
hunger	.0191291	.0158687	1.21	0.228	-.011975	.0502332
gari	-.0058891	.0095812	-0.61	0.539	-.024669	.0128909
rice	-.0639988	.0051951	-12.32	0.000	-.0741817	-.0538159
yamorcassavaormaizeflour	-.3948515	.0060871	-64.87	0.000	-.4067828	-.3829201
beans	-.0519511	.009789	-5.31	0.000	-.0711384	-.0327637
meatorfish	-.0000369	.0000941	-0.39	0.695	-.0002212	.0001475
mosqitonetpossession	-.0203512	.0116187	-1.75	0.080	-.0431249	.0024224
primaryeducation	-.0330551	.0383677	-0.86	0.389	-.1082592	.042149
secondaryeducation	-.0001537	.0002166	-0.71	0.478	-.0005783	.0002709
higherdegree	-.0015675	.0035253	-0.44	0.657	-.0084773	.0053424
nobasiceducation	.0546709	.0087295	6.26	0.000	.0375603	.0717815
hadelectricity	-.0605658	.0213264	-2.84	0.005	-.1023673	-.0187642
noelectricity	.0006128	.0009526	0.64	0.520	-.0012544	.00248
pipebornewater	-.0694591	.0123731	-5.61	0.000	-.0937115	-.0452066
borehole	-.0028211	.0045934	-0.61	0.539	-.0118246	.0061824
riverandspring	.0540653	.0120654	4.48	0.000	.0304159	.0777146
noaccesstowater	.0194772	.0061704	3.16	0.002	.0073826	.0315718
waterormodernlatrine	-.0115629	.0052113	-2.22	0.027	-.0217775	-.0013482
pitorlatrine	.0407454	.0156518	2.60	0.009	.0100665	.0714243
notoiletfacility	.0705782	.0119981	5.88	0.000	.0470609	.0940955
alcoholicdrinks	.0056853	.0060898	0.93	0.351	-.0062514	.0176219
selfmedication	.0165655	.006698	2.47	0.013	.0034367	.0296942
seekingmedicalcare	-.00432	.0067632	-0.64	0.523	-.0175765	.0089364
otherhealthcare	.0003897	.0012056	0.32	0.747	-.0019734	.0027528
wagesandsalaries	-.021779	.0067937	-3.21	0.001	-.0350952	-.0084628
enterprisesandbusiness	-.0189255	.0075326	-2.51	0.012	-.03369	-.004161
farmingcropandlivestock	-.0322863	.0280863	-1.15	0.250	-.0873379	.0227652
monetaryass1	-.0106956	.0093724	-1.14	0.254	-.0290664	.0076752
remittances	.0192488	.0192603	1.00	0.318	-.0185032	.0570007
pensionsandgrants	-.0095004	.0273755	-0.35	0.729	-.0631589	.0441581
dividendandinterestfrominvestmen	.0175054	.0190945	0.92	0.359	-.0199216	.0549323
incomesfrommlandandpropertiesowne	-.0118754	.01161	-1.02	0.306	-.0346319	.0108812
ginicoefficient	.0021283	.0006299	3.38	0.001	.0008936	.0033629
_cons	1.000868	.0758414	13.20	0.000	.852212	1.149523
sigma_u	.07739303					
sigma_e	.29693685					
rho	.06361093	(fraction of variance due to u_i)				

F test that all u_i=0: F(36, 19190) = 29.62 Prob > F = 0.0000

TABLE H5: HOMOGENEITY TEST FINDINGS FOR WAVE I DATA

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{illness}[\text{state},t] = Xb + u[\text{state}] + e[\text{state},t]$$

Estimated results:

	Var	sd = sqrt(Var)
illness	.125787	.3546646
e	.0882267	.2970298
u	.0007185	.0268048

Test: Var(u) = 0

chibar2(01) = 11600.41
 Prob > chibar2 = 0.0000

TABLE H6: HAUSMAN SPECIFICATION TEST FOR WAVE I DATA

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) fee		
familysize	.0009057	.0004968	.0004089	.0000839
hungerandn~d	-.0001138	-.0031997	.0030859	.
gari	-.0060618	-.0074816	.0014198	.0007962
rice	-.0590511	-.0637587	.0047076	.
yamorcassa~r	-.3945603	-.3947124	.0001521	.0001563
beans	-.0527965	-.0522586	-.0005379	.0008467
meatorfish	-.0000338	-.0000419	8.19e-06	5.93e-06
mosquitone~n	-.0209487	-.0206924	-.0002564	.0003258
primaryedu~n	-.0004279	-.0004465	.0000185	.0004937
secondaryc~e	.0004823	.0000889	.0003934	.
higherdegree	-.0017701	-.0014384	-.0003318	.0002527
nobasicedu~n	.0569079	.0545592	.0023487	.0007281
hadelectri~y	-.0616535	-.0601921	-.0014614	.0018575
noelectric~y	.0006441	.0006098	.0000343	.0000805
pipebornew~r	-.0676728	-.0690925	.0014197	.001076
boreholean~l	.0245967	.0208256	.0037711	.
riverandsp~g	.056177	.054218	.0019589	.0010851
noaccessto~r	-.0446459	-.0333707	-.0112752	.0030124
waterormod~e	-.0134691	-.0112855	-.0021837	.000165
pitorlatrine	.0419156	.040238	.0016776	.0014322
notoiletfa~y	.0693644	.0704902	-.0011258	.000766
alcoholicd~s	.0058917	.0056876	.0002041	.0005593
selfmedica~n	.0173511	.016968	.0003831	.0006168
seekingmed~e	-.0048577	-.0040147	-.000843	.0006213
otherhealt~e	.0003812	.0003369	.0000442	.0001149
wagesandsa~s	.0159761	.0192648	-.0032887	.0013829
entreprise~s	-.0228877	-.018421	-.0044667	.
farmingcro~k	-.0230121	-.031818	.0088059	.0022315
remittances	-.0190661	-.0215407	.0024746	.
monetaryan~s	.0143292	.010974	.0033552	.0022274
pensionsan~s	-.0113687	-.010295	-.0010737	.0024734
dividendan~n	.0152558	.0167058	-.00145	.001747
incomesfro~e	-.0129056	-.0122106	-.000695	.001032
ginicoeffi~t	.0020388	.0021521	-.0001133	.

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(34) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = -90.48 chi2<0 ==> model fitted on these

TABLE H7: ROBUSTNESS CHECK: MULTILEVEL LOGISTIC REGRESSION FOR WAVE I

```

Mixed-effects logistic regression      Number of obs      =      11967
Group variable:      state_gini      Number of groups   =          37

                                      Obs per group: min =          2
                                      avg =      323.4
                                      max =      766

Integration method: mvaghermite      Integration points =          7

                                      Wald chi2(33)      =      1825.41
Log likelihood = -3538.153           Prob > chi2       =      0.0000
    
```

illness	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	.0053334	.0167321	0.32	0.750	-.0274608	.0381277
hungerandnofood	.0647556	.0541601	1.20	0.232	-.0413963	.1709075
gari	-.3401484	.1414931	-2.40	0.016	-.6174698	-.062827
rice	-.6787604	.0738895	-9.19	0.000	-.8235811	-.5339397
yamorcassavaormaizeflour	-2.557521	.0738177	-34.65	0.000	-2.702201	-2.412841
beans	-.5463935	.1246564	-4.38	0.000	-.7907154	-.3020715
meatorfish	.0000978	.0009682	0.10	0.920	-.0017999	.0019955
mosquitonetpossession	-.1510735	.1553396	-0.97	0.331	-.4555334	.1533864
primaryeducation	-.0467961	.1087196	-0.43	0.667	-.2598827	.1662904
secondarycertificate	.0130765	.0193761	0.67	0.500	-.0249	.0510529
higherdegree	.0267672	.0469385	0.57	0.568	-.0652305	.1187649
nobasiceducation	.3435598	.0948245	3.62	0.000	.1577072	.5294124
hadelectricity	-.6387701	.2533803	-2.52	0.012	-1.135386	-.1421539
noelectricity	.0080886	.0130277	0.62	0.535	-.0174452	.0336224
pipebornewater	-.4397192	.1402028	-3.14	0.002	-.7145116	-.1649269
boreholeandwell	.2303016	.1204808	1.91	0.056	-.0058364	.4664396
riverandspring	.224918	.1218864	1.85	0.065	-.0139749	.4638109
noaccesstowater	-.5432824	.3802283	-1.43	0.153	-1.288516	.2019514
waterormodernlatrine	-.1211017	.0703289	-1.72	0.085	-.2589439	.0167405
pitorlatrine	.3746184	.166221	2.25	0.024	.0488313	.7004054
notoiletfacility	.3170022	.1518474	2.09	0.037	.0193869	.6146176
alcoholicdrinks	.1160752	.0791926	1.47	0.143	-.0391394	.2712899
selfmedication	.0429365	.0894318	0.48	0.631	-.1323466	.2182196
seekingmedicalcare	-.1519157	.1085701	-1.40	0.162	-.3647093	.0608779
otherhealthcare	.0119018	.0182448	0.65	0.514	-.0238573	.0476609
wagesandsalaries	.2192181	.173918	1.26	0.208	-.1216548	.5600911
entreprisesandbusiness	-.1171411	.0923004	-1.27	0.204	-.2980466	.0637644
farmingcropandlivestock	-.4165984	.3438393	-1.21	0.226	-1.090511	.2573142
remittances	-.3162549	.0886945	-3.57	0.000	-.490093	-.1424168
monetaryandconditionaltransfers	.5738707	.3299606	1.74	0.082	-.0728401	1.220582
pensionsandgrants	-.0481125	.3817454	-0.13	0.900	-.7963198	.7000948
dividendandinterestfrominvestmen	.6908956	.2787747	2.48	0.013	.1445071	1.237284
incomesfromlandandpropertiesowne	-.1488928	.1664724	-0.89	0.371	-.4751726	.1773871
_cons	3.947843	1.045913	3.77	0.000	1.897892	5.997795
state_gini						
var(_cons)	1.691699	.5013291			.9463952	3.023944

LR test vs. logistic regression: chibar2(01) = 668.66 Prob>=chibar2 = 0.0000

TABLE H8: AVERAGES OF ANNUAL HOUSEHOLDS' INCOMES (NAIRA)

Variable	Obs	Mean	Std. Dev.	Min	Max
wavei	21612	20508.64	884496.8	0	1.00e+08
waveii	24123	28274.62	1111615	0	1.50e+08
waveiii	24506	49606.62	2006370	0	3.00e+08

TABLE H9: ROBUSTNESS CHECK: HOUSEHOLDS WITH INCOMES <#20,508.64

Random-effects GLS regression	Number of obs	=	11967
Group variable: state	Number of groups	=	37
R-sq: within = 0.2447	Obs per group: min =	=	2
between = 0.1845	avg =	=	323.4
overall = 0.2466	max =	=	766
	Wald chi2(34)	=	3846.94
corr(u_i, X) = 0 (assumed)	Prob > chi2	=	0.0000

illness	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	.0000127	.0001026	0.12	0.902	-.0001884	.0002138
hungerandnofood	-.0044327	.0055589	-0.80	0.425	-.0153278	.0064625
gari	-.0275644	.0114878	-2.40	0.016	-.0500801	-.0050487
rice	-.0570888	.0066109	-8.64	0.000	-.070046	-.0441316
yamorcassavaormaizeflour	-.3691514	.0076763	-48.09	0.000	-.3841966	-.3541061
beans	-.0626385	.0127318	-4.92	0.000	-.0875924	-.0376846
meatorfish	-.0007074	.0018647	-0.38	0.704	-.0043621	.0029473
mosquitonetpossession	-.0337908	.015872	-2.13	0.033	-.0648993	-.0026823
primaryeducation	-.0074988	.0107434	-0.70	0.485	-.0285555	.0135579
secondarycertificate	.0015811	.0016493	0.96	0.338	-.0016515	.0048137
higherdegree	.0028796	.0046368	0.62	0.535	-.0062084	.0119676
nobasiceducation	.0686093	.0105794	6.49	0.000	.0478742	.0893445
hadelectricity	-.0953245	.0290123	-3.29	0.001	-.1521875	-.0384614
noelectricity	.0007994	.0011179	0.68	0.498	-.0015114	.0031102
pipebornewater	-.0660059	.0154484	-4.27	0.000	-.0962842	-.0357275
boreholeandwell	.0287603	.0102015	2.82	0.005	.0087658	.0487547
riverandspring	.0336415	.013282	2.53	0.011	.0076094	.0596737
noaccesstowater	-.0838694	.0443994	-1.89	0.059	-.1708907	.0031518
waterormodernlatrine	-.011471	.0063864	-1.80	0.072	-.0239881	.001046
pitorlatrine	.0630428	.0198269	3.18	0.001	.0241829	.1019028
notoiletfacility	.0450482	.0158367	2.84	0.004	.0140089	.0760875
alcoholicdrinks	.0147318	.0080983	1.82	0.069	-.0011406	.0306042
selfmedication	.0001113	.0091202	0.01	0.990	-.0177639	.0179866
seekingmedicalcare	-.0218293	.0101553	-2.15	0.032	-.0417332	-.0019253
otherhealthcare	.0010877	.0017195	0.63	0.527	-.0022825	.0044579
wagesandsalaries	.0202354	.018876	1.07	0.284	-.0167608	.0572316
enterprisesandbusiness	-.0155653	.0092575	-1.68	0.093	-.0337097	.002579
farmingcropandlivestock	-.0518926	.0338458	-1.53	0.125	-.1182291	.0144439
remittances	-.0271652	.0083566	-3.25	0.001	-.0435439	-.0107865
monetaryandconditionaltransfers	.0543873	.0349491	1.56	0.120	-.0141117	.1228863
pensionsandgrants	-.0118083	.032497	-0.36	0.716	-.0755012	.0518846
dividendandinterestfrominvestmen	.058068	.0246773	2.35	0.019	.0097015	.1064346
incomesfromlandandpropertiesowne	-.0117189	.0143634	-0.82	0.415	-.0398707	.0164329
giniql	.0018231	.0008414	2.17	0.030	.0001741	.0034722
_cons	1.036538	.1057275	9.80	0.000	.8293158	1.24376
sigma_u	.11230336					
sigma_e	.30008189					
rho	.12285115	(fraction of variance due to u_i)				

APPENDIX I: ESTIMATION RESULTS FOR WAVE II**TABLE II: RELIABILITY TEST FOR WAVE II DATA**

Item	alpha
illness	0.7165
familysize	0.8116
hungerandfood	0.8237
gari	0.8132
rice	0.8413
yamorcassavaormaizeflour	0.8107
beans	0.8299
meatorfish	0.7991
mosquitonetpossession	0.8269
primaryeducation	0.8512
secondarycertificate	0.7975
higherdegree	0.8067
nobasiceducation	0.8851
hadelectricity	0.8659
noelectricity	0.8734
pipebornewater	0.8632
boreholeandwell	0.8271
riverandspring	0.8302
noaccesstowater	0.8727
waterormodernlatrine	0.8308
pitorlatrine	0.8775
noiletfacility	0.8287
alcoholicdrinks	0.8267
selfmedication	0.8513
seekingmedicalcare	0.8165
otherhealthcare	0.8542
wagesandsalaries	0.8211
enterprisesandbusiness	0.8294
farmingcropandlivestock	0.8974
remittances	0.8438
monetaryandconditionaltransfers	0.8215
pensionsandgrants	0.8624
dividendandinterestfrominvestment	0.8813
incomesfromlandandpropertiesowned	0.7894
ginicoefficient	0.8126
Test scale	0.8341

TABLE I5: HETEROGENEITY TEST: BREUSCH-PAGAN LM RESULTS – WAVE II

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{illness}[\text{state},t] = Xb + u[\text{state}] + e[\text{state},t]$$

Estimated results:

	Var	sd = sqrt(Var)
illness	.1128013	.3358591
e	.0724955	.2692499
u	.002666	.0516336

Test: Var(u) = 0

chibar2(01) = 1489.49
 Prob > chibar2 = 0.0000

TABLE I6: HAUSMAN TEST FINDINGS FROM WAVE II

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
familysize	.0271962	.0273589	-.0001627	.0003622
hungerorno~d	.2761082	.2760836	.0000247	.0002727
gari	.0015167	.0014336	.0000831	.0001643
rice	-.0464178	-.0464381	.0000203	.0002948
yamorcassa~r	-.0084124	-.0083559	-.0000565	.0001682
beans	-.0163369	-.0163906	.0000537	.0001763
meatorfish	-.0396747	-.0398836	.0000209	.0003717
mosquitone~n	-.0950474	-.0946693	-.000378	.000369
primaryedu~n	-.1358892	-.1359028	.0000137	.0003097
secondarye~n	-.0021345	-.0019277	-.0002068	.0001868
highercert~e	-.0622951	-.0622816	-.0000135	.0002094
nobasicedu~n	-.0055802	-.0054943	-.0000859	.0001919
hadelectri~y	-.0213611	-.0212809	-.0000802	.0002105
noelectric~y	-.0005221	-.0004705	-.0000516	.0002109
pipebornew~r	-.0132281	-.013284	.0000559	.0000924
boreholean~l	-.0021701	-.0022166	.0000465	.0000517
riverandsp~g	.0207551	.0207653	-.0000102	.0001389
noaccessto~r	.0042825	.0080605	-.003778	.002667
watermod~t	-.0008045	-.0011636	.0003591	.0005137
pitorlatri~t	.0001121	.0001442	-.000032	.0000238
notoiletfa~y	.0051461	.0050814	.0000646	.0001233
alcoholicd~s	.0092803	.0094173	-.000137	.0002538
selfmedica~n	-.0016012	-.0015121	-.0000891	.0006221
seekingort~e	-.0074594	-.0074775	.0000181	.0001885
otherhealt~e	.0003923	.0002931	.0000992	.0000806
wagesandsa~s	-.0021876	-.002241	.0000535	.0000647
entreprise~s	-.0006419	-.0007223	.0000804	.0000468
cropandliv~s	-.0063706	-.0058536	-.000517	.0003386
remittances	-.0086657	-.0085172	-.0001485	.0004841
monetaryan~s	-.0150834	-.0210908	.0060074	.0041037
pensionsan~s	.0021572	.0017271	.0004301	.000306
dividendan~n	.0234164	.0225877	.0008287	.0004445
incomesfro~p	.0048832	.0048296	.0000537	.0000968
ginicoeffi~t	.4514089	.4511391	.0002697	.000217

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(34) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 12.55
 Prob>chi2 = 0.9997

APPENDIX J: ESTIMATION RESULTS FOR WAVE III**TABLE J1: RELIABILITY TEST TABLE FOR WAVE III ESTIMATIONS**

Item	alpha
illness	0.8544
familysize	0.8623
hungerandfood	0.8727
gari	0.8341
rice	0.8355
yamorcassavaormaizeflour	0.8172
beans	0.8285
meatorfish	0.8143
mosquitonetpossession	0.7853
primaryeducation	0.8613
secondarycertificate	0.8758
higherdegree	0.8765
nobasiceducation	0.8515
hadelectricity	0.7599
noelectricity	0.8437
pipebornewater	0.8333
boreholeandwell	0.8276
riverandspring	0.8221
noaccesstowater	0.8549
waterormodernlatrine	0.8392
pitorlatrine	0.8769
noiletfacility	0.8267
alcoholicdrinks	0.8267
selfmedication	0.8523
seekingmedicalcare	0.8165
otherhealthcare	0.8548
wagesandsalaries	0.8171
enterprisesandbusiness	0.8942
farmingcropandlivestock	0.8749
remittances	0.8384
monetaryandconditionaltransfers	0.8722
pensionsandgrants	0.8127
dividendandinterestfrominvestment	0.8381
incomesfromlandandpropertiesowned	0.7948
ginicoefficient	0.8133
Test scale	0.8388

TABLE J4: RANDOM EFFECT REGRESSION MODEL FOR WAVE III

```

Random-effects logistic regression      Number of obs      =      26774
Group variable: state                  Number of groups   =           37

Random effects u_i ~ Gaussian          Obs per group: min =           6
                                       avg =          723.6
                                       max =          1367

Integration method: mvaghermite        Integration points =           12

Wald chi2(34)                          =      4926.55
Prob > chi2                             =           0.0000

Log likelihood = -6433.7957

```

illness	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	.0730176	.0402185	1.82	0.069	-.0058092	.1518445
hungerorfood	2.066238	.1232832	16.76	0.000	1.824607	2.307868
gari	-.0487604	.1038455	-0.47	0.639	-.2522939	.1547731
rice	-.5198573	.1205585	-4.31	0.000	-.7561476	-.283567
yamorcassavaormaizeflour	-.1088638	.0653639	-1.67	0.096	-.2369747	.0192471
beans	-.1856169	.0690693	-2.69	0.007	-.3209902	-.0502435
meatorfish	-1.605512	.1465904	-10.95	0.000	-1.892824	-1.3182
mosquitonetpossession	-.8287445	.1388754	-5.97	0.000	-1.100935	-.5565538
primaryeducation	-.1407379	.1428332	-0.99	0.324	-.4206858	.13921
secondaryeducation	-.0032129	.3848574	-0.01	0.993	-.7575195	.7510936
highercertificate	-.4545063	.0956131	-4.75	0.000	-.6419045	-.2671081
nobasiceducation	3.434006	.0515201	66.65	0.000	3.333029	3.534984
hadelectricity	-.0133298	.0282576	-0.47	0.637	-.0687137	.0420541
noelectricity	.1027423	.0771057	1.33	0.183	-.0483822	.2538667
pipebornewater	-.158993	.0162468	-9.79	0.000	-.1908361	-.1271498
boreholeandwell	-.0221113	.0159529	-1.39	0.166	-.0533784	.0091558
riverandspring	.2894305	.0633433	4.57	0.000	.16528	.413581
noaccessstowater	.0531793	.0965928	0.55	0.582	-.136139	.2424976
waterandmoderntoilet	-.1765948	.232998	-0.76	0.448	-.6332625	.2800729
pitorlatrinetoilet	.0020015	.0021417	0.93	0.350	-.0021961	.0061992
notoiletfacility	.1011831	.0538813	1.88	0.060	-.0044223	.2067884
alcoholicdrinks	.0621704	.0455662	1.36	0.172	-.0271377	.1514785
selfmedication	.0973168	.179923	0.54	0.589	-.2553259	.4499595
seekinghealthcare	-.06243	.0373073	-1.67	0.094	-.1355509	.0106909
others	-.1448384	.3178582	-0.46	0.649	-.7678291	.4781522
wagesandsalaries	-.129727	.0556495	-2.33	0.020	-.238798	-.020656
businesstradingandenterprises	-.0299376	.0219261	-1.37	0.172	-.072912	.0130368
cropandlivestockincomes	-.1311607	.0570292	-2.30	0.021	-.2429358	-.0193855
remittances	.0731043	.1669724	0.44	0.662	-.2541556	.4003642
monetaryandconditionaltransfers	-.0337019	.0250413	-1.35	0.178	-.0827819	.015378
pension	-.0253367	.0547965	-0.46	0.644	-.132736	.0820625
dividendfrominterestandinvestmen	-.0083833	.1378245	-0.06	0.951	-.2785144	.2617478
incomesfromrentandpropertiesowne	.075829	.1438847	0.53	0.598	-.2061798	.3578377
ginicoefficient	.3341064	.1569505	2.13	0.033	.0264891	.6417237
_cons	.3512731	.6282118	0.56	0.576	-.8799993	1.582546
/lnsig2u	-1.657429	.2707696			-2.188128	-1.126731
sigma_u	.4366101	.0591104			.3348529	.56929
rho	.0547705	.0140179			.032959	.0896776

Likelihood-ratio test of rho=0: chibar2(01) = 232.28 Prob >= chibar2 = 0.000

TABLE J5: HOMOGENEITY TEST RESULTS FOR WAVE III DATA

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{illness}[\text{state},t] = Xb + u[\text{state}] + e[\text{state},t]$$

Estimated results:

	Var	sd = sqrt(Var)
illness	.11317	.3364075
e	.0725663	.2693812
u	.0004319	.0207831

Test: Var(u) = 0
 chibar2(01) = 1303.79
 Prob > chibar2 = 0.0000

TABLE J6: HAUSMAN TEST FOR WAVE III

. hausman fe re

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
familysize	-.0035997	-.0019365	-.0016631	.0005441
hungerorfood	.2758063	.2754148	.0003915	.
gari	.0263661	.0267951	-.000429	.
rice	-.0455929	-.0459452	.0003524	.
yamorcassa~r	-.0076937	-.0072381	-.0004555	.000263
beans	-.0155396	-.0153964	-.0001432	.0003625
meatorfish	-.150947	-.1501279	-.000819	.
mosquitone~n	-.0955961	-.0942025	-.0013936	.
primaryedu~n	-.0361661	-.037301	.0011349	.
secondarye~n	.005359	.001034	.0043249	.
highercert~e	-.0658415	-.0655135	-.0003279	.
nobasicedu~n	.4524457	.4510552	.0013905	.0003816
hadelectri~y	-.0012789	-.001064	-.0002149	.0001622
noelectricity	.0087122	.0065122	.0021999	.0002704
pipebornew~r	-.0130373	-.0131667	.0001293	.0002019
boreholean~l	-.0019985	-.0019704	-.0000281	.0000446
riverandsp~g	.0200687	.0199414	.0001273	.0001024
noaccesssto~r	.0049791	.0037569	.0012222	.0004174
waterandmo~t	-.0150274	-.0341014	.019074	.0112911
pitorlatrirt	.0001156	.000144	-.0000284	.0000261
notoiletfa~y	.007754	.007646	.0001079	.0000501
alcoholicd~s	.0046403	.0050401	-.0003998	.0001012
selfmedica~n	.0062278	.0250148	-.018787	.0111484
seekinghea~e	-.005066	-.0044012	-.0006648	.0003099
others	-.0046812	-.0042922	-.0003891	.
wagesandsa~s	-.0082373	-.0089842	.0007469	.0003694
businessan~g	-.0023802	-.0023738	-6.35e-06	.0001124
cropandliv~s	-.0098043	-.0101577	.0003534	.000372
remittances	.003704	.0042016	-.0004976	.0002319
monetaryan~s	-.0021967	-.0023235	.0001268	.
pension	-.0025684	-.0052934	.002725	.0008904
dividendfr~n	-.0035756	-.0022732	-.0013024	.0043314
incomesfro~e	-.0018051	.0075053	-.0093104	.0065084
ginicoeffi~t	.011607	.0123054	-.0006984	.0004394

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(34) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 271.18
 Prob>chi2 = 0.0000
 (V_b-V_B is not positive definite)

APPENDIX K: Income Inequality and Health-Seeking Behavior (All Waves)

TABLE K1: RELIABILITY TEST FOR ALL NGHPS WAVES

Item	alpha
illness	0.8021
familysize	0.8342
hungerandfood	0.8173
gari	0.8329
rice	0.8625
yamorcassavaormaizeflour	0.8254
beans	0.8835
mosquitonetpossession	0.8251
primaryeducation	0.816
secondaryeducation	0.7442
higherdegree	0.8323
nobasiceducation	0.7892
hadelectricity	0.8372
noelectricity	0.8118
pipebornewater	0.8446
boreholeandwell	0.8064
riverandspring	0.8447
noacesstowater	0.8383
waterormodernlatrine	0.7924
pitorlatrine	0.8612
notoiletfacility	0.8589
selfmedication	0.8448
seekingmedicalcare	0.8474
otherhealthcare	0.8776
wageandsalaries	0.8759
enterprisesandbusiness	0.8264
farmingcropandlivestock	0.8929
remittances	0.8816
monetaryandconditionaltransfers	0.8921
pensionsandgrants	0.8657
dividendandinterestfrominvestment	0.8898
incomesfromlandandpropertiesowned	0.9133
ginicoefficient	0.8825
Testscale	0.8614

TABLE K5: BREUSCH PAGAN TEST FOR ALL NGHPS WAVES

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{medicalcareconsultation}[\text{state},t] = Xb + u[\text{state}] + e[\text{state},t]$$

Estimated results:

	Var	sd = sqrt(Var)
medical~n	.2201604	.4692125
e	.0675526	.2599088
u	.0005247	.022907

Test: Var(u) = 0

chibar2(01) = 32591.73
 Prob > chibar2 = 0.0000

TABLE K6: HAUSMAN TEST FOR ALL NGHPS WAVES

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
familysize	-.0783541	-.077649	-.0007051	.
noeducation	-.0082333	-.0079665	-.0002668	.
primaryedu~n	.1249219	.1261304	-.0012084	.
secondarye~n	.1090681	.1092829	-.0002148	.
highereduc~n	.0839563	.0854645	-.0015083	.0001478
male	-.025554	-.0271041	.0015501	.000583
female	.0123751	.0129402	-.0005651	.
married	.0216141	.0216713	-.0000571	.
nevermarried	.0055644	.0062034	-.000639	.
singlepare~s	-.0193074	-.0188553	-.0004521	.
widowed	-.003121	-.0033321	.0002111	.000023
yes	.0136999	.0132782	.0004216	.
no	-.2355666	-.2347379	-.0008287	.
wagesandsa~s	.0706887	.0710683	-.0003796	.
businessen~s	.0018788	.0019497	-.0000709	.
cropandliv~s	.1817898	.1846501	-.0028603	.
remittances	.0291739	.0303744	-.0012005	.0000631
pensions	.0276799	.0282074	-.0005274	.
dividendfr~n	-.1164792	-.1230948	.0066156	.0005164
incomefrom~s	.0372361	.0387115	-.0014753	.0000785
ginicoeffi~t	-.0030742	-.0030785	4.24e-06	.

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(21) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 366.32
 Prob>chi2 = 0.0000

APPENDIX L: Income Inequality and Health-Seeking Behavior Wave I Estimations

TABLE L1: POLS RESULTS FOR WAVE I

Logistic regression	Number of obs	=	26184
	LR chi2(22)	=	5328.51
	Prob > chi2	=	0.0000
Log likelihood = -6075.251	Pseudo R2	=	0.3049

medicalcareconsultation	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	-.0205841	.0145471	-1.42	0.157	-.0490959	.0079276
nobasiceducation	-.0238041	.0747328	-0.32	0.750	-.1702778	.1226696
primaryeducation	2.244705	1.354949	1.66	0.098	-.4109467	4.900357
secondaryeducation	.4936334	.047252	10.45	0.000	.4010212	.5862457
higherdegree	.1197544	.0364683	3.28	0.001	.0482779	.1912308
male	.0940527	.1110084	0.85	0.397	-.1235198	.3116252
female	.0622761	.0602539	1.03	0.301	-.0558193	.1803715
married	.4439548	.228872	1.94	0.052	-.0046262	.8925358
singleparent	1.674341	1.126871	1.49	0.137	-.5342854	3.882967
widowed	.3868048	.2964624	1.30	0.192	-.1942508	.9678603
nevermarried	-.7196103	.0516406	-13.93	0.000	-.820824	-.6183965
yes	.3829988	.2175915	1.76	0.078	-.0434728	.8094703
no	-2.823109	.0525162	-53.76	0.000	-2.926038	-2.720179
wagesandsalaries	.3736593	.1477315	2.53	0.011	.0841109	.6632077
enterprisesbusinessandtrading	.0019419	.0023675	0.82	0.412	-.0026984	.0065822
farmingcropandlivestock	.5175838	.2912931	1.78	0.076	-.0533401	1.088508
remittance	-.2027175	.0425149	-4.77	0.000	-.2860452	-.1193898
monetaryandconditionaltransfers	.7142648	.2718391	2.63	0.009	.1814699	1.24706
pension	-.0130192	.0107115	-1.22	0.224	-.0340133	.0079749
dividendandinterestfrominvestmen	-.0622416	.1108936	-0.56	0.575	-.279589	.1551057
incomefrompropertiesandhouseowne	-.0469328	.0563821	-0.83	0.405	-.1574396	.063574
ginicoefficient	-.2041868	.074047	-2.76	0.006	-.3493164	-.0590573
_cons	-1.491469	1.661914	-0.90	0.369	-4.748761	1.765823

TABLE L2: FIXED EFFECT RESULTS FOR WAVE I

> useowne ginicoefficient, fe

```

Fixed-effects (within) regression      Number of obs   =   26184
Group variable: state                 Number of groups =    37

R-sq:  within = 0.2589                Obs per group:  min =    215
      between = 0.3399                    avg =   707.7
      overall = 0.2651                    max =   1367

                                          F(22,26125)    =   414.89
corr(u_i, Xb) = -0.0359                Prob > F        =   0.0000
    
```

medicalcareconsultation	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
familysize	-.0011981	.0010264	-1.17	0.243	-.0032099	.0008136
nobasiceducation	-.0030291	.0056471	-0.54	0.592	-.0140978	.0080396
primaryeducation	.0885304	.0809501	1.09	0.274	-.0701361	.247197
secondaryeducation	.0568798	.0044768	12.71	0.000	.048105	.0656546
higherdegree	.0105431	.0029785	3.54	0.000	.0047051	.0163811
male	.0032494	.0072921	0.45	0.656	-.0110435	.0175422
female	.0066684	.0048962	1.36	0.173	-.0029284	.0162652
married	.0186876	.0135088	1.38	0.167	-.0077904	.0451656
singleparent	.0660844	.0676395	0.98	0.329	-.0664928	.1986616
widowed	.012789	.0188076	0.68	0.497	-.024075	.049653
nevermarried	-.0610221	.0039035	-15.63	0.000	-.0686732	-.0533711
yes	.0195877	.0143972	1.36	0.174	-.0086316	.0478069
no	-.3630601	.0045725	-79.40	0.000	-.3720225	-.3540977
wagesandsalaries	.0582655	.0130569	4.46	0.000	.0326733	.0838576
entreprisesbusinessandtrading	.000033	.0001529	0.22	0.829	-.0002668	.0003328
farmingcropandlivestock	.0321479	.0227306	1.41	0.157	-.0124053	.0767011
remittance	-.0169009	.0029333	-5.76	0.000	-.0226503	-.0111515
monetaryandconditionaltransfers	.0481133	.0206857	2.33	0.020	.0075681	.0886584
pension	.0017324	.0019672	0.88	0.379	-.0021234	.0055882
dividendandinterestfrominvestmen	-.0040263	.0067445	-0.60	0.551	-.0172459	.0091932
incomefrompropertiesandhouseowne	-.0001126	.0010338	-0.11	0.913	-.0021389	.0019138
ginicoefficient	-.0162472	.0051521	-3.15	0.002	-.0263456	-.0061488
_cons	.5559419	.1004829	5.53	0.000	.35899	.7528938
sigma_u	.04195521					
sigma_e	.25963145					
rho	.02544849	(fraction of variance due to u_i)				

F test that all u_i=0: F(36, 26125) = 12.55 Prob > F = 0.0000

TABLE L3: RANDOM EFFECT RESULTS FOR WAVE I

```

Random-effects logistic regression      Number of obs      =      26184
Group variable: state                  Number of groups   =          37

Random effects u_i ~ Gaussian          Obs per group: min =          215
                                          avg =          707.7
                                          max =          1367

Integration method: mvaghermite        Integration points =          12

Wald chi2(22) = 3852.87
Log likelihood = -5929.9803             Prob > chi2 = 0.0000
    
```

medicalcareconsultation	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	-.0189489	.0153239	-1.24	0.216	-.0489831	.0110854
nobasiceducation	-.0414266	.0769718	-0.54	0.590	-.1922886	.1094354
primaryeducation	1.958467	1.388522	1.41	0.158	-.7629871	4.67992
secondaryeducation	.458121	.0486371	9.42	0.000	.362794	.5534479
higherdegree	.1141327	.0371085	3.08	0.002	.0414014	.186864
male	.0486074	.1137431	0.43	0.669	-.174325	.2715399
female	.0770621	.0616763	1.25	0.211	-.0438211	.1979454
married	.3931076	.2346099	1.68	0.094	-.0667194	.8529346
singleparent	1.492792	1.155017	1.29	0.196	-.7709991	3.756583
widowed	.3017982	.3044093	0.99	0.321	-.2948331	.8984295
nevermarried	-.862973	.0562857	-15.33	0.000	-.973291	-.752655
yes	.3368784	.2247012	1.50	0.134	-.1035278	.7772847
no	-2.892777	.0553001	-52.31	0.000	-3.001164	-2.784391
wagesandsalaries	.3803207	.1508933	2.52	0.012	.0845752	.6760662
entreprisesbusinessandtrading	.0007238	.0024245	0.30	0.765	-.0040281	.0054757
farmingcropandlivestock	.4861379	.2991299	1.63	0.104	-.1001458	1.072422
remittance	-.2328434	.0451379	-5.16	0.000	-.321312	-.1443747
monetaryandconditionaltransfers	.7076487	.2687392	2.63	0.008	.1809294	1.234368
pension	.0047887	.024858	0.19	0.847	-.0439322	.0535095
dividendandinterestfrominvestmen	-.0400701	.1145896	-0.35	0.727	-.2646615	.1845214
incomefrompropertiesandhouseowne	-.0539949	.0587506	-0.92	0.358	-.1691439	.0611542
ginicoefficient	-.195393	.0777297	-2.51	0.012	-.3477405	-.0430455
_cons	-.7910711	1.705125	-0.46	0.643	-4.133055	2.550912
/lnsig2u	-1.170979	.2670048			-1.694299	-.6476591
sigma_u	.5568333	.0743386			.4286351	.7233735
rho	.0861303	.0210165			.0528927	.137228

Likelihood-ratio test of rho=0: chibar2(01) = 290.54 Prob >= chibar2 = 0.000

TABLE L4: HOMOGENEITY TEST FOR WAVE I

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{medicalcareconsultation}[\text{state},t] = Xb + u[\text{state}] + e[\text{state},t]$$

Estimated results:

	Var	sd = sqrt(Var)
medical~n	.0931834	.3052596
e	.0674085	.2596315
u	.0008587	.0293043

Test: Var(u) = 0

chibar2(01) = 1466.88
 Prob > chibar2 = 0.0000

TABLE L5: HAUSMAN TEST FOR WAVE I

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
familysize	-.0011981	-.0012538	.0000557	.0000895
nobasicedu~n	-.0030291	-.0029502	-.0000789	.000095
primaryedu~n	.0885304	.0878617	.0006687	.
secondarye~n	.0568798	.0575989	-.0007191	.0001449
higherdegree	.0105431	.0106241	-.000081	.0000897
male	.0032494	.0035437	-.0002944	.0001379
female	.0066684	.0066214	.000047	.
married	.0186876	.0185786	.000109	.
singleparent	.0660844	.0648761	.0012083	.
widowed	.012789	.0125297	.0002593	.0001857
nevermarried	-.0610221	-.0596706	-.0013515	.0004206
yes	.0195877	.0197915	-.0002039	.
no	-.3630601	-.3629936	-.0000665	.000248
wagesandsa~s	.0582655	.0583809	-.0001154	.
enterprise~g	.000033	.0000394	-6.38e-06	3.42e-06
farmingcro~k	.0321479	.0325185	-.0003706	.
remittance	-.0169009	-.0165578	-.0003432	.0002044
monetaryan~s	.0481133	.0487588	-.0006456	.
pension	.0017324	-.0002171	.0019495	.0011869
dividendan~n	-.0040263	-.0043865	.0003602	.000209
incomefrom~e	-.0001126	-.0001276	.0000151	.
ginicoeffi~t	-.0162472	-.0166056	.0003584	.000293

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(22) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 33.12
 Prob>chi2 = 0.0602
 (V_b-V_B is not positive definite)

TABLE L7: FIXED EFFECT RESULTS FOR WAVE II

```

Fixed-effects (within) regression      Number of obs   =   27363
Group variable: state                 Number of groups =    37

R-sq:  within = 0.3025                Obs per group:  min =    6
      between = 0.6533                    avg =   739.5
      overall  = 0.3115                    max =  1370

corr(u_i, Xb) = 0.0354                F(22,27304)    =   538.22
                                         Prob > F       =   0.0000
    
```

healthcareconsultation	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
familysize	-.0025359	.0021629	-1.17	0.241	-.0067754	.0017035
nobasiceducation	-.0001663	.0026099	-0.06	0.949	-.0052818	.0049493
primaryeducation	.0012929	.0070116	0.18	0.854	-.0124503	.0150361
secondaryeducation	-.000304	.0103086	-0.03	0.976	-.0205094	.0199014
highereducation	.4258039	.0042127	101.08	0.000	.4175467	.434061
male	-.0904117	.0117425	-7.70	0.000	-.1134276	-.0673957
female	.0005741	.0013867	0.41	0.679	-.002144	.0032921
married	.0176408	.0043003	4.10	0.000	.009212	.0260695
nevermarried	-.0072261	.0058174	-1.24	0.214	-.0186285	.0041764
singleparents	-.0969859	.0079088	-12.26	0.000	-.1124876	-.0814843
widow	-.0248621	.0093407	-2.66	0.008	-.0431704	-.0065539
yes	.0032212	.0070187	0.46	0.646	-.0105359	.0169782
no	-.0807974	.0121031	-6.68	0.000	-.1045201	-.0570746
wagesandsalaries	.0020897	.0043525	0.48	0.631	-.0064414	.0106207
businessentreprisesortrade	.0171035	.0106652	1.60	0.109	-.0038007	.0380078
farmingcropandlivestockincomes	.0002522	.000152	1.66	0.097	-.0000457	.0005502
remittance	.0001859	.0073394	0.03	0.980	-.0141996	.0145715
monetarytransferandassistance	.0374541	.0118146	3.17	0.002	.0142969	.0606113
pension	.0026104	.0051271	0.51	0.611	-.0074391	.0126598
dividendfrominvestmants	.0008156	.0089701	0.09	0.928	-.0167662	.0183974
incomefrompropertiesowned	-.0024776	.0022591	-1.10	0.273	-.0069055	.0019503
ginicoefficient	-.0325315	.0089336	-3.64	0.000	-.0500419	-.0150212
_cons	.2894552	.0203405	14.23	0.000	.2495869	.3293236
sigma_u	.03689254					
sigma_e	.26319748					
rho	.01926919	(fraction of variance due to u_i)				

F test that all u_i=0: F(36, 27304) = 12.14 Prob > F = 0.0000

TABLE L9: HOMOGENEITY TEST FOR WAVE II

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{healthcareconsultation}[\text{state},t] = Xb + u[\text{state}] + e[\text{state},t]$$

Estimated results:

	Var	sd = sqrt(Var)
healthc~n	.1020391	.3194355
e	.0692729	.2631975
u	.0012733	.0356832

Test: Var(u) = 0

chibar2(01) = 1704.60
 Prob > chibar2 = 0.0000

TABLE L10: HAUSMAN TEST FOR WAVE II

	Coefficients			
	(b) fe	(B) ree	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
familysize	-.0025359	-.0028173	.0002814	.0005002
nobasicedu~n	-.0001663	-.0001	-.0000663	.0000952
primaryedu~n	.0012929	.0012604	.0000325	.000169
secondarye~n	-.000304	-.0001337	-.0001703	.0003218
highereduc~n	.4258039	.4261466	-.0003427	.000269
male	-.0904117	-.0909536	.0005419	.0003889
female	.0005741	.0006428	-.0000687	.0000954
married	.0176408	.0178023	-.0001615	.0002471
nevermarried	-.0072261	-.0071533	-.0000727	.0001784
singlepare~s	-.0969859	-.0969159	-.00007	.0001883
widow	-.0248621	-.0247998	-.0000623	.0001415
yes	.0032212	.0033524	-.0001312	.0003164
no	-.0807974	-.0803582	-.0004391	.0003841
wagesandsa~s	.0020897	.0018929	.0001968	.0001758
businessen~e	.0171035	.0148553	.0022483	.0035351
farmingcro~s	.0002522	.0002291	.0000231	.0000341
remittance	.0001859	.0005722	-.0003863	.0003776
monetarytr~e	.0374541	.0378351	-.000381	.0003592
pension	.0026104	.0024932	.0001172	.0002843
dividendfr~s	.0008156	.000061	.0007546	.0006095
incomefrom~d	-.0024776	-.0026031	.0001255	.000217
ginicoeffi~t	-.0325315	-.0325775	.0000459	.0001491

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(22) = (b-B)' [(V_b-V_B)^(-1)] (b-B)
 = 13.08
 Prob>chi2 = 0.9310

TABLE L11: POLS REGRESSION FOR WAVE III

Iteration 6: log likelihood = -8169.129

Logistic regression

Number of obs = 26774

LR chi2(22) = 4425.53

Prob > chi2 = 0.0000

Log likelihood = -8169.129

Pseudo R2 = 0.2131

medicalcareconsultation	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
familysize	-.0644956	.0183075	-3.52	0.000	-.1003776	-.0286136
noeducation	-.0736325	.0941796	-0.78	0.434	-.2582212	.1109562
primaryeducation	.0017618	.1363741	0.01	0.990	-.2655266	.2690502
secondaryeducation	.0049832	.0540581	0.09	0.927	-.1009689	.1109352
highereducation	.9398048	.0827504	11.36	0.000	.7776169	1.101993
male	-.0423334	.0570056	-0.74	0.458	-.1540622	.0693955
female	.0876786	.0863266	1.02	0.310	-.0815184	.2568756
married	.0043882	.0384088	0.11	0.909	-.0708916	.079668
nevermarried	-.0761868	.1220007	-0.62	0.532	-.3153038	.1629302
singleparents	-.072903	.0557136	-1.31	0.191	-.1820995	.0362936
widowed	-.1786877	.0649045	-2.75	0.006	-.3058982	-.0514773
yes	-.0157682	.0582893	-0.27	0.787	-.1300132	.0984768
no	-.126423	.1263236	-1.00	0.317	-.3740126	.1211666
wagesandsalariesincomes	-.3604191	.0857101	-4.21	0.000	-.5284078	-.1924305
businessenterprisesandtrades	-.6499355	.3062807	-2.12	0.034	-1.250235	-.0496364
cropandlivestockincomes	.6069024	.0440595	13.77	0.000	.5205474	.6932574
remittances	.1380351	.143866	0.96	0.337	-.1439372	.4200073
pensions	-.016151	.02141	-0.75	0.451	-.0581139	.0258118
monetarytransferandassistance	.296829	.0437527	6.78	0.000	.2110753	.3825827
dividendfrominterestandinvestmen	-3.057167	.068032	-44.94	0.000	-3.190507	-2.923826
incomefromproperties	-.0216944	.0097973	-2.21	0.027	-.0408968	-.0024921
ginicoefficient	-.071248	.0687511	-1.04	0.300	-.2059976	.0635016
_cons	1.428141	.3887846	3.67	0.000	.6661369	2.190144

TABLE L14: HOMOGENEITY TEST FOR WAVE III

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{medicalcareconsultation}[\text{state},t] = Xb + u[\text{state}] + e[\text{state},t]$$

Estimated results:

	Var	sd = sqrt(Var)
medical~n	.1136394	.3371044
e	.080623	.283942
u	.0010889	.0329986

Test: Var(u) = 0

chibar2(01) = 8741.96
 Prob > chibar2 = 0.0000

TABLE L15: HAUSMAN TEST FOR WAVE III

	Coefficients			
	(b) re	(B) fe	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
familysize	-.0039045	-.0039809	.0000764	.0001035
noeducation	-.0029591	-.0040908	.0011317	.0005546
primaryedu~n	.0056452	.0073742	-.001729	.001017
secondarye~n	-.0019915	-.0017378	-.0002537	.0002701
highereduc~n	.0654412	.0665533	-.0011121	.
male	-.0036299	-.0035629	-.000067	.0003909
female	.000217	-.0005725	.0007896	.0005538
married	.0038657	.0037793	.0000864	.0000824
nevermarried	-.0058085	-.0044665	-.001342	.0009215
singlepare~s	-.0057747	-.0058365	.0000618	.000319
widowed	-.009353	-.0052378	-.0041152	.
yes	-.0000779	.0007821	-.0008599	.0004121
no	-.0104798	-.0111264	.0006466	.0009293
wagesandsa~s	-.00247	.0160697	-.0185397	.
businessen~s	-.0344667	-.0329265	-.0015402	.0020311
cropandliv~s	.0487534	.0450919	.0036615	.0002329
remittances	.0056802	.0059317	-.0002515	.0010983
pensions	.000711	.0018179	-.0011069	.
monetarytr~e	.0254445	.0220878	.0033567	.
dividendfr~n	-.4270767	-.3735009	-.0535758	.
incomefrom~e	-.0126023	-.0141988	.0015966	.0004703
ginicoeffi~t	-.0009183	-.0006501	-.0002682	.0000625

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(22) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = -251.14 chi2<0 ==> model fitted on these
 data fails to meet the asymptotic

