ESSAYS IN ECONOMICS OF HEALTH

a developing country perspective

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Summary

This thesis provides empirical evidence on two topical health economics-related issues which are analysed from individual-level data from two developing countries. Sub Sahara Africa (SSA) is ranked the worst for almost every health indicator. Regardless of promises of better healthcare by various governments and donor communities, the region has the highest share of all disease burdens and millions of people die each year from preventable diseases. Yet, the utilisation of appropriate healthcare services remains low largely due to the burden of paying directly from the pocket at the health facilities. Although informal risk-sharing mechanisms in the form of savings have long existed in many countries in SSA, the concept of insurance in the health sector is relatively new. Ghana is among the few countries in the region currently experimenting health insurance in her health sector.

Ghana's national health insurance scheme (NHIS) is a fully home-grown policy that does not receive any external support. After more than ten years of its implementation, there is a paucity of quantitative study estimating the impact of the policy on out-of-pocket (OOP) healthcare expenditure; which is the main objective of the NHIS in Ghana. Therefore the first chapter of this thesis is focused on estimating the impact of the NHIS on OOP healthcare expenditure in Ghana. The chapter also looks at the effect of the NHIS on the use of healthcare services from appropriate health facilities. Aside from the problem of health expenditures, high levels of morbidity and mortality levels, there exist weak functioning health systems with high inequality levels in many countries in the region; making the poor very vulnerable. Nigeria is ranked among the most unequal countries in the world. Meanwhile, there are some empirical evidence regarding inequality in various healthcare utilisation and outcome in the country. Therefore accounting for unobserved heterogeneities between individuals, the second chapter of this thesis is devoted to investigating the socio-economic inequality in health hypothesis with evidence from Nigeria.

The analyses carried out in the two papers yield the following conclusions: in the first paper where Ghana's health insurance policy is evaluated, the empirical estimation with the entire sample using the full set of explanatory variables shows a statistically significant negative impact of the NHIS policy on OOP expenditure on healthcare. This significant impact remains evident in the male and female sample independently even though the magnitude of the policy impact in the female sample is marginally higher. This means that the NHIS

is reducing the burden of high healthcare expenditure among the insured in Ghana. Also, the insured are observed to be more likely to seek healthcare from appropriate health facilities than their uninsured counterparts.

Then in the second paper; unlike income, using consumption and wealth as measures of living standard (or socio-economic status (SES)) are found to be statistically significant in explaining inequality in health status in Nigeria even after accounting for unobserved heterogeneities. The health status was measured using the global indicators for activities of daily living (ADLs). However, there is no empirical evidence with regard to socio-economic inequality in health expenditures. Finally, decomposing the SES inequality in health status revealed age, household size, marital status and place of residence to have appreciable contributions to health status inequalities.

Co-authorship Statement

Aside from a general introduction to the original empirical works, this thesis consists of two main chapters. The introductory part of the thesis presents the motivation for the two empirical issues investigated in the two chapters. Specifically, this research manuscript are as follows:

Introduction

Chapter 1: The Impact of National Heath Insurance Scheme on Healthcare Expenditure and Facility Utilisation in Ghana.

Supervised by Prof. Carlo Fiorio

Chapter 2: Socio-economic Inequality in Health Status and Health Expenditure - *evidence from Nigeria.*

Supervised by Prof. Carlo Fiorio

While these research were carried out under the supervision of Prof. Carlo Fiorio, as the main author and as part of the requirements for this PhD programme, I identified the research problem(s), carried out the empirical analysis and wrote everything contained in this thesis.

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Contents

Introduction

Health economics research has steadily become an important branch of economics particularly for developing economies given the role that health plays in the growth and development process of an economy. In other words, the health of a population is an indication of the wealth of that nation. It is therefore not surprising that in comparing the health outcomes of developed countries to their developing counterparts, the latter is seen to be worse-off in almost all health indicators making health economics research even more critical in the developing world. Among the developing economies, Africa which is the poorest region in terms of per capita income, is also the most challenged in other areas including socio-economic and demographic factors. Furthermore, these challenges are even worse in Sub Sahara Africa (SSA). In addition, the continent is confronted with a heavy burden of communicable and non-communicable diseases and high healthcare costs whereby patients are required to pay directly out from their pockets at the moments when healthcare is needed. Even though a number of the prevailing challenges can be reduced by the existence of strong institutions and the political will, many population health difficulties can be eliminated (or at least be reduced) by investment into research and the willingness on the side of policy makers to implement findings from these research.

While the focus of many health economics research in the region has been on issues such as health outcomes (morbidity and mortality levels), healthcare accessibility and utilisations levels, other aspects of population health such as healthcare financing and health inequities remain unresolved; thereby creating some research gap in many developing economies, particularly in SSA. These are equally important areas that need attention in the literature in terms of country-specific evidence for a holistic result in the health sector and also for the development of research in the field. It is therefore not surprising that issues regarding healthcare financing are among the priority aspects of healthcare for the World Health Organisation (WHO). This is evident in the 2005 World Health Assembly resolution which emphasises the point that everyone should be able to access health services and not be subject to financial hardship (WHO, 2010).

This resolution was made due to the growing reliance of user-fee in the health sectors of many member countries (especially developing economies) and the repercussions it had on population health. User-fee in the social sector (especially education and health), were generally introduced as a cost recovery measure in many African countries during the early 1980s as a recommendation

by the World Bank when they sought financial assistance from the Bank. Subsequently, the user-fee in the health sector became an important source of revenue for many African governments. Unfortunately, this method of healthcare financing resulted in many problems. For example, in Ghana, some of the problems were delay in reporting to health facilities, low healthcare service utilisation, partial purchase of prescribed drugs and many needless deaths (Asenso-Okyere, Anum, Osei-Akoto, and Adukonu, 1998). Therefore as a step to eliminate or at least minimise the problems associated with the user-fee system by making healthcare accessible to all at the lowest cost possible, health insurance (HI) has become a globally accepted means of financing healthcare expenditures. Unlike the developed world, in Africa, this cost sharing strategy in the health sector is a relatively new phenomenon. African countries such as Democratic Republic of Congo, Ghana, Rwanda, Senegal and South Africa, are currently experimenting the health insurance scheme as an alternative to provide affordable health to the population but the coverage has been relatively low due to health systems weaknesses (Kirigia and Barry, 2008). In other words, in the developing world, health insurance implementing countries are at different stages in the implementation process. For instance, Ghana, Indonesia, The Philippines, Rwanda and Vietnam are considered to be in their intermediate stage of HI reform; while others such as Kenya, India, Mali and Nigeria are at the very early stage of the implementation process (Lagomarsino, Garabrant, Adyas, Muga, and Otoo, 2012).

Even though insurance in the health sector is relatively far advanced in the developed world, it remains a topical issue. Some of the recent issues that have generated research and discussions on various platforms in these countries relate to the sustainability of healthcare funds and how to encourage the uninsured (especially those in the informal sector) to enrol. Nevertheless these are also potential problems (if not existing) in the developing world too. The United States for instance has undertaken tax reforms to extend tax incentive for health insurance in order to encourage people in the informal sector to enrol (Gruber and Poterba, 1994); even though the effectiveness of this strategy, just like any other normal good largely depends on the elasticity of demand for the health insurance.

Meanwhile, health systems differ from country to country and the existing healthcare systems may be an indication of the norms and values prevailing in that particular country. Traditionally, based on the source of financing, there are three types of health insurance models namely; Beveridge model, Bismarck

model and Private insurance model (Lameire, Joffe, and Wiedemann, 1999). The Beveridge insurance model is a system run by the state whereby universal access to health care (preventive and curative treatments) is financed mainly from general taxation (O'Connell, 2012). Here, health care budget competes with other spending priorities and health services are mainly provided by public providers. Aside from the United Kingdom (UK), Canada, Denmark, Finland, Italy, Spain and Sweden are also known for implementing this type of health insurance. The Bismark model on the other hand is an insurance-based but run by the government which requires mandatory enrolment for the entire population and financed through progressive contributions based solely on income. Under this model, healthcare services may be provided by both public and private providers and allows more flexible spending on healthcare (Lameire et al., 1999). Notable examples of countries implementing this model are Austria, Germany, France and Switzerland. The third, Private health insurance operates in a form of contract between the insurance company and the clientelè based on an insurance premium for a given benefit coverage. Obviously, majority of the providers here belong to the private sector. For a pure private health insurance, a classic example of implementing country is the United States. In the developing world, countries with reasonable private providers include *inter alia* Brazil, Chile, Lebanon and Saudi Arabia.

Although this kind of private risk-sharing in health is a relatively new phenomenon in many low and middle-income countries, there seem to be an increasing trend with a greater proportion happening in Asia and Eastern Europe. Not surprising, SSA lags behind in this regard and this has been attributed to the prevailing low per capita income and weak institutional structures. Yet in Africa, South Africa and Morocco are the countries known to have a sizeable private insurance industry (Drechsler and Jutting, 2007). In terms of which health insurance model is the best, there is no direct answer. The Bismarck model appears to be relatively more appealing in welfare economics because of its equity consideration which is based on the ability-to-pay principle. However, regards issues on fund sustainability, the Beveridge model seems to be a better option.

Now, since the issue of universal health coverage received substantial attention in low income countries, attempts have been made to create various risk-pooling groups; hence the establishment of community-based health insurance (CBHI) scheme in some of these countries. The CBHI is made up of smaller risk-sharing groups (usually residents in a community) and premiums are rela-

tively moderate compared to the private health insurance model. This also has an advantage of adapting to the needs of subscribers (Drechsler and Jutting, 2007). Democratic Republic of Congo, Senegal and Rwanda are notable examples of countries implementing the community-based health insurance strategy (Spaan, Mathijssen, Tromp, McBain, Have, and Baltussen, 2012). By defining the benefit package of HI based on the the general health needs of members, the design and implementation of health insurance schemes typically in developing countries vary among countries, reflecting peculiar country characteristic(s). For example, in analysing the health insurance systems in nine (9) low and lower-middle income countries[1] in Africa and Asia, Lagomarsino et al. (2012) found varying health insurance models among these countries and these models also did not strictly conform to the historical archetypes.[2] Nonetheless many health insurance schemes in developing countries are largely financed through tax revenues. An exception is in Rwanda where close to half (47 percent) of HI funding comes from donor support (Lagomarsino et al., 2012).[3] However, the benefit package and targeted population are among some of the features distinguishing the various HI schemes. For instance, the benefit package of Ghana's national health insurance scheme (NHIS) is based on the country's disease profile and thereby does not include certain life-style diseases (e.g. obesity, kidney-related issues, etc.), sickling cell diseases, cosmetic and beautification surgery. While Ghana's NHIS scheme has the entire population as its ultimate target, India's *Rashtriya Swasthya Bima Yojna*[4] and Vietnam's health care fund for the poor are designed mainly to provide free healthcare for the poor (see. Wagstaff, 2009; Lagomarsino et al., 2012).[5] Hence the success or otherwise of any health insurance programme is dependent on many factors such as the prevailing health systems, cultural and religious beliefs of the people it serves.

The growing demand for the expansion of health insurance globally as a means to move closer to attaining universal health coverage necessitates proper evaluation of the policy that takes into account the varying economic and demographic characteristics of implementing countries. Therefore the first chapter of this thesis provides an empirical evidence regards how Ghana's health insur-

[1] The countries include Ghana, India, Indonesia, Kenya, Mali, Nigeria, The Philippines, Rwanda and Vietnam.

[2] i.e. Beveridge, Bismarck or Private models

[3] Yet in Kenya and Mali, donor funding accounts for at least a quarter of HI funding; i.e. 36 and 27 percent respectively.

[4] i.e. the national health insurance in India

[5] However, India's *Rashtriya Swasthya Bima Yojna* has been extended to include other vulnerable groups such as street vendors and domestic workers (Lagomarsino et al., 2012).

ance scheme is impacting on out-of-pocket expenditure on healthcare and the utilisation of healthcare services from appropriate health facilities.

As earlier indicated, inequality in health is another population health issue which needs more attention in the literature as far as health in SSA is concerned. Yet, much of the discussions over the rising level of inequality is with respect to total or some components (e.g. wage rates, earnings, remittances) of income inequality. Relating this to health, considerable effort (though not enough) has been devoted to the socio-economic status (SES) and health inequality hypothesis in the literature but existing empirical evidence seem to suggest that this debate is far from being settled. Again, as mentioned already, countries differ in terms of their healthcare systems and factors that influence their living standards. Empirical studies that support the SES and health inequality hypothesis have provided evidence to argue that health[6] is affected by the distribution of socio-economic status within an economy (see for example: Ben-Shlomo, White, and Marmot, 1996; Kaplan, Pamuk, Lynch, Cohen, and Balfour, 1996; Kawachi and Kennedy, 1997; Kennedy, Kawachi, Glass, and Prothrow-Stith, 1998; Shibuya, Hashimoto, and Yano, 2002; Wagstaff, van Doorslaer, and Watanaba, 2003; Wagstaff, 2005). While there is an extensive empirical evidence from the developed world, the same cannot be said for the developing world. Unfortunately in the developing world, factors such as culture and religion also play key roles in influencing the beliefs and choices made by the people which may eventually affect their living standards. Therefore, the effect of socio-economic status on health may be country-specific and probably contribute to reasons why the debate is still far from conclusion. Studies on socio-economic status and health inequality hypothesis vary in a number of ways and hence making this hypothesis a controversial one.

Firstly, many empirical studies investigating the SES and health inequality relationship have been conducted at various levels of aggregation; including population, community/states and individual levels; with quite contrasting revelations. For example, there are studies at the population level of aggregation[7] that suggest an inconclusive evidence (see Rodgers, 1979; Waldmann, 1992; Bidani and Ravallion, 1997; Beckfield, 2004). Here, while income inequality is found to have an important effect on health (Rodgers, 1979; Waldmann, 1992), in other studies, income inequality no longer mattered in the health of the

[6] of an individual and/or population

[7] whereby the effect of SES inequality on health is investigated using the population health and SES indicators.

poor (Bidani and Ravallion, 1997; Beckfield, 2004). In addition, other empirical evidence have shown that studies carried out at the aggregate level may be associated with aggregation-related problems[8] and may therefore lead to biased estimates (Wagstaff and van Doorslaer, 2000; Gravelle, Wildman, and Sutton, 2002; Mellor and Milyo, 2002). Meanwhile, a number of community level studies (such as: Ben-Shlomo et al., 1996; Kaplan et al., 1996; Kawachi and Kennedy, 1997; Kennedy, Kawachi, and Prothrow-Stith, 1996a; Lynch, Kaplan, Pamuk, Cohen, and K.E. Heck, 1998); focusing on the within-country relationship have confirmed the existence of some correlation between SES inequality and health. However, in Kennedy et al. (1998), the evidence of SES inequality in health is mixed such that the association between income and health inequality diminishes as one goes further up on the income distribution[9]. Then at the individual level of aggregation, again the findings are mixed. That is, while there are studies supporting the SES inequality in health hypothesis (Kennedy et al., 1998; Shibuya et al., 2002; Wagstaff et al., 2003; Wagstaff, 2005; Lindelow, 2006), others empirical studies find no consistent association between socio-economic inequality and health inequality (Daly, Duncan, Kaplan, and Lynch, 1998; Fiscella and Franks, 1997; Mellor and Milyo, 2002; Osler, Prescott, Gronbaek, Christensen, Due, and Engholm, 2002; Sturm and Gresenz, 2002).

Secondly, significant number of these studies have relied on income as a measure of living standard[10] (see for example: Daly et al., 1998; Fiscella and Franks, 1997; Gravelle et al., 2002; Kennedy et al., 1998; Osler et al., 2002; Shibuya et al., 2002; Sturm and Gresenz, 2002; Wildman, 2003b); suggesting health is directly affected by income inequality. However for developing countries (such as Nigeria), consumption is argued to be a better measure of living standard since it captures what households consumed whether they purchased, produced or financed it through current, future or past income (Deaton and Grosh, 2000). Also, because many households are engaged in subsistence agriculture making home production an important component of household consumption, consumption level is argued to be a better approximation of households' standard of living in the developing world (O'Donnell, Doorslaer, Wagstaff, and Lindelow, 2008). In addition, consumption may be different from income in instances where consumers borrow or save, or receives transfers from other family members or as in-kind payments from employers or from the government as part of government

[8] especially when dealing with non-linear functions

[9] This effect is even no more at the top of the income distribution.

[10] probably because of data constraints

social protection programme.

Thirdly, reliance on cross-sectional data for such analysis and(or) failure to control for other covariates are(is) very common among a lot of the existing studies (see: Kennedy et al., 1998; Lindelow, 2006; Shibuya et al., 2002; Wagstaff and Watanabe, 2003). Ability to control for the influence of unobserved differences among respondents in regression models is critical for estimating unbiased outcome(s). Certainly, studies that rely on only a cross-sectional data will be unable to account for such unobserved heterogeneities between countries or individual and hence may produce biased estimates. A possible solution to this problem is to use fixed effect regression model but only a few have done so (examples include: Daly et al., 1998; Mellor and Milyo, 2002; Beckfield, 2004).

Fourthly, in estimating the SES health inequality, conventional measures such as the Gini coefficient (Judge, 1995; Kennedy et al., 1998; Gravelle et al., 2002; Shibuya et al., 2002; Mellor and Milyo, 2002), income shares (Daly et al., 1998; Fiscella and Franks, 1997; Sturm and Gresenz, 2002), coefficient of variation (Soobader and LeClere, 1999), and Robin Hood index (Kennedy, Kawachi, and Prothrow-Stith, 1996b) which are insensitive to the socio-economic dimension to inequalities in health are frequently used. For example the use of coefficient of variation by Kennedy et al. (1996b) revealed only the inequality in the health variable and not the SES-related health inequality. Taking into account this deficiency, the analysis carried out in this study uses health concentration indices. The concentration index has an additional advantage of accounting for this dimension of inequality ignored by other measures of inequality.

Finally, the main focus of many empirical studies on this relationship particularly in the developing world has been restricted to maternal and child health[11] (see: Wagstaff, 2000, 2005; Wagstaff et al., 2003; Wagstaff and Watanabe, 2003). A probable reason for this trend may be attributed to data constraints and thereby creating a research gap regards other aspects of health and health-related behaviours such as the functional capabilities of an individual and health expenditure which are among the health-related variables considered in the second chapter of this thesis.

Inequality is increasingly becoming a matter of concern in Nigeria (UNDP, 2009). Despite being one of the world's leading exporters of oil, the country is ranked 47th (Factbook) in terms of inequality with a Gini index of about 0.44[12];

[11] mainly mortality levels and maternal healthcare services (i.e. antenatal care, institutional deliveries, etc.)

[12] The Gini index is according to The World Bank's world development indicators (WDI)

placing Nigeria among the most unequal countries in the world. The income shares held by the highest 20 and 10 percent of the population in 2009 were estimated to be 49 and 33 percentages respectively. Meanwhile, the income share for the lowest 10 percent of the population was just about 2 percent. In addition, about 53.47 percent of the population were estimated as poor using the poverty headcount ratio of USD 1.90 per day.[13] The high poverty problem is suggested to be a characteristic of the high inequality level prevailing in the country and this systematic structure of inequity may among other things imply limited opportunities and low purchasing power (UNDP, 2009); which may include expenditure on healthcare services. Consequently, there are great disparities in health status even though some health indicators have shown steady, albeit slow improvement (WHO, 2014).

Comparing Nigeria's health indicators to those of other countries within the same income group (lower-middle income status) shows that the country is far behind. For instance, the life expectancy at birth in Nigeria which was about 52.74 years in 2014; was lower than that of the group's average of 67.15 years, or other lower-middle income countries such as; Ghana (61.31 years), Kenya (61.58 years), India (68.01 years), Morocco (74.02 years) and Vietnam (75.63 years) during the same period. Meanwhile, healthcare expenditure remains high in Nigeria with private healthcare expenditure (as a percentage of gross domestic product (GDP)) estimated at 2.75 (in 2014). The health indicators within the country also vary greatly with the northern part of the country being worse-off. Currently, there is no well functioning health insurance system making patients bear almost all healthcare expenditure. That is, out-of-pocket (OOP) healthcare expenditure is estimated at 95.74 percent[14] representing a huge burden on an average Nigerian. Given the prevailing high inequality level, the burden of OOP healthcare expenditure, generally low health status and the associated differences in these health indicators within the country, the second chapter of the thesis is interested in estimating the SES inequality in health by finding out if the variation in socio-economic status (measured independently by consumption, income and wealth levels) affects inequality in health status and health expenditures in Nigeria after accounting for unobserved heterogeneity.

By carrying out this analysis, the study provides an empirical evidence as to whether or not the socio-economic inequality in health hypothesis holds for health status (measured by the functional capabilities of an individual) and

[13]This is with respect to 2011 purchasing power parity. All estimates are according to WDI.
[14]Figures sourced from WDI.

health expenditures after controlling for unobserved heterogeneity. Also, the use of three (3) different measures of socio-economic status (consumption, income and wealth) independently in the analysis has an advantage of estimating and presenting the socio-economic inequality in health completely from different angles and judgements. The analysis further looks at how the factors vary in terms of their contribution to socio-economic health inequality.

Chapter 1

The Impact of National Health Insurance Scheme on Out-of-Pocket Healthcare Expenditure and Facility Utilisation in Ghana

Abstract

The concept of health insurance (HI) is relatively new in the developing world. Meanwhile among countries experimenting HI, there is a dearth of empirical studies regarding the impact of the HI scheme on healthcare expenditure, particularly in Sub Saharan African (SSA). This study provides an insight into how Ghana is using her health insurance scheme; the country's major social protection programme, to impact out-of-pocket (OOP) healthcare expenditure and facility utilisation. The policy impact is estimated by using difference-in-difference (DID) estimation strategy. The analysis also takes into account self selection into the HI programme by using propensity score matching to create a comparable control group. The use of DID estimation means that the impact estimated here relates to the effect of the HI only on those covered by the scheme (average treatment effect on the treated). Generally the results in the full set model show that the HI scheme is serving as a cushion against the burden of OOP healthcare expenditure in Ghana. Meanwhile, the outcome by gender indicates that the magnitude of the benefits derived from the scheme is only marginally higher in the female sample. Finally, the insured are found to be more likely to seek healthcare from appropriate heath facilities than their uninsured counterparts. Given that the HI scheme is criticised for its piece-meal implementation, to achieve improvements in the health of all, the findings in this chapter is an indication for policy makers to introduce some form of incentives to encourage those in the informal sector to enrol.

Keywords: health insurance, healthcare expenditure, utilisation, Ghana
JEL: I13

1.1 Introduction

Although informal risk-sharing mechanisms in the form of savings have long existed in many developing countries including Ghana, the concept of risk-sharing in the health sector is a relatively new phenomenon in many of these countries. Out-of-pocket (OOP) payments remain the main source of healthcare financing in many low and middle-income countries, making the utilisation of appropriate healthcare services generally low in these countries. Meanwhile the promotion and protection of health is regarded essential to human welfare and the sustenance of economic and social development (WHO, 2010). As a result, health continues to be a major political concern as governments strive to meet the demands and expectations of their people. For instance, African leaders recognised that though the prevailing healthcare systems on the continent needed some external help, such assistance could only be achieved if the leaders themselves demonstrated some form of commitment. Therefore, during an annual meeting of African Union (AU) heads of States in Abuja-Nigeria, 2001, African leaders/governments pledged to allocate at least 15 percent of their respective annual budget to the improvement of their health sectors. Unfortunately, many African countries[1] had not been able to fulfil this pledge as at the end of 2013. Those who have managed to achieve this target have also not been consistent.[2] In Ghana, the target was achieved only in 2005, 2007 and 2009 (WHO, 2016).[3]

More than a decade into this resolution, over-reliance on out-of-pocket (OOP) payment for healthcare continues to be an impediment to a more rapid movement toward universal health coverage (UHC) in developing countries particularly Asia and Sub-Saharan Africa (SSA). Therefore, patients are required to make payments (either in full or part) at the moments when healthcare is needed. Ghana is no exception regards the burden of OOP expenditure on the utilisation of healthcare services. The out-of-pocket expenditure on healthcare in Ghana, as a percentage of total health expenditure between 1995 and 2013 have witnessed fluctuating trends and remains an important determinant of healthcare services utilisation. This averaged about 30 percent between 1995 and 2004[4]; and then recorded some marginal declines until 2012. In 2013, the

[1] Such as Angola, Benin, Botswana, Cape Verde, Cameroon, Cote d'Ivoire and Mali.

[2] Examples include Burkina Faso, Burundi, Central African Republic, Ethiopia, Ghana and Mali. It is worth noting that the government of Mali has shown tremendous commitment such that in 2012, the government's share to the health sector as a percentage of total government expenditure was 22.1 percent (WHO, 2016).

[3] These were 15.1, 16.2 and 16.4 percentages respectively.

[4] Just before the implementation of the National Health Insurance Scheme in Ghana in

country recorded the highest percentage (36.2) for OOP expenditure on health. Expressing OOP as a percentage of private health expenditure, households in Ghana not only bear more than half of the entire cost but also, the figure has been increasing over the period. For instance in 1995, this was estimated at 64.2 percent but in 2014, the figure had increased to 66.8 percent. Although when comparing Ghana's rates to those of her immediate neighbouring countries (Burkina Faso, Cote d'Ivoire and Togo), they are relatively low for Ghana, these countries have rather been improving given that they witnessed declining trends in their OOP health expenditures within the same period.[5] Again, Ghana's rate of 66.8 percent in 2014 was far above both the World's average (45.5 percent) and OECD members' average (36.0 percent) within the same period.[6]

Globally, as part of measures to reduce (or eliminate) the burden of financing healthcare directly from the pocket, health insurance (HI) has emerged as a promising alternative. Health insurance may be financed by the state through general taxation; insurance-based run by the state; or through private contract between the insurance company and the clientèle based on insurance premium for a given benefit coverage (O'Connell, 2012; Lameire et al., 1999). Regardless of the financing strategy, HI may be implemented for various reasons including *inter alia;* to increase utilisation of appropriate healthcare services, reduce incidence of self-medication,[7] reduce OOP expenditure on healthcare, minimise delays in reporting to health facility when sick/injured, improve social inclusion and generally to improve the health status of the population it serves. Despite the general impression that HI should increases the utilisation of healthcare services, health insurance can lead to an improvement in health status and thereby reduce the need and use of healthcare services (Taubman, Allen, Wright, Baicker, and Finkelstein, 2014). However, such an effect may probably happen in the long term. Meanwhile, among the reasons outlined earlier, the primary objectives of any HI model are to reduce OOP health expenditure and increase utilisation of appropriate healthcare services.

Just like many goods and services, it is expected that removing the difficulties in accessibility may lead to "abuse" of the service (that is the moral hazard component associated with the provision of free or subsidised good or service).

2005.

[5] That is, these countries recorded the following: Burkina Faso (94.3 percent), Cote d'Ivoire (81.6 percent) and Togo (83.5 percent) in 1995. However, by 2014 these rates declined significantly to 81.9, 719 and 75.1 percentages respectively.

[6] Figures were sourced from https://data.worldbank.org/indicator/SH.XPD.OOP.ZS

[7] Which is very common in developing economies.

But healthcare services appear to be quite unique since patients bear some form of pain/burden or in the worse case, may lose their lives in the case of any hidden action. Therefore, individuals are likely to take good care of themselves and rather visit a health facility when the need arises. Even in instances of increased healthcare service utilisation after health insurance, Wagstaff (2009) indicates that part of the increase in utilisation is a form of risk-pooling whereby resources are rather transferred from those "fortunate" not to have fallen sick to their "unfortunate" counterparts who fell sick and this represents a welfare gain from insurance.

Although HI has been successful in many countries, such successes largely depend on prevailing health systems and the group it serves.[8] Empirically, there is evidence that HI provides financial protection by reducing the burden of OOP healthcare expenditure; and thereby improving health service utilisation (see. Xu, Evans, Kawabata, Zeramdini, Klavus, and Murray, 2003; Chaudhuri and Roy, 2008; Spaan et al., 2012; Wagstaff, 2009; Brugiavini and Pace, 2011; Blanchet, Fink, and Osei-Akoto, 2012). However, according to Spaan et al. (2012), there is rather a weak evidence of HI providing financial sustainability in countries like Rwanda and Uganda; and there is also an insufficient evidence of HI improving social inclusion.[9]

In Ghana, the national health insurance scheme (NHIS) was implemented in 2005 mainly as a strategy to remove financial barriers to healthcare service utilisation. Although the intention is to eventually make the NHIS free to everyone, currently, the scheme is highly subsidised for formal sector employees. The policy was received with much enthusiasm when it was first introduced. This was evident in the very long queues in NHIS-accredited health facilities. Unfortunately, in recent times, there has been mixed feelings and the enthusiasm appears to have come down. A number of concerns have also been raised both by patients and the service providers with some facilities threatening to decline the provision of the service package to beneficiaries. One of such complaints regards delay[10] in NHIS reimbursement to service providers. This according to many service providers puts unnecessary pressures on them in terms of how to raise funds to run the day-to-day activities of the facilities. Therefore in some

[8] That is, in instances where HI is implemented on a piece-meal basis.

[9] With respect to social inclusion, it was revealed that while HI increased the number of insured indigents in The Philippines and The Thai, the poor in Cameroon, Guinea and Senegal were mostly not enrolled because of the premium charged (Spaan et al., 2012). See Spaan et al. (2012) who extensively reviewed existing studies on the impact of HI.

[10] Sometimes as far back as 9 to 13 months of unpaid funds.

facilities, even when the prescribed drugs are available, patients are requested to pay because they are told those drugs are not available in the facility's pharmacy. There is also the issue of co-payments (although illegal) existing in some health facilities.

Evaluating the impact of the NHIS is useful because despite being credited as one of the few developing countries that achieved the millennium development goal one (MDG 1)[11] even before the set 2015 deadline, the health-related MDGs (goals 4, 5 and 6) were not even achieved at the end of 2015. In addition, Ghana's life expectancy at birth of 61 years (2013) is not very impressive compared to the likes of other lower-middle-income[12] countries such as Cape Verde (73 years), Egypt (71 years), Morocco (74 years), Bangladesh (71 years) and India (68 years) during the same period. Given that OOP expenditure on healthcare is still high and life expectancy at birth is relatively low in Ghana, there is obviously the need to evaluate the impact of Ghana's NHIS policy on OOP healthcare expenditure after a decade of its implementation.

Another reason for this study is the fact that the NHIS is currently the only major social protection programme implemented by the government of Ghana. The programme does not receive any sponsorship from the Donor Community. Therefore, being a fully home-grown policy, there is a considerable interest in estimating the impact of the policy on health expenditure[13] since not much has been done in this regard. Then also, prior to the implementation of the NHIS, the healthcare financing system that existed required patients to make part-payment even before healthcare was received. This discouraged many Ghanaians from seeking appropriate healthcare; with some resorting to self medication or cheap and unsafe tradition methods. Therefore, the paper asks the following questions; has the health insurance scheme in Ghana reduced OOP healthcare expenditure and by how much? is there any variation in the policy impact by gender? and does being enrolled under the scheme influence the utilisation of healthcare services from appropriate health facilities in Ghana?

The study's main objective shares a similarity with that by Brugiavini and Pace (2016), but the focus and the methodology adopted in this study are very different. Here in this study, the analyses are carried out by first using

[11] MDG 1 was to eradicate extreme poverty and hunger and Ghana achieved this in 2006.

[12] Ghana attained a lower-middle-income status in 2010 with her gross domestic product and gross national income per capita at market prices estimated at USD 38.62 billion and USD 1,590 respectively in 2014 (both values are in current US dollars). The values were sourced from WDI's data.worldbank.org/country/ghana.

[13] which is the main objective of the policy

propensity score matching to account for some observable characteristics that may bias the study's outcome. Secondly, unlike Brugiavini and Pace (2016) who used a probit model that to some extent accounts for self selection into the health insurance enrolment, this study uses difference-in-difference estimation strategy to account for unobserved heterogeneity that may bias the results.[14]

Thirdly, aside from estimating the policy impact for the entire sample, this study introduces a gender perspective in the analysis by also estimating the policy impact in the male and female samples independently. That is, for an informative analysis of the health insurance policy impact, there is the need to divide the sample into groups that provide meaningful implications. The gender-perspective analysis carried out in this study is worthy for three main reasons. Firstly, it provides a relatively more detailed information on the contribution made by the NHIS policy to respondents' budgetary allocation particularly to healthcare given that estimating the policy impact in the entire sample may mask certain details that may be driven by gender disparities. Secondly and most importantly, although family, lifestyles, social and cultural factors play significant roles in the health of an individual, biologically, men and women have different health needs that may require varying degree of healthcare service utilisation and hence the implication(s) on their healthcare expenditure. For instance, compared to males, the reproductive stage (15 - 49 years) of females is associated with many health risks which may influence their healthcare decisions. Finally, in certain parts of the country, particularly in the north, women's involvement in decision making is very limited. That is men are regarded as superior in the household and therefore are required to make all decisions concerning running the household and the welfare of all its members, thereby restricting women autonomy and their access to certain services such as healthcare. Therefore, the gender-perspective analysis is expected to unravel the extent to which men and women are taking advantage of the HI policy and the impact (if any) on their out-of-pocket health expenditures. This is undoubtedly a vital contribution to the empirical evidence on the health insurance policy impact in Ghana and to the literature at large.

The final distinction lies in the choice of dataset used in the analysis. While the study by Brugiavini and Pace (2016) was conducted using a cross-section data from the 2013 Ghana Demographic and Health Survey (GDHS), this study uses two repeated cross-section datasets from the Ghana Living Standard Sur-

[14]The study by Brugiavini and Pace (2016) was an only an extensive margin analysis.

vey which provide before and after policy implementation information of respondents needed to carry out the difference-in-difference estimations. The datasets are extensively described later in the chapter.

Carrying out this study is very important both from Ghanaian and international perspectives. From a Ghanaian perspective, the NHIS was introduced to provide free health insurance coverage for workers and to reduce the burden of OOP healthcare expenditure in Ghana. A reduction in household or individual budget on healthcare will ensure that they have enough disposable income to consume other equally important goods and services. Also, the health insurance in Ghana was a major political campaign tool in the run-down to the 2000 general elections by the then main opposition political party (New Patriotic Party) because of the existing financial hardship in accessing healthcare and Ghanaians waited anxiously for it when the party gained political power in 2001. Since its implementation in 2005, not much has been done with regard to the quantitative impact of the policy on out-of-pocket healthcare expenditure. That is, many of the existing empirical studies have either been qualitative in nature; or used data on selected parts of the country.

In addition, these have primarily focused on enrolment levels, healthcare services provided, utilisation and patient satisfaction; and willingness and acceptability of the policy (see. Asenso-Okyere, Osei-Akoto, Anum, and Appiah, 1997; Jehu-Appiah, Aryeetey, Spaan, Hoop, Agyepong, and Baltussen, 2011; Dalinjong and Laar, 2012; Brugiavini and Pace, 2011, 2016). The use of area/district-specific data for such analysis makes the analysis not nationally representative and so outcomes cannot be generalised. In this study, a nationally representative household survey data which contain a wide range of information is used in the analysis. Finally, unlike other social protection programmes in the past, the NHIS is a home-grown insurance which is modelled based on the country's socio-economic characteristics with no funding from external sources (Seddoh, Adjei, and Nazzar, 2011). In fact, the NHIS is the only social protection programme the country currently can boast of; making it necessary for an evaluation to find out the extent to which Ghanaians are benefiting from the scheme in order to make some policy recommendations.

From an international perspective, Africa (especially SSA) is far behind in terms of the WHO's universal health coverage (UHC) agenda. Also, there is heterogeneity among health insurance implementing countries in terms of the

design[15] of insurance, targeted groups,[16] benefits package, disease profile, and the preferences and expectations of the people it serves. For instance, with respect to the targeted group, while Vietnam's healthcare fund for the poor is specifically designed to cover the poor and those living in vulnerable communities (Wagstaff, 2009); Ghana's NHIS appears to be pro-rich (see. Jehu-Appiah et al., 2011; Brugiavini and Pace, 2016) given that the formal sector employees whose healthcare expenditures are highly subsidised under the scheme are rather relatively better-off economically. The differing characteristics in relation to the prevailing health systems necessitate country-specific study to find out the impact of the policy on intended objectives. Furthermore, this study provides an insight into the extent to which Ghana is using her home-grown health insurance scheme to reduce financial barrier(s) to healthcare service utilisation. This may help institutions like the WHO and UNICEF on how to apply the findings from this study to other areas of healthcare to guide country programming in support for the universal health coverage agenda. Finally, this study is also a contribution to the empirical evidence on the impact of health insurance on healthcare expenditure and utilisation of healthcare services from appropriate health facilities such that the findings may be useful for other countries that share Ghana's characteristics and with the intention of introducing health insurance to their heath sector.

The rest of the paper is organised in the following manner: section 1.2 provides an overview of the health systems that have existed in Ghana right from independence to the current national health insurance scheme (NHIS). The section also highlights some of the problems that prevailed in Ghana's health system prior to the implementation of the NHIS in the country. This is followed by the empirical model and other related issues in treatment evaluation literature in section 1.3. In section 1.4, the data and the description of variables used in the estimation are presented. The results and discussions are subsequently presented in section 1.5 and the final section concludes the chapter.

1.2 Ghana's healthcare system

Beginning from independence[17] until the mid-1970s, there was "free universal healthcare" policy in Ghana. Unfortunately, the period between 1966 and 1981

[15] This includes both the institutional design and the organisational models.
[16] Particularly in countries where the policy does not cover the entire population.
[17] Ghana obtained political independence from the British on 6th March, 1957.

witnessed significant political instability mainly in the form of series of coup d'etat which led to frequent change of governments and inadequate investment in healthcare by successive governments. Generally, the early 1980s were very challenging moments for many SSA countries and most sought help from international and multinational institutions particularly the World Bank and the International Monetary Fund (IMF); and Ghana was no exception, hence the introduction of the Structural Adjustment Programme(SAP) in Ghana around the same period. An important aspect of the SAP was the introduction of cost recovery measures in the social sectors (particularly education and health) in the form of user charges or fees (Asenso-Okyere et al., 1998).

The introduction of the "user fee" or "fee-for-service" system in 1985 required Ghanaians to pay for their healthcare to enable cost recovery for the health sector. Patients were therefore required to pay partly for consultations and diagnostic procedures, and fully for drugs supplied (Asenso-Okyere et al., 1998). Later in 1992, the government of Ghana introduced the "cash and carry" system where patients were still required to pay for consultations and diagnostic procedures and fully for drugs supplied. With this system, patients' first point of contact in a health facility was the revenue collection point of the outpatient department (OPD). The "cash and carry" system led to delay in reporting to health facilities, partial purchase of prescribed drugs and sharing of prescribed drugs with other household members. In some instances, when more than one person in a household was sick, only one member visited a health facility, took the prescribed drugs and shared with other sick members in order to avoid multiple payments of consultations and diagnostic fees (Asenso-Okyere et al., 1998).

The "cash and carry" system resulted in many needless deaths and hence in 2003, the government of Ghana instituted the national health insurance scheme (NHIS); which was established by the National Health Insurance Act 2003 (Act 650) to provide financial access to quality basic healthcare for residents in Ghana but this was fully implemented in 2005. Even though on paper, there are three types of schemes under the NHIS Law,[18] only the District-Wide Mutual Health Insurance Scheme (DMHIS) is operative because of the support it receives from the government. Under the DMHIS, each district is divided into health insurance communities so that health insurance is brought to the door-step of all. The government uses the NHIS as a source of social protection for the people of

[18]The types of scheme are: District-Wide Mutual Health Insurance Scheme, Private Mutual Health Insurance Scheme and Private Commercial Health Insurance Scheme.

Ghana. The responsibility for managing the Scheme is assigned to a Council, who reports to the Minister for Health; who subsequently serves as a channel of communication with the President for executive decisions and Parliament for budgetary and legislative decisions regards running of the Scheme (Seddoh et al., 2011).

Eligibility for membership requires an annual premium of GHC 16 (about USD 5.00) and an enrolment fee of GHC 1.50 (USD 0.50). Although the scheme is designed to eventually cover the entire population, an important feature of the NHIS is its piece-meal implementation whereby, the following category of people are exempted from paying any premium; contributors of Social Security National Insurance Trust (SSNIT) or those drawing pension on SSNIT, persons less than 18 years (provided both parents are enrolled or covered by the exemption clause), persons 70 years old and beyond and indigents. The exempted groups are required to pay only the enrolment fee which is a one-time payment. Membership is transferable across districts so that a person automatically becomes a member of the resident Scheme any time (s)he relocates.

Following from Ghana's New Pensions Act in 2010, the SSNIT contribution is 18 percent in total of the monthly salary of workers. Of this, 13.5 percent is paid by the employer and 5 percent by the worker. From the 13.5 percent paid by the employer, 2.5 percent goes into the National Health Insurance Fund. It is important to note that all benefits associated with being a member of SSNIT prior to the introduction of the national health insurance scheme have remained unchanged. This means that for formal sector employees, the NHIS is a policy to help subsidise their healthcare expenditures. Other major sources of funds for the National Health Insurance Fund are through 2.5 percentage points of value added tax (VAT), and voluntary National Health Insurance Levy (NHIL) which mainly covers the informal sector workers (NHIA, 2012). As earlier indicated, for the formal sector employees (SSNIT contributors), they are classified under the exemption clause so that they only pay a one-time enrolment fee at the Scheme's offices for their identity cards to be issued.

The National Health Insurance Authority (NHIA) directly reimburses the NHIS-accredited health facilities for the cost incurred in providing free healthcare to the beneficiaries. The NHIS-accredited facilities include all public health facilities at all levels and some selected private and mission based health facilities. This means that these beneficiaries are not required to pay deposits or any form of co-payments at the NHIS-accredited health facilities whenever they seek care. Unlike the formal sector employees with SSNIT, the NHIS is voluntary for

the informal sector employees since they are required to pay both the premium and the enrolment fee before they can benefit from the service package which covers at least 90 percent of the disease burden in Ghana.[19]

As noted earlier, the health insurance in Ghana is being implemented on a piece-meal[20] basis with formal sector employees currently benefiting greatly. The reasons to deduct formal sector workers' contribution from their social security deduction instead of the their salary earnings is to provide free health insurance coverage for workers within minimum benefit package, minimise the proportion of healthcare expenditure of their household budget so that they have enough disposable income during their working days and when they go on retirement (NHIA, 2012). The fact that formal sector employees are highly subsided under the health insurance scheme does not mean people can easily switch jobs and work in the formal sector. The informal sector employs over 70 percent of the Ghanaian working population given that it's relatively easier to find work there. As at the end of 2012, the NHIS covered about 35 percent of the population in Ghana (NHIA, 2012). Although the country has recorded some improvements in her health indicators,[21] the scheme has had some challenges; of which some of them have been noted earlier in the chapter.

Now, given Ghana's national health insurance scheme (NHIS) and the fact that the major objective of the policy is to reduce the burden of paying directly from one's pocket at the point when healthcare is needed, this study asks the following questions: has the NHIS reduced out-of-pocket healthcare expenditure; does the impact of the NHIS on OOP healthcare expenditure differ by gender; and does being enrolled under the scheme influence the utilisation of services from appropriate healthcare facilities? Providing empirical answers to these questions is expected to be very useful particularly for policy makers since over a decade of the scheme's implementation, not much has been done empirically regarding the scheme's major objective of reducing out-of-pocket expenditure on healthcare.

[19] The benefit package does not include family planning commodities, beautification surgery and some chronic and long-term illness such as kidney-related problems (Seddoh et al., 2011).

[20] This may be attributed to the fact that the country is not financially sound currently to cover the entire population under the HI scheme. Besides, it is relatively easy to start with the formal sector rather than the informal sector workers since the latter is not very organised for implementation and proper supervision.

[21] It is worth noting that the improvement has been relatively slow compared to other lower-middle income countries particularly in Asia, South America and The Caribbean.

1.3 Empirical Model

1.3.1 Policy Impact evaluation

Sample Selection

As will be explained later in the section, the empirical analysis to be carried out in this study does not rely on data from randomised trials. Rather, the empirical estimations here in this study are based on observational data. Therefore, simply observing that a health insured person now spends relatively less on his/her healthcare needs is not sufficient to conclude that the health insurance policy caused a reduction in the healthcare expenses of the insured. For example, a person may be witnessing a fall in healthcare expenditure simply because he/she did not seek healthcare attention or probably resorted to traditional (cheap) alternative for healthcare. This study also acknowledges that no one individual can be observed simultaneously "with" and "without" the health insurance policy. In addition, in reality, it is possible that the "NHIS-enrolled" are very different from their non-enrolled counterparts in terms of, say, socio-economic characteristics. For example, in Ghana, people working in the formal sector[22] are generally assumed to be relatively better-off economically because they have relatively stable jobs that generally pay well. Therefore, they are more likely to be able to afford better lifestyles than their counterparts in the informal sector.

Also, formal sector employees generally are expected to have a certain level of formal education (as result of the job entry requirements) that can eventually affect their way of life and subsequently their health expenses and health outcomes. Closely related to the issue of education is the possibility that these formal sector employees (SSNIT contributors) whose healthcare expenses are currently highly subsidised under the NHIS scheme may be relatively older because of the time/period spent in acquiring formal education. Therefore, all things being equal, the older a person is, the more likely (s)he may have healthcare needs[23] which may translate into higher health expenditures. In this case, the non-enrolled who are in the informal sector and who are more likely to be relatively younger may incur lower health costs. Therefore, simply comparing the healthcare expenses of these two groups may lead to an incorrect estimate

[22] i.e. those currently benefiting directly from the subsidised health expenditure

[23] This is based on the assumption that the stock of health depreciates with age; as typically assumed in demand for health models.

of the policy's impact on OOP expenditure on healthcare. In other words, the group that did not enrol under the health insurance scheme would not provide a good estimate of the counterfactual needed for this analysis.

Therefore, acknowledging the possibility of sample selection into the health insurance scheme, this study adopts the treatment effects approach to estimate the impact of Ghana's national health insurance scheme (NHIS) on out-of-pocket (OOP) payment for healthcare. In doing so, this study also takes into account any difference(s) between the "NHIS-enrolled" and the "non-enrolled", by using matching strategy to create a comparison group that is used to estimate the counterfactual.

Treatment Evaluation

The methods used in estimating treatment effect rely on assumptions in order to identify the causal effects.[24] The obvious way to measure such a policy impact will be to compare the average outcomes of the units affected by the policy to the average outcome of the units without the policy. Such an approach provides unbiased estimates when the analysis is carried out with experimental data. However, experimental data are relatively costly to obtain and so many of such treatment evaluation in the literature are carried out with observational data. One disadvantage of using observational data in treatment evaluation has to do with the non-random assignment to treatment given that for example; individuals choose to be "treated"[25] or otherwise. Yet, with a good estimate of the counterfactual and the necessary assumptions made, observational data can still provide a good estimate of the impact of the policy under consideration. This study specifically uses propensity score matching (PSM) and difference-in-difference (DID) estimation strategies to account for the presence of observable and unobservable characteristics respectively that may bias the results.

Propensity Score Matching

As indicated earlier, in carrying out this analysis with an observational data, it is obvious that the assignment to treatment is not random. The change to be estimated is not directly observed given the cross-sectional nature of the data and also the fact that no one person can be observed in both periods (before and after policy implementation). Therefore, the treatment is assumed

[24] see Cameron and Trevidi (2005).
[25] being "treated" means to have the policy or to be affected by the policy.

to be dependent on a set of observable characteristics and the study attempts to estimate the average benefit gained from being insured (average treatment effect on the treated) by first matching the "treated" with the non-treated. Matching here is very useful since it assumes that; conditional on the observables, the selection of participants is unrelated to the non-treated outcome. Instead of matching on each observable characteristic, the study matches on the propensity scores so that for each "treated" unit, we look for a non-treated unit whose propensity score is sufficiently closer to the "treated". Therefore assuming X is a vector of the observable characteristics, and D is a binary indicator that takes a value of 1 if an individual is "treated"; and 0 if otherwise; then the propensity score matching (PSM) which is a conditional probability measure of treatment participation given x is represented by $p(x)$ as:

$$p(x) = Pr(D = 1|X = x) \tag{1.1}$$

where x is the specific observable characteristic (Cameron and Trevidi, 2005). In carrying out the propensity score matching (PSM), this study uses nearest-neighbour matching method with the common support restriction in order to improve the quality of the matches. In effect, this type of PSM takes each "treated" unit and searches for the "control" units with the closest propensity score (Becker and Ichino, 2002). So equation (1.1) simply means that the assignment to treatment is random for individuals with the same propensity score so that the treatment and the comparison groups become identical with respect to their average characteristics.[26] The variables: age, level of education (formal), relationship to household head, religion, income and marital status were used to carry out the propensity score matching. The nature of these variables in the treatment and comparison groups for both "before" and "after" the matching are presented in detail in the next section; where issues regarding the data for this study are presented.

The use of matching alone implicitly assumes that unobservable characteristics do not play any role in the assignment to treatment and the determination of outcome. Therefore, the empirical estimations further employ difference-in-difference (DID) estimation strategy to take into account unobservable characteristics. By combining the propensity score matching (PSM) and the difference-in-difference estimation strategy, the analysis attempts to minimise the bias(es)

[26] Conditioning on the propensity score is equivalent to getting rid of the correlation between the observables and treatment assignment.

associated with using only the PSM.

Difference-in-Difference Estimation

The use of treatment effect approach here in this study to estimate the impact of the health insurance policy on OOP expenditure on healthcare requires that we estimate the outcome for the same individuals "with" and "without" participation into the health insurance programme at the same time. Unfortunately, this is quite impossible particularly with observational data. However, given that this study benefits from having data for "before" and "after" the implementation of the policy, it becomes possible to employ the difference-in-difference (DID) estimation strategy. Here, the comparison group created from the propensity score matching is used to estimate the counterfactual needed for the implementation of the DID estimation. By using the PSM and DID estimation strategies, any variable that is constant across time between the "treated" and the "control" units are eliminated.

The set-up for the DID estimation is based on the comparison of difference in outcome variable for "before" and "after" the policy intervention. In the absence of a panel data but with an aggregate data, the DID estimation can be regarded as a version of fixed effects estimation and the strategy is additive in nature for potential outcomes in the no-treatment region (Angrist and Pischke, 2008). The validity of the DID estimation rests on the assumption that both "treated" and "untreated" groups have the same trend in the unobservable so that the two groups have the same change in their means. In other words, in the absence of the health insurance policy, the outcome in the treatment group should move in the same way as that of the comparison group.[27]

In its simplest form, assume a fixed effect model as given by the specification in equation (1.2):

$$Y_{it} = \phi D_{it} + \delta_t + \alpha_i + \varepsilon_{it} \tag{1.2}$$

where Y_{it} is the outcome variable for the ith individual at time t, D is the policy (or treatment) status, α_i represents the individual specific fixed effect, δ_t is the time-specific fixed effect and ε_{it} is the error term. Now suppose there are two periods indicating "before" and "after" policy periods which are represented by t_1 and t_2 respectively. Then the outcome in the two periods will be:

[27] This is known as the parallel trend assumption.

$$Y_{i1} = \phi D_{i1} + \delta_1 + \alpha_i + \varepsilon_{i1} \tag{1.3}$$

$$Y_{i2} = \phi D_{i2} + \delta_2 + \alpha_i + \varepsilon_{i2} \tag{1.4}$$

taking the first difference, (1.4) − (1.3) gives:

$$\Delta Y_{it} = \phi \Delta D_{it} + \Delta \delta_t + \Delta \varepsilon_{it} \tag{1.5}$$

From equation (1.5), ϕ is the treatment effect for the ith individual and this can be estimated by pooled ordinary least square (OLS) regression of ΔY_{it} on ΔD_{it} and a full set of time dummies (Cameron and Trevidi, 2005). However, with the DID approach, in the first period (t_1), the policy $D_{i1} = 0$ for all individuals (i), but in period t_2, $D_{i2} = 0$ for the "untreated" (since this group does not receive the policy). Therefore dropping the time-subscript (t), equation (1.5) becomes:

$$\Delta Y_i = \phi D_i + \delta + v_i \tag{1.6}$$

where D_i is the binary treatment variable indicating the treatment status of the individual. From equation (1.6), the effect of treatment can be estimated by an OLS regression of ΔY on an intercept and the binary regressor D.

Now, defining the following; $\Delta \bar{y}^{tr}$ and $\Delta \bar{y}^{nt}$ to be the sample average of ΔY_i in the "treated" and "untreated" groups respectively, then the OLS estimator becomes:

$$\hat{\phi} = \Delta \bar{y}^{tr} - \Delta \bar{y}^{nt} \tag{1.7}$$

Equation (1.7) is the DID estimate this chapter is interested in computing for the NHIS policy impact on OOP expenditure on healthcare. However in estimating this policy impact, we use an incremental regression approach whereby we first consider a model without account for additional covariates. The second model then controls for some respondents' characteristics in addition to the "type of health facility" a respondent visited for healthcare when (s)he was sick (i.e. public or private health facility). Then in the third model, we include only the covariates that were statistically significant in the previous (second) model. It is worth noting that all DID estimations were carried out using clustered standard errors.

1.3.2 Utilisation of healthcare services

Recall that this study is also interested in investigating whether or being enrolled under the health insurance scheme influences a person's decision to utilise healthcare services from a health facility in Ghana. Considering this objective, there are only two possible outcomes; whether a person consulted from a health facility or not. Therefore, if the probability of going to a health facility is p, then the probability of not going will be $(1-p)$. Obviously, an OLS regression of whether or not seeking care from a health facility on a set of independent variables will not constrain the predicted probabilities to be between zero (0) and one (1). In this case, a more appropriate model will be either the logit or probit model which is formed by parameterising the probability (p) to be dependent on a set of covariates (X) and a $K*1$ parameter vector β.

Now, suppose the dependent variable; $y=1$ if a person goes to a health facility; and $y=0$ if otherwise, then assuming the function $(F(.))$ is the cdf of the logistic distribution, we use the logit model which is specified as:

$$p = Pr\left[y_i = 1|X_i\right] = \Lambda\left(X^{'}\beta\right) = \frac{e^{X^{'}\beta}}{1+e^{X^{'}\beta}}, \tag{1.8}$$

where; $\Lambda(.)$ is simply the logistic cdf (Cameron and Trevidi, 2005). Equation (1.8) ensures that the predicted probabilities lie between zero (0) and one (1). Again, equation (1.8) is carried out by maximum likelihood estimation (MLE). The first order conditions for the logit MLE are:

$$\Sigma_{i=1}^{N}(y_i - \Lambda(X^{'}\beta))X_i = 0 \tag{1.9}$$

Then the marginal effect of the jth regressor for the ith individual is given as:

$$\frac{\partial p_i}{\partial X_{ij}} = p_i(1-p_i)\beta_j = \Lambda(X^{'}\beta)\left[1-\Lambda(X^{'}\beta)\right]\beta_i \tag{1.10}$$

Therefore after estimating equation (1.8), our variable of interest will be the insurance status of the respondent. So from equation (1.10), we compute the marginal effect of a change in insurance status (from being uninsured to being insured) on the probability that a person utilises a health facility.

1.4 Data

1.4.1 Source of data

The study relied on data from the Fourth and Sixth Rounds of the Ghana Living Standard Survey (GLSS) conducted by the Ghana Statistical Service (GSS). These are both nation-wide surveys with focus on household as the key socio-economic unit, providing information on the living conditions and well-being of households in Ghana. The Ghana Living Standard Survey Four (GLSS 4) and Ghana Living Standard Survey Six (GLSS 6) were conducted in 1998/1999 and 2012/2013 respectively. Although the GLSSs have generally focused more on issues relating to *inter alia* monitoring and evaluating employment policies and programmes, income generating and maintenance scheme, the surveys also provide information on patterns of household consumption and expenditure disaggregated at greater levels and hence the inclusion of information on healthcare expenditure of respondents, which forms the basis for this study. Unfortunately, no information on health outcomes is reported in the GLSS dataset. The survey instruments and methodology were based on those of earlier Rounds with minimal modifications (GSS, 1997, 2013).

The sample frame of the GLSS 4 was based on the 1984 Population Census and covered about 300 Enumeration Areas.[28] Meanwhile, the GLSS 6 had its sample frame based on the 2010 Population and Housing Census in Ghana and covered 1,200 Enumeration Areas. The enumeration areas in both surveys were then stratified based on the country's ecological zones and these were further stratified into rural or urban depending on the size of the locality. Each data collection period lasted 12 months[29] in order to ensure a continuous recording of household consumption and expenditures and the associated changes if any. In all, the GLSS 4 covered about 5,998 households and the GLSS 6 successfully covered 16,772 households. The financial support for the GLSS 4 came from the government of Ghana, World Bank and the European Union. The GLSS 6 was financially supported by the UK Department for International Development (DFID), International Labour Organisation (ILO), United Nations Development Programme (UNDP) and the United Nations International Children's Emergency Fund (UNICEF) and the government of Ghana (GSS, 1997, 2013).

[28] Although the time between the census period and the survey was long, the census data was the only best available data at the time (GSS, 1997).

[29] April 1998 to March 1999 for GLSS 4 and October 2012 to October 2013 for GLSS 6.

1.4.2 Description of data

The GLSS places expenditure on food, clothing, furniture, health, education, etc in separate sections. Although the demographic and socio-economic variables were extracted from the other sections of the data, the analysis in this study mainly focused on the section on health. The purpose of this section in the GLSS was to gather information to measure the cost of medical care and the utilisation of the different kinds of health services and facilities (GSS, 2013). Hence, the study summed all expenditure-related questions on health in order to arrive at the total out-of-pocket (OOP) healthcare expenditure; the dependent variable, for each respondent.[30] The recall period was two weeks preceding the survey in order to minimise memory lapse (GSS, 2013).

Categorising household expenditures based on UN's Classification of Individual Consumption According to Purpose (COICOP), generally from the main GLSS 4 dataset, healthcare expenditure formed about 5 percent of households' total cash expenditure (GLSS 4 Report) within the recall period. This is quite significant given that there are 12 main expenditure groups under this classification and already, food and non-alcoholic beverage expenditure alone constituted almost half (45.6 percent) of total cash expenditure. However, according to the GLSS 6 survey and still under the same COICOP expenditure groups, health expenditure formed about 1.6 percent of households' total cash expenditure. Well, any comparison of health expenditures between the two surveys should be done carefully since at this point, the decline in the health expenditures cannot necessarily be attributed to the NHIS policy since it is possible that people were not utilising healthcare services or were rather relying on some cheap unsafe traditional healthcare methods in order to avoid paying higher cost in the appropriate health facilities.

The empirical estimations are carried out using a pooled cross-section of GLSS 4 and 6 datasets. The set up for the empirical estimation in this chapter is such that a person is either covered by the health insurance (formal sector employee who is insured) or not; so that if (s)he is covered, (s)he is referred to as "treated" and if not covered, (s)he is referred to as "untreated" or "control".[31] The focus here is to estimate how successful the national health insurance scheme (NHIS) in Ghana has been by estimating the average treatment effect on the "treated". Furthermore, using only the GLSS 6 dataset and con-

[30] Each survey period asked multiple questions ranging from fees paid during registration, consultation, treatment and administration of drugs at the health facility.

[31] All respondents are within the working age by Law, i.e. 15 - 60 years old.

trolling for the availability or presence of health facility in one's community, we also look at the effect of being insured on seeking healthcare from a health facility.

1.4.3 Description of explanatory variables

Empirical studies on health seeking behaviours and determinants of healthcare services utilisation have revealed economic, cultural, physical and demographic variables to be important (e.g. Yip, Wang, and Liu, 1998; Ensor and Cooper, 2004; Brugiavini and Pace, 2016). Therefore in carrying out the propensity score matching and the difference-in-difference estimations, the following variables are used: age (in completed years), marital status, income (in new Ghana cedis),[32] level of formal education, relationship to household head, type of health facility visited and religion. The level of education is a four-categorical dummy (none, basic, secondary, and at least degree); and the "no education" group is always used as the reference category.

The marital status considers whether or not the respondent is married;[33] and the reference category is "married/union" group. A household head variable is included as a dummy of whether or not the respondent is a household head; those who do not head their households are the reference group. Given that Ghana is a very religious country and the fact that religion influences the believes of Ghanaians and hence plays a key role in healthcare decisions, the "religion" variable is a four-categorical dummy (no religion, Christian, Muslim, and other);[34] and the "other" group is used as the reference category.

In Ghana, there are basically two types of health facilities; public and private. Although the public sector plays a relatively bigger role in the health sector, the contribution by the private sector cannot be underestimated. Given the increasing population, disease burden and the fact that successive governments' commitments to the health sector have not been very impressive, the private and mission-based facilities have played an important role in the delivery of healthcare and have also created employment opportunities in Ghana's health sector. They operate both in the rural and urban areas of the country. As

[32] The Bank of Ghana embarked on a re-denomination exercise of the "old cedi" (the local currency) in July 2007 by setting ten thousand cedis to one new Ghana Cedi (GHC), which is equivalent to one hundred Ghana Pesewas (Gp). That is 10,000cedis=GHC1=100Gp. The major reasons for this exercise were to make transaction of the local currency convenient and to reduce the risk of carrying loads of currency.

[33] Being married is made up formal marriage or other forms of union between couples.

[34] "other" group is made up Traditional/Spiritualist and other minority groups.

earlier indicated, the health insurance package is provided in all public health facilities at all levels. Typically in the private facilities which are not NHIS-accredited, they are relatively less crowded with patients and therefore relatively more convenient to receive healthcare. Again in Ghana, the private health sector appear to be in some form of competition with the public sector in providing quality healthcare. Therefore, they try to offer services that set them apart from the public sector. Also, even in the few private facilities that accept the NHIS cards, there are some reports of the existence of co-payment (which is illegal) in the delivery of healthcare services. Therefore the type of health facility visited is included in the regression model as a dummy of whether a respondent sought healthcare from a public or private health facility.

Finally, given that the analysis uses data from "before" and "after" the policy implementation periods, incomes and expenditures are all in real terms in order to account for the influence of inflation.[35]

1.4.4 Summary statistics of variables

This subsection presents the summary statistics for the variables used in the empirical analysis. The first part considers only the dependent variable for the two surveys. Then, the independent variables are presented in the subsequent subsection.

Dependent variables

Before presenting the descriptives, recall that from the data, the average OOP expenses on healthcare was recorded with a recall period of two(2) weeks preceding the survey to minimise memory lapses. Therefore, the expenditure values in Table 1.1 reflect this recall period.

Table 1.1: Descriptive of the dependent variable for the two periods[36]

Average OOP expenses for healthcare		
	Treated	**Control**
GLSS_4	0.2903	0.4968
GLSS_6	1.0758	1.5803

[35] Note that the dependent variable which is out-of-pocket (OOP) healthcare expenditure is also in real terms.

[36] Note that for consistency, all expenditure values have been converted into the new currency values (new Ghana cedis (GHC))

Considering the two periods under review, healthcare expenses increased for both "treated" and "control" groups. For instance, in 1998/99 (GLSS4), the "treated" spent about $GHC0.30$ on healthcare but in 2012/13 (GLSS6), the corresponding amount was about $GHC1.10$. A similar upward trend is seen among the comparison group (i.e. about $GHC0.50$ and $GHC1.60$ respectively). This is not very surprising given the time difference between the two survey periods and also if healthcare service is assumed to be a normal good.

Explanatory variables

As noted earlier, the study uses propensity score matching to control for biases from observable characteristics. Therefore Tables 1.2 and 1.3 present the summary statistics for "before" and "after" matching. In this way, we see how well the matching improves the comparability of the "treated" and "untreated" groups.

Table 1.2: Descriptives of variables "before" and "after" matching (GLSS 4)

		Mean		*t-test*	
Variable	**Sample**	**Treated**	**Untreated**	**t-value**	$p > t$
age	Unmatched	41.819	36.224	5.170	0.000
	Matched	41.819	42.299	-0.410	0.685
Level of education					
basic	Unmatched	0.367	0.479	-2.530	0.012
	Matched	0.367	0.318	0.980	0.326
secondary	Unmatched	0.119	0.139	-0.660	0.507
	Matched	0.119	0.172	-1.420	0.157
at least degree	Unmatched	0.469	0.116	10.440	0.000
	Matched	0.469	0.469	0.000	1.000
Marital status					
single	Unmatched	0.802	0.573	5.500	0.000
	Matched	0.802	0.781	0.500	0.620
Relationship to household head					
head	Unmatched	0.774	0.736	0.980	0.326
	Matched	0.774	0.853	-1.920	0.056
Religion					
none	Unmatched	0.034	0.049	-0.830	0.406
	Matched	0.034	0.017	1.010	0.312
Christian	Unmatched	0.898	0.785	3.320	0.001
	Matched	0.898	0.921	-0.740	0.460
Muslim	Unmatched	0.034	0.105	-2.890	0.004
	Matched	0.034	0.044	-0.490	0.622
incomeGHC	Unmatched	17.969	11.576	2.580	0.010
	Matched	17.969	17.193	0.230	0.815
No. of obs		*177*	*447*		

Table 1.3: Descriptives of variables "before" and "after" matching (GLSS 6)

		Mean		*t-test*	
Variable	**Sample**	**Treated**	**Untreated**	**t-value**	$p > t$
age	Unmatched	39.239	32.151	14.180	0.000
	Matched	39.166	41.537	-3.820	0.000
Level of education					
basic	Unmatched	0.184	0.611	-20.280	0.000
	Matched	0.186	0.156	1.490	0.137
secondary	Unmatched	0.238	0.207	1.590	0.111
	Matched	0.238	0.282	-1.910	0.057
at least degree	Unmatched	0.566	0.047	32.770	0.000
	Matched	0.564	0.540	0.910	0.361
Marital status					
single	Unmatched	0.716	0.537	8.030	0.000
	Matched	0.713	0.686	1.120	0.263
Relationship to household head					
head	Unmatched	0.705	0.667	1.790	0.073
	Matched	0.704	0.804	-4.460	0.000
Religion					
none	Unmatched	0.017	0.088	-6.440	0.000
	Matched	0.017	0.014	0.380	0.700
Christian	Unmatched	0.871	0.786	4.760	0.000
	Matched	0.871	0.847	1.310	0.191
Muslim	Unmatched	0.111	0.124	-0.870	0.387
	Matched	0.110	0.138	-1.590	0.113
incomeGHC	Unmatched	689.500	198.570	23.790	0.000
	Matched	642.190	660.040	-0.640	0.525
No. of obs.		*723*	*1,302*		

Columns 3 and 4 of Tables 1.2 and 1.3 report the means of the variables in the "treated" and "untreated" groups for both the unmatched and matched samples. There are appreciable disparities in the variables in the unmatched sample. For instance in the GLSS 4 sample, the average age for the "treated" group is about 41.8 years while that of the "untreated" is 36.2 years (see columns 3 and 4 of Table 1.2). The matching however reduces this difference greatly so that the average ages are now relatively comparable in the matched sample (41.8 years and 42.3 years for the "treated" and "untreated" groups respectively). Similarly in the GLSS 6 sample (see Table 1.3), the average ages before matching are 39.2 and 32.2 years for the "treated" and "untreated" groups respectively. The matched samples therefore provides relatively comparable ages of 39.2 and 41.5 years in the respective groups.

Regards the level of education in the GLSS 4 sample, about 36.7 percent of the "treated" group have only basic education compared to 47.9 percent in the "untreated" group in the unmatched sample. By the matching, the difference between the two groups is reduced considerably to 36.7 and 31.8 percentages in

the "treated" and "untreated" groups respectively with only basic education. Similar conclusions can be made for the means of the other variables as shown in Tables 1.2 and 1.3 after matching. It is however important to note that although the null hypothesis that there is no difference between the mean values of the two groups is rejected for a number of the variables (except for relationship to household head in GLSS 4; and age, secondary level of education, and relationship to household head in GLSS 6), through propensity score nearest-neighbour matching, a comparable "untreated" group is generated for each cross-section in order to be used for the difference-in-difference estimations.

1.5 Estimation of Results and Discussions

1.5.1 Estimation of model (1.7) for the entire sample

Given the objectives already outlined, the first part of the results looks at the impact of the NHIS policy on out-of-pocket (OOP) healthcare expenditure for the entire sample[37] and this is presented in Tables 1.4. The estimations are carried out using incremental regression approach. Therefore for the results presented, model 1 does not control for additional covariates. In model 2, adjustments are made for some characteristics of the respondents. Now, given the nature of Ghana's health system and the operations of the health insurance scheme, model 2 also includes a variable that measures whether a respondent sought healthcare from a public or private health facility.[38] Finally in model 3, we include only covariates that were statistically significant from the previous model. Therefore model 2 contains the full set of the explanatory variables used in the regression analysis.

[37] Since the GLSSs do not contain data on health outcome(s), the impact of the policy on health status cannot be estimated with the data. All means and standard errors are estimated by linear regression.

[38] Recall that, all public health facilities are NHIS-accredited.

Table 1.4: OLS regression of model (1.7) for the entire sample[39]

	Model 1	*Model 2*	*Model 3*
OOP. Health Exp.	**Coef.**	**Coef.**	**Coef.**
Period			
1.wave	1.0836***	1.5158***	1.4033***
	(0.2499)	(0.5022)	(0.4535)
Treatment			
1.treated	-0.2065*	-0.3782**	-0.2619*
	(0.1202)	(0.1746)	(0.15533)
Policy			
1.insured	-0.2980	-2.8026***	-2.7350***
	(0.2702)	(1.0525)	(1.0352)
Marital status			
1.married/union		0.0719	
		(0.2797)	
age		0.1245**	0.1216**
		(0.0590)	(0.0563)
age_squared		-0.0013**	-0.0013**
		(0.0007)	(0.0007)
income		-0.2506*	-0.2047
		(0.1484)	(0.1277)
Gender			
1.male		-0.0762	
		(0.2366)	
Level of education			
1.secondary		0.7889	
		(0.5247)	
2.at least degree		0.3679	
		(0.2930)	
Type of health facility			
1.public		3.8294***	3.8243***
		(1.2474)	(1.2470)
_cons	0.4968***	-1.7414*	-1.5834*
	(0.1062)	(0.9467)	(0.9536)
No. of Obs.		*2,641*	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Clustered std. errors in parentheses

From Table 1.4, the difference-in-difference (DID) estimation for the entire sample yields a statistically significant negative impact of the national health insurance scheme (NHIS) on out-of-pocket (OOP) healthcare expenditure in models 2 and 3.[40] That is, given the recall period, the NHIS policy is found to have reduced OOP healthcare expenditure by about $GHC3.00$. These are statistically significant at all conventional levels (see models 2 and 3 of Table 1.4). The implication of the result is that, the insured are comparatively spending less on health which further suggests that the health insurance scheme is serving as a cushion against health expenditure shock for beneficiaries. The

[39]Model 1 estimates the policy impact without controlling for other covariates. Model 2 controls for some characteristics of the respondents in addition to the type of health facility visited for healthcare. Then in model 3, we control for only the covariates that were statistically significant as indicated in model 2.

[40]The estimated policy impact is represented by the variable "policy (or insured)" and it is an interaction between wave and treatment status.

result obtained here is in contrast with earlier finding by Brugiavini and Pace (2016) where they found only a weak effect of the policy on out-of-pocket healthcare expenditure.[41] As indicated earlier, Brugiavini and Pace (2016) relied on a cross-sectional data of the Ghana Demographic and Health Survey (GDHS 2013 dataset). The GDHS data is constrained in many ways and therefore estimating the impact of the NHIS policy on OOP healthcare expenditure with that kind of dataset can be criticised for a number of issues.

First, although the GDHS is nationally-representative in nature, the survey does not contain information on certain important variables such as income, value of wealth and expenditure on variables such as healthcare which is key for this kind of analysis. Here, the only information on living standard is provided in terms of wealth index (in quintiles) which obviously provides only an aggregated information on household living standard. Again, in their analysis, they failed to control for the "the type of health facility" a respondent visited which is quite critical given that the NHIS-package is not provided in most private health facilities.

Second, even though the data includes the health insurance status,[42] the outcome variable of interest which is out-of-pocket healthcare expenditure is not recorded in the data. The closest variable which the data collected is a "yes" or "no" answer to the question of whether or not a respondent had to pay for healthcare service received in any facility. Therefore, the nature of the health expenditure information available in the GDHS dataset compelled Brugiavini and Pace (2016) to carry out only an extensive margin analysis using probit models. This renders their results of insignificant effect of the NHIS policy on out-of-pocket expenditure on healthcare incomplete. Aside from the estimated policy impact, this study further estimated a logit regression model to find out if the insurance status of an individual influences his or her decision to seek healthcare from a health facility; and this is presented later in the section.

1.5.2 Estimation of model (1.7) by gender

As noted earlier, men and women have different healthcare needs which may influence their demand for healthcare services and expenditures incurred. Therefore, the novelty and another interesting part of the analyses lies in the gender perspective of the evaluation. In this case, the policy impact is disaggregated

[41] However, they provide evidence of increased utilisation of healthcare services by the insured.

[42] i.e. whether or not a respondent is insured

by gender to provide an in-depth evaluation of the NHIS policy (presented in Tables 1.5 and 1.6). Besides, in estimating the policy impact by gender, we also get to see the behaviour of other covariates in respective samples (particularly if there are any variation(s)).

Table 1.5: OLS regression of model (1.7) for the female sample[43]

	Model 1	*Model 2*	*Model 3*
OOP. Health Exp.	**Coef.**	**Coef.**	**Coef.**
Period			
1.wave	1.5037***	2.2006*	1.2341***
	(0.5287)	(1.3136)	(0.3736)
Treatment			
1.treated	0.0754	-0.1546	0.0241
	(0.1341)	(0.3455)	(0.1379)
Policy			
1.insured	-1.0342*	-2.9391*	-3.2770*
	(0.5408)	(1.5230)	(1.7653)
Marital status			
1.married/union		-0.3859	
		(0.5693)	
age		0.2806	
		(0.1992)	
age_squared		-0.0033	
		(0.0023)	
income		-0.3918	
		(0.3790)	
Level of education			
1.secondary		0.5034	
		(0.7678)	
2.at least degree		0.3888	
		(0.4211)	
Type of health facility			
1.public		3.4493*	3.3379*
		(1.9213)	(1.8478)
_cons	0.3787***	-4.1194	0.3787***
	(0.0776)	(3.0417)	(0.0776)
No. of Obs.			*702*

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Clustered std. errors in parentheses

Here in the female sample, the effect of the health insurance policy remains statistically significant whether or not we control for additional covariates; although this is only weakly significant (see the variable "insured" in columns 2, 3 and 4). However, the magnitude of the policy impact is higher in models that control for respondents characteristics.

[43]Model 1 estimates the policy impact without controlling for other covariates. Model 2 controls for some characteristics of the respondents in addition to the type of health facility visited for healthcare. Then in model 3, we control for only the covariates that were statistically significant as indicated in model 2.

Table 1.6: OLS regression of model (1.7) for the male sample[44]

	Model 1	*Model 2*	*Model 3*
OOP. Health Exp.	**Coef.**	**Coef.**	**Coef.**
Period			
1.wave	0.9678***	1.3112**	0.7276***
	(0.2862)	(0.5324)	(0.1904)
Treatment			
1.treated	-0.3420**	-0.4975**	-0.4205**
	(0.1493)	(-0.2107)	(0.1700)
Policy			
1.insured	0.0015	-2.6946**	-2.7654**
	(0.3211)	(1.3038)	(1.3357)
Marital status			
1.married/union		0.2819	
		(0.3308)	
age		0.0720*	0.0101
		(0.0418)	(0.0079)
age_squared		-0.0008	
		(0.0005)	
income		-0.2117	
		(0.1578)	
Level of education			
1.secondary		0.8956	
		(0.6567)	
2.at least degree		0.3835	
		(0.3601)	
Type of health facility			
1.public		4.0091**	3.9622**
		(1.5595)	(1.5472)
_cons	0.5372***	-0.9626	0.1495
	(0.1390)	(0.8167)	(0.2751)
No. of Obs.		*1,939*	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Clustered std. errors in parentheses

Similar to the trend observed in the estimation for the entire sample, from Table 1.6, the statistical significance of the policy is only evident in models 2 and 3 perhaps emphasising why it is important to control for some covariates. Unlike the results of models 2 and 3 in the male sample, the somehow consistency in the significance of the NHIS policy in the female sample (as in Table 1.5) may be a signal that, perhaps females are relatively taking more advantage of the scheme than their male counterparts.

Considering model 2 where we have the full set of covariates being controlled for in the regression, the results in Tables 1.5 and 1.6 are not very different in terms of the magnitude of the policy impact estimated; i.e. about $GHC3.00$ reduction in OOP expenses for health with respect to the recall period of two (2) preceding the surveys. So generally, there is an evidence of a statistically

[44]Model 1 estimates the policy impact without controlling for other covariates. Model 2 controls for some characteristics of the respondents in addition to the type of health facility visited for healthcare. Then in model 3, we control for only the covariates that were statistically significant as indicated in model 2.

significant negative effect of the health insurance policy on OOP healthcare expenditure. In other words, the NHIS policy appears to be reducing the burden or the amount people (insured) spend as OOP payment for healthcare service both in the male and female samples independently. The magnitude of the policy impact is only marginally higher in the female sample.

1.5.3 Estimation of model (1.7) by type of health facility

This part of the empirical estimations is to assess whether the benefits obtained from being enrolled under the NHIS scheme vary by the type of health facility consulted for healthcare. As noted earlier, automatically, all public health facilities (regardless of the level) accept the NHIS cards. Therefore, here, we estimate the policy's impact independently for patients who visited public or private health facility; and this is represented in Table 1.7.

Table 1.7: OLS regression of model (1.7) for the type of facility[45]

	Public facility	*Private facility*
OOP. Health Exp.	**Coef.**	**Coef.**
Period		
1.wave	13.9494***	0.4038***
	(4.5422)	(0.0973)
Treatment		
1.treated	0.9595	-0.3102**
	(1.3883)	(0.1521)
Policy		
1.insured	-8.9578***	0.1545
	(3.0602)	(0.1183)
Marital status		
1.married/union	0.6258	-0.0594
	(1.1252)	(0.0639)
age	0.7628**	-0.0014
	(0.3490)	(0.0123)
age_squared	-0.0086**	0.0001
	(0.0040)	(0.0002)
Gender		
1.male	-0.1303	-0.0311
	(0.8160)	(0.0489)
income	-1.7427*	0.0173
	(0.9378)	(0.0213)
Level of education		
1.secondary	3.0776	0.0248
	(2.3106)	(0.0410)
2.at least degree	1.9067	0.1574
	(1.5752)	(0.1342)
_cons	-11.9353**	0.4065*
	(5.7994)	(0.2118)
No. of Obs.	*655*	*1,986*

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Clustered std. errors in parentheses.

[45] Column 2 estimates the policy impact for only patients who visited a public health facility and column 3 does it for those who visited a private health facility. Clustered standard errors are in parentheses.

From Table 1.7, the variable of interest (insured) is statistically significant only in the public health facility sample. Specifically, patients who visited a public health facilities recorded about GHC9.00 reduction in their OOP expenses on healthcare with respect to the recall period. This is of course not surprising given that these facilities are automatically NHIS-accredited. On the other hand, the NHIS policy was not statistically significant among patients who opted for private health facilities.

1.5.4 Healthcare service utilisation

Using a cross-section of the GLSS6 dataset, this part of the analysis presents the marginal effects after estimating equation (1.8). The purpose is to estimate the determinants of seeking healthcare from a health facility. Seeking healthcare from a health facility is necessary for patients to receive the right care from qualified health personnel.

In estimating equation (1.8), we acknowledge that the decision to utilise healthcare from a health facility is jointly determined by demand and supply side factors. Therefore, an important aspect in the estimation was to control for a supply-side variable(s). In this regard, the empirical estimation also controls for the presence or availability of health facility in the community that a respondents resides.[46] We also control for the region of residence in order to account for any regional imbalances that may exit in terms of infrastructure and other opportunities that may influence a person's healthcare decisions.

[46] This variable was obtained from the community-level data.

Table 1.8: Healthcare utilisation from a health facility[47]

Healthcare utilisation	**Marginal Effects**	**Standard Error**
Insurance status		
1. insured	0.0342**	0.0165
Presence of health facility		
2.no	-0.0165	0.0188
age	0.0010	0.0024
age_squared	0.0000	0.0000
Gender		
1. male	-0.0183	0.0151
Formal education		
2. no	0.0027	0.0171
income	-0.0055	0.0043
Marital status		
2.married/union	0.0249	0.0245
3.divorced/widowed/sep.	0.0666**	0.0336
Region of residence		
2.Central	-0.0444	0.0349
3.Greater Accra	-0.1029***	0.0397
4.Volta	0.0695*	0.0404
5.Eastern	-0.0509	0.0317
6.Ashanti	0.0282	0.0447
7.Brong Ahafo	-0.0224	0.0346
8.Northern	-0.0533	0.0331
9.Upper East	0.0237	0.0539
10.Upper West	-0.0929***	0.0286
No. of obs.	***2,295***	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Std. errors are clustered adjusted.

Now from Table 1.8, the important point is the fact the insured are more likely to seek care from a health facility than their uninsured counterparts. This suggests that the health insurance policy is encouraging the enrolled to seek appropriate care for their health needs. For a developing country such as Ghana where a lot of people either resort to self-medication or wait until their illness got worse before going to a health facility in order to avoid paying relatively higher costs at health facilities, such an outcome is quite encouraging in order to promote good health practices to ensure a healthy population.

In effect, the negative effect of the NHIS policy on health expenditure obtained in the female sample here in this study may even explain why in the same study by Brugiavini and Pace (2016), they found an increase in utilisation of maternal healthcare services; specifically antenatal check-ups, institutional de-

[47]In Ghana, there are ten (10) administrative regions. Therefore, the "region of residence" variable controls for the specific region in which the respondent lives in and "Western region" is used as the reference category. This variable is included to capture the differences in availability and accessibility of healthcare services.

livery[48] and supervised delivery[49] among insured women after they controlled for self selection into the health insurance programme. The statistically negative impact of the policy in the male sample is also very encouraging. Even here, the statistical significance improves compared to the female sample. This perhaps emphasises the importance of health insurance, which may help cushion the insured against any possible health expenditure shocks.

1.6 Conclusion

The aim of this chapter of the thesis has been to estimate the impact of Ghana's national health insurance scheme (NHIS) on out-of-pocket (OOP) healthcare expenditure and to find out if the insurance status of a person influences his or her decision to seek healthcare from a health facility. Although the NHIS in Ghana is currently the only major social protection programme implemented by the government of Ghana, not much has been done regards empirical study to estimate quantitatively the impact of the scheme on out-of-pocket healthcare expenditure which is one of the scheme's main objectives. The closest empirical study in this regard is a recent work by Brugiavini and Pace (2016); where they looked at the effect of Ghana's NHIS on maternity care and expenditure on health. As earlier noted, their choice of dataset and empirical model for this kind of analysis makes their results incomplete. Therefore, unlike Brugiavini and Pace (2016), the use of propensity score matching (PSM) and difference-in-difference (DID) estimation strategies in this study removes biases that were not earlier accounted for in the work by Brugiavini and Pace (2016). This improves the completeness of the analysis and increases the confidence in the results obtained in this study.

The negative impact of the NHIS policy on OOP healthcare expenditure (as presented in models 2 and 3 of Tables 1.4 to 1.6) is a step in the right direction since the scheme is helping reduce the burden of OOP payment for healthcare; which is the scheme's main objective. This result also implies that the beneficiaries now have relatively higher disposable income (because of the reduction in their health expenditures) which they can spend on other equally important goods and services or even save for the future. In addition, controlling for the availability or presence of health facility in the community in which a

[48] i.e. delivery in a health facility

[49] i.e. delivery supervised by a professionally trained health personnel such as doctor, nurse, midwife or community health officer.

person resides, we found that the insured are more likely to seek healthcare from a health facility than their uninsured counterparts. This is of course good for the promotion of good health; which needs to be encouraged.

Now, given that currently the NHIS is highly subsidised for formal sector employees drawing pension on Social Security National Insurance Trust (SSNIT), this study recommends that some incentives are put in place to encourage voluntary participation into the programme from the informal sector in order to reduce the burden of OOP payment for healthcare for them too. This can ensure that there is improvement in the health of all. Also, the policy impact estimated with respect to public and private health facility independently, emphasises the importance of the "type of health facility" visited in deriving any benefits from the policy. Therefore, to ensure that benefits from the health insurance policy is increased, more private health facilities should be accredited and encouraged to provide the NHIS package. This can even reduce the pressures in the public health facilities which is a contributing factor to the long waiting hours in public health facilities.

Meanwhile, certain challenges associated with the scheme such as delay in reimbursement of NHIS funds to accredited health facilities and other service providers and the attitudes of health personnel in NHIS-accredited facilities need to be improved in order ensure smooth running of the scheme. Finally, even though the NHIS package covers about 90 percent of the disease burden in the country, certain lifestyle diseases (e.g. kidney-related, lung-related, stroke, etc.) which are currently not covered under the service package should be considered since these kinds of diseases are gradually becoming a matter of public health concern because of the change in the lifestyle of the average Ghanaian.

Chapter 2

Socio-economic Inequality in Health Status and Health Expenditure - *evidence from Nigeria*

Abstract

Aside from being ranked among the most unequal countries in the world, there is evidence of health disparities and comparatively poor health indicators in Nigeria. Commonly-cited evidence suggest inequality in socio-economic status (SES) harms health but this hypothesis remains inconclusive. Meanwhile, most studies in the developing world have focused on maternal and child health creating a research gap in other aspects of health. In addition, many exiting studies have relied on methods that fail to account for unobserved heterogeneity between individuals. Using data from Nigeria, this paper estimates the effect of SES inequality on inequality in health status and health expenditure using concentration indices and fixed effect (FE) models. The relationship between SES and health inequality shrinks in models that account for other covariates. In the FE models, the SES remains statistically significant in explaining inequality in health status and this finding holds for two indicators of SES: *consumption* and *wealth*. However, the relationship between SES and inequality in health expenditure disappears in the FE model for all three SES indicators (*consumption, income* and *wealth*). Meanwhile, a decomposition analysis shows that reducing health inequalities is not a simple case of redistributive policies but age, marital status, household size and residing in rural areas also have appreciable contributions to health inequalities.

Keywords: socio-economic status, concentration index, health inequality
JEL: I14 D63

2.1 Introduction

Nigeria has one of the fastest growing economies with petroleum oil resources playing a major role in the growth of the economy. The country is ranked $6th$ and $8th$ in the world in terms of oil production and exportation respectively; and has the $10th$ largest proven reserves (UNICEF, 2007). Although Nigeria is rich, it cannot boast of basic facilities in many parts of the country particularly in the north; indicating there is a skewed distribution of Nigeria's wealth. Inequality is increasingly becoming a matter of concern in Nigeria (UNDP, 2009) such that the country is ranked 47th[1] when it comes to inequality with a Gini index of about 0.44[2]; placing the country among the most unequal countries in the world. For instance, the income shares held by the highest 20 and 10 percent of the population in 2009 were estimated at 49 and 33 percentages respectively. Meanwhile, the income share of the lowest 10 percent of the population was just about 2 percent. In addition, about 53.47 percent of the population were estimated poor using the poverty headcount ratio of USD 1.90 per day[3]. The high poverty problem is suggested to be a characteristic of the high inequality level prevailing in the country and this systematic structure of inequity may among other things imply limited opportunities and low purchasing power (UNDP, 2009); which may include expenditure on healthcare services.

A comparison of the country's health indicators to other countries within the same income group[4] and/or the group's average shows Nigeria lags behind in almost all indicators. For example, in terms of life expectancy at birth, as at 2014, while a child born in a lower-middle income country was expected to live for 67.15 years, in Nigeria, such a child could only live for 52.74 years. Meanwhile, the life expectancy for other lower-middle income countries within the same period was; Ghana (61.31 years), Kenya (61.58 years), India (68.01 years), Morocco (74.02 years) and Vietnam (75.63 years). The average maternal mortality ratio for the lower-middle income group was estimated at 251 deaths per 100,000 live-births in 2015; but in Nigeria, it was 814 deaths per 100,000 live-births. Infant and under-five mortality rates within the same period averaged 40 and 53 deaths per 1,000 live-births respectively for the lower-middle income group; but in Nigeria, these were 69 and 109 deaths per 1,000 live-births respec-

[1] This is according to CIA.

[2] The Gini index is according to The World Bank's world development indicators (WDI).

[3] Poverty rate is with respect to 2011 purchasing power parity. All estimates are sourced from the WDI.

[4] Nigeria is classified as a lower-middle-income country.

tively. Meanwhile, healthcare expenditure remains high in Nigeria with no well functioning health insurance system making patients bear almost all healthcare expenditures. Specifically, out-of-pocket (OOP) healthcare expenditure is estimated at 72 percent of total expenditure on health while this is averaged at about 56 percent within the lower-middle income group,[5] representing a huge burden on the average Nigerian.

Even within the country, there are great disparities in health (WHO, 2014) and these exit in various forms. Health inequity is not only very visible in the rural areas and urban slums but also prevails in the northern part of the country, where the incidence of poverty is also the highest (see. Audu, Ojua, Ishor, and Abari, 2013; Alaba, Adeoti, and Abiodun, 2012). For instance in 2011, the infant mortality rate (123 deaths per 1,000 live-births) in the north western part of the country was more than two times that for the south western zone (NBS, 2011).[6] The unacceptable high rate of poverty in the northern part of the country may have some repercussion(s) on how much they spend or might spend on healthcare even when the need arises. Meanwhile, the use of maternal healthcare services in the form of antenatal care and supervised delivery is found to be disproportionately lower among the poor[7] and the uneducated women (Obiyan and Kumar, 2015). With respect to gender disparities, for the year 2014, the WDI estimate for survival to age 65 in terms of percentage of cohort for females was 47.57, while that for males was 44.35. Access to healthcare service is generally low in the rural areas of the country (Alaba et al., 2012).

Recognising the unacceptable health inequities within and between countries and economic status as being one of the social determinants of health, the heads of government, ministers and government representatives during the World Conference on *"Social Determinants of Health"* on 21st October, 2011 expressed their commitment to reduce health inequities and to achieve other global priorities (WHO, 2011). Nonetheless, considerable effort has been devoted to the socio-economic status (SES) and health inequality hypothesis in the literature but empirical evidence seems to suggest that this debate is far from being settled. That is, studies that support the SES health inequality hypothesis have provided evidence to argue that health[8] is affected by the distribution of socio-economic status within a society (see. Ben-Shlomo et al., 1996; Kaplan et al.,

[5] Figures sourced from WDI.
[6] i.e. 55 deaths per 1,000 live-births.
[7] poverty here is measured by their wealth index
[8] of an individual and/or population

1996; Kawachi and Kennedy, 1997; Kennedy et al., 1998; Shibuya et al., 2002; Wagstaff, 2005; Wagstaff et al., 2003). In Nigeria, health inequalities are found to be evident in the distribution of health facilities (Ityavyar, 1988; Iyun, 1988; Nwakeze and Kandala, 2011); access to healthcare services (Alaba et al., 2012; Adeyanju, Tubeuf, and Ensor, 2016; Olaleye, Ogwumike, and Olaniyan, 2013); utilisation of services (Ityavyar, 1988; Obiyan and Kumar, 2015); and health outcome (Antai, 2011). Meanwhile there are also empirical findings that contrast this SES health inequality hypothesis (see for example: Beckfield, 2004; Bidani and Ravallion, 1997; Daly et al., 1998; Fiscella and Franks, 1997; Kennedy et al., 1998; Mellor and Milyo, 2002; Osler et al., 2002; Sturm and Gresenz, 2002).

Unfortunately, the main focus of many studies on this relationship in the developing world including Nigeria has been on maternal and child health (see. Wagstaff, 2000, 2005; Wagstaff et al., 2003; Wagstaff and Watanabe, 2003); and many have used methods that fail to control for other covariates or unobserved heterogeneity among respondents; and thereby yielding results that appear to support the SES health inequality hypothesis. Therefore, there is a dearth of empirical study on the effect of SES inequality on other aspects of health and health-related behaviours. For instance, among the existing empirical studies on inequality in health, relatively very little about inequalities in self-rated health such as functional disabilities that inhibit an individual's ability to carry out everyday activity is investigated in Africa's context (Sibanda and Doctor, 2013). Now, with Nigeria's high inequality level and being a country where healthcare expenses are almost entirely financed by individuals themselves through direct payments from one's pocket because there are no well functioning health insurance systems, the rich are expected to be in a position to spend relatively more on their health for better health outcomes. Meanwhile, the extent of out-of-pocket payment for healthcare services is also likely to put the poor particularly, in a great deal of financial risk which may deter their access and utilisation of appropriate healthcare services and subsequently affect their quality of health. So whether or not the problem of health inequalities can be reduced by redistributive policies requires an investigation of the effect of disparities in socio-economic status on health. Therefore the purpose for this study is to investigate if there exist inequality in health status and health expenditures in Nigeria and whether or not these inequalities can be systematically attributed to inequality in socio-economic status. In doing these, the empirical questions this chapter seeks to address are; what is the extent of SES inequality in health-

care expenditure and health status in Nigeria?[9] does the SES inequality in health status and/or health expenditures hold after controlling for unobserved heterogeneity among Nigerians? and how do factors vary in terms of their contribution to socio-economic inequalities in health among Nigerians? Given that such an analysis needs information on households' economic status, it is worth noting that the choice of SES indicator is also very critical for effective policy targeting. Therefore, the study uses three(3) SES measures (consumption, income and wealth) to independently investigate the issues at hand in order to present a more complete analysis.

This study contributes to the empirical evidence on the SES inequality in health hypothesis (from a developing country perspective) by using data from Nigeria, considering health variables that have not received relatively much attention in the empirical literature in Sub Sahara Africa and accounting for unmeasured heterogeneities using fixed effect (FE) regression models.[10] Therefore, the findings in this study can provide evidence as to whether the disparities in health status and health expenditures in Nigeria can be attributed to the inequality in socio-economic status. As already indicated, the socio-economic status here is measured independently by relative consumption, income and wealth levels. In addition, the health inequalities are measured by concentration indices in order to incorporate the socio-economic dimension of differences in health. The health inequality is further decomposed to find out which demographic factors are important contributors to health differences.

By recognising that any progress towards reducing inequalities in health is largely dependent on the ability of empirical studies to identify and measure the extent and magnitude of all aspects of inequalities (Sibanda and Doctor, 2013), then carrying out such a study may be useful to policy makers in terms of a holistic and effective healthcare policy targeting in Nigeria. For instance, a significant SES-health status inequality means redistribution of that living standard measure (i.e. the socio-economic status proxy) can help reduce SES-related inequality in health status. Thus the study's approach of using different SES measures in computing the inequality in health in an FE regression model can help provide an unbiased estimate of the effect of socio-economic inequality

[9] Health status in this study is measured by using the activities of daily living (ADL) indicators. These ADLs measure the functional capabilities of an individual. Therefore one novelty in this study lies in the choice of the health variables used in estimating health equalities.

[10] Note that the analysis also explores the fixed effect vector decomposition *(fevd)* estimation technique in order to estimate time-invariant covariates and also to account for rarely changing covariates.

on health.

Again, such empirical evidence from Nigeria could be useful for other developing countries that share Nigeria's characteristics because of her position in Africa and sometimes referred as the "Giant of Africa"; owing to its population[11] and economy. The World Bank for instance considers Nigeria to be an emerging economy given that it overtook South Africa in 2014 to become Africa's largest economy. Finally, the choice of Nigeria is also motivated by the availability of a panel data,[12] which is deemed useful to understand better how inequality in health varies with socio-economic status among the same respondents.

The rest of the chapter is organised as follows; section 2.2 presents the empirical method used in this study. Here, the health concentration index is explained followed by the method used in decomposing the health inequality. It also shows how the variables used in the empirical estimation are measured. In section 2.3, the data source and some descriptives of the explanatory variables are presented. The empirical results and discussions are presented in sections 2.4 and 2.5 respectively. The final section concludes the chapter.

2.2 Empirical Method

The empirical strategy used in this study begins with the estimation of concentration index (CI) of health status and healthcare expenditure independently for each wave; using three different SES indicators (consumption, income and wealth) in order to provide an insight into the extent and trend in SES health inequality for the period under consideration. Using a balanced-panel data, the next step involves computing the health inequality using the standard ordinary least squares (OLS) regression models. The analysis then uses a model (FE regression technique)[13] that accounts for unobserved heterogeneity between individuals to further examine the hypothesis. The final part of the analysis decomposes the computed health concentration indices specifically for models in which the SES inequality emerge significant in explaining health-related inequality.

[11] Nigeria is the most populous country in Africa with a population of about 177.5 million

[12] which is not common in developing countries

[13] i.e. both the standard fixed effect model and the fixed effect vector decomposition technique

2.2.1 Measuring health inequality

In computing the inequalities in the selected health variables, this study uses health concentration indices. The concentration index is one of the two measures argued to be best suited for the measurement of inequality in health because of its ability to reflect the socio-economic dimension to inequalities in health (Wagstaff, Paci, and Doorslaer, 1991; Doorslaer, Wagstaff, Bleichrodt, Calonge, Gerdtham, Gerfin, Geurts, Gross, Hakkinen, Leu, O'Donnell, Propper, Puffer, Rodriguez, Sundberg, and Winkelhake, 1997; O'Donnell et al., 2008).[14] Other conventional measures of inequality such as the range, Gini coefficient, index of dissimilarity and coefficient of variation are criticised for being unable to reflect the socio-economic dimension to health inequalities (Wagstaff et al., 1991; Doorslaer et al., 1997; Wildman, 2003a). In addition, the concentration index reflects the experiences of the entire population making it sensitive to changes in the distribution of the population across socio-economic groups (Doorslaer et al., 1997).

The concentration index (CI) is based on the concept of concentration curve. The concentration curve here shows the share of the health variable that is accounted for by the cumulative proportions of individuals in the population ranked from the most disadvantaged (poorest) to the least disadvantaged (O'Donnell et al., 2008). Therefore, the CI is defined as twice the area between the concentration curve and the diagonal (i.e. the 45^o line which is also known as the line of equality) and is formally specified as:

$$CI = 1 - 2\int_0^1 L_h(p)dp \tag{2.1}$$

where; the function $L_h(p)$ represents the concentration curve.

Therefore the concentration index, similar to the Gini coefficient, measures the relative inequality so that the concentration index remains unchanged if for instance; everyone's health variable is doubled (Wagstaff et al., 2003). The CI is zero if there is no inequality in health, suggesting that the health variable is equally distributed among the unit of analysis regardless of the living standard rank. In this case, the $L_h(p)$ coincides with the 45^o line. The CI is negative if the $L_h(p)$ lies above the 45^o line, and this means that the health variable

[14] The other measure is relative index of inequality (RII) and this is closely related to the concentration index. That is, the RII is only equal to the concentration index divided by twice the variance of the fractional rank of the unit of analysis in the SES distribution (Wagstaff et al., 1991).

is concentrated among the most disadvantaged.[15] When the $L_h(p)$ lies below the diagonal, the CI is positive and this means that inequality in the health variable is concentrated among the least disadvantaged (O'Donnell et al., 2008). Therefore, from equation (2.1), the concentration index (CI) lies between -1 and 1.[16]

Now, with an individual-level analysis (as to be used in this study), let $h_i (i = 1, ..., n)$ which represents the health variable of interest for the ith individual be a linear function of the socio-economic status (X) and be specified as:

$$h = g(X) \tag{2.2}$$

If individuals are ranked in ascending order of their socio-economic status (SES), then the concentration curve for h can be explained as the share of total h received by observations with socio-economic status of X or less. Therefore $F_i\left[g(X)\right]$ is graphed against the population share of those SES no greater than X, $F(X)$ (Jenkins, 1980). Analogous to the specification in equation (2.1), the concentration index of the health variable of interest can be defined as:

$$CI_h = 1 - 2\int_0^X F_i\left[g(X)\right] dF(X) \tag{2.3}$$

where; $F_i\left[g(X)\right] = \int_0^X g(X)dF(X)/\bar{g}(X)$ is the probability distribution function of h; $\bar{g}(X) = \int_0^X g(X)dF(X)$; and "$-$" denotes "mean". Meanwhile, Kakwani (1980, pp.173) has shown that equation (2.3) can be written using "convenient covariance" so that;

$$CI_h = \frac{2}{E\left[g(X)\right]} cov\left[g(X), F(X)\right] \tag{2.4}$$

Therefore following Kakwani (1980); Jenkins (1986); and Lerman and Yitzhaki (1984) and analogous to equation (2.4), the health concentration index can also be re-written as:

$$CI_h = \frac{2}{\bar{h}_t} cov(h_{it}, R_{it}) \tag{2.5}$$

where; R_{it} is the fractional rank of the ith individual regards the SES distribution at time t so that $cov(.)$ is the covariance between the health variable

[15] In other words, health inequality favours the poor.

[16] For instance, if the health variable in question is "good health", then in the extreme case, the CI is -1 when only the most disadvantage person is healthy and CI will be 1 when only the least disadvantaged person is healthy.

and the fractional rank; and $\bar{h_t}$ is the mean of the health variable at time t.

Equation (2.5) clearly shows the dependence of the concentration index on the socio-economic dimension to the distribution of the health variable which the Gini coefficient for example does not. That is, given that the Lorenz curve ranks individuals by their health (and not the SES variable), the Gini coefficient which measures the area between the Lorenz curve and the diagonal fails to take into account this socio-economic dimension in health inequality. In this case, using the Gini coefficient does not address the extent to which inequalities in health are systematically related to socio-economic status which this chapter is interested in estimating. Therefore given that to calculate the Gini index for any health variable, the unit of analysis must be ranked by the health variable and not the socio-economic distribution, generally, the CI is not equal to the Gini index. However, the concentration curve and CI will give the same result as the Lorenz curve and the Gini index respectively if the ranking of the unit of analysis by health is the same as the ranking by the socio-economic status (Wagstaff et al., 1991). The specification in equation (2.5) also shows that the CI depends on the health variable in question of all the unit of analysis which using the "range" for instance fails to account for. That is, the range as a measure of health inequality simply provides the inequality estimate by comparing the experiences of the extreme socio-economic groups (Wagstaff et al., 1991).

Now, given the relation between covariance and ordinary least square (OLS) regression and following Kakwani, Wagstaff, and Doorslaer (1997), an equivalent estimate of the CI and standard error can be obtained by ranking individuals according to their SES (as measured independently by consumption, income and wealth in this paper) and running OLS regression on the model in (2.6). That is:

$$2\sigma_R^2 \left[\frac{h_{it}}{\mu} \right] = \alpha + \delta R_{it} + \varepsilon_{it} \tag{2.6}$$

where; $\mu = \frac{1}{n}\Sigma_{i=1}^{n} h_i$ is the mean of the health variable; $R_{it} = \frac{i}{n}$ is the fractional rank of the ith person with respect to the SES distribution at time t so that, $i = 1$ for the most disadvantaged person and $i = n$ for the least disadvantaged individual in the sample; δ is an estimate of the CI; σ_R^2 is the variance of the fractional rank of individual i; α and ε_{it} are the intercept and error terms respectively. Hence the left-hand-side of equation (2.6) is the transformed health variable of interest which reflects the socio-economic dimension to inequalities in health.

Given that the probability distribution function $F(X)$ in equation (2.3) which is equivalent to the fractional rank of individuals (R_i) in the SES distribution always has a mean equal to $\frac{1}{2}$ (Kakwani, 1980), the estimator $\hat{\delta}$ which measures the health concentration index is:

$$\hat{\delta} = \frac{2}{n\mu}\Sigma_{i=1}^{n}(h_i - \mu)(R_{it} - \frac{1}{2}) \tag{2.7}$$

According to O'Donnell et al. (2008), estimating the CI in this way provides another interpretation of the CI as: the slope of the line that passes through the heads of a parade of people ranked by their socio-economic status so that each person's height is proportional to his/her health variable which is expressed as a fraction of its mean.

Equation (2.6) is therefore a simple bivariate OLS model that regresses the transformed health variable on the fractional rank of the individual in the SES distribution. From there, we can account for other covariates (j) by specifying:

$$2\sigma_R^2\left[\frac{h_{it}}{\mu}\right] = \alpha + \delta R_{it} + \Sigma_j \psi_j Z_{jit} + \varepsilon_{it} \tag{2.8}$$

where; $j = 1, ..., J$; so that Z_{jit} are the other covariates for individual i at time t; $\hat{\delta}$ is the estimated concentrated index (O'Donnell et al., 2008); and $\hat{\psi_j}$ measures the effect of characteristic j on health inequality.

Since another important aspect of this paper is to account for unmeasured heterogeneities in the analysis, the specifications in (2.9) and (2.10) are the corresponding fixed effect (FE) models.

$$2\sigma_R^2\left[\frac{h_{it}}{\mu}\right] = \alpha_i + \delta R_{it} + \varepsilon_{it} \tag{2.9}$$

$$2\sigma_R^2\left[\frac{h_{it}}{\mu}\right] = \alpha_i + \delta R_{it} + \Sigma_j \psi_j Z_{jit} + \varepsilon_{it} \tag{2.10}$$

where; α_i represent individual specific characteristics which were not accounted for in the earlier specifications. The use of FE models makes it possible to account for time-invariant characteristics that may bias the inequality in health estimates so that we can assess the net effect of inequality in socio-economic status (SES) on inequality in health.

This study also explores the fixed effect vector decomposition *(fevd)* method of estimation by Plumper and Troeger (2007), in order to adjust for the presence of any rarely-changing covariates. The *fevd* model is built on the account

that there are some characteristics that are almost invariant with respect to the period under consideration. Given that the FE model performs only "within" transformation on all variables including those with relatively little "within" variances, the variance of the estimates for these slowly changing variables approaches infinity which means that in instances where the "within" variances are very small relative to the "between" variances, the point estimates of the FE estimator become unreliable.[17]

Therefore, by using the *fevd* technique, we estimate a model of the form:

$$2\sigma_R^2\left[\frac{h_{it}}{\mu}\right] = \alpha_i + \delta R_{it} + \Sigma_j \psi_j Z_{jit} + \Sigma_m \phi_m W_{mit} + \varepsilon_{it} \tag{2.11}$$

where; $m = 1, ...M$; so that W_{mit} are the rarely changing covariates for the ith individual at time t; and ϕ_m measures the effect of covariate m on inequality in that health variable under consideration.

In this case, the *fevd* technique invariably carries out three estimations by first running the standard FE estimation. In the second stage, the procedure divides the unit effects into explained and unexplained parts by regressing the unit effects on the rarely changing covariates. The final stage performs a pooled-OLS estimation of the original model by including all covariates (time varying, time-invariant and the rarely changing variables) and the unexplained part of the FE vector. In effect, the use of the *fevd* model is expected to improve the reliability of the estimation in the presence of covariates with very low "within" variance relative to the "between" variance.

2.2.2 Decomposition of health inequality

Inequality decomposition has received significant attention in the literature whether looked at it from a theoretical (a priori reasoning) or empirical (regression based) perspective. Whichever way, Cowell and Fiorio (2011) have shown how the two approaches can be reconciled such that the regression based (RB) methodology can be derived from the a priori approach to factor-source decomposition. This section uses the RB methodology to provide an insight into SES inequality in health decomposition by subgroups. Conducting such an analysis is particularly useful for effective policy targeting. Therefore, following Cowell and Fiorio (2011), assume a basic model of the form:

[17] See Plumper and Troeger (2007) for detailed discussions on the estimation of rarely changing variables.

$$H = \beta_0 + \beta_1 X_2 + ... + \beta_k X_k + \varepsilon \tag{2.12}$$

where H is the health status; X represent the explanatory variables; and ε is the error term. Let us further assume X_1 to be a discrete random variable that takes only finite number of values $\{m = 1, 2, ..., t_1\}$.

If $X_{k,m} := \iota.X_k$; where ι is an indicator function which is equal to 1 if $X_1 = m$ and equal to 0 if otherwise, then equation (2.12) can be represented for the subgroup of interest (say m) as:

$$H_m = \beta_{0,m} + \beta_{1,m} X_{1,m} + \Sigma_{k=2}^{K} \beta_{k,m} X_{k,m} + U \tag{2.13}$$

where U is the corresponding error term. If we define; $P_m = Pr(X_1 = X_{1,m})$ to be the proportion of the population for which $X_1 = X_{1,m}$, then, within-group inequality in health can be represented by:

$$I_w(H) = \Sigma_{m=1}^{t_1} W_m I(H_m) \tag{2.14}$$

where, t_1 is the number of groups considered and W_m is the weight which is a function of P_m and H_m. The overall inequality in health $I(H)$ is the summation of within-group ($I_w(H)$) and between-group ($I_b(H)$) inequality represented by:

$$I(H) = I_b(H) + I_w(H) \tag{2.15}$$

whereby; the between-group inequality is given by (2.14) into (2.15) and rearranging:

$$I_b(H) = I(H) - \Sigma_{m=1}^{t_1} W_m I(H_m) \tag{2.16}$$

If α is the weight given to distances between SES at different parts of the SES distribution,[18] then;

$$W_m = P_m \left[\frac{\mu(H_m)}{\mu(H)} \right]^{\alpha} = R_m^{\alpha} P_m^{1-\alpha} \tag{2.17}$$

where, $R_m := P\frac{\mu(H_m)}{\mu(H)}$ is subgroup $m's$ share of the health variable; $\mu(H_m)$ is the mean health variable for subgroup m; and $\mu(H)$ is the mean health variable for the whole population.

Meanwhile, the inequality in Health can also be written as:

[18] α can take any value

$$I(H) = \frac{1}{\alpha^2 - \alpha}\left[\int \left[\frac{H}{\mu(H)}\right]^{\alpha} dF(H) - 1\right] \tag{2.18}$$

Then from equations (2.17) and (2.18), (2.14) becomes:

$$I_w(H) = \frac{1}{\alpha^2 - \alpha}\left[\Sigma_{m=1}^{t_1} P_m \left[\frac{\mu(H_m)}{\mu(H)}\right]^{\alpha} \int \left[\frac{H_m}{\mu(H_m)}\right]^{\alpha} dF(H_m) - 1\right] \tag{2.19}$$

then,

$$I_b(H) = \frac{1}{\alpha^2 - \alpha}\left[\Sigma_{m=1}^{t_1} P_m \left[\frac{\mu(H_m)}{\mu(H)}\right]^{\alpha} - 1\right] \tag{2.20}$$

Now, using a sample of n under the assumption that OLS conditions are satisfied, equation (2.13) can be estimated by dummies for different group identifications as:

$$h_m = b_{0m} + \Sigma_{k=2}^{K} b_{k,m} x_{k,m} + u_m \tag{2.21}$$

where, $b_{0,m}$ represents the OLS estimates of $\beta_{0,m} + \beta_{1,m}\mu(x_{1,m})$ in subsample m; so that $\mu(x_{1,m})$ is the corresponding mean of the variable x_1, and u_m is the OLS residual of each group.

Given the OLS estimate for the mean of h_m as:

$$\mu(h_m) = b_{o,m} + \Sigma_{k=2}^{K} b_{k,m}\mu(x_{k,m}) \tag{2.22}$$

the between-group inequality in health is:

$$I_b(h) = \frac{1}{\alpha^2 - \alpha}\left[\Sigma_{m=1}^{t_1} p_m \left[\frac{b_{0,m} + \Sigma_{k=2}^{K} b_k \mu(x_{k,m})}{b_0 + \Sigma_{k=1}^{K} b_k \mu(x_k)}\right]^{\alpha} - 1\right] \tag{2.23}$$

where, n_m is the size of subgroup m; and $p_m := \frac{n_m}{n}$ is the population share. The estimated within-group inequality in health (by substitution into (2.14)) is given by:

$$I_w(h) = \Sigma_{m=1}^{t_1} w_m I(h_m)\left[\Sigma_{k=2}^{K} \frac{b_{k,m}^2 \sigma^2(x_{k,m}) + \sigma^2(u_m)}{\sigma^2(h_m)}\right] \tag{2.24}$$

where, $w_m = (q_m)^{\alpha}(p_m)^{1-\alpha}$ is the weight expressed as a function of p_m and

h_m; and $q_m := \frac{p_m \mu(h_m)}{\mu(h)}$ is the health share of group m.[19]

Alternatively, the inequality in health for subgroup m can also be written as:

$$I(h_m) = \Sigma_{k=1}^{K+1} \Theta_{m,k} \tag{2.25}$$

where, $\Theta_{m,k}$ is variable $k's$ contribution to the overall inequality in health for subgroup m. If the proportional contribution of variable k to inequality for subgroup m is defined by $\theta_{m,k} := \frac{\Theta_{m,k}}{I(h_m)}$, then by substitution, the within-group inequality can also be written as:

$$I_w(h) = \Sigma_{m=1}^{t_1} w_m \Sigma_{k=1}^{K+1} \Theta_{m,k} = \Sigma_{m=1}^{t_1} w_m \Sigma_{k=1}^{K+1} I(h_m) \theta_{m,k} \tag{2.26}$$

The *"ineqrbd"* command in STATA helps to compute equation (2.26) easily.

2.2.3 Measurement of variables

Dependent variables

In carrying out the above analysis, the main outcome variables are "health status" of individuals, out-of-pocket (OOP) expenditure for healthcare, and total healthcare expenditures. The "health status" here is based on global indicators for activities of daily living (ADLs). Characteristically, the indicators used for health equity analysis can be categorised into medical, functional and subjective (Wagstaff et al., 1991). Therefore, the use of ADLs in the socio-economic inequality in health analysis here in this study defines health in relation to incapability to carry out everyday tasks (O'Donnell et al., 2008). Specifically, the ADLs are routine activities that people tend to do everyday and they are indicators of independence and functional capabilities of an individual. These are therefore key elements to measure quality of life and functional status of an individual.

Unlike the self-assessed health which is typically derived from an ordered response to a question evaluating one's health status, the ADL used here is an index constructed from a range of responses to health-related problems as provided by the data. The ADL-related questions in the survey include *inter alia* ability to do rigorous activities,[20] walking uphill, walking 100meters, walking

[19] Equation (2.24) is applicable when $Corr(X_{1,m}, X_{k,m}) = 0$ and $Corr(X_{1,m}, U) = 0$.

[20] such as running, lifting heavy object, participating in sports, doing hard labour, etc

for at least 1km, bending over or stooping, difficulty in seeing, hearing, climbing stairs or difficulty with self care.[21] The response to each question is 1 if the respondent can do the activity or 0 if (s)he is unable to do it. The nature of the ADL-related questions makes it sensitive to many health problems (O'Donnell et al., 2008) since these questions cut across ability or inability to do an appreciable range of activities. This makes the use of ADL quite an informative estimate about a person's health status. Now, following Gertler and Gruber (2002) and in accordance with other related literature, the responses are then aggregated following an algorithm developed for the RAND Medical Outcome Study (O'Donnell et al., 2008) so that in this study it is specified as:

$$ADL_i = \frac{11 - \Sigma_{a=1}^{11} health_i^a}{11} \tag{2.27}$$

where $health_i^a$ is the health status of individual i for the ath health item which considers the ability do a specific routine activity. In all, there are eleven of such health items in the data which means that the maximum aggregate score an individual can obtain if (s)he can perform all activities without any difficulty is eleven. Therefore, equation (2.27) represents the ADL-index used in the analysis as a proxy for health status.[22]

The second dependent variable is total healthcare expenditure and this is made up of consultation fee; medicine and drugs purchased over the counter, from kiosk or Patent Medicine Vendors (PMV); and transportation (round trip) purposely to the facility or the health practitioner for healthcare needs.[23]

The last dependent variable, out-of-pocket (OOP) healthcare expenditure specifically looks at the amount of money that the respondent paid himself/herself when (s)he sought treatment within the reference period.

Key independent variables

The main independent variable is the socio-economic status (standard of living) and this is measured independently by households' consumption, income and wealth levels. The computation of the living standard is measured at the household level because of the "sharing" and inter-dependence that take place in a typical household in a developing economy.[24]

[21] such as bathing, dressing, feeding, toileting, etc.
[22] Note that the ADL index in this study is computed in a way that increase in good health.
[23] The reference period is 4 weeks preceding the survey.
[24] All measurements are adjusted to reflect a reference period of twelve months.

Consumption as a measure of socio-economic status, is made up of food, non-food items, consumer durables and housing. The food consumption sub-aggregate consists of food purchased in the market, food from home production,[25] food items received as gifts or remittances from other household(s) and food received as in-kind payments from employers. The non-food sub-aggregate is made up of education, health, clothing and footwear, toiletries, fuel and other household items which are all converted to a uniform reference period of twelve months. In the case of the consumption of durable goods, the focus here is to compute the user cost of these goods. The survey provided information on the current value and the age (in years) of each durable good owned by households. Therefore, if T_{it}^{d} is the age of durable good d; of household i at time t, then for N households, the average age for each durable good in the survey is given by:

$$\bar{T} = \frac{\Sigma_{d=1}^{N} T_{it}^{d}}{N} \tag{2.28}$$

where; there are $d = 1, ..., D$ durable goods. Now, following Deaton and Zaidi (2002), the user cost (UC) of durable goods is computed by:

$$UC_{it} = \frac{S_t P_t}{2\bar{T}_t^{d} - T_{i,t}^{d}} \tag{2.29}$$

where; P_t is the price of the durable good at the beginning of the year; S_t is the quantity owned by the household, so that $S_t P_t$ represents the current value of that durable good(s); $2\bar{T}_t^{d}$ is the estimated average lifetime[26] of each item (d) at time t; and $2\bar{T}_t^{d} - T_{it}^{d}$ is the remaining life of each item (d).

The last component of consumption, housing sub-aggregate is the monetary measure of the flow of services that the household receives from occupying its own dwelling (Deaton and Zaidi, 2002). Subsequently, the total consumption derived from summing the various consumption components are adjusted to reflect differences in prices using the Paasche price index. The final adjustment was in relation to the household size in order to obtain per capita consumption for each household.

The second SES measure is income. In order to obtain a good estimate (given the challenge associated with collecting information on household incomes in surveys particularly in developing countries), income as used in the analysis is made up of wage income from labour services, rental income from

[25] i.e. subsistence agriculture

[26] This is under the assumption that purchases are uniformly distributed through time Deaton and Zaidi (2002).

leasing assets,[27] household agricultural income from the consumption of home-grown agricultural produce, non-farm self employment income,[28] income from remittances and other income sources such as education scholarships and investment income.

Finally the socio-economic status is also measured by the household's wealth. Here, instead of creating an index out of the household's ownership of durables and housing characteristics (which is typically done in such studies), another novelty of this analysis lies in the computation of the value of assets held by households and the value of their dwellings (for owner-occupying dwellings). The decision to use the value of wealth and not an index for wealth is because the monetary measure of socio-economic status is noted to have the advantage of clearer policy implications[29](Howe, Hargreaves, Gabrysch, and Huttly, 2009). Again, the motivation for using the value of wealth is to ensure a substantial within-respondent variation in the variable of interest (wealth) in order to carry on the study's objectives.

Other independent variables

For the health status (ADL), it is anticipated that the quality of health will decline as one advances in age and so, the respondent's age (in completed years) is controlled for in the regression models. If the deterioration of health status with age holds, then healthcare expenditure is also expected to increase with age, all things being equal. However, this may not always be the case given that some ill health may not be anticipated and so people may make unexpected expenditures on healthcare irrespective of their age. The inclusion of household size is to adjust for differences in household decompositions. The respondent's place of residence (rural/urban) and wave (wave1/wave2) are included to account for any community and/or time effect on health inequality.[30] Nigeria is divided into six (6) geo-political zones.[31] Unfortunately areas within the north (particularly north-east and north-west) have witnessed serious security problems in the form of terrorism attacks at least in the last decade which have affected many facets of life including health and standard of living. Therefore the zone of residence is included in the empirical estimations to account for any differences among

[27] such as land, equipment, imputed rents for owner-occupying houses, etc.

[28] from other businesses excluding agricultural activities

[29] The information needed are all provided in the data.

[30] "Rural" and "wave1" are always used as the reference category for place of residence and time (wave) respectively.

[31] These are north-central, north-east, north-west, south-east, south-south and south-west.

the geo-political zones within the period under review.[32]

The multivariate regression models control for marital status as three-categorical dummies (never married; married/union; and divorced/separated/widowed) and the "never married" group is always used as the reference category. Finally, the level of formal education is included to account for the influence of education on health inequality. This is categorised into: "below/basic",[33] "secondary", "professional/diploma", and "at least degree"; and here, the "below/basic education" group is always used as the reference category. As one climbs the education ladder, (s)he is expected to make decisions that will improve his/her health. The effect on healthcare expenditure may be ambiguous. On one hand, healthcare expenditure may decrease if for instance education improves an individual's lifestyle. On the other hand, it may be high given that the relatively more educated will be more equipped in identifying any health changes and thereby seek the appropriate healthcare regularly.

2.3 Data

2.3.1 Source of data

The study uses the panel survey component of the General Household Survey (GHS); which is a nationally representative household survey covering all the thirty-six states and the Federal Capital Territory (Abuja) in Nigeria.[34] The survey was fielded by the country's National Bureau of Statistics (NBS) and it is the first panel survey carried out by the institution. Based on the 2006 Housing and Population Census, a two-stage stratified sample selection process was used to select the sample. The first stage involved the selection of the primary sampling units (enumeration areas (EAs)) and these EAs were selected based on probability proportional to size of the total EAs in each state and Federal Capital Territory and the total households listed in those EAs, yielding a total of 500 EAs. The second stage which was the selection of households was carried out randomly using a systematic selection of ten (10) households from each EA (NBS, 2013).

The main survey instruments were questionnaires. Currently, there are two

[32] North-central is always used as the reference category in the analysis.

[33] This is made up of those with no formal education, informal (adult and functional literacy) programmes, and basic levels of education.

[34] The GHS in itself is a cross sectional survey of 22,000 households but a sub-sample of 5,000 households forms the panel component.

waves available; the first was conducted in 2010-2011 and the second was in 2012-2013.[35] The GHS-panel is a multi-purpose survey that contains a wide range of socio-economic topics. Each wave of the survey consists of two household questionnaires and one community questionnaire. While the first set of the household questionnaire contains information such as demographics, education, health, labour and time use, expenditures and consumption, safety nets and information and communication technology, the second set is an agriculture questionnaire administered only to households engaged in agricultural activities. The final set of questionnaire is the community questionnaire which was administered to the community to collect information on the characteristics of the EAs where the sampled households reside[36](NBS, 2013).

The GHS is the result of partnership between Nigeria's National Bureau of Statistics, Bill and Melinda Gates Foundation and the World Bank.[37] Even though 500 EAs made up of 5,000 households were selected, because households were not selected using replacement and some challenges such as relocation of and non-response by households, in all 4,851 households were successfully interviewed in both post planting and post harvesting periods (NBS, 2013).

2.3.2 Description of variables

As noted earlier, the panel data consists of two waves. In carrying out this analysis, the study uses respondents whose information are recorded in both waves (balanced panel dataset). Therefore the summary statistics presented in Table 2.1 first show the characteristics of each cross sectional dataset independently; and those of the balanced panel data set which is eventually used in the empirical estimations.

[35]Two visits were carried out in each wave. That is; August-October 2010 for post planting and February-April 2011 for post harvesting in wave one. Similar time lines between 2012 and 2013 were also used to collect the wave two post planting and post harvesting data.

[36]The community questionnaire was very useful in computing the value of household consumption since it contained the prices of food and non-food items.

[37]Due to the nature of the panel component, the partnership also involved the country's Federal Ministry of Agriculture and Rural Development and the National Food Reserve Agency.

Table 2.1: Descriptive statistics of explanatory variables

Variable	**Wave 1**	**Wave 2**	**Balanced panel**
age	26.60	24.51	28.06
household size	7.04	5.67	6.43
Gender			
male	49.50	49.87	49.99
female	50.50	50.13	50.01
Place of residence			
rural	70.98	73.55	72.87
urban	29.02	26.45	27.13
Marital status			
never married	56.68	63.30	54.24
married/union	39.13	32.19	41.15
divorced/widowed/sep.	4.19	4.51	4.61
Level of education			
basic (maximum)	79.78	79.99	79.51
secondary	14.08	14.28	14.28
professional/diploma	3.30	3.18	3.33
at least degree	2.84	2.54	2.88
Zone of residence			
north_central	15.82	17.52	16.15
north_east	20.24	20.56	20.52
north_west	21.94	23.52	24.10
south_east	15.78	13.34	15.74
south_south	14.06	14.39	13.42
south_west	12.16	10.67	10.07
log (consumption)	11.49	11.21	11.35
log (income)	10.64	10.59	10.61
log (wealth)	13.00	12.98	13.07
No. of obs.	*15,914*	*25,005*	*26,654*

Note that the balanced panel dataset is made up of 13,346 observations in each wave.

From Table 2.1, the average age of respondents (in completed years) in waves 1 and 2 independently are about 27 and 25 respectively; while in the balanced panel, it is 28. The gender representation is almost balanced and respondents are predominantly residing in the rural areas (more than 70 percent) in each dataset. Majority of the respondents have either no or very low (basic) formal education (nearly 80 percent). Only about 3 percent of the respondents have at least bachelor degree level of education. On average, a household is made up of about six members in both the second wave and the balanced panel datasets; majority of the respondents have never married (54.24 percent in the balanced panel), with about 5 percent being currently single either as result of divorce, separation or death of the partner in the balanced panel dataset. Majority of the respondents are residents from the north western and north eastern part of the country; with the least representation being from the south western part.

Now, considering only the balance panel dataset, Table 2.2 provides detailed summary statistics showing how the standard deviation of the time varying variables used in the empirical estimations decompose into "between" and "within" variances. Given the argument made by the fixed effect vector decomposition

(fevd) technique (see. Plumper and Troeger, 2007), this is particularly useful in order to see which variables are rarely changing within the period considered here in this study.

Table 2.2: Summary statistics of time-varying covariates

Variable		Mean	Std. Dev.	btn./within ratio
age	overall	28.06	18.88	
	between		18.63	
	within		3.12	5.97
household size	overall	6.43	3.05	
	between		2.16	
	within		2.16	1.27
Marital status				
never married	overall	0.54	0.50	
	between		0.49	
	within		0.06	8.51
married/union	overall	0.41	0.49	
	between		0.49	
	within		0.08	6.16
divorced/widowed/separated	overall	0.05	0.21	
	between		0.20	
	within		0.07	2.81
Level of formal education				
basic (maximum)	overall	0.80	0.40	
	between		0.37	
	within		0.15	2.44
secondary	overall	0.14	0.35	
	between		0.31	
	within		0.17	1.85
professional/diploma	overall	0.03	0.18	
	between		0.16	
	within		0.09	1.76
at least degree	overall	0.03	0.17	
	between		0.15	
	within		0.07	2.15
log (consumption)	overall	11.35	1.12	
	between		0.94	
	within		0.61	1.53
log (income)	overall	10.61	1.61	
	between		1.32	
	within		0.93	1.42
log (wealth)	overall	13.07	1.98	
	between		1.73	
	within		0.97	1.78

Column 5 is the ratio of "between" to "within" variance for each variable.

From Table 2.2, although the "between" variances are relatively larger than the "within" variances, this is only marginal for most variables. However, the difference is quite appreciable for the variables: age and marital status. Recall that the main variable of interest in this study is the socio-economic status (consumption, income and wealth). From Table 2.2, the "between to within" variance ratios for these SES variables are not very high compared to the 2.8-threshold suggested by Plumper and Troeger (2007) in order for us to be worried. Nonetheless, considering the "between to within" variance ratios and the threshold suggested by Plumper and Troeger (2007), the *fevd* analyses consider

age and marital status as the rarely changing covariates.

Now, with respect to the study's objectives, the focus here is not in the level of a person's socio-economic status but rather, his or her relative rank with respect to that specific SES measure. Therefore, Table 2.3 specifically provides the detailed summary statistics for the respective SES rank.

Table 2.3: Summary statistics of socio-economic status (SES) rank

Variable		Mean	Std. Dev.	btn./within ratio
consumption rank	overall	0.5	0.29	
	between		0.25	
	within		0.15	1.69
income rank	overall	0.5	0.29	
	between		0.24	
	within		0.16	1.45
wealth rank	overall	0.5	0.28	
	between		0.24	
	within		0.14	1.76

Column 5 shows the "between" to "within" variance ratio for each variable.

Here again, the "between to within" variance ratios are not very high. However, as shall be presented later, we use the *fevd* model, taking into account the variables: age and marital status as the rarely changing covariates based on their relatively higher "between to within" variance ratios.

2.4 Results

2.4.1 SES inequality in health by wave

Extent and trend in socio-economic health inequality

This section estimates the extent and trend in SES health inequality for the period under review. Therefore Table 2.4 presents the health concentration indices which measure the SES inequality in health by estimating equation (2.6) for each cross section of the datasets.[38]

[38] Recall that estimating model (2.6) gives the health concentration index which measures the SES-related inequality in health. All standard errors are robust standard errors.

Table 2.4: SES inequality in health by wave (from model 2.6)

	Consumption	**Income**	**Wealth**
	Wave 1 (2012/2013)		
ADL index	0.0019***	0.0027***	0.0016***
	(0.0005)	(0.0005)	(0.0005)
Total health exp.	0.2738***	0.1819**	0.2689***
	(0.0894)	(0.0776)	(0.0898)
OOP health exp.	0.2898***	0.2626***	0.2644***
	(0.0556)	(0.0490)	(0.0596)
	Wave 2 (2012/2013)		
ADL index	0.0029***	0.0031***	0.0040***
	(0.0005)	(0.0005)	(0.0005)
Total health exp.	0.1860***	0.0999***	0.1234***
	(0.0302)	(0.0296)	(0.0235)
OOP health exp.	0.3033***	0.2890***	0.2390***
	(0.0404)	(0.0420)	(0.0386)

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$.

Robust Standard errors in parentheses

Clearly from Table 2.4, health inequality in Nigeria is concentrated among the rich regardless of the SES indicator and the health variable under consideration. This is indicated by the positive values of all the concentration indices during the period under review.[39] A positive concentration index for health expenditure implies healthcare payment is progressive. Generally from the results, the implication is that, for each period (wave), the higher the rank of the respondent in the specific SES distribution, the better the health status or the higher the healthcare expenditure incurred. Nonetheless the SES inequality in health is comparatively higher with respect to healthcare expenditure than health status (ADL). Also, comparing the two waves, SES inequality in health status (ADL) and out-of-pocket (OOP) healthcare expenditure have generally been rising (though marginally) with respect to the SES indicators.[40]

2.4.2 SES inequality in health using the panel data

Estimation of models (2.6) **and** (2.9)

Unlike the output in Table 2.4, this section presents the results obtained from estimating the simple OLS and FE models specified in (2.6) and (2.9) respectively; and independently for each of the three health-related variables consid-

[39] Note that model (2.6) is a simple OLS regression that neither controls for other covariates nor individual heterogeneities but only for the respondent's "rank" on the SES distribution.

[40] except for wealth as an SES-measure in the case of OOP

ered. These are carried out using the balanced panel data and for each SES indicator. The results are shown in Table 2.5. This therefore provides the extent to which inequalities in health are systematically related to socio-economic status; a major objective of this study.

Table 2.5: SES and health inequality from models (2.6) and (2.9)

OLS regression						
	ADLs		**Total health exp.**		**OOP. Health exp.**	
SES rank	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
consumption	0.0012***	0.0003	0.2738***	0.0385	0.2954***	0.0425
income	0.0014***	0.0004	0.2509***	0.0318	0.2797***	0.0349
wealth	0.0007*	0.0004	0.1522***	0.0338	0.1636***	0.0369
No. of obs.	*26,260*		*26,554*		*25,908*	
Fixed Effect Model						
	ADLs		**Total health exp.**		**OOP. Health exp.**	
SES rank	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
consumption	-0.0005	0.0006	0.0180	0.0359	0.0289	0.0384
income	-0.00003	0.0005	0.0143	0.0284	0.0148	0.0319
wealth	0.0017***	0.0006	-0.0328	0.0430	-0.0085	0.0499
No. of obs.	*26,260*		*26,554*		*25,908*	

$***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Standard errors are robust standard errors.

The OLS results in Table 2.5 support the widely-cited relationship between socio-economic status (SES) and health inequality. That is, inequality in socio-economic status affects disparities in health status and expenditure on health. These are statistically significant at almost all the conventional levels. This means that inequality in health using each SES measure (consumption, income and wealth) is concentrated among the rich, again suggesting that the rich spend relatively more on health;[41] and also have relatively better health in Nigeria. However, the FE results at this level of analysis generally contrast the OLS findings since out of the nine models, only one of the SES ranks (wealth) is statistically significant in explaining inequality in health status.[42]

Estimation of models (2.8) and (2.10)

Similarly, this section estimates models (2.8) and (2.10) independently for each health-related variable and each SES indicator. Note that here, each model adjusts for other covariates and model (2.10) further accounts for unmeasured heterogeneities in the regression. The results in Table 2.6 shows the SES inequality in health when consumption is used as the SES measure for the respondent.

[41] Whether in relation to out-of-pocket or total healthcare expenditure.

[42] Note that each SES rank is used in estimating three independent models (ADL, OOP and total health expenditure) and here, only the variable "wealth rank" in the ADL model is significant.

Tables 2.7 and 2.8 provide similar analyses using wealth and income as the SES measures.

Table 2.6: Consumption and health inequality from models (2.8) and (2.10)

	ADL		**Total health exp.**		**OOP health exp.**	
	OLS	*FE*	*OLS*	*FE*	*OLS*	*FE*
Variable	**Coef.**	**Coef.**	**Coef.**	**Coef.**	**Coef.**	**Coef.**
consumption rank	0.0010***	0.0011*	0.1432***	0.0376	0.1435***	0.0452
	(0.0004)	(0.0006)	(0.0284)	(0.0312)	(0.0306)	(0.0330)
1.wave	0.0022***	0.0020***	0.0209	0.0324	0.0169	0.0319
	(0.0002)	(0.0002)	(0.0198)	(0.0269)	(0.0212)	(0.0298)
age	0.0006***	0.0002**	-0.0051**	-0.0008	-0.0044*	-0.0056
	(0.0000)	(0.0001)	(0.0022)	(0.0036)	(0.0023)	(0.0042)
age_squared	0.0000***	-0.0000**	0.0001***	0.0000	0.0001***	0.0001
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
Gender						
1.male	0.0015***		0.0565***		0.0935	
	(0.0002)		(0.0170)		(0.0188)	
Level of education						
1.secondary	-0.0005**	-0.0006	0.0158	-0.1644*	0.0323	-0.1712
	(0.0003)	(0.0004)	(0.0283)	(0.0919)	(0.0320)	(0.1088)
2.professional/diploma	-0.0009	-0.0006	0.0759	-0.1998*	0.0640	-0.2560*
	(0.0006)	(0.0010)	(0.0599)	(0.1135)	(0.0528)	(0.1406)
3.at least degree	0.0005	-0.0007	0.2709*	-0.3680	0.3654	-0.2689
	(0.0005)	(0.0011)	(0.1565)	(0.2465)	(0.1811)	(0.2977)
Marital status						
1.married	-0.0001	-0.0039*	0.1685***	0.0063	0.1793	0.0576
	(0.0003)	(0.0021)	(0.0247)	(0.0643)	(0.0266)	(0.0544)
2.divorced/widowed/sep.	-0.0048***	-0.0047*	0.1378**	0.0715	0.1749	0.0846
	(0.0009)	(0.0025)	(0.0549)	(0.0753)	(0.0591)	(0.0724)
Place of residence						
1.urban	-0.0005*		-0.0060		-0.0004	
	(0.0002)		(0.0221)		(0.0243)	
Zone of residence						
1.north_east	-0.0017***		-0.0210		-0.0214	-
	(0.0003)		(0.0286)		(0.0295)	
2.north_west	-0.0021***		-0.0667***		-0.0584	
	(0.0003)		(0.0255)		(0.0278)	
3.south_east	0.0002		0.1363***		0.1291	
	(0.0003)		(0.0490)		(0.0524)	
4.south_south	0.0005		0.1476***		0.1605	
	(0.0003)		(0.0405)		(0.0441)	
5.south_west	0.0001		0.0666		0.0843	
	(0.0004)		(0.0500)		(0.0543)	
household size	0.0001*	0.0000	0.0057	0.0069	0.0045	0.0062
	(0.0000)	(0.0000)	(0.0039)	(0.0049)	(0.0040)	(0.0053)
_cons	0.1607***	0.1651***	-0.0837	0.1640**	-0.1191	0.1943***
	(0.0006)	(0.0015)	(0.0586)	(0.0636)	(0.0614)	(0.0653)
No. Of obs.	*25,892*		*26,178*		*25,547*	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Robust standard errors in parentheses

Table 2.7: Wealth and health inequality from models (2.8) and (2.10)

	ADL		**Total health exp.**		**OOP health exp.**	
	OLS	*FE*	*OLS*	*FE*	*OLS*	*FE*
Variable	**Coef.**	**Coef.**	**Coef.**	**Coef.**	**Coef.**	**Coef.**
wealth rank	0.0006*	0.0012**	0.0936***	-0.0239	0.1023***	0.0006
	(0.0004)	(0.0006)	(0.0306)	(0.0420)	(0.0336)	(0.0485)
1.wave	0.0021***	0.0019***	0.0076	0.0295	0.0036	0.0279
	(0.0002)	(0.0002)	(0.0204)	(0.0267)	(0.0218)	(0.0294)
age	0.0006***	0.0002**	-0.0052**	-0.0007	-0.0045*	-0.0055
	(0.0000)	(0.0001)	(0.0022)	(0.0036)	(0.0023)	(0.0042)
age_squared	-0.0000***	-0.0000**	0.0001***	0.0000	0.0001***	0.0001
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
Gender						
1.male	0.0015***		0.0575***		0.0948***	
	(0.0002)		(0.0171)		(0.0190)	
Level of education						
1.secondary	-0.0005*	-0.0006	0.0245	-0.1649*	0.0408	-0.1718*
	(0.0002)	(0.0004)	(0.0292)	(0.0919)	(0.0332)	(0.10874)
2.professional/diploma	-0.0008	-0.0006	0.0903	-0.1994*	0.0776	-0.2561
	(0.0006)	(0.0001)	(0.0602)	(0.1136)	(0.0531)	(0.1407)
3.at least degree	0.0006	-0.0007	0.2894*	-0.3677	0.3824**	-0.2689
	(0.0005)	(0.0011)	(0.1583)	(0.2466)	(0.1831)	(0.2978)
Marital status						
1.married	0.0000	-0.0040*	0.1741***	0.0068	0.1862***	0.0566
	(0.0003)	(0.0021)	(0.0252)	(0.0642)	(0.0272)	(0.0544)
2.divorced/widowed/sep.	-0.0047***	-0.0048*	0.1530***	0.0702	0.1920***	0.0825
	(0.0009)	(0.0025)	(0.0537)	(0.0752)	(0.0582)	(0.0724)
Place of residence						
1.urban	-0.0004		0.0108		0.0161	
	(0.0002)		(0.0220)		(0.0241)	
Zone of residence						
1.north_east	-0.0019***		-0.0480		-0.0493*	
	(0.0003)		(0.0293)		(0.0299)	
2.north_west	-0.0022***		-0.0860***		-0.0781***	
	(0.0003)		(0.0261)		(0.0284)	
3.south_east	0.0001		0.1317***		0.1238**	
	(0.0003)		(0.0487)		(0.0521)	
4.south_south	0.0005		0.1438***		0.1559***	
	(0.0003)		(0.0400)		(0.0435)	
5.south_west	0.0002		0.0737		0.0914*	
	(0.0004)		(0.0504)		(0.0548)	
household size	0.0001*	0.0000	0.0045	0.0064	0.0033	0.0056
	(0.0000)	(0.0000)	(0.0039)	(0.0049)	(0.0040)	(0.0052)
_cons	0.1610***	0.1652***	-0.0449	0.1967***	-0.0838	0.2200***
	(0.0006)	(0.0016)	(0.0628)	(0.0668)	(0.0659)	(0.0706)
No. Of obs.	*25,892*		*26,178*		*25,547*	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Robust standard errors in parentheses

Table 2.8: Income and health inequality from models (2.8) and (2.10)

	ADL		**Total health exp.**		**OOP health exp.**	
	OLS	*FE*	*OLS*	*FE*	*OLS*	*FE*
Variable	**Coef.**	**Coef.**	**Coef.**	**Coef.**	**Coef.**	**Coef.**
income rank	0.0008**	0.0004	0.1031***	0.0161	0.1142***	0.0134
	(0.0004)	(0.0005)	(0.0246)	(0.0288)	(0.0257)	(0.0320)
1.wave	0.0021***	0.0019***	0.0102	0.0293	0.0061	0.0281
	(0.0002)	(0.0002)	(0.0204)	(0.0269)	(0.0217)	(0.0297)
age	0.0006***	0.0002**	-0.0049**	-0.0007	-0.0042*	-0.0055
	(0.0000)	(0.0001)	(0.0022)	(0.0036)	(0.0023)	(0.0042)
age_squared	0.0000***	0.0000**	0.0001***	0.0000	0.0001***	0.0001
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
Gender						
1.male	0.0015***		0.0549***		0.0920***	
	(0.0002)		(0.0170)		(0.0187)	
Level of education						
1.secondary	-0.0005**	-0.0006	0.0214	-0.1650*	0.0371	-0.1718
	(0.0002)	(0.0004)	(0.0288)	(0.0919)	(0.0327)	(0.1088)
2.professional/diploma	-0.0008	-0.0006	0.0861	-0.2003*	0.0724	-0.2566*
	(0.0006)	(0.0010)	(0.0596)	(0.1135)	(0.0526)	(0.1405)
3.at least degree	0.0006	-0.0008	0.2848*	-0.3688	0.3774**	-0.2695
	(0.0005)	(0.0011)	(0.1572)	(0.2465)	(0.1819)	(0.2977)
Marital status						
1.married	-0.0001	-0.0039*	0.1623***	0.0051	0.1728***	0.0561
	(0.0003)	(0.0021)	(0.0243)	(0.0642)	(0.0261)	(0.0544)
2.divorced/widowed/sep.	-0.0048***	-0.0048*	0.1334**	0.0701	0.1702***	0.0826
	(0.0009)	(0.0025)	(0.0550)	(0.0753)	(0.0591)	(0.0723)
Place of residence						
1.urban	-0.0004		0.0062		0.0111	
	(0.0002)		(0.0216)		(0.0237)	
Zone of residence						
1.north_east	-0.0019***		-0.0444		-0.0446	
	(0.0003)		(0.0291)		(0.0297)	
2.north_west	-0.0022***		-0.0829***		-0.0743***	
	(0.0003)		(0.0259)		(0.0281)	
3.south_east	0.0001		0.1226**		0.1138**	
	(0.0003)		(0.0500)		(0.0535)	
4.south_south	0.0004		0.1318***		0.1421***	
	(0.0003)		(0.0409)		(0.0445)	
5.south_west	0.0000		0.0525		0.0682	
	(0.0004)		(0.0505)		(0.0547)	
household size	0.0001*	0.0000	0.0045	0.0064	0.0033	0.0056
	(0.0000)	(0.0000)	(0.0039)	(0.0049)	(0.0040)	(0.0052)
_cons	0.1609***	0.1656***	-0.0433	0.1776***	-0.0828	0.2140***
	(0.0006)	(0.0015)	(0.0596)	(0.0635)	(0.0610)	(0.0668)
No. Of obs.	*25,892*		*26,178*		*25,547*	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$. Robust standard errors in parentheses

Again in the OLS models, the SES indicators maintained their statistical significance (regardless of the choice of SES indicator) as presented in Tables 2.6 to 2.8. However, all the SES-health inequality coefficients shrank. Well, this decline in the size of the SES inequality effect on health inequality may be an indication that earlier bivariate analyses may have generated some form of biased estimates. Nevertheless, the results from estimating equation (2.8) also support the SES inequality in health hypothesis but this effect may have been

overstated in instances where other observable characteristics have not been accounted for.

Once again in the FE models, the coefficients of the SES indicators fail to reach statistical significance in seven out of the nine models. Here again, the results suggest that unmeasured heterogeneity among respondents matters in the analyses of inequalities in socio-economic status and inequality in health. The results from using the *fevd* estimation technique are basically not very different from those obtained from the FE model (see Appendix for the *fevd* output). As indicated earlier, under the *fevd* model, we are also able to estimate the coefficients of the time-invariant variables. As expected, there are some changes in the regression coefficients of the rarely changing variables; but these are only marginal because the differences between the "within" and "between" variances were not very appreciable. Nevertheless since in this study, the interest is in estimating the SES-inequality in health, it is worth noting that this remains unchanged since they were not considered as rarely changing variables based on their "between to within" variance ratios.

Thus comparing the socio-economic status in terms of the three measurements reveals that relative consumption and wealth levels have significant effect on inequality in health status in Nigeria.[43] However, inequality in socio-economic status has no statistically significant effect on inequality in healthcare expenditure (see Tables 2.6 to 2.8).[44] This revelation is important for policy purposes.

2.4.3 Decomposition of health inequality

Here in the analysis, the interest is in decomposing the within-group inequality in health by gender, level of formal education and place of residence. Decomposing health inequality by gender is important given that men and women may have some innate characteristics that may influence their health status and hence their contribution to health inequality differently. Regards education, the effect of formal education on health is well documented in the literature; whereby all things being equal, acquiring formal education is expected to influence an individual's health positively (see for example: Huang, 2015; Cutler, Huang, and Lleras-Muney, 2014; Ross and Wu, 1995). This may have some effect on health inequality. Lastly, residing in a rural or an urban area in a developing country

[43] see ADL output in Tables 2.6 and 2.7. Recall that health status is measured by ADL index. This suggests that, SES inequality in health matters in terms of health status.

[44] for OOP and total health expenditure FE output.

such as Nigeria may come with its own challenges given that there is a vast difference between these localities, for example in terms of infrastructure and economic opportunities which may subsequently affect their livelihoods and/or health.[45] It is therefore insightful to find out the extent to which the place of residence accounts for the inequalities in health.

Since the earlier analyses revealed consumption and wealth inequalities to be statistically significant in explaining inequality in health status (ADL) even in the multivariate FE models, this section aims to provides an insight into the inequalities that generate the inequalities in ADL by providing the within-group differences in the contribution to inequality in health status. Therefore from equation (2.26), h_m is a vector of individual health status in group m and the covariates used are SES rank (consumption and wealth independently), age, marital status (three category dummies), household size, place of residence and four category dummies for the level of education.

The estimation of equation (2.26) uses the "fields" option so that the health inequality decompositions reported in this section give the regression-based decomposition in the predicted SES health status inequality.[46] Tables 2.9 and 2.10 present the decomposition by gender. Note that in Table 2.9, the SES indicator of respondents is their "consumption rank" while Table 2.10 uses their respective "wealth rank".

Table 2.9: Within-group inequality in health status using decomposition by gender

	Male		*Female*	
Variable	**2011**	**2013**	**2011**	**2013**
consumption rank	0.0692	0.0834	0.0669	0.0775
age	0.0297	0.0497	0.0252	0.0357
secondary	0.0031	0.0034	0.0034	0.0027
professional/diploma	-0.0003	0.0006	0.0003	-0.0003
at least degree	-0.0003	-0.0011	0.0005	-0.0002
married/union	-0.0087	-0.0150	-0.0046	0.0001
divorced/widowed/sep.	0.0001	0.0001	0.0031	0.0011
rural	0.0482	0.0831	0.0510	0.0810
household size	0.0965	0.0653	0.0906	0.0666
Total	0.2375	0.2694	0.2363	0.2643

[45] For instance, the rural areas may be disadvantaged when it comes to provision of good infrastructure and other basic facilities such as potable drinking water. On the other hand, the urban areas also suffer from congestion and pollution of all kinds.

[46] The 1^{st} and 2^{nd} waves are referred to as "2011" and "2013" for simplification purposes. Note that all Tables for the subgroup decomposition report only the output for equation (2.26) which is the product of the factor (variable) source decomposition of equality in each group $I(h_m)$ and its weight (w_m).

Table 2.10: Within-group inequality in health status using decomposition by gender

	Male		*Female*	
Variable	**2011**	**2013**	**2011**	**2013**
wealth rank	0.0608	0.0803	0.0583	0.0755
age	0.0455	0.0540	0.0386	0.0426
secondary	0.0064	0.0072	0.0065	0.0058
professional/diploma	0.0004	0.0014	0.0010	0.0007
at least degree	0.0006	0.0003	0.0010	0.0006
married/union	-0.0131	-0.0124	-0.0076	0.0028
divorced/widowed/sep.	0.0000	0.0000	0.0021	0.0004
rural	0.0485	0.0732	0.0499	0.0706
household size	0.1172	0.0802	0.1075	0.0784
Total	0.2664	0.2842	0.2573	0.2775

Generally, the results in Tables 2.9 and 2.10 do not vary much in terms of the trend in contributions from the various variables to health status inequality. Table 2.9 shows SES (consumption rank) to account for relatively large share to within-group health inequality for both men and women. There appears to be an increasing trend (quite substantial) in the SES's contribution to health inequality for both sexes regardless of the choice of SES indicator (see Tables 2.9 and 2.10) in Nigeria. Residing in a rural area and household size also account for appreciable contributions to health inequality for both males and females in Nigeria.

The results for the decomposition by the level of education are presented in Tables 2.11 and 2.12 for each SES indicator as before. These show the largest contributors to within-group inequality in health status (ADL) to be household size, SES rank (consumption or wealth), and age. In Table 2.11; where individuals are ranked by their consumption levels, SES rank generally has the highest contribution to health status inequality among those with relatively higher education level (i.e. professional/diploma and at least degree holders). The output in Table 2.12, whereby individuals are ranked by their level of wealth produces similar results except that SES (wealth) rank shows an increasing trend regards its contribution to inequality in health status between 2011 and 2013 among almost all levels (except for those with at least degree) of education. The individual's marital status either reduces (married/union group) or has relatively little contribution (divorced/widowed/separated group) to inequality in health status. While residing in a rural area has an appreciable contribution (i.e. in terms of magnitude of coefficient) to health status inequality among those with relatively low education (basic and secondary levels); this is not the case among

those with relatively higher level of education (see Tables 2.11 and 2.12).

Table 2.11: Within-group inequality in health status using decomposition by level of educ.

	Educational level			
Variable	**basic/below**	**sec.**	**prof./dipl.**	**degree+**
	2011			
consumption rank	0.0558	0.0598	0.0667	0.0934
age	0.0225	0.0804	0.0514	0.0276
female	0.0135	0.0102	0.0143	0.0096
married/union	-0.0099	-0.0150	-0.0036	-0.0016
divorced/widowed/sep.	0.0035	-0.0004	0.0018	0.0002
rural	0.0542	0.0158	0.0046	0.0088
household size	0.0899	0.0511	0.0578	0.0314
Total	0.2295	0.2020	0.1929	0.1695
	2013			
consumption rank	0.0651	0.0631	0.0738	0.0780
age	0.0321	0.1024	0.0981	0.0639
female	0.0211	0.0132	0.0056	0.0082
married/union	-0.0111	-0.0172	-0.0171	-0.0142
divorced/widowed/sep.	0.0020	-0.0011	-0.0006	0.0000
rural	0.0888	0.0271	0.0164	0.0113
household size	0.0590	0.0359	0.0392	0.0334
Total	0.2570	0.2234	0.2153	0.1807

Table 2.12: Within-group inequality in health status using decomposition by level of educ.

	Educational level			
Variable	**basic/below**	**sec.**	**prof./dipl.**	**degree+**
	2011			
wealth rank	0.0528	0.0322	0.0383	0.0452
age	0.0340	0.1231	0.0838	0.0922
female	0.0184	0.0166	0.0213	0.0178
married/union	-0.0147	-0.0208	-0.0116	-0.0080
divorced/widowed/sep.	0.0027	-0.0007	0.0016	-0.0002
rural	0.0536	0.0106	0.0030	0.0109
household size	0.1031	0.0645	0.0780	0.0583
Total	0.2499	0.2256	0.2146	0.2161
	2013			
wealth rank	0.0704	0.0411	0.0481	0.0444
age	0.0368	0.1331	0.1264	0.0998
female	0.0237	0.0174	0.0125	0.0125
married/union	-0.0107	-0.0190	-0.0149	-0.0159
divorced/widowed/sep.	0.0013	-0.0012	-0.0013	-0.0004
rural	0.0782	0.0200	0.0108	0.0083
household size	0.0679	0.0499	0.0511	0.0532
Total	0.2676	0.2413	0.2327	0.2019

Regards the decomposition by place of residence, Tables 2.13 and 2.14 also show the SES rank, household size and age to account for relatively larger contribution to within-group health inequality in both localities in Nigeria. While household size's contribution to health inequality shows a declining trend (be-

tween 2011 and 2013), there appears to be an increasing trend in the contribution of differences in socio-economic status (SES) to inequality in health for both the rural and urban areas within the period; with relatively higher shares in the urban areas. An observation of concern is the fact that being a female shows a rising trend in the contribution to health status inequality particularly in the rural areas regardless of the SES indicator in Nigeria (see Tables 2.13 and 2.14).[47]

Table 2.13: Within-group ineq. in health status using decomposition by place of residence

	Rural		*Urban*	
Variable	**2011**	**2013**	**2011**	**2013**
consumption rank	0.0553	0.0761	0.1181	0.1283
age	0.0476	0.1078	0.0355	0.0532
female	0.0219	0.0468	0.0135	0.0190
secondary	0.0020	0.0017	0.0029	0.0035
professional/diploma	-0.0003	-0.0005	-0.0009	-0.0007
at least degree	-0.0001	-0.0010	-0.0015	-0.0038
married/union	-0.0167	-0.0274	-0.0103	-0.0123
divorced/widowed/sep.	0.0015	-0.0030	0.0031	0.0018
household size	0.1490	0.1317	0.0836	0.0806
Total	0.2601	0.3322	0.2442	0.2696

Table 2.14: Within-group ineq. in health status using decomposition by place of residence

	Rural		*Urban*	
Variable	**2011**	**2013**	**2011**	**2013**
wealth rank	0.0637	0.1079	0.0628	0.0770
age	0.0452	0.0759	0.0839	0.0822
female	0.0211	0.0363	0.0307	0.0292
secondary	0.0024	0.0020	0.0131	0.0125
professional/diploma	-0.0001	-0.0002	0.0009	0.0017
at least degree	0.0001	-0.0006	0.0008	-0.0009
married/union	-0.0155	-0.0143	-0.0221	-0.0161
divorced/widowed/sep.	0.0013	-0.0013	0.0016	0.0004
household size	0.1398	0.1052	0.1324	0.1160
Total	0.2579	0.3108	0.3041	0.3021

2.5 Discussion

The rising inequality and poor health outcomes in Nigeria is undoubtedly a matter of concern which obviously needs to be addressed in order to unravel

[47] i.e. whether socio-economic status is measured by consumption or wealth.

any relationship. There are empirical studies that link the differences in health to differences in socio-economic status (see. Ben-Shlomo et al., 1996; Kaplan et al., 1996; Kawachi and Kennedy, 1997; Kennedy et al., 1998; Shibuya et al., 2002; Wagstaff, 2005; Wagstaff et al., 2003). Nonetheless, commonly-cited evidence for SES health inequality comes from studies based on cross-sectional data analysis (see. Shibuya et al., 2002; Wagstaff et al., 2003; Sturm and Gresenz, 2002; Wagstaff, 2005) whose parameter estimates may have been biased by their inability to account for unobserved heterogeneity among respondents. This set-back is among the concerns, motivating this study.

While acknowledging the data constraints for this study,[48] to a greater extent, the study's choice of SES measures (consumption, wealth and income levels) ensures some substantial variability in the SES among respondents so that the FE model is used. For instance, one source of variation in consumption or income levels may come from home production (subsistence agriculture) which is a major source of livelihood in Nigeria. This type of agriculture is mostly rain-fed and besides, prices for these produce are highly unpredictable thereby generating some reasonable variations in living standard levels. Also, as already mentioned, unlike the wealth index, the use of wealth level here in this study ensures some form of variations between respondents. Therefore, by running FE models, the threat of omitted variables is reduced significantly. Nonetheless, it is still important to note that the inferences from this study are made cautiously. In this regard, this study makes two main observations and the robustness of the findings lies in the fact that the study independently uses three different SES indicators (consumption, income and wealth levels) and three different health-related variables (health status, out-of-pocket (OOP) healthcare expenditure and total expenditure on health). This therefore can be seen as a valuable contribution to the literature on SES health inequality hypothesis particularly from a developing country perspective.

The first observation is that, after accounting for unobserved heterogeneity among individuals in the FE models, the SES inequality in health hypothesis does not hold with respect to healthcare expenditure.[49] In other words, the significance of inequality in the SES indicator in explaining inequality in healthcare expenditure evident in the OLS regressions disappears in the corresponding FE models; regardless of the choice of SES indicator. This is an indication that interpretations of socio-economic inequality in healthcare ex-

[48] That is, the availability of only two waves of the data.
[49] whether out-of-pocket or total healthcare expenditure.

penditure from simple cross-sectional data analysis should be carefully made. A possible implication from this finding is that identifying the disadvantaged individuals or households by their level of consumption, income or wealth under a policy aimed at reducing inequality in healthcare expenditure may not yield the desired outcome in Nigeria. However, the generally positive concentration index for the health expenditure observed regardless of the choice of SES measure means that healthcare expenditure or payment is progressive in Nigeria.

The second observation is that, in terms of SES inequality in health, relative consumption and wealth do matter regards inequality in health status or quality of life among Nigerians. That is, the socio-economic status; measured independently by consumption and wealth remains statistically significant in explaining inequality in health status (ADL) even after accounting for unobserved heterogeneity. Given that most social protection policies in developing economies are rolled-out on a "piece-meal" basis, this finding suggests that; for an effective "piece-meal" policy targeting the health of the poor, such individuals or households must be identified using their relative consumption or wealth levels and not their relative income levels. In this case, an increase in the relative consumption or wealth of such individuals or households may lead to an improvement in their health status which may subsequently reduce health inequality resulting from differences in living standards. Therefore the preliminary findings from this study should stimulate empirical works particularly for developing countries where enough panel dataset at the individual-level exists.

Meanwhile, the decomposition of SES inequality in health status shows that reducing inequality in health status is not a simple case of redistributing consumption or wealth but other variables such as age, residing in a rural area and household size have appreciable contributions to socio-economic inequality in health status.[50] Well, even though the study attempts to provide some insight into the within-group differences in health inequality decomposition, the use of a single equation makes the analysis quite descriptive (Cowell and Fiorio, 2011). Nevertheless, it is important to recall that the analysis of the SES health inequality carried out earlier in the chapter uses both bivariate and multivariate FE models in addition to the standard OLS models in order to minimise the biases on the estimates. Once again, it is acknowledged that any inference(s) here must be made cautiously.[51]

[50] see Tables 2.9 to 2.14.

[51] given that any structural model approach for inequality analysis may come with a cost such as being sensitive to model specification (Cowell and Fiorio, 2011).

2.6 Conclusion

The major concern raised at the beginning of this chapter was to find out if the rising inequality in Nigeria plays any significant role in the prevailing health disparities and if this SES inequality in health hypothesis still holds in a model that accounts for unobserved heterogeneity. This was based on the fact that most empirical evidence on SES inequality in health have either relied on cross-sectional data for one country or cross-national analysis. Also there has been some debate on the choice of living standard measure (SES indicator) particularly for developing economies where quality data is scarce. In addition, there has been doubts about empirical findings on this hypothesis conducted at the aggregate level, thereby informing an individual-level analysis. Now given Nigeria's systematic structure of inequality, unimpressive health indicators and the burden of high healthcare expenditure, this chapter sought to contribute to the literature on socio-economic status and health inequality by using models that adjust for unmeasured heterogeneity among individuals and considering health-related variables that have not received relatively much attention in this area of research.

Generally, the study fails to find a statistically significant relationship between SES inequality and inequality in healthcare expenditure. This finding holds for all three indicators of socio-economic status (consumption, income and wealth) used in the analysis; suggesting that any unmeasured heterogeneity in such empirical analysis may bias the outcome(s). However, there appears to be a statistically significant effect of consumption and wealth inequality on inequality in health status.[52] While the differences in socio-economic status (consumption and wealth) have significant effect on inequality in health status, the health status inequality decomposition also shows that age, household size, and place of residence (rural/urban) have appreciable contribution to health inequality. The findings in this chapter are signals for where policy makers in Nigeria could direct effort and resources to; in order to reduce any SES-related inequality in health status.

[52]The health status is measured by an individual's ability to perform routine activities (i.e. activities of daily living index).

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Appendix: Results from using *fevd* technique[53]

Appendix 1: Consumption and health inequality from model (2.11)

	ADL		**Total health exp.**		**OOP health exp.**	
Variable	*Coeff.*	*Std. Err.*	*Coeff.*	*Std. Err.*	*Coeff.*	*Std. Err.*
consumption rank	0.0011***	0.0003	0.0376	0.0343	0.0452	0.0382
1.wave	0.0020***	0.0002	0.0324*	0.0179	0.0319	0.0199
age	0.0006***	0.0000	0.0073***	0.0024	0.0012	0.0027
age_squared	-0.0000***	0.0000	-0.0000*	0.0000	0.0001*	0.0000
Gender						
1.male	0.0015***	0.0002	0.0740***	0.0177	0.1128***	0.0197
Level of education						
1.secondary	-0.0006**	0.0003	-0.1644***	0.0267	-0.1712***	0.0298
2.professional/diploma	-0.0006	0.0005	-0.1998***	0.0487	-0.2560***	0.0543
3.at least degree	-0.0007	0.0005	-0.3680***	0.0532	-0.2689***	0.0591
Marital status						
1.married	-0.0001	0.0003	0.0824**	0.0339	0.1446***	0.0378
2.divorced/widowed/sep.	-0.0048***	0.0005	0.0334	0.0565	0.0887	0.0630
Place of residence						
1.urban	-0.0005**	0.0002	0.0593***	0.0213	0.0716***	0.0238
Zone of residence						
1.north_east	-0.0021***	0.0003	-0.0494	0.0322	-0.0494	0.0363
2.north_west	-0.0021***	0.0003	-0.0983***	0.0276	-0.0940***	0.0307
3.south_east	0.0000	0.0003	0.1534***	0.0313	0.1508***	0.0347
4.south_south	0.0004	0.0003	0.1767***	0.0313	0.1973***	0.0348
5.south_west	-0.0003	0.0004	0.0915**	0.0393	0.1119**	0.0437
household size	-0.00001	0.0000	0.0069*	0.0035	0.0062	0.0039
eta	1.0000***	0.0068	1.0000***	0.0083	1.0000***	0.0087
_cons	0.1614***	0.0005	-0.1730***	0.0524	-0.1396**	0.0584
No. Of obs.	*25,892*		*26,178*		*25,547*	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$.

[53]Note that η in the output is the part of the individual effect that is neither explained by the time-invariant nor rarely changing variable(s) and its coefficient is either equal to 1 or close to 1 (by accounting for serial correlation) in the stage three(3) of the *fevd* estimation process (Plumper and Troeger).

Appendix 2: Wealth and health inequality from model (2.11)

	ADL		**Total health exp.**		**OOP health exp.**	
Variable	*Coeff.*	*Std Err.*	*Coeff.*	*Std Err.*	*Coeff.*	*Std Err.*
wealth rank	0.0012***	0.0003	-0.0239	0.0312	0.0006	0.0348
1.wave	0.0019***	0.0002	0.0295*	0.0177	0.0279	0.0197
age	-0.0001***	0.0000	0.0075***	0.0024	0.0013	0.0027
age_squared	0.0000***	0.0000	0.0000	0.0000	0.0001*	0.0000
Gender						
1.male	0.0016***	0.0002	0.0732***	0.0177	0.1126***	0.0197
Level of education						
1.secondary	-0.0006**	0.0003	-0.1650***	0.0266	-0.1718***	0.0296
2.professional/diploma	-0.0006	0.0005	-0.1994***	0.0484	-0.2561***	0.0540
3.at least degree	-0.0007	0.0005	-0.3677***	0.0528	-0.2689***	0.0587
Marital status						
1.married	0.0052***	0.0003	0.0780**	0.0341	0.1427***	0.0380
2.divorced/widowed/sep.	-0.0024***	0.0005	0.0254	0.0569	0.0858	0.0634
Place of residence						
1.urban	0.0001	0.0002	0.0673***	0.0208	0.0795***	0.0231
Zone of residence						
1.north_east	-0.0024***	0.0003	-0.0576*	0.0315	-0.0593*	0.0356
2.north_west	-0.0026***	0.0003	-0.1043***	0.0272	-0.1009***	0.0302
3.south_east	0.0003	0.0003	0.1548***	0.0314	0.1507***	0.0348
4.south_south	0.0009***	0.0003	0.1800***	0.0314	0.1988***	0.0349
5.south_west	-0.0002	0.0004	0.0901**	0.0393	0.1117**	0.0438
household size	0.0000	0.0000	0.0064*	0.0035	0.0056	0.0039
eta	1.0000***	0.0068	1.0000***	0.0083	1.0000***	0.0087
_cons	0.1693***	0.0005	-0.1399***	0.0507	-0.1129**	0.0565
No. Of obs.	*25,892*		*26,178*		*25,547*	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$.

Appendix 3: Income and health inequality from model (2.11)

	ADL		**Total health exp.**		**OOP health exp.**	
Variable	*Coeff.*	*Std Err.*	*Coeff.*	*Std Err.*	*Coeff.*	*Std Err.*
income rank	0.0004	0.0003	0.0161	0.0324	0.0134	0.0362
1.wave	0.0019***	0.0002	0.0293*	0.0177	0.0281	0.0197
age	-0.0001***	0.0000	0.00745***	0.0024	0.0013	0.0027
age_squared	0.0000***	0.0000	0.0000	0.0000	0.0001*	0.0000
Gender						
1.male	0.0015***	0.0002	0.0738***	0.0177	0.1126***	0.0197
Level of education						
1.secondary	-0.0006**	0.0003	-0.1650***	0.0266	-0.1718***	0.0297
2.professional/diploma	-0.0006	0.0005	-0.2003***	0.0485	-0.2566***	0.0542
3.at least degree	-0.0007	0.0005	-0.3687***	0.0530	-0.2694***	0.0588
Marital status						
1.married	0.0050***	0.0003	0.0804**	0.0339	0.1423***	0.0378
2.divorced/widowed/sep.	-0.0027***	0.0005	0.0312	0.0565	0.0859	0.0630
Place of residence						
1.urban	0.0001	0.0002	0.0641***	0.0209	0.0782***	0.0233
Zone of residence						
1.north_east	-0.0024***	0.0003	-0.0567*	0.0315	-0.0587*	0.0356
2.north_west	-0.0026***	0.0003	-0.1033***	0.0273	-0.1004***	0.0302
3.south_east	0.0003	0.0003	0.1511***	0.0317	0.1488***	0.0351
4.south_south	0.0009***	0.0003	0.1748***	0.0319	0.1961***	0.0355
5.south_west	-0.0003	0.0004	0.0890**	0.0396	0.1096**	0.0441
household size	0.0000	0.0000	0.0064*	0.0035	0.0056	0.0039
eta	1.0000***	0.0068	1.0000***	0.0083	1.0000***	0.0087
_cons	0.1697***	0.0005	-0.1574***	0.0503	-0.1181**	0.0561
No. Of obs.	*25,892*		*26,178*		*25,547*	

Inference: $***p < 0.01$; $**p < 0.05$; and $*p < 0.1$.