

**UNIVERSITY OF GHANA
(COLLEGE OF HUMANITIES)**

**THE IMPACT OF HEALTH INSURANCE ON LAND-RELATED
INVESTMENT IN AGRICULTURE: EVIDENCE FROM GHANA**

**BY
DORCAS SOWAH
(10382618)**

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA,
LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE
AWARD OF MPhil FINANCE DEGREE**

JULY, 2018

DECLARATION

I hereby declare that this work is the original work of Dorcas Sowah under the supervision of Dr. Edward Asiedu and Dr. Karimu Amin and that it has not been submitted in part or in full to this university or any other university for the award of a degree. I further declare that all references and acknowledgement have been given to the scholarly works used.

I bear the sole responsibility for any shortcomings.

Name

Signature

Date

**DORCAS SOWAH
(10382618)**

.....

CERTIFICATION

We hereby certify that this thesis was supervised in accordance with procedures laid down by the University of Ghana.

Name	Signature	Date
DR. EDWARD ASIEDU (SUPERVISOR)
DR. KARIMU AMIN (CO-SUPERVISOR)

DEDICATION

To the Almighty God and Jelidos family

ACKNOWLEDGEMENT

I give thanks to the Almighty God for seeing me through this journey. Indeed, I consider this as a stepping stone for greater heights.

My special thanks also go to my supervisors, Dr. Edward Asiedu, and Dr. Karimu Amin for the immense support they have given me and for the trouble of supervising me throughout my study.

Again, I am grateful to my family Mr. Nicholas S. Odotei, Mrs. Rebecca S. Odotei, Miss Elisheba Sowah and Mr. Jeremiah Sowah, Rev. Kingsley Adams, Pastor John Adu Boahene and Barrister Francis Akuamoah-Boateng for the immeasurable support they have given and prayers offered towards the completion of this study.

Not forgetting my friends and colleagues who helped me out Mr. Andrews A. Abbey, Mr. Eugene Abraham, Mr. Abdul Ganiyu Idrissu, Mr. Sylvester S. Sadekla, Miss Faustina Bechaiyiri, Miss Alexandra Fafali I thank you all for your suggestions.

ABSTRACT

Agriculture is labour intensive and output produced depends to a great extent on the readiness and value of the working labour. It has been observed that health shocks decrease the productivity and potential investments into agriculture, and perpetuates poverty among smallholder farmers. It is argued that, Health Insurance coverage for smallholder farmers can go a long way to ameliorate the impact of health shocks and smoothen investments for farmers. However, little is known about the impact of health insurance on smallholder farmers. Ghana introduced the National Health Insurance Scheme (NHIS) in 2004 to help reduce the financial burden on household's in the event of incurring huge health care expenses. Thus, this study using enrolment information on the NHIS examines the determinants of Health Insurance coverage amongst smallholder farmers and goes further to examine the impact of Health Insurance on agricultural investments in the form of the level of agricultural inputs used in production and the level of hired labour employed.

The data for the empirical analysis is the Ghana Living Standard Survey (GLSS) wave 6 conducted in 2012/2013. The study employed a number of estimation approaches to address issues relating to endogeneity – the fact that NHIS coverage is nonrandom or in other words NHIS is not randomly assigned. To address this issue and estimate causal impact of NHIS, propensity score matching (PSM) estimations and two-stage residual inclusion model was estimated to augment the Ordinary Least Squares (OLS) estimator. The result shows that, household head characteristics such as gender, age and educational level, as well as farm size and household expenditure influences the adoption of NHIS amongst smallholder farmers. In terms of impact, estimates from propensity score matching and the two-stage residual inclusion reveals a positive and significant effect of NHIS on land investment and hired labour.

TABLE OF CONTENTS

DECLARATION	i
CERTIFICATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT.....	v
TABLE OF CONTENTS.....	vi
LIST OF FIGURES.....	ix
LIST OF TABLES.....	x
LIST OF ABBREVIATIONS	xi
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background	1
1.2 Statement of the Problem	3
1.3 Research Objective	5
1.4 Research Questions	6
1.5 Significance of the Study.....	6
1.6 Scope of the Study	6
1.7 Organization of the Study	7
CHAPTER TWO	8
LITERATURE REVIEW	8
2.1 Introduction	8
2.2 Conceptual Framework.....	8
2.3 Overview of Ghana	10
2.4 Structure of Health System in Ghana.....	11
2.5 Origin of Health Insurance in African Countries	14
2.6 Types of Health Insurance Schemes	16
2.6.1 Community Based Health Insurance.....	16
2.6.2 Social Health Insurance.....	17
2.6.3 Tax -Based Health Scheme.....	19
2.6.4 Private Health Insurance.....	19
2.6.5 District Mutual Health Insurance Scheme.	20

2.7	History of Health Insurance in Ghana	21
2.7.1	Colonial Era	21
2.7.2	Post-Independence Era	21
2.7.3	Ghana’s National Health Insurance Scheme	24
2.7.4	Structure of District Mutual Health Insurance Scheme	25
2.7.5	Funding.....	26
2.7.6	Benefit Package.....	27
2.7.7	Membership.....	28
2.8	Economic Consequences of Seeking Health Care	29
2.9	Agriculture in Ghana	31
2.10	Farming Inputs	32
2.10.1	Fertilizer	32
2.10.2	Irrigation.....	34
2.10.3	Purchased Seedlings.....	35
2.10.4	Pesticides/Insecticides	36
2.10.5	Herbicides	37
2.11	Empirical Review	39
2.11.1	Determinant of NHIS.....	39
2.11.2	Impact of Health Shocks on Agriculture.....	40
2.11.3	Impact of Health Insurance on Health Outcomes.....	42
2.11.4	Impact of Health Insurance on Agriculture.....	43
2.12	Summary	45
CHAPTER THREE		46
METHODOLOGY		46
2.13	Introduction	46
2.14	Research Design and Empirical Strategy.....	46
2.15	Model Specification	46
2.16	Detailed Description of Variables	48
2.16.1	Dependent Variable for the impact of NHIS on Land-related Investment in Agriculture... 48	
2.16.2	Independent Variables.....	49
2.17	Impact Estimation Approaches	52
2.17.1	Propensity Score Matching (PSM)	52
2.17.2	Two-Stage Residual Inclusion Model Estimator.....	56

2.18	Data Source	57
2.19	Summary	57
CHAPTER FOUR		59
ANALYSIS AND DISCUSSION		59
4.1	Introduction	59
4.2	Descriptive Statistics	59
4.3	Impact Estimation	62
4.4	Estimates from Propensity Score Method	64
4.4.1	Treatment Effect	68
4.4.2	Impact of NHIS on Hired Labour	69
4.5	Additional Robustness Checks -Two Stage Residual Inclusion	71
4.6	Summary	73
CHAPTER FIVE		75
CONCLUSION AND RECOMMENDATIONS.....		75
5.1	Introduction	75
5.2	Summary of Findings.....	75
5.3	Conclusions	77
5.4	Policy Recommendations.....	78
REFERENCES.....		79
Appendix		112

LIST OF FIGURES

Figure 1: Theory of Change (Impact of Health Insurance on Land-related Investment in Agriculture). ... 10

Figure 2.: Structure of the Health System..... 12

Figure 3: Distribution of Propensity Score for the Matched Samples 67

LIST OF TABLES

Table 2. 1: Active Membership (2013).....	29
Table 2. 2: Households owning/ operating a farm by locality	32
Table 3. 1: Definitions and Measurement of Variable.....	48
Table 4. 1: Farm Household NHIS Coverage by Gender.....	60
Table 4. 2: Descriptive Statistics on the Enrolled and Non-enrolled Farm Household	61
Table 4. 3: Ordinary Least Square Estimates of the Impact of NHIS on Land-related investment in agriculture.	64
Table 4. 4: Results of Probit Treatment Model from Propensity Score.....	66
Table 4. 5: Indices of the Matching Quality	67
Table 4. 6: Effect of NHIS on Land-related Investment in Agriculture Input. (Nearest Neighbour Matching).....	69
Table 4. 7: Treatment Effect of NHIS on Land-related Investment in Agriculture Input (Kernel Matching).	69
Table 4. 8: Effect of NHIS on Hired Labour (Nearest Neighbour Matching)	70
Table 4. 9: Effect of NHIS on Hired Labour (kernel matching).....	70
Table 4. 10: Effect of NHIS on Agricultural Inputs (two-stage residual inclusion)	72
Table 4. 11: Two- stage residual Inclusion Estimation of Impact of NHIS on Hired Labour	73

LIST OF ABBREVIATIONS

ATE	Average Treatment Effect
ATT	Average Treatment on Treated
ATU	Average Treatment on Untreated
Ca	Calcium
CBHI	Community Based Health Insurance
CHPS	Community-Based Health Planning and Services
CIA	Conditional Independence Assumption
Cu	Copper
DANIDA	Danish International Development Agency
DFID	Department for International Development
DHA	District Health Administration
DHIA	District Health Insurance Assembly
DHMT	District Health Management Team
DMHIS	District Mutual Health Insurance Scheme
DTPI	Deep Tissue Pressure Injury
FAO	Food and Agriculture Organization
FASDEP	Food and Agriculture Sector Development Policy
Fe	Iron
GAO	Government Accountability Office
GIDA	Ghana Irrigation Development Authority
GDP	Gross Domestic Product
GHS	Ghana Health Sector

GLSS	Ghana Living Standard Survey
GOG	Government of Ghana
GSPAS	Global Study Process Allocation System
HePB1	Hepatitis B
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
IMF	International Monetary Funds
IV	Instrument Variables
K	Potassium
Mg	Magnesium
MOFA	Ministry of Food and Agriculture
MOH	Ministry of Health
N	Nitrogen
Na	Sodium
NGOs	Non-Governmental Organizations
Ni	Nickel
NHIA	National Health Insurance Authority
NHIC	National Health Insurance Council
NHIF	National Health Insurance Fund
NHIL	National Health Insurance Levy
NHIS	National Health Insurance Scheme
OECD	Organization for Economic Co-Operation and Development
OIT	Organization International Du Travail

OLS	Ordinary Least Squares
OSHA	Occupational Safety and Health Administration
PHI	Private Health Insurance
PRSP	Poverty Reduction Strategy Paper
RHA	Regional Health Administration
S	Sulfur
SAP	Structural Adjustment Program
SHI	Social Health Insurance
SSNIT	Social Security and National Insurance Trust Fund
TBA	Traditional Birth Attendants
USDA	United State Department of Agriculture
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WHR	World Health Report
2SLS	Two Stage Least Squares
2SRI	Two Stage Residual Inclusion

CHAPTER ONE

INTRODUCTION

1.1 Background

Studies have shown that, the status of a farmer's health can influence his income by changing the farmer's harvesting time, his skills for working and his productivity (Inwood, 2015). Hawkes & Ruel (2006) also confirmed that poor health reduces wage and efficiency making it difficult for the farm households to address their poor health status. In Africa, the agriculture sector is also more labour intensive and therefore relies mostly on household labour and less skilled labour force that is increasingly becoming expensive to employ. A lot has been invested in increasing labour productivity but then it has been observed that health shocks decreases farm investments directly through lower labour productivity (Asenso-Okyere et al., 2011). Africa is known to have a high prevalence of diseases, like malaria, Buruli ulcer, guinea worm, and HIV/AIDS etc., and this can affect smallholder farmers who live in rural parts of Africa significantly and result in lower agricultural productivity and investment. Malaria is still a predominant disease in the rural areas due to the environment that supports the breeding of mosquitoes and also seen as a major cause of death in rural Africa (Asenso-Okyere et al., 2011). In addition, farmer's exposure to chemicals such as pesticides and herbicides do have serious impact on their health (Del Prado-Lu, 2007). Due to the high prevalence of diseases any possible health shock coming from the environment and agronomic activities can adversely affect the farmer's health, productivity and general household's welfare (Adharyu & Beegle, 2012).

Economists and public health professionals have argued that bad health can enforce extensive costs on individuals and families and intend put pressure on the society as a whole. Thus, any possible health shock can have an undesirable effect on the financial situation of poor households

(see Dealon, 1997; Gertler & Gruber, 2002; Townsend, 1994; Wagstaff, 2007). Some developing countries in Africa including Ghana, Kenya, Nigeria, Rwanda, and Tanzania have in recent times initiated National Health Insurance Schemes (NHIS) with the aim of reducing out-of-pocket expenditure and making sure that individuals particularly the poor have access to quality health care when needed at an affordable cost (Carrin et al., 2008; Ekman, 2004 cited in Abuosi, 2014 Nigeria; Mensah et al. 2010; Witter & Garshong, 2009). Due to the motivation from international organizations such as WHO and donor governments, many countries are convinced that Health Insurance is one of the major answers to improving quality health care (Assuming, 2013; Wagstaff & Pradhan, 2005). However, the influence of Health Insurance on households in developing countries are still not well understood (Bernal, Carpio & Klein, 2015). Sekyi & Domanban (2012) found out Health Insurance has helped to reduce financial barriers on the usage of health care services for insured users whereas the uninsured users continue to radically recount grave health care utilization. With regards to the impact of health insurance on farm households, very little is known. According to Nguyen & Zawacky (2009), Health Insurance has helped improved the performance of employees in the manufacturing firms in United States. Studies have shown positive relations of Health Insurance with Health care utilizations. Mensah et al., (2010) found out most women insured NHIS visited the hospital more often specially to receive antenatal care, and to deliver at the hospital. Sekyi & Domanban (2010) also confirms that individuals with Health Insurance visited the health facilities frequently. Unlike the issues of the impact of Health Insurance on health status, there has been few empirical studies on Health Insurance and agriculture. This study aims to examine the impact of NHIS in Ghana on smallholder farmer's land investments and labour employment.

This study is very important because agriculture continues to play a significant role in many African economies (FAO, 2005; Haggblade et al., 2004). It is well noted that the sector contributes about 80 percent of the total labour force, 17 percent of the Gross Domestic Product (GDP) and 20 percent of the total exports in Africa (NEPAD, 2003). In addition, according to Obwona & Chirwa (2006) it is estimated that, approximately 80 percent of the African population can be found in rural areas and 70 percent of this population are involved in agriculture (crop farming and livestock rearing). As such anything that negatively impacts agricultural investment and productivity does have larger implications for many African countries.

1.2 Statement of the Problem

Rural productivity in developing countries is subjected to physical strength and stamina and consequently good health and as such poor health influences labour efficiency to a large extent. Specifically, ill health and the associated high medical expenditure has the ability to reduce the adoption of enhanced agricultural practices and new innovation in agriculture (Asenso-Okyere et al, 2010), Also, Slater & Wiggins, (2005) posited that ill health can lead to cultivation of less-intensive crops, reduction in farming sizes and decrease in livestock numbers evolving into household poverty. Asfaw (2003) added that bad health leads to direct expenditure on medicine, treatment and transport and also reduce labour supply and productivity indirectly.

In the context of agriculture, the sector plays a major role in developing countries. Majority of rural households depend on agriculture for their living (Global Donor Platform for Rural Development, 2007). According to the World Bank, Agriculture employs about 65 percent of the poor working adults in developing countries (World Bank, 2017). In Ghana, Ligon & Elisabeth (2007) recorded that poverty has reduced severely in the rural household as a result of agricultural

investments and growth. Currently, agriculture sector is known to be the least growing sector with its share of GDP declining from 18.7 percent as at 2016 to 18.3 percent as at 2017 (GSS, 2018). Thus, investment and growth in agriculture have the potential of lessening rural poverty in Ghana. However, agriculture is labour intensive, hence the wellbeing of farmers and their households can affect agriculture investment and as such rural poverty (Lipton, 1988). Agriculture has been the main source of revenue for rural households in many developing countries in Africa. Thus, agriculture's output in Africa continually relies on the readiness and quality of the labour and as such disease or ill-health has the potential to reduce labour productivity (Osei-Akoto, Adamba, & Osei, 2013). Also, the Ghana Health Service (GHS) have observed high prevalence of diseases such as malaria, tuberculosis, HIV in the country (GHS, 2017).

Studies have shown how bad it can be, when individuals in a household most especially farm households are faced with health shocks. Bad health reduces their farm profits and wages resulting in a decline in productivity (see O'Donnell, 1995; Schultz & Tinsel, 1997; Strauss, 1986; Deolalikar, 1988; Dercon & Krishnan, 2000; Gertler & Gruber, 2002; World Bank, 2007), selling of farm assets in order to pay for their health expenses (Wagstaff et al., 2007), makes the household resort to traditional healers and drug vendors. Baldwin & Weisbrod (1974) found a negative impact of health shocks on agricultural productivity. Audibert & Etard, (1998, 2003) examined the effect of schistosomiasis on rice production using a quasi-experimentation and found that health enhancement had no effect on rice production but then improved the household's use of its labour resources and their ability to utilize other resources. In the context of Ghana, Osei-Akoto et al. (2013) conducted a study on the "impact of health shocks on farm labour use at all stages of farming activities, use of non-labour inputs and on end value of agricultural inputs". In

examining the impact, they found that poor health affects the “family labour for land preparation and farm management”.

Bovbjerg & Hodley (2007) posited that the health of individuals can be become better via universal coverage of health insurance. Ghana’s National Health insurance Scheme, as at the end of 2013 had a coverage rate of roughly 38% of the national population. (NHIA, 2013). Scholars have indicated the impact of the Ghana NHIS on health (Mensah et al., 2010; Sekyi & Domanban, 2012) and have concluded that, the scheme reduces the financial stress of expensive health care expenses. Hence, there is the need to examine further whether the reduction in health care expenditure have triggered higher agricultural investments. This empirical work can serve as a strategy to help formulate policies that would enhance the health of farmers, increase agricultural investments, trigger economic growth via agriculture and reduce overall poverty.

1.3 Research Objective

The main objective of this study is to examine the impact of Ghana’s National Health Insurance on land –related Investment in agriculture.

The specific objectives are,

- I. To examine the determinant of National Health Insurance Scheme adoption among smallholder farmers in Ghana.
- II. To examine the impact of Health Insurance on agricultural inputs used by smallholder farmers.
- III. To examine the impact of Health Insurance on Hired labour in agriculture.

1.4 Research Questions

- I. Which household characteristics determines National Health Insurance adoption?
- II. Does Ghana's National Health Insurance Scheme have heterogenous effect on agricultural inputs used by the smallholder farmer?
- III. What is the impact of health Insurance on Hired labour?

1.5 Significance of the Study

The ultimate goal of this study is to provide an evidence-based on the potential of increased enrollment and utilization of the health insurance on farm outcomes in the form of farm investments. The findings of the study would be vital to a number of individuals notable among them are policy makers. The findings will aid policy makers to adopt best strategies to help increase health insurance enrollment especially amongst small holder farmers. The study will also provide useful information for non-governmental organizations (NGOs) and international organization who are interested in agro- businesses to develop and design complementary health interventions or projects for smallholder farmers they engage.

1.6 Scope of the Study

The study covers all the 10 regions of Ghana using the wave 6 of the Ghana living standard survey (GLSS). The study is limited to the health and agriculture sector of the country, specifically examine the benefits of health insurance for smallholder farmers in Ghana.

1.7 Organization of the Study

This study is structured into five (5) chapters. Chapter one introduces the study which includes the background of the study, statement of the problem, objectives of the study, research question, scope and organization of the study. Chapter Two presents the literature review which includes overview of health insurance and agriculture in Ghana and its impact on Ghana and also discusses the theoretical and empirical review relating to the study. Chapter three covers the methodology used in the study; it gives a detailed account of the method of analysis and findings and Chapter four explains the results found for the study. In chapter five, the results of the data analysis are summarized and conclusions are drawn. Recommendations for policy and further research are made towards wellbeing and agricultural development

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the theory and empirical reviews on the impact of NHIS on land-related investment in Agriculture. This chapter is divided into various sections. The first section presents an overview of the country in context: Ghana. It also presents an overview of the structure of the health system in Ghana. It also presents the various versions of health insurance systems and the history behind the development of the Ghana National Health Insurance scheme. It subsequently presents an overview of the Agricultural sector in Ghana. The next broad section discusses the conceptual framework used for the study. Finally, it presents the empirical evidence of the link between health insurance and agriculture.

2.2 Conceptual Framework

The study adopted the theory of change (Kirkpatrick, 1998) which suggests how the intervention will help farmers invest in agricultural inputs. The theory explains how interventions are carried out to produce a series of outcomes and how the intermediary that can contribute to achieving a final intended outcome. This theory can be modeled and or is modified for any kind of policy intervention. Hence, the theory change used here depicts the rational of how and why health insurance will achieve its expected results. With NHIS, farm households will not depend more on their household income for health expenses, therefore income earned can be channeled to agricultural investment. Farming is known to be one of the riskiest occupation and Health Insurance has been viewed by farmers as a risky management strategy.

Figure 2 below presents the schematic conceptual framework that aids in analyzing this study. The framework captures the intervention as an input, which translates into an output, outcomes and the impact it will have on the farm households. From the framework, the household has to decide on whether to be covered with the insurance scheme or not. Health Insurance scheme can then help to reduce the financial stress in the event of catastrophic and non-catastrophic health care expenses. However, households that enroll on the scheme, will not have to spend a little of their income on NHIS enroll or have to borrow to pay for their health care services when they are faced with a health shock. This is because, households that enroll on the scheme pay a minimum amount of income as premium for the year. Household that decides not to enroll can also decide not to seek health attention, resulting in lower productivity and lower investments. In this study, farm households that enroll will not have to spend so much on health care services in event of a health shock and routine visits to hospitals for check-ups.

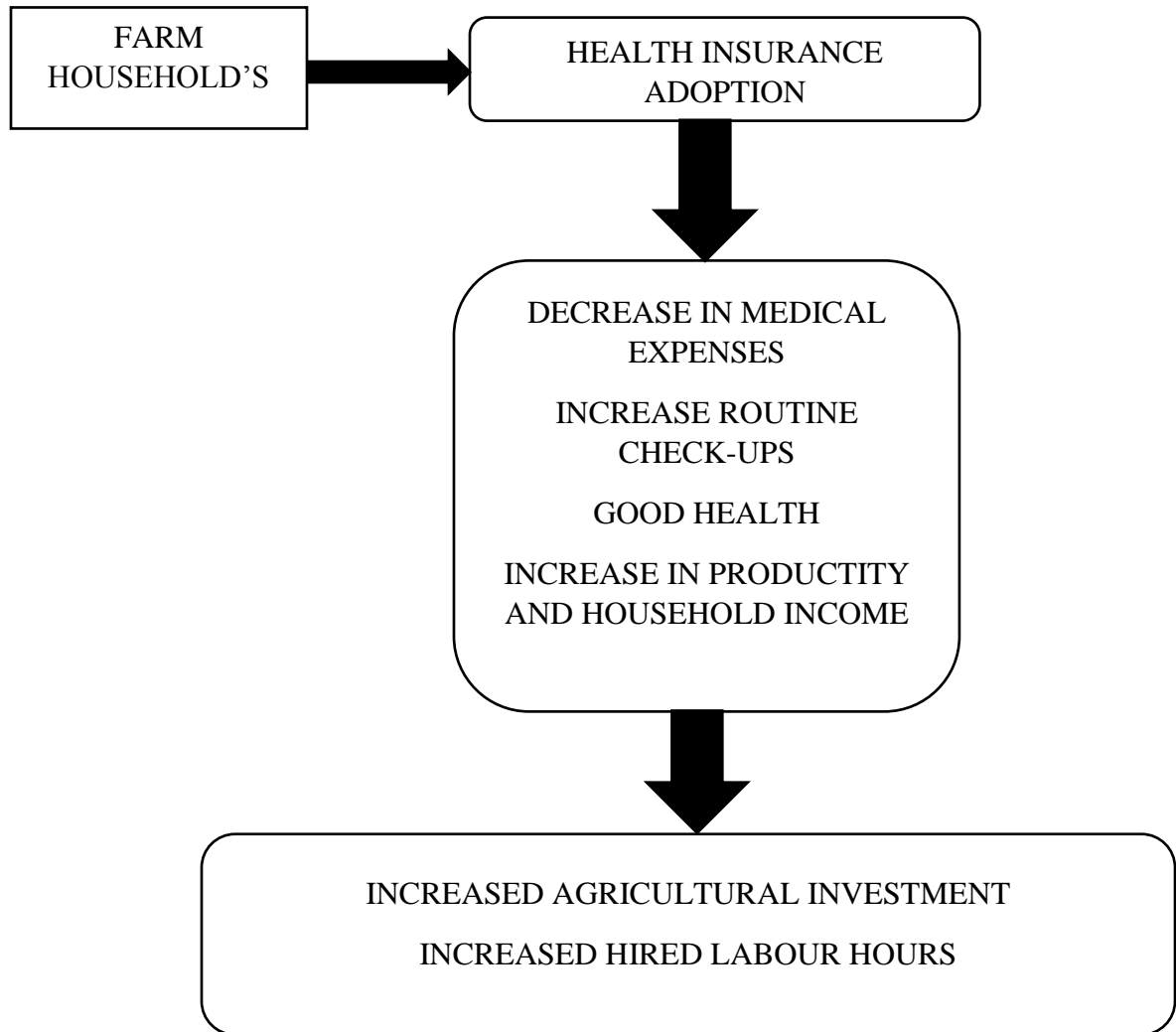


Figure 1: Theory of Change (Impact of Health Insurance on Land-related Investment in Agriculture).

2.3 Overview of Ghana

The former British colony (Gold Coast) attained independence at midnight on March 6, 1957 and was renamed Ghana. Ghana is located on the west African Coast. In Africa, Ghana is 24th by size out of 53 percent, 9th by population and 7th by Population Density. Ghana spans a land mass of 238535 km² and lies between latitude 4°45'N and 11°N and longitude 1°15'E and 3°15'W. The capital of Ghana and seat of government is the coastal city Accra. The country's total population

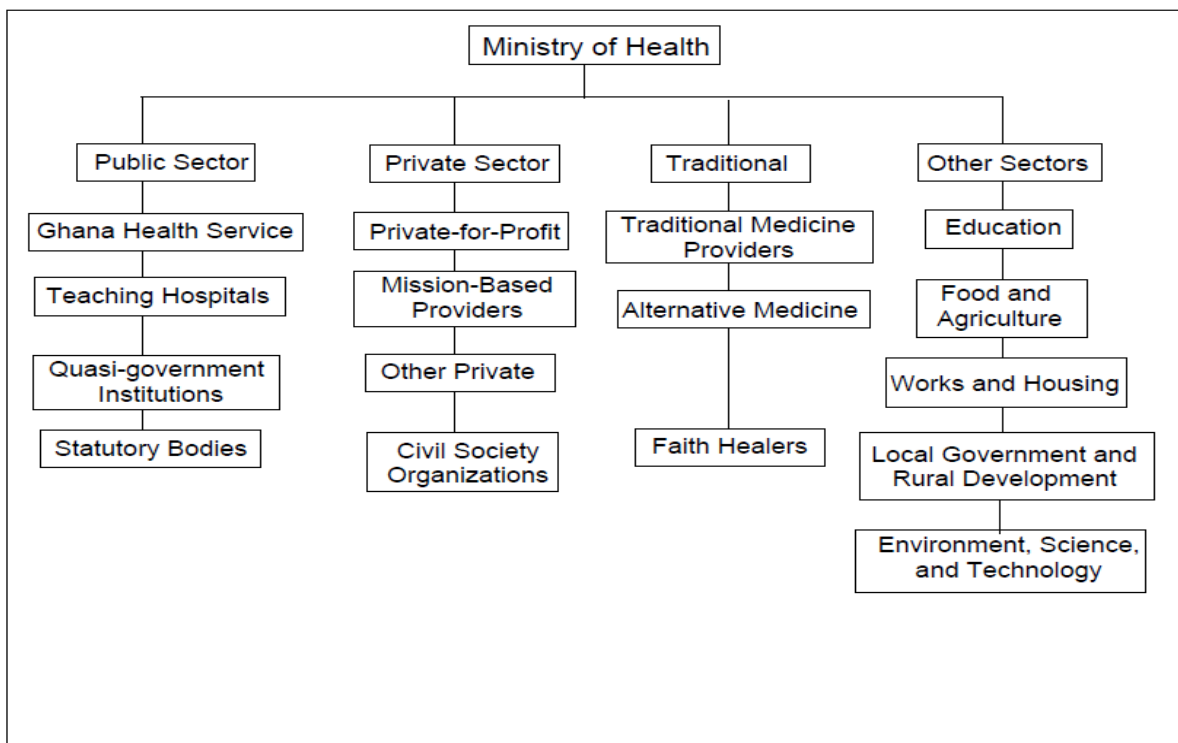
is estimated at 28.2 million people in 2016 according to the latest census figures. The Gross Domestic Product (GDP) is estimated at \$42.69 billion (2016 estimate) (World Bank, 2017). Ghana is a democratic country in which the head of state is also the head of Government. The country has ten (10) administrative regions and lies in the middle of the West African Coastline which makes the country enjoy a seasonal change of dry season and wet season. The southern part of the country consists of the rainy forest which has two rainy seasons. The most extensive rainy season is between May and June and less extensive in September. The country has two types of rain forest which are the evergreen (it gets more rain and keeps their leaves throughout the year) and the semideciduous forest which drops off forage during the dry season. The northern part of the country which is mainly savanna woodland has only one rainy season which normally starts between August and September. About 70% of the entire population can be found in the southern regions and the over a quarter of the population in the urban area. GLSS 6 indicates that the country has approximately 6.6 million households with a mean household of 4.0, however, it is realized that the three northern regions has a higher household size (5.4 for northern region, 5.5 for upper west, 4.5 for upper east). Household sizes in the rural areas (4.5) are generally higher than the urban areas (3.6).

2.4 Structure of Health System in Ghana

In the past decades, the health sector has undergone many changes. Originally, Ministry of Health was the sole supplier of health services in partnership with Para government institutions and missions like the police, the military, and the mines. The services of the sector as at then was towards the “curative care” other than the “preventive care” and other programmes that were influenced mostly by the donors. In 1996, the passage of the ACT 525 established the Ghana

Health Service as the executing body for public sector health services. This explained their purpose for the delivery service of the public-sector service, isolating the administration service, strategy and the regulatory segment of the Ministry of health (MOH). Hence, the MoH focused on monitoring and evaluation, provision of general government policy direction and providing for administrative support for the minister. In February, 2003 the Ghana Health Service was launched. The health Sector increased thus, it can add up the government health services; traditional, private, civil society and non-government providers, and community groups.

Figure 2.: Structure of the Health System



Source: Ghana Health Sector

Now, the public sector is in charge of the “Reproductive and Child Health Programme, the Malaria Control Programme, the National AIDS/STI Control Programme, the Occupational Health

Programme, the Parasitic Diseases Control Programme and others, with Maternal, Child Health and Family Planning Services included under the reproductive and Child Health Unit". Due to decentralization and health sector reform, services have been categorized under three groups from national to the sub districts. At the regional level, therapeutic services and public health services are carried out at the regional hospitals and District Health Management Team (DHMT) likewise the public health division of the regional hospital. The Regional Health Administration (RHA) gives supervision and administration support to the areas and sub-districts inside each region. At the district level, their therapeutic administration is conveyed by the district hospitals, a significant number of which are mission based. Public health administrations are conveyed by the DHMT and the public health unit of the district hospitals. The District Health Administration (DHA) gives supervision and administration support to the sub-districts. At the subdistrict level, both preventive and remedial administration are given by the health services, likewise outreach administrations to the groups inside the catchment territories. Essential preventive and remedial administrations for minor diseases are taken care of the group and family level with the introduction of the community-based Health Planning and Services (CHPS). The duties of traditional Birth Attendants (TBAs) and the Traditional Healers also receives national acknowledgement. The Ghana Health Sector (GHS) supports the health administration of NGOs and the private sector in a few ways. In December 2002, the GHS began granting contracts to NGOs to attempt particular health administrations in view of their outmost favorable position. Government revenue from the decentralized expenditure process were used to pay the available NGOs administration. The GHS offers help to Mission health offices by favoring staff and giving some fundamental kits. Presently, the private sector contributes 35 percent of the health administration in the nation. Government supports are aiming at raising the sectors contribution to 65 percent in some years to come. The

private division, in any case, gives fundamental therapeutic health administration as compared to preventive administrations. The NGO's and the private sector work as a team with the DHMT and give a quarterly advance report. Reports to the policy planning, monitoring and evaluation unit of GHS are introduced twice per year and staffs are prepared by GHS even though they are not supported by the administration. Their exercises are guided by the GHS models and conventions (GSS, 2003).

2.5 Origin of Health Insurance in African Countries

The Health Insurance scheme started not long ago in African countries. In the olden days, when individuals are faced with ailment or are bereaved, they turn to either their kinsmen or the community or any informal group for support. The slaves and the literates that occupied the urban areas had an upper hand with the health care systems at independence. The independent African countries invested so much in their health care systems by training local health personnel and also strategized ways of correcting inequalities during the colonial era. Majority of the African countries grasped the policy decided on health care at the "Alma Ata Conference" in 1978 which prioritized "Community-Based care" as a principal right of citizens and a duty for the government. Along the lines, countries charged no individual for health care services and this increased medical professionals, health care infrastructures and even areas without access were able to get access. (Yudkin, 1999).

Criel (1998) recorded that the "Free universal health care system" was unsustainable due to the rapid growth of population and decrease in economic growth. It was found that most African countries lowered their budget for social services including health as a result of the OPEC oil crisis of the 1970's. Economic growth kept reducing in the 1980's which forced these countries to seek

for assistance by applying for loans and grants from international bodies like the World Bank and International Monetary Fund (IMF). Circumstances beyond their control, caused a switch from the “Socialist-based development policies” to an “open market reforms” under the Structural Adjustment Programs (Mensah, 2006). It was expedient of the government to take off government subsidies and the impositions of user fees for social services like education and health in the early 1990’s (Mensah, 2008a; Mensah 2008b). Out-of-pocket payment for health care services was what individuals used as means of getting checked up at the various hospitals and clinics. (Mwabu, 2008; Vandemoortele et al, 1997).

Studies show that the Out-of-pocket system which was known as the *Cash and Carry* system produced worse results and changed everything; it caused most health care services to be less accessible (WHO, 2007; Oppong, 2001). The diminishing indicators were welcomed with a unanimous uproar, some international organizations such as UNICEF sent a representative to ask for modifications of the situation and also ILO campaigned for a “decent work arrangement under the economic reform” (Mensah, 2008c). United Nations, the G8 countries, the African Union and WHO also joined in the stunning ensemble, supporting incremental financing for health insurance in Africa (Mensah et al, 2010).

Health Insurance schemes became an answer to the emergency of health care subsidizing in African nations. Currently, a lot of African countries like Rwanda, Kenya, Tanzania, Ghana and Nigeria are trying and testing with the different types of health insurance schemes in different ways (Mensah & Oppong, 2007). Moreover, a lot of studies have showed that the households would have been impoverished if there were no health subsidies like the insurance schemes (Criel & Kegels, 1997; Jutting, 2004; Schneider & Diop, 2001; Van Doorslaer et al., 2006). Hsiao et al (2006) defined “Health Insurance as a tool used to achieve several goals; mobilize more funds for

health, promote equal access to reasonable health care for the poor, pool health risk and prevent impoverishment as well as improve the efficiency and quality of health care”.

2.6 Types of Health Insurance Schemes

Health Insurance Schemes can be grouped under two broad groups; the mandatory and voluntary health insurance. Mandatory Health Insurance is a scheme that pays the cost of medical services for the individuals who are enrolled on which enlistment is required for all individuals (Savedoff & Gottret, 2008). While Voluntary Health Insurance is a system where the decision to join and payment of the premium is not obligatory. A wide range of types of voluntary health insurance are present, they range from the employer-based schemes to the small non-profit schemes like the community-based health insurance. In the developed countries, it is realized that Voluntary Health Insurance complements the benefits financed by the government likewise cover speedier access to health care where records keeping is an issue (WHO, 2018). With mandatory insurance it is observed that it is mostly provided for the state workers and workers of big firms who contribute about 1% of their salary and employers contribute about 2%.

2.6.1 Community Based Health Insurance

Churchill (2006) explained community-based health insurance as “the protecting of low-income people against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of the risk involved”. Community Based Health Insurance (CBHI) is a system that is primarily used in the low and middle-income countries specifically the rural areas in (Carrin & WHO, 2003; Dror, Radermacher & Koren, 2007; OIT, 2009). Over the past years, it has been noted that health insurance helps households to manage their financial risk (OIT, 2009). Therefore,

the duty of CBHI is to aid households to manage their risk in terms of their finances in order to lessen their burden whenever they are faced with any financial shocks. There are a few conceivable approaches to group this scheme, as indicated by: Kind of benefits given, level of risk pooling, conditions of their creation, fund possession what's more, administration and the refinement whether the plans center around scope for high-cost, low frequency occasions or on minimal effort, high-frequency events (Jutting, 2004). CBHI is typically in light of the accompanying attributes: “Voluntary membership, Non-Profit Objective, linked to a health care provider usually a hospital closer to the household, risk pooling and relying on an ethic of mutual aid/solidarity” (Ahuja & Jutting, 2004). For sure, a large portion of the CBHI plans have either been started by the health providers i.e., missionary health centers, or have a tendency to be set around the providers themselves (Atim, 1998; Musau, 1999). In this manner, the potential advantage of these plans is seen as far as the assembling of assets as well as in the change and association of social insurance administrations (Jutting, 2004) It is contended that, CBHI plans are successful in achieving a substantial number of destitute individuals who might some way or another have no financial insurance against the cost of disease (Dror & Jacquie, 1999).

2.6.2 Social Health Insurance

Social health Insurance (SHI) can be described as a technique for financing and overseeing health care issues which depends for its assets on mandatory commitments from workers and their employers where individual's dangers such as previous conditions, age, disabilities don't impact the level of commitment or don't prompt rejections from participations where commitments are regularly in light of the capacity to pay which is non-profit (ILO, 2015). Also, insurers health care needs and not being able to pay for the Scheme concludes on what treatment or health care need

is made accessible and this payments to the social health fund are kept independent from the compulsory government taxes and charges (Jacobs & Goddard,2000). Thus, it ensures individuals against health issues and financial dangers and is generally a reasonable strategy for financing health care services. However, alluring it is, very few low-income country and the slightest developed countries have prevailed in satisfactorily extending the scope of SHI. Many nations depend basically on charge subsidized back, which is generally reasonable (Who, 2003). SHI usage usually relies upon the level of financial improvement mainly banking and socio-economic development and working conditions particularly the presence of a bigger extent of formal sector organized establishment. In this way, nations with a high socio-economic status and high employment ratio incline to SHI coverage. Countries in Asia and pacific like Japan and the Republic of Korea have a universal coverage of SHI whiles some low-middle countries like Thailand and Philippines have also a high ratio of SHI coverage (WHO, 2003) SHI can be said to have the same strategy as the tax financed insurance but differs which commonly entitles all natives and sometimes occupants to services consequently giving universal coverage (WHO, 2004). However, there are other characteristics that define SHI even though they are not really characteristics that have to be followed strictly. These are:

- “Government support for those who are unable to pay goes through the insurance fund
- Employees and employers may share some responsibility for management of the fund or funds, although that is not always the case.
- There may be more than one social health insurance fund and some other choice may be available to citizens
- Patients have at least some choice in the doctor and other health care providers they use.
- Social health insurance is compulsory for at least some categories of citizens

- A basic package of health care benefits is defined which may or may not vary across funds
- Health insurance funds may not turn away applicants for membership” (Jacobs et al, 2000)

SHI pools both the health risk of its member and the contributions from organizations, governments and households. However, is by and large sorted out by the national government. (Carrin 2002, WHO, 2004).

2.6.3 Tax -Based Health Scheme

Tax-based health protection which is popularly known as the taxed-financed national health systems basically provides free health care service to any citizen of the country at the point of use although user charges apply to some services like the prescriptions and some other treatments but children, the elderly and unemployed are exempted from the charges (Besley, Hall & Preston, 1998). Revenue is generated from the tax and charges to the citizens by the government. Risk pooling is for the whole population, it is able to distribute fairly between the high and low risk and high and low-income groups amongst the populace. Furthermore, the strategy is able to control for cost and is efficient in all governmental duties. Even though they might have strong positive strength it also has some weaknesses which must be looked at, there might be a possible instability of funds and this could be as a result of the other competing public expenditure and some form of inefficiency due to the absence of motivating forces and powerful open supervision (ILO,2015).

2.6.4 Private Health Insurance

Private Health Insurance is a type of strategy that can be found in many countries starting from the OECD countries to developing countries like the Philippines and Peru. Members of this particular

scheme pay a risk-related premium to get a free health services at their point of use since they become entitled to it. Experience has demonstrated that, without satisfactory direction, private protection expands disparities in access to and nature of wellbeing administrations and also neglecting to guarantee sufficient customer security. In a study done by Besley et al. (2000) about 15% of household in their sample from 1990 to 1991 were covered by the private health insurance and above 11% in 1983 were also covered. It was also recorded by Jowett (1999) that there was an introduction of user charges in many low-income countries which brought about a rise in private financing of health care. Private health insurance is preferred to out of pocket expenditure and raises financial protection and access to health services to insurers, it covers the rich ratio of the population and Supports better quality and cost-effectiveness of medical care services. The disadvantages of PHI are as follows:

- High authoritative expenses
- Insufficient in lessening cost weights on general wellbeing financing frameworks
- Discriminatory without financed premiums or controlled protection substance and cost
- Requires authoritative and money related framework and limit (ILO, 2015)

2.6.5 District Mutual Health Insurance Scheme.

The District Mutual Health Insurance Scheme (DMHIS) combines both the Social Health Insurance Scheme for the formal sector and the Traditional Mutual health Insurance for the informal sector with the focus on districts. In a way, the DMHIS integrates members from the two sectors in the economy. Members of this particular scheme are entitled to all health care services provided so far as premium has being paid. It is not for profit thus it is opened to all. In case for

any surplus at the end of the year, it is transferred back into the scheme in order to increase the benefit package (MOH, 2004). Consequently, there is the need for every district to launch a health insurance scheme in order for all indigents of the district to register as insurers. DMHIS guarantee “transparency, build subscriber confidence and bring health insurance to the door steps of residents”. Nonetheless, the government partners DMHIS and receives subsidy in the form of “risk equalization and reinsurance” for terrible events. (MOH, 2004)

2.7 History of Health Insurance in Ghana

Ghana has undergone different shifts of financing health care (Sekyi et al, 2012).

2.7.1 Colonial Era

Before Independence, payment of health services in Ghana has more often been private, out of pocket with some public financing for some civil servants leaving outside the country (Agyepong, 2013). The health system in their rule favored only a small number of the colonial officials and their staff (Arhinful & Tenkorang, 2001; 2003). The hospitals were in the urban areas and so the rest of the populace had to rely on the traditional healers and missionary health centres.

2.7.2 Post-Independence Era

Suddenly, after independence, a tax-funded public system was introduced which provided health services for free at the point of use, which means that individuals demanding for health services at the public health facilities did not pay out of their own means or income. Also, there were some

external donor support. This was as a result of the expansion of public infrastructure and investment in human resources by training medical professionals as they were being paid by the government. The economy began to grow as the international prices for cocoa was high; the economy grew at 1.1 percent yearly from 1950 to 1960 this helped in financing the health sector and also made Ghana one of the west African countries that had a lot of labourers from different countries in west Africa (Asuming, 2013; Mensah, 2006b). In the early 1970's, with cocoa prices depreciating, the economy failed to grow significantly and the country experienced increasing budget deficits due to inflation rising from 6 percent in 1965-73 to 50 percent the following decade (World Bank, 1985). This made the government unknown and could be partly attributed to his removal from government. It caused the next government not to accept any health policies that could be helpful like insurance (Escobar et al., 2011). Financing health care delivery through taxes became increasingly difficult when Ghana was introduced into a decade of political instability and military government (Agyepong et al, 2007; Sekyi et al, 2012).

The situation continued until mid-1980's when the user fee was introduced by the ruling government then known as the cash and carry system with a goal of restoring 20 percent nominal fees from patients due to the structural adjustment Program laid out by the International Monetary fund (Ramachandran & Hsiao, 2007; Singleton, 2006). The SAP's began to invert the rate of economic decline: "Agricultural and industrial sectors increased in production, inflation reduced from 31 percent in 1988 to 10 percent in 1992; domestic savings increased and the budget deficits decreased" (Ewusi, 1993). Moreover, in 1997, some few exemptions for children below the age of 5 year, those older than 70 years, pregnant women those suffering from some communicable diseases were made with respect to having a proper health care service in the hospitals (Atim et al, 2001; GOG/SAPRI, 2001; Sulzbach et al, 2005 cited in Gobah & Liang, 2011). Nevertheless, the

exemption policies faced a few obstacles due to “non-existent guidelines, uneven application and inadequate budgetary allocation” (Atim et al, 2001). Atim & Stock (2000) observed that a lot of patients found it difficult to pay for their health care services most importantly their admission fees. Furthermore, the public health facilities did not have adequate drugs needed (MOH, 2004). Despite all these challenges the government went on to implement another strategy where many people turned up to the health facilities at the later stages of their illness especially when they had a lot of complications. Those who could not afford hospital bills, flee without paying for the treatment. (Agyepong, 2013)

In 1992, the ruling government initiated a multi-party democracy and ruled until 2000 (Mensah, 2006a; 2006b). The opposition party took over from 2000, with Mr. John Kuffour as the president. Under his government, Ghana experienced a decline in poverty due to the stability, the poverty rate fell from 60 percent 1987/88 to below 40 percent in 1999 even though it varied across regions with the Northern and Upper regions having higher rates of poverty, the service sector aggrandized, export increased from 16 percent of GDP in 1980-83 to 28 percent in 1999-2001(Mensah, 2006b; 2006c).

Against the background of cash and carry and its negative attributes, everyone wanted to explore other ways (Agyepong, 2013). Some stakeholders wanted to examine some available options to the cash and carry system (Escobar, Griffer & Hsiao, 2010). The first community health Insurance scheme as established by the catholic diocese of sunyani in Nkoranza District Hospital in 1992 to improve the financial access of health care (Agyepong, 2013; Escobar et al, 2010). Others also began to search more and experiment more on a scheme similar to the community Health Insurance schemes. A new model was initiated, report showed that the new model (mutual health insurance) that was initiated around 1999 extended in other areas of the country, it increased

from 3 schemes in 1999 to 41 in 2001, 159 in 2002 and 168 in 2003 covering about 1 percent of the population (Sulzbach et al, 2005). Examples of such schemes in no particular order are, “Dangme west Health Insurance scheme (Dangme Hewani Namikpee), Nkoranza Community Financing Health Insurance scheme, Jaman South Health Insurance Scheme, Salamba Women’s health Insurance Scheme, Gomoaman health Insurance Scheme, Agogo Community health Insurance Scheme, Asutifi Health Insurance scheme and the likes”. (Aikins, 2003 cited in Sekyi et al, 2012)

In an attempt to curb the cash and carry system and expand the health care usage, government of Ghana introduced and passed the National Health Insurance Law in 2003 (Act 650) and the National Health Insurance Regulations in 2004 (L1.1809) which aimed at nullifying the cash and carry system and constraining out- of- pocket at the point of service delivery and Ghana was the first Sub-Saharan African Country to initiate NHIS (Agyepong & Adjei, 2008 ; GoG, 2004).

2.7.3 Ghana’s National Health Insurance Scheme

In 2000 when the National Patriotic Party (NPP) assumed office, they sought to replace the cash and carry system of healthcare payment with the NHIS. Ghana International Health Development Partners (WHO, DANIDA, DFID, & ILO) and other important national agencies with NGO’s were consulted. In view of that, a Ministerial Task Force on Health care financing was instituted in March, 2002 with the intention of carrying out more research in order for them to be able to suggest a better scheme for Ghana. In 2003, their suggestions were submitted to parliament which brought about the launching of the National Health Insurance Act of 2003 (Act 650) in the same year.

The National Health Insurance Act 650 sets out three prominent types of health Insurance schemes to be established and operated in Ghana. These Includes: “District Mutual Health Insurance, Private Mutual Health Insurance and Private Commercial Health Insurance”. The mission of Ghana’s health Insurance is “to ensure equitable universal access for all residents of Ghana to an acceptable quality of essential health services without out-of-pocket payment being required at the point of service” (MOH, 2004a). In order for these schemes to function legally in the country the schemes have to register with the government. In order for the health Facilities to be accredited they need to meet a minimum requirement. Amongst these schemes, the NHIS is formulated around the District Mutual Health Insurance Schemes and the government provides direct financial aid to support the District Mutual Health Insurance scheme (Sabi, 2005).

Recently in 2012, the NHIS Act was amended from ACT 650 to ACT 852 with the objective that every Ghanaian is expected to enroll on the scheme including residents in Ghana and non- residents visiting Ghana. This is to provide universal coverage and also offer those covered by the scheme proper access to health care services (NHIA, 2013).

2.7.4 Structure of District Mutual Health Insurance Scheme

Ghana has structured it’s NHIS in the form of DMHIS amongst the three types listed. The DMHIS has been structure in a way that each District with DMHIS has a District Health Insurance Assembly (DHIA) which is made up of a chairman or secretaries of the Community Health Insurance Committee of the various communities in the district. DHIA appoint Board of Directors and introduce a constitution and provide approach course for the operation of the scheme. The Board of Directors makes sure all constitution is followed, appoint management staff, and approve

of budget and offer operational and financial accounts to the assembly. The community or electoral shall have a health insurance committee including a chairman, secretary publicity coordinator, contribution collector and any other member deemed necessary. The committee then instigates the recognizable proof of the poor for approval by the political District Assembly and additionally the National Health Insurance Council. They will likewise manage the stratification of the inhabitants into Socio-economic groupings in light of the capacity to pay and contributions collecting (MOH, 2004).

2.7.5 Funding

The National Health Insurance Fund was established by section 39 of ACT 852, thus, NHIS is financed mainly by a sales tax levy (a 2.5 percent earmarked addition to the value added tax) and a 2.5 percent of formal sector workers contributions to the Social Security and National Insurance Trust Fund (SSNIT) which is controlled by the NHIF (Escobar et al., 2011). Hence, 80 percent of the financing is done through a tax revenue and donor funds and 20 percent is internally generated through the out-of-pocket system (MOH, 2004).

The NHIS receives subsidies from the NHIF at the focal levels in order to reinsure them against cataclysmic events and also reduce the risk level of diseases in one region to the other. This subsidy is to help programs that build up more access to health care services and also to take care of the social insurance for indigents and other observed groups considered deserving of being financed (Escobar et al., 2011; MOH, 2004)

Certified healthcare providers occasionally send claims for the utilization of health care services by the enrolled members to the district mutual scheme managers who then send the cases

to the national authority for settlement. The NHIS repays the suppliers through a similar way, from the national fund to the district office, which at that point pays the suppliers. In extraordinary conditions, the national fund may send reimbursement specifically to the suppliers (Asenso-Boadi, 2009). At the end of 2013, the NHIA earned GH¢904.30 million and sustained an expenditure of GH¢1, 001, 10 million which brought a net deficit of GH¢96.80 million. The NHIL at the end of 2013 was GH¢332.21 million and funds investment portfolio was GH¢144.44 million (NHIA, 2013).

2.7.6 Benefit Package

The council defines the minimum benefit package of services that is being supplied by the Health Insurance Schemes operating in Ghana in the rules and regulations. Some factors that have had an effect on the benefit package are as follow:

- “The health needs of the people
- Services availability at the various levels of care
- Services affordability
- Existing Infrastructure
- Quality of care
- Availability of financial resources
- Cost of healthcare services”. (MOH, 2004)

NHIS proffers an exceedingly liberal package that covers over 95 percent of the diseases that affect Ghanaians encompassing outpatient and inpatient care deliveries (including complications), diagnostic tests, generic medicines and emerging care (Escobar et al, 2011). The groups excluded

from paying premiums include SSNIT contributors, retirees who are also SSNIT contributors, aged from 70 years and above, children under age 18, and pregnant women (Asenso-Boadi, 2009).

2.7.7 Membership

To become a member, individual must register as a benefactor of NHIS with the closet district mutual scheme or through an operator. The individual pays an annual premium if he or she is not part of the exempt group. Individuals are able to register in their districts and their memberships can be transferred from one district to the other (Asuming, 2003). At the end of 2013, the total NHIS active membership rose from 8,885,757 in 2012 to 10,145,196 in 2013 which was 38% of the national Population (NHIA, 2013).

Table 2. 1: Active Membership (2013)

REGION	NEW	RENEWALS	ACTIVE MEMBERSHIP	PERCENT OF TOTAL
Ashanti	472,903	1,242,485	1,715,388	17%
Brong Ahafo	405,088	948,752	1,353,840	13%
Central	382,595	484,341	866,936	9%
Eastern	337,097	773,024	1,110,121	11%
Greater Accra	565,281	714,976	1,280,257	13%
Northern	391,728	488,789	880,517	9%
Upper East	166,538	476,740	643,278	6%
Upper West	99,620	322,797	422,417	4%
Volta	326,243	584,326	910,569	9%
Western	297,477	664,396	961,873	9%
Total (National)	3,444,570	6,700,626	10,145,196	

Source: NHIS report, 2013

2.8 Economic Consequences of Seeking Health Care

“Out of pocket payment for health services-especially hospital care-can make the difference between a household being poor or not” (Claeson et al., 2001). Most literature speculated that, the total economic cost of ailment is above 10 percent of the household’s income. For instance, in Kenya households in a year contribute about a total of 18 percent of their annual household income for malaria and in Nigeria spent about 13 percent (Leighton & Foster, 1993). For all form of illness, a total cost of 11.5 percent was spent from their monthly household income in Sri Lanka (Russell, 2001) and around 11 percent of their average income in Nigeria (Onwujekwe, Chima & Okonkwo,

2000). Prescott (1999) & Ranson (2002) added that the household income deducted because of health shocks are very catastrophic where catastrophic means that the expenditure level can shorten their consumption on other needs and cause them to borrow and be debt which will lead to poverty (Russell, 2004). Likewise, it is not just about the levels yet additionally the planning of the health services cost, which must be forked over the required funds at the season of the ailments on account of the out-of- pocket installments. This can be attributed to the unexpected huge medical expenses which is highly influenced by the provider of the health care service of which this happens when income level is very low (McIntyre et al., 2006). Medicines bought frequently contribute a sizeable share of these expenses. For instance, in Ghana Asenso-Okyere & Dzator (1997) posited that medicines represented over 60 percent of direct expenses for treatment of malaria and also about 33% of direct and large over all kinds of illness in Sri Lanka (Russell, 2001). Transport cost for patients and every now and then an individual accompanying the sick person, which are identified with geographic access, can likewise be considerable and may surpass 20 percent of every direct cost (Attanayake et al., 2000; Nahar & Costello, 1998). Equally, costs that are regularly not considered, for example, the expenses of nutritious nourishment for a sick individual relative or a convenience and sustenance of the accompanying individual may also be in the range of 20 percent of the direct cost (Attanayake et al., 2000; Babu et al., 2002; Nahar & Costello, 1998). Direct and Indirect Cost will be prejudiced by the type and seriousness of the ailment and health care service administration attributes that impact access and decisions of the supplier. Ailment cost going above the household day to day and month to moth spending plan may trigger adapting procedures like borrowing or selling of assets (Russell, 2004).

2.9 Agriculture in Ghana

Agriculture in Ghana is mainly on the smallholder basis. Most farmlands are less than two (2) hectares when measuring, most farmers still use the traditional systems of farming which involves the hoe and cutlass as tools used for farming. Even though some cultivate their land using the mechanized systems especially the northern farmers practice the bullock farming (Chamberlin, 2007; FAO, 2013). Agriculture has been known as one of the important economic sectors especially in the developing countries. It accounts for 23% of the national Gross Domestic product (GDP) in 2013. The agriculture sector has expanded so well from 2007 due to the high international prices especially for the cocoa which is the main export. In spite of the expansion, agriculture in Ghana has largely depended on the rainfalls for its irrigation (FAO, 2015).

Ghana has five distinct agro-ecological zones which are (1) The Coastal Savannah, (2) Transition, (3) Northern Savannah (Guinea and Sudan Savanna), (4) Deciduous Forest and (5) Rainforest Zones. These zones have their distinct farming systems. Agriculture production differs with amount and appropriation of rainfall yet soil factors are additionally vital such as the texture, nutrient levels and ph. Most of the food crops are intercropped due to the nourishment of the food crop whereas large scale farmers practice mono cropping. Soils are prevalently light in texture in which sandy soil and loamy soils are normal. Soils in the savannah areas have low levels of organic matter, high levels of iron, and are prone to erosion (FAO, 2013 cited in Shaw, 2014). It is observed that south western areas are hot and sunny whiles the north is dry and hot. It has also been found out that the tropical east coastal belt is warm and relatively dry. The average temperature in a year ranges from 26.1°C in the coastal areas to 28.9°C in the farther north. Cocoa, cassava, maize, yam, with other fruits and other cereals has being the main commodities produced in Ghana. The main cash crops are the oil palm, rubber, cashew, coconut, and cotton, (FAO, 2013).

According to the GLSS wave 6, a little above half of the households operates on a farm or owns a farm of which farming has frequently been rural, with 82 percent of the rural households engaged: 93 percent of the households are involved in the rural savannah, and 81.3 percent in the rural forest and 64.7 percent in the rural coastal.

Table 2. 2: Households owning/ operating a farm by locality

Locality	Households owning or operating a farm		*Female Proportion of persons engaged in agricultural activities
	Percent	Estimated Total Number	
Urban	26.6	970,934	41.2
Accra (GAMA)	4.0	46,106	38.7
other Urban	37.1	924,918	41.3
Rural	82.5	2,430,638	41.3
Rural Coastal	64.7	253,089	48.3
Rural Forest	81.3	1,369,281	43.8
Rural Savannah	92.9	808,269	35.1
Ghana	51.5	3,401,572	41.2

source: GLSS wave 6 report (2012/2013)

Ghana is a net importer of agricultural commodities, and imports basic consumer-ready products such as rice, wheat, sugar and poultry (USDA Gain Report, 2012)

2.10 Farming Inputs

2.10.1 Fertilizer

Farmers in Ghana are exposed to two types of fertilizer which is the organic fertilizer and the inorganic fertilizer. Organic fertilizer which is popularly known as the manure is the natural or

chemical sources of nutrients for the crops. (Dead waste of plants) plants residue, animal waste, human excrete and other waste are the natural sources which are important ingredient in soil management of arable crop production system (Chander et al, 1997). Organic products come out of manuring and these products are called the organic manure. It has been examined that if the manure is well taken care of, it can decrease or eliminate the use of inorganic fertilizer (Golletton et al, 2001). Most of the animal manure contains nitrogen and phosphorus (Golletton et al, 2001) whilst some contains potassium and calcium inclusive (Probert, Okalebo & Jones, 1995). In these large areas in Africa, animal manure is mostly used as fertilizer in cultivable land (Murwira, Swift & Frost, 1995 ; Burton & Turner, 2003)

The soil becomes impoverished when the nutrients taken out in the crops whilst cropping is not restored. Manuring of the farmlands is an essential tool for most subsistence farming systems (Probert et al., 1995). Manure offers its full range of nutrients including the trace elements and also keeps the organic matter content of the soil (Nambier & Ambrol, 1989). Further, it enhances the condition of the roots and expands the capacity of plant nutrients and increases the soil properties (physical, chemical & biological) which affects the soil properties (Bohme, Langer & Bohme, 2005) such as the stability of aggregate and porosity that can develop the plant. A study examined in Ghana showed that the application of poultry manure intensified the level of moisture in the soil and added organic matter to the soil since the manure was high in its organic carbon content and decrease bulk density (Boateng, Zickermann & Kornahrens, 2006) as opined by Bhagat & Verma, 1991; Khaleel et al, 1981) it works over a period of time to make the plants grow healthy.

The organic fertilizer contains minerals or chemicals which are rich in salts and are manufactured by man-made. Due to their richness in salt, they are able to break rapidly and promptly accessible

to the plants relying upon them to give basic food as nitrogen, phosphorus and potassium. Thus, it helps dying plants to restore its self immediately. Inorganic fertilizer is made in accessible in various media like dry granules, water-solvent powders and fluid concentrates and many more (Okese, 2018). According to MOFA(2007) farmers mostly use 8 kilogram of fertilizer for a hectare, which is one of the lowest rates in sub-saharan africa. Farmers with large farm and 10 percent of the small holder farmers with under a hectare use inorganic fertilizer (GOG, 2010) fertilizer is mostly used on cash crops such as palmoil, cocoa and cotton. It can be concluded that most cash crop famers receive higher income after havesting.

2.10.2 Irrigation

Irrigation is explained as the “artificially supplying and systematically dividing of water from agriculture and horticulture in order to obtain higher or qualitatively better production” Cantor (1967) further added that artificial addition of water is to overcome the dearth of rainfall for the development of plants or crops. In conventional agriculture, irrigation scheme was perceived for its defensive part of protection against the caprice of dry season and rainfall. In any case, now, appropriation of high yielding varieties, in organic fertilizer, and many cropping systems adopted has controlled irrigation for expanding productivity. Irrigation is one of the essential farming inputs for agricultural output. Without irrigation, cultivating is extremely constrained and if rainfall abates to under 30cm, agriculture ends inconceivable without irrigation. (King, 1953) Also it enhances crops yields and guards the farm from famine. It promotes prevalent harvests with the water supply according to the need of the yields. Eventually it helps in the financial improvement. Irrigation enhances water conditions in the soil, expands the water substance of plant filaments, breaks down supplements and makes them accessible to plants. Irrigation influences temperature

conditions by managing the temperature of the surface layer of the soil and ground layer of the air and makes conceivable control of the development and advancement of plants and change of the nature of the harvest (Sredojevic et al., 2006 cited in Mihailović et al, 2014).

Smallholder farmers reduce their dependency on the variability of rainfall when irrigation systems are made available. Proper irrigation systems aid in balancing other technologies like fertilizer and other chemical inputs. Ghana has low formal irrigation schemes and presently, it is only 1 percent of the nation's entire arable land that uses any of the irrigation system. An investigation directed by the Ghana Irrigation Development Authority (GIDA) evaluated that there are 32,000 hectares of "immature inland valleys all through the nation that could profit by moisture improvement technologies for food production". Likewise, less than 33 percent of the aggregate irrigated land lies in an open plane (Makombe et al., 2011).

2.10.3 Purchased Seedlings

Seeds are the establishment of farming. Innovation has restructured quite a bit the everyday tasks for farming, except without a consistent supply of seeds with high quality, crop quality and yields would be significantly diminished. The quality of a seed assumes an imperative part in the making of horticulture and agronomic crops. Qualities, for example, "trueness to variety, germination percentage, purity, vigor, and appearance" are vital to agriculturists planting crops and to mortgage holders building up yards and greenery enclosures. Accomplishing and keeping up high seed quality is the objective of each expert seed maker.

Seeds come in numerous sizes and shapes. They extend in size from the miniaturized scale smaller than normal orchid seed, as little as a molecule of sand, to the immense twofold coconut seed, more than 1 foot long and weighing numerous pounds. Shapes change from the basic, round

tobacco seed to the intricate, winged, streamlined maple seed. A few seeds are shaggy, for example, the cotton or thorn. Others, similar to grass, have long spikes. Some have thistles. Seeds are made up of variety of chemicals but distinct in its own chemical in that they become the store house for chemicals that serves as food reserves for the next plant to be planted in the future. Seeds keep three major classes of chemicals which are proteins, carbohydrates and Lipids even though the seeds may contain all three they vary with the kind of seed. For example: Corn contains 10 percent of protein, 62 percent of carbohydrate and 5 percent of Lipid, while Bean contains 23 percent of Protein, 56 percent of carbohydrate and 1 percent of Lipid (Ferguson, Keys, McLaughlin & Warren, 1991). Welch (1999) opined that the seed size and protein content are correlated. The nutrients gotten from the seed are adequate to manage growth until the point when the system of the root assumes control over the supply of nutrients. Amid the early stages, the seed supplies part of the nutrients as well as the soil. Hence, seeds that store large amount of nutrients are particularly essential for crops developed on soils that are inadequate in at least one of it (Asher, 1987). Rengel & Graham (1995) examined in their study that seeds with high Zinc content and low Zinc content had neither higher or lower contents in other nutrients (Fe, N, Ca, Mg, Na, K, S, Cu, Ni, P). Most farmers now have adapted the usage of hybrid seed which involves the making and the sustenance of parental lines which has at least two seasons.

2.10.4 Pesticides/Insecticides

An agricultural chemical is a general term used to refer to the chemicals used to control for pests, rodents, virus, diseases and many others. They can be categorized as follows;

1. Insecticides
2. Rodenticides

3. Fungicides
4. Fumigants and
5. Herbicides.

Insecticides are chemicals used to control or kill pests by disturbance of their imperative procedures through chemical activities. They can either be organic or inorganic and can be classified into three main groups; contact poisons, stomach poisons, and fumigants. Most farmers used fumigants because it is believed to be the effective and efficient insecticides used when pest encroaches and the plants they are destroying are at a tight place like the storeroom, greenhouse or house. Other chemicals like attractants, repellents, insect growth regulators and pheromones are also used to control insects even though their mode of application is different. Generally speaking, these chemicals are not poisonous to the objective creatures. Inorganic chemicals are just as powerful as the stomach poisons and are used now in baits. Most organic insecticides either artificially made or originate from plants, go about as stomach poisons or as fumigants (FAO, 2013; Yair, 2007). Venkatesh & Nithyashree (2014) agreed that a pesticide decreases the number of insects, pest and diseases on the quality and quantity of the farm products.

2.10.5 Herbicides

These are chemicals used to control, retard and regulate the growth of weeds. Controlling of weeds is one major activity that has caught the attention of many farmers and others in the ancient days (Holm & Johnson, 2009). This may be because of the fact that it can influence the quality and quantity of crops by depriving the plants of their soil nutrients, water, sunlight, space and air available (Wyss et al., 2001). Farmers in the world now have increased their application of herbicides because of its effectiveness even though it may have some side effects on the health of

the farmers or sprayers (Ayansina et al., 2003). Herbicides can be classified under two main groups: (1) the pre-emergence herbicides; this type is usually applied to the soil before the weeds surfaces. (2) Post- Emergence Herbicides; these are applied to the weeds directly. There are other categories where it either residual or non-residual, thus, residual herbicides have long lasting effect on the soil while the non-residual have either no effect or a little effect on the soil unless on the weeds that have surfaced already (Holm & Johnson, 2009). Time of herbicides application is essential in deciding the viability and length of weed control span (Carter et al., 2007; James et al., 2007). Herbicides are applied at pre-planting in crops developed from seedlings, for example, of most vegetables; pre-sowing if there should arise an occurrence of seed-sown grain field yields and a few vegetables, for example, numerous cucurbits; and as postemergence. The initial two classifications are soil connected, control sprouted seeds or weed seedlings either by a contact or foundational activity, anticipate weed seed germination or seedlings development and consequently anticipate early weed rivalry and shield crops from planting or sowing date until the point when a decent shade is produced. This period in crop life cycle is most helpless against weed rivalry and harvest recuperation may not be conceivable if weeds escape control amid this period. In all cases crop resistance and herbicide selectivity are fundamental elements (Jamal, 2011).

Paloma (2011) argues that, herbicides cannot be denied in today's agricultural systems indirectly saying that without it, quantity and quality of food production will decrease and this would cause a decrease in supply and an increase in price of the farm product. However not all farmers are able to purchase herbicides in the developing countries due to the high prices of the chemicals, inadequate technical extension, experience they encounter when applying the chemicals, most importantly cheap labour.

2.11 Empirical Review

2.11.1 Determinant of NHIS

Some scholars have analyzed the determinants of health Insurance among south African women (Kirigia et al., 2005), Ghanaian adults (Ayitey, Nketiah-Amponsah & Barimah, 2013) and working-age adults in some regions in Ghana (Duku, 2018) just to mention a few. They have identified Socio-demographic factors, economic factors, household size, behavioral factors and place of residence as significant predictors of health insurance enrolment. Some theories have stated that as individuals ages, they intend experiences a lot of health shocks therefore they invest in the health by purchasing health insurance just to avoid the catastrophic health expenses (Grossman, 1972). Nevertheless, the effect of age on Health insurance has presented some inconsistent findings. While Jutting (2001) and Ying et al (2007) found that young individuals are more likely to enroll on health Insurance, Savage & Wright (2001), Bhat & Jain (2006), Mwaura & Pongpanich (2012) and Ayitey et al. (2013) found individuals that have advanced in age increase their probability of enrolling on health insurance. Other empirical studies have also found that being married and having a higher level of education increases the likelihood of having a health insurance (Asenso Okyere et al., 1997; Mwaura & Pongpanich, 2012). However, Muurinen (1982) found highly educated individuals have low probability of purchasing health insurance and explained that these individuals are less likely to encounter any health shocks hence they have low probability of enrolling on Health Insurance.

Empirical evidence on the effect of Gender on health insurance have also reported inconsistent results. While Jutting (2001) and Ayitey et al. (2013) found that female headed households increase their probability of health insurance enrolment, Asenso et al. (1997) and Bourne & Kerr-Campbell (2010) found male headed households increase the likelihood of

enrolling on health insurance. Also, Household sizes have been reported to be a significant determinant of health insurance. From the empirical evidence available, it can be presumed that demographic characteristics and other factors may be responsible for the health insurance enrolment.

2.11.2 Impact of Health Shocks on Agriculture

Some economists have looked at the impact of health shocks (Malaria, HIV/AIDS and others) in diverse scales, investigating family units, communities and comparing states and nations. It is widely known that health shocks caused by disease are causing huge problems in agriculture especially in the developing countries. Mwaniki (2006) claims that these diseases reduce available labour-hours to agriculture and decrease farmers access to obtaining food. The impact of ill-health of the agriculture workforce is one of the main causes of the food insecurities as cited by the U.S Government Accountability Office (GAO, 2008). According to Audibert et al. (2003) in their investigation which evaluated the impact of malaria on the cotton-crop development in the savannah zone using a production frontier model, they estimated that unhealthy households would not be efficient enough for their farm than the healthy ones. Their outcomes confirmed their suspicions and demonstrated a basic limit above which malaria positively affected technical efficiency in the cotton crop and also realized that these farm households in which the extent of dynamic Plasmodium Falciparum was higher or equivalent to 25 for every penny was less productive than farm households in which this extent is lower. Later in 2009, they evaluated the impact of malaria on coffee and cotton yield, this time controlling for malaria endogeneity and village heterogeneity and furthermore used a two stage least squares examination. In that occurrence, they discovered, in opposition to the prior outcomes on the cotton-crop that malaria

appears to have no impact on cotton and cocoa crops. Despite the fact that they theorized that the absence of impact is maybe because of the way that cotton and cocoa crops are less consuming when juxtaposed to rice or cotton crops, the distinctive factual instrument utilized and the utilization of panel data may have added to the diverse outcomes gotten. According to Lui (2016), he found out that, a 10 percent increase in the span of health shock is related with a decrease in agricultural investment including farming (6 percent) and livestock (12 percent), he concluded that these farm households change economic activities as a channel to safeguard against health shocks and that a decrease in livestock suggests that the households are moving far from rearing livestock to moderate generation with specific end goals to ensure themselves from adverse income shocks. Osei-Akoto et al. (2013) in their study in Ghana found that a severe health shock can deplete the individual or household's investible capital which can affect agriculture investment due to the catastrophic expenditure on health care services. Thus, their results confirmed few expectations that health shock would have a negative impact or relation on the value of investment made on purchasing seedlings, chemicals, hiring of tools or using tool. Empirically from the same study, the study reports a vivid illustration of their result; there was a decrease in the income spent on hiring a tractor and purchasing of chemical by a 2.2 percent due to illness, also a decrease in income spent on purchased seedlings by about 3.4 percent due to illness. Practically, in sub-Saharan Africa, it is observed that household's expenditure on malaria treatment ranges from US\$2 to US\$25 and for prevention each month ranges from US\$0.20 to US\$15 (Mills, 1998; Goodman et al., 2000 Chima et al., 2003 & Russell, 2003). In Kenya and Nigeria, the treatment cost is being estimated to 5 percent and 13 percent of their household expenditure respectively (WHO, 1999), and in Northern Ghana 34 percent of poor household income (Akazili, 2002; Akazili et al., 2007). Osei-Akoto et al. (2013) confirmed with Chima et al. (2003) & Malaney et al. (2004) and

concluded that even though Malaria which is a health shock depletes household cash reserves and reduces the productivity of labour, it also lessens the demand for agricultural inputs for production and also for other goods and services.

2.11.3 Impact of Health Insurance on Health Outcomes

An assessment done by Mishra et al., (2012) to examine the effect of health insurance on health care expenditure of farm households in the united states, found that having health insurance coverage positively affected total expenses on health care services along these lines those with health insurance spent less on health care services. From their investigations, income and age were observed to be noteworthy determinants of healthcare expenditure.

Further, in Ghana, Blanchet et al., (2012) discovered in their study to examine the effect of Ghana's National Health Insurance Scheme on health care services that women registered with NHIS were observed to be significantly more inclined to get larger prescriptions, visit clinics and look for formal health services when affected by an ailment. Most especially, insured women were 40 percent more inclined to have gone to a hospital, have around 57 percent more prescriptions and about twice as liable to have remained overnight at a hospital than the uninsured ones. This study adopted the propensity score matching method, using a cross sectional data from Women's health study of Accra wave II.

According to Gnawali et al. (2009), in their study to measure the impact of Community-Based Health Insurance (CBHI) on the use of health care service. They found that the insured members had a higher outpatient visit of 40 percent as compared to the uninsured members even though there was no significant effect on inpatient visit. The study was conducted in the rural Burkina Faso, and the Propensity score matching method was employed. However, they concluded

that individuals who are enrolled on CBHI would have a higher access on using the healthcare services even though the socio-economic group may not enjoy it full benefit.

Furthermore, Nguyen et al. (2011) using a probit model investigated on the effect of financial protection of NHIS in Ghana, using two rural districts (Nkoransa and Offinso) as case study to find out the disastrous health expenditures. They observed that, there was a likelihood of lessen the high cost of health care services with the insurance but the insured members still had to pay for some care from informal sources and for some drugs that are not covered on the NHIS at the hospital. They also concluded on the fact that individuals with health insurance paid less at the health facilities than those without the insurance.

Once more in Ghana, Gajate- Garrido & Ahiadeke (2013) conducted a study in 2008 to examine if “parental enrollment in NHIS affects vaccine uptake using data from the Ghana Demographic and Health Survey 2008 and the census of all District Mutual Health services” using an Instrumental variable estimation method. The study reported that children had a higher probability of getting vaccinated since their parents were enrolled on NHIS. The methodology adopted gave specifics and it was observed that NHIS increased the likelihood of a child being vaccinated against Tuberculosis at 16.8 percent and against Influenza 2/HepB1/DTPI by 22.7 percent also, Influenza 3/HepB1/DTPI by 26.1 percent. Moreover, being enlisted in the NHIS builds the likelihood of accepting the Polio 0 and Polio 2 antibodies by 36.6 percent and 21.6 percent respectively.

2.11.4 Impact of Health Insurance on Agriculture

Studies have shown that farmers, labourers, and their family members are exposed to a lot of health, safety and environmental risk and are highly prone to fatal and non-fatal injuries and ailments (OSHA, 2013). Most especially, a safe and healthy farmer has a greater effect on the family’s quality of life and how productive the farm will be. When an employer or employee is

indisposed because of an illness, it causes a lot of consequences for management, marketing and productivity, the farmer is able to manage a health shock and recover if he or she has access to the health care center (Gillespie & Johnson, 2010). USDA (2016) observed that some noteworthy hazard confronting households is household members falling sick with related high medical cost acquired which depletes the household's assets. In United States of America, health insurance at least gives individuals an opportunity for their expenses to be reduced as an end-results of a forth night intermittent expense. He added that Health insurance decreases health related financial risk individual bears. Studies have shown that the rate at which farmers suffer injury is very high which is more than the rate of any other worker. In US, it is rated at 40 percent which results in the loss of work time and perpetual hindrance (U.S. division of labour, 2010; C.D.C, 2013) on the capacity of farm households to oversee. Some scholars examined the impact of health insurance rebate initiatives and community supported agriculture projects in southern Wisconsin and the findings suggest that in 2010, the number of MACSAC farms increased from 16 farms to 42 farms while the number of shares increased annually from 2000 shares to 9000 shares, for a total of 27,600 shares in that six-year period. At the long run, it increased support by community for agriculture and also motivated households to consume more fresh fruits and vegetable (Jackson, Raster & Shattuck, 2011). Inwood (2015) examined that 65 percent of commercial farmers distinguished the cost of health insurance as the most genuine risk to their farm, higher than the cost of land inputs, economic situations, keeping in mind the end goal to develop the up and coming age of agriculturist and increase development in the rural areas, there is the need to see how health insurance cost, access, protection influence agribusiness and rural advancement. Inwood et al., (2018) stated in their study, three out of four farmers surveyed claimed "health insurance is an important risk management strategy". It was also reported that 40 percent of the farmers pointed,

if inflicted by an ailment will have an effect on their farmlands and 50 percent reported they would have no one to run their farm for them if there is any major disease. In the same study, over 50 percent of the farmers surveyed stated emphatically that they will not be able to bear the cost if they are faced with major injury or illness and recommended that they would have to sell up their farm assets to cater for their health costs. In the developing countries, findings from some studies have shown that members of the household have increased their access to formal care and have decreased their out-of-pocket expenditure (Witter & Garshong, 2009). In a study conducted by Lui (2016) even though there was a negative relationship between health shock and agricultural investment, he found that after the introduction of health insurance there was a positive relationship as health insurance interacted with health shock. He proposed that the household no longer delays in buying agriculture inputs with response to a health shock

2.12 Summary

This chapter reviews both theoretical and empirical literature on the impact of health insurance on Land-related investment in agriculture. Factors that influenced the farm household's decision to adopt NHIS included gender, age, marital status, educational level, of the household head, household's income and expenditure. The empirical literature available presents evidence in conformity to the impact health insurance will have on Agriculture (Gillespie & Johnson, 2010; Zen & Zimmer, 2008) and on Agricultural Inputs (Lui, 2016). The introduction of health insurance, farm households no longer delay in buying agricultural inputs with response to a health shock.

CHAPTER THREE

METHODOLOGY

2.13 Introduction

This chapter provides a detailed account of the methods used in the study, justification for the chosen methods, the data type and sources, models and the econometric techniques employed to analyze the data towards the achievement of the objective of the study.

2.14 Research Design and Empirical Strategy

This research is based on a cross-sectional data set of 5,883 farming households out of 16,772 total households interviewed in the GLSS wave 6 conducted between October 2012 and October 2013 which includes household with Health Insurance and households without Health Insurance. The Using a quantitative approach, the Ordinary Least Square (OLS) was first used to examine impacts. Due to possible endogeneity (omitted variable problem and selection bias), Propensity Score Matching and the Two-Stage Residual Inclusion model estimation are carried out to improve causal interpretation of the results.

2.15 Model Specification

We estimate the impact of national health insurance scheme on agricultural investment by using the OLS. However, as indicated in the earlier section NHIS was not randomized therefore, this could raise an endogeneity problem via possible omitted variables problem and selection bias where households of a certain characteristics opt for NHIS and as such any observed impact of NHIS may not be due to the NHIS itself but this variable driving NHIS adoption. One way to overcome this problem is to use the propensity score matching (see Dehejia & Wahba, 2002) and a second possible approach is the two-stage residual inclusion (Terza et al., 2008). These two

methods help to improve the causal interpretation of the impact of the National Health Insurance Scheme on Land-related Investment in agriculture.

Estimation Model:

$$\begin{aligned} InLinvest_i = & \beta_0 + \beta_1 NHIS_i + \beta_2 Mar_i + \beta_3 Edu_i + \beta_4 InHHInc_i + \beta_5 InHHExp_i \\ & + \beta_6 HHSize_i + \beta_7 FSize_i + \beta_8 Male_i + \beta_9 Age_i + \varepsilon_i \end{aligned} \quad (1)$$

Where $InLinvest_i$ denotes the amount of money spent on agricultural inputs (such as fertilizer, herbicides, pesticides, insecticides, irrigation, purchase seedlings, hired technological inputs such as hired tractors, ploughs etc), $NHIS$ dummy which assumes a value of one (1) if more than half of the household members are enrolled on NHIS and zero (0) if otherwise, Mar represents Marital Status of the household head, Edu represents the educational level of the household head, Age variable represents the age of the household head, $InHHInc_i$ denotes household Income, $InHHExp_i$ denotes household expenditure, $HHSize$ represents household size, $FSize$ represents farm size of the household and $Male$ represents the gender of the household head. β_0 is the intercept. Furthermore, the subscript “i” represents a household. The coefficient of the respective parameters varies from β_1 to β_9 and ε_i is the error term for each household in the model. For definitions and measurement of all the variables used in Model (1) above, (see Table 3.1).

Table 3. 1: Definitions and Measurement of Variables.

List of variables	Definition and Measurement of Variables
Marital Status	Marital Status of the Household Head (married =1; Single =0)
Educational Level	The educational Level of the Household Head (none=1; basic=2; secondary=3; tertiary=4; other =5)
Household Income	Total household Income (Continuous)
Household Size	Household size (1-3 =1; 4-6=2; 7-9=3, >=10 ==4)
Farm Size	Farm size of the household (continuous)
Age	Age of household head in years
Male	Gender of the household head (Male=1; Female=0)
Household Expenditure	Household Expenditure (continuous)

2.16 Detailed Description of Variables

The household is preferred in this study for assessing the impact of National Health Insurance Scheme because decisions on how best to treat the ailment and how well to cope with the consequences are built on the consultations within the households, cost of sickness are acquired via guardians and also the sick, and the cost falls on the Household budget (Berman, Kendall & Bhattacharyya, 1994; Sauerborn et al., 1995)

2.16.1 Dependent Variable for the impact of NHIS on Land-related Investment in Agriculture.

Land-Related Investment in Agriculture is the dependent variable, to measure this variable the survey asks: “Did you spend anything on any of the agricultural inputs in the past 12 months and how much was spent in cash on the input during the past 12 months” This variable only includes

inputs used on farm lands excluding animal rearing inputs. Here, the dependent variable is continuous since it is measured in terms of expenditure.

2.16.2 Independent Variables

2.16.2.1 National Health Insurance Scheme

This is measured categorically whereby a value of 1 is assigned to insured households (more than half of households are enrolled) and value of 0 to those that are not insured.

2.16.2.2 Marital Status

The marital status was presented to assess the impact of NHIS on Agriculture investment of the married, and the unmarried. It is expected that, those that are married would have a better option of getting treatment from a well-equipped health sector (Envuladu et al., 2013) thereby increasing the income level. The study expects that married couples will invest more in agricultural inputs. A value of 1 was allocated to those who are married and a value of 0 was allocated to heads that are not married, Divorced, Separated or Widowed.

2.16.2.3 Age

The household head's age is measured in years and it is a continuous variable. It considers only the adult starting from the age of 15. Studies have shown that most older farmers do not have much ability to carry out the physical ability than the youthful ones because of their strength. In a study done by Dlova, Fraser, & Belete (2004), they suggested that most young farmers would want to experiment on their farms and so would try adapting some mechanism which includes agriculture

inputs. It is expected that as age increases, the investment level on Agricultural inputs would decrease.

2.16.2.4 Male

FAO (1997) explains gender to be “the relations between men and women, both perceptual and material” Gender in this study is expressed as a dummy where male is equal to 1 and female is equal to 0. It is believed that a lot of male headed farmers engage themselves in harvesting of crops, plowing, using farm machinery and many more and the female headed households only involve themselves in farmhouse activities like maintaining the farm compound, feedstuffs, and preparing and preserving of food. Studies have shown that in many geographical places there are difference in relation to gender when getting access to agriculture input (Saito & Weidemann, 1990). Freeman & Richardson (2005) concluded that the female farmers stay without adequate access to agricultural inputs even in Ghana. It is expected to have a positive sign for males and a negative sign for females.

2.16.2.5 Educational Level

The variable is expressed in categories thus, farmers without any education have 1, farmers with basic education have 2, farmers with secondary and vocational training have 3 then farmers with tertiary qualification also have 4. Education is seen as one of the most important factor that impacts subsistence farming for the development of agriculture. IFPRI (1995) stated that educated farmers adapt new farming practices. Moock (1973) cited in Saito & Weidemann (1990) observed in his study that farmers who were educated had higher yields due to increase in accurate agricultural inputs. Mohsenian-Rad et al (2010) assumed that the aim for education is purposely to transfer

accumulated wisdom and knowledge from one generation to the other they further added that education often upgrades dynamic investment in advancement and the improvement of new information. They additionally agree that education upgrades the capacity to infer, translate and assess valuable data for horticultural creation. Expectation is that education should have a positive relationship with land-related Investment in agriculture.

2.16.2.6 Household Size

Studies have shown that household size is very significant due to the free access to family labour, the larger the size the more labourers for the farm. In this study the household size is measured in categories. Household refers to “a person or a group of related or unrelated persons who live together in the same dwelling and also share housekeeping and cooking arrangements and are considered as one unit, who acknowledge an adult male or female as head”. Household with large size are able to participate more in agriculture activities because it gives the chance to lessen its expenditure for food (Dossa et al., 2011). Then again, it can be said that larger households are exceptionally likely to take an interest in rural activities because of their expanded capacity to supply work for the farm work.

2.16.2.7 Farm Size

The size of the farm is very fundamental in determining the amount of farm input it needs and also determine which type of farming practices to adapt. Studies have shown that smaller farms mostly use the maximum number of current farm inputs even though it is being claimed that, large farms have better access to loans which can help purchase farm inputs to have higher yields however the farmer is largely terrified to adopting new farming practices.

2.16.2.8 Household Income

Most households take part in agriculture activities because of income that will be acquired. This income can be acquired specifically from the sales of products from the farm and by implication from the reduction of food expenditure. Subsequently, agriculture gives security net to the poor people and to households seeking to enlarge their decreasing income (Hovorka et al., 2009). Most investigations have reasoned that agriculture is overwhelmed by the poor trying to secure some wellspring of income (Zezza & Tasciotti, 2010).

2.17 Impact Estimation Approaches

2.17.1 Propensity Score Matching (PSM)

It is very necessary for every individual in the country, in this case every farmer in Ghana to have NHIS but randomly assigning individuals NHIS coverage status can not be possible. In order to reduce selection bias, as indicated the propensity score matching estimation method is employed. This method, gives the contrast between farmers in the naturally occurring treatment and control groups based on their observed characteristics. Thus, the propensity score approach constructs a control and a treatment group based on observable household characteristics. Variables captured for estimating the pscores (likelihood of enrolment) are farm size, household size, the sex of the household head, age of household head, household income, household expenditures, and marital status of the household head. Khandker, Koolwal & Samad (2009) explained propensity score matching to be based on a model of probability of participating in the intervention using the “observed characteristics” to construct a statistical comparison group. Therefore this study uses a PSM to construct the difference of investing in agriculture inputs if a household has a NHIS or

not given same or likely similar household characteristics that probably can make a household receive the service:

$$p(H_i) = \Pr[(T_i) = 1|H_i] = E[(T_i)|H_i]; \quad p(H_i) = F\{z(H_i)\} \quad (2)$$

Where H_i denotes a vector of pre-Treatment characteristics of the household i , T_i indicates if the household has NHIS or not it a binary variable $T_i = (1,0)$, E is the expectation operator, and $F\{\cdot\}$ represents a logistic or normal cumulative distributive frequency.

Propensity score matching is a two-stage process. In the first (1) stage, a logit or probit estimation model is used to generate the p-scores - the propensity of a household to enroll in NHIS based on observables (Rosenbaum & Rubin, 1983). The approach uses a probit model to estimate the factors that influence NHIS adoption predict the scores (Sianesi, 2004). The predicted score is then used to examine the impact by examining households with similar p-scores but different enrollment outcomes. Majority scholars have argued that the Average Treatment effect (ATE) is a very good estimator which is used to measure the mean difference in outcomes across the two groups (control and treatment group) (Heckman, 1996; Becker & Ichino, 2002; Khandker et al., 2009). Average Treatment effect on treatment group (ATT) and the Average Treatment for the Untreated (ATU) is mostly used in studies reviewed. The ATE captures the treatment effect for the whole sample; ATT represents the treatment effects on participants in the intervention and ATU represents the treatment effect on the non-participants. ATT has been highlighted to be the best parameter of interest for the estimation of the propensity score (Becker & Ichino, 2002)

Given the $p(H_i)$, the effects are examined as;

$$ATE = E[E\{y_i^*|(T_i) = 1, p(H_i)\} - E\{y_i|(T_i) = 0, p(H_i)\}]$$

$$ATT = E[E\{y_i^*|(T_i) = 1, p(H_i)\} - E\{y_i|(T_i) = 0, p(H_i)\} | (T_i) = 1] \quad (3)$$

$$ATU = E[E\{y_i^* | (T_i) = 1, p(H_i)\} - E\{y_i | (T_i) = 0, p(H_i)\} | (T_i) = 0]$$

Where y_i^* is the counterfactual outcome of households with “NHIS “, y_i is the counterfactual outcome of households without “NHIS”, the counterfactual estimates denote what the investment level in agricultural input would be if they did not have NHIS.

In the second stage, the control and treatment groups are matched together to find similarities using their observed characteristics which are not affected by the intervention. A number of matching methods have been recommended for such estimation such as Nearest-Neighbour Matching, Radius Matching, Kernel Matching and Stratification Matching. Matching is usually employed to eliminate over-biasness and evaluate the treatment effect. These methods are adopted for robustness purposes.

2.17.1.1 Nearest-Neighbour Matching

This technique matches participants are matched to the closet non- participant with same observed characteristics. This is carried out “with replacement” or “without replacement”. Matching with replacement involves a “trade-off” between variance and bias which reduces the biasness and increase the “average quality of matching”, this is normally used where the Propensity Score Distribution is actually different in the control and treated group. A participant from the control group can be matched to more than one person while without replacement, a participant can be match only once. This type ensure that ordering is randomized and the estimates relies on the order in which the observation will be matched (Smith & Todd, 2005).

2.17.1.2 Kernel Matching

The weighted average of all control variables is matched to every single treated unit, with weights contrarily corresponding to the distance between the propensity scores of the control and treated groups. Since all controls groups add up to the weight, lower variance is achieved. Smith & Todd (2005) stated, “Kernel matching can be seen as a weighted regression of the counterfactual outcome on an intercept with weights given by the kernel weights”.

The balancing and the conditional assumption must be satisfied to ensure the robustness check. The balancing assumption suggest that conditional on the propensity score, each farm household should have similar likelihood of enrolling in NHIS. Hence, the distribution H_i is assumed to be balanced when the balancing property is satisfied.

Also, the Conditional Independence Assumption (CIA) states that, the treatment variable (that is enrolling in NHIS), and the outcome variable (land-related investment in agriculture) must be uncorrelated pre-vector of observables, H_i are controlled for.

Rosenbaum & Rubin (1985) suggested a standardized bias approach to certify the quality of matches. This can be achieved by carrying out a “a comparison of condition before and after the matching to verify if any changes have occurred after conditioning on the propensity score”.

Sianesi (2004) recommended another assessment of the quality of the matching by re-estimating the p-score of the matched Enrolled farm households and matched non-enrolled farm households. The covariates are balanced if the probability of the F-statistics is not significantly different from zero whilst the pseudo- R^2 is fairly low after matching. If there are any unobserved characteristics that influence both enrollment in NHIS and land-related investment in agriculture, a hidden bias may occur. Rosenbaum (2002) proposes the use of bounding approach to assess the impact of

“unmeasured variables on the selection process, since it might not possible to examine the degree of selection bias with non-experimental data”.

2.17.2 Two-Stage Residual Inclusion Model Estimator

Hausman (1978) proposed the two-stage residual inclusion as an avenue for addressing endogeneity in estimating the causal impact of a variable. First, under this approach the study runs the regression for the determinants of NHIS coverage status on household characteristics. The residual from the first stage is then included in the second stage of the residual inclusion model “control Model” (2SRI) (Terza, Basu & Rathouz, 2008). In this case, any omitted variables which is captured in the residual is controlled for in the second stage model thereby controlling for both observables and unobservable (Breuer & Asiedu, 2017).

The First Stage Equation is:

$$\begin{aligned}
 NHIS_i = & \beta_0 + \beta_1 Mar_i + \beta_2 Edu_i + \beta_3 Age_i + \beta_4 InHHInc_i + \beta_5 InHHExp_i + \beta_6 HHSIZE_i \\
 & + \beta_7 FSize_i + \beta_8 Male_i + \beta_9 Surveyyear_i \\
 & + \varepsilon_i
 \end{aligned} \tag{5}$$

The Second Stage Equation is

$$\begin{aligned}
 lnInvest_i = & \alpha_0 + \alpha_1 Mar_i + \alpha_2 Edu_i + \alpha_3 Age_i + \alpha_4 InHHInc_i + \alpha_5 InHHExp_i + \alpha_6 HHSIZE_i \\
 & + \alpha_7 FSize_i + \alpha_8 Male_i + u_i + \hat{\varepsilon}_i
 \end{aligned} \tag{6}$$

Where $\hat{\varepsilon}_i$ is the residuals predicted from the first stage and the definition for the other variables are the same as the already defined ones in the land-related investment in agriculture model.

2.18 Data Source

The Ghana Living Standards Survey is a household level survey conducted with a nationwide sample of households so as to statistically be a representative of all of Ghana. The data used for the empirical analysis is from the sixth wave of the Ghana Living Standard Surveys: GLSS 6 (2012/13). The GLSS 6 centers on the main socio-economic unit and provides meaning to the living conditions in Ghana. The study considers the health section of the wave and focuses on the insurance section where questions like if the household member has registered or is covered with health insurance scheme, if the household member is still registered or covered under the scheme, and if the household is no longer under scheme. Also, which type of health insurance the household use, either National/District Health Insurance (NHIS), or Private Health Insurance, or both. According to wave 6 of the GLSS, 67.6 percent of the population have registered with NHIS. The study, also consider the agricultural sector and focuses on the agricultural cost and expenses section where information like amount spent for crop cost, organic and inorganic fertilizer and other inputs were provided and also the amount spent in kind were also provided. The analysis is restricted to these sections of the Sixth wave of GLSS. The sample size for this study is 5,883 household which consist of farm households (involved in cultivation of crops) who are insured or not insured. This research considers GLSS 6 because it gives information on households with Health Insurance that have benefited from the scheme and households without Health Insurance as compared to GLSS 5, since NHIS in Ghana started in 2004.

2.19 Summary

This chapter tends to focus on the data and methodology for this study. The chapter emphasized on the empirical model and procedures for estimation and description of the variables implemented

for the study. This study uses the ordinary Least Square which give the partial correlation between NHIS and Land- related Investment in Agriculture for estimation. Due to endogeneity problem, Propensity score matching and the two-stage residual method is used in estimating the impact of NHIS on Agricultural Inputs Used and on Hired Labour. Data for empirical analysis is obtained from Ghana Living standard survey wave 6 which was conducted in 2012/2013.

CHAPTER FOUR

ANALYSIS AND DISCUSSION

4.1 Introduction

The chapter presents and discusses the results of the econometric estimation of this study including the descriptive statistics, analysis and discusses findings of the study based on scientific methods and procedures adopted. The chapter seeks to find answers to the research questions listed in chapter one by presenting empirical findings and thorough discussions in the form of tables to show the estimated impact for the impact of National Health Insurance Scheme on land investment by smallholder farmers. Results for all research questions are found in this chapter.

4.2 Descriptive Statistics

The section provides descriptive statistics on the demographic characteristics of the farm household sampled as well as the pre-treatment variables used in evaluating the impact of NHIS on Land-related investment in Agriculture. According to GLSS 6, 16,772 households were selected for the survey and 72,372 individuals were interviewed across these selected households, however this study focuses on 5,883 farming households and examines characteristics of those with and without health Insurance.

Table 4. 1: Farm Household NHIS Coverage by Gender

Sex of	NHIS	No NHIS	Total	
FH. Head	Count	Count	Count	%
Male	2,567	1,666	4,233	71.95
Female	1,204	446	1,650	28.05
Total	3,771	2,112	5,883	100

Note: FH means farming Household. Source: Author's Estimations from GLSS 6 data where % means percentage of the farm household

From Table 4.1, out of the 5,883, 64.1 percent are enrolled in the NHIS whereas 35.9 percent are not under NHIS coverage. In term of household headship, 72 percent (4,233 farm households) of farm households are headed by males whereas 28.05(1650 farm households) are headed by females. In terms of NHIS coverage at the household level, 73 percent (1,204) of female headed household are enrolled on NHIS whereas 61 percent of the male headed households have enrolled on NHIS.

Table 4.2 compares differences between the enrolled and those not enrolled. N represents the total number of observations recorded per variables. Std.Dev represents the standard deviations Also, the Minimum (Min) and Maximum (Max) observations are also indicated.

Table 4. 2: Descriptive Statistics on the Enrolled and Non-enrolled Farm Household

Variable Names	Pooled	With NHIS	Without NHIS	Min	Max	Differences in Mean	t-value
	Mean	Mean	Mean			Mean	
Treatment Variable							
NHIS	Yes=1, No=0						
Outcome Variables							
Land-related Investment in Agriculture	494.78	560.692	375.299	1.2	15720	185.39***	-5.195
Independent Variables							
Age	46.245	48.441	42.325	15	98	6.116***	-14.23
Gender	0.720	0.681	0.789	0	1	0.108***	8.912
Educational Level	1.328	1.328	1.215	0	4	0.175***	-6.110
Marital Status	0.673	0.665	0.688	0	1	-0.023**	1.815
Farm Size	5.011	5.782	3.441	0.045	1497.37	2.341	-1.382
Household Income	7546.2	7789.27	7112.43	-98320.6	788349	676.84	-1.072
Household Expenditure	25282	26933.15	22333.87	563.34	440268	4599.6***	-6.957
Household Size	1.789	1.790	1.786	1	4	0.0043	-0.185

*** p<0.01, ** p<0.05, * p<0.1 Note: Difference in Mean= Mean (1)- Mean (0) , Min and Max is for the pooled data. Source: Authors Own Compilation using stata 15

The descriptive statistics above shows that there are differences between Farm Households with NHIS and those without NHIS based on their observable characteristics. The first column presents the descriptive statistics for the entire sample whereas the second and third column presents the statistics of farm households with NHIS and without NHIS respectively. The fourth and fifth column presents the minimum and Maximum, also the sixth and seventh reveals the difference in mean and the t-test which shows the significance of the predictor between enrolled and non-enrolled households.

Estimates from Table 4.2 shows that Farm Households that have NHIS are slightly older than those without NHIS as indicated earlier, there are male headed households than female

household heads however, there are slightly more males without NHIS than males with NHIS. Farm households that have NHIS are slightly more educated than those without NHIS. There is no significant difference in farm size amongst farm households with NHIS and those without. There are also no significant differences in household income between households that are enrolled and those who are not. Despite similar income, farm households with NHIS tend to spend (household expenditure) than those without NHIS therefore any observed differences in enrollment cannot be attributed to income. On the average, farm households without NHIS are slightly more married than farm households with NHIS. Lastly, on the average farm households with NHIS tend to have higher farm investments than households without NHIS.

4.3 Impact Estimation

As indicated earlier, ordinary least square is carried out to examine the impact of NHIS on Land-related investment. However, the linear model is an initial step in the empirical analysis which helps to evaluate the partial correlation between NHIS and the other variables indicated in the model. Table 4.3. shows the estimation results of the OLS. The table reports the result which shows that NHIS has an impact on Land-related Investment in agriculture. From the results presented below, it is observed that there is a positive effect of NHIS on Land-related Investment in agriculture. The coefficient on NHIS is positive and significant at 1 percent, which means that households with NHIS tend to invest more on Land-related investment in agriculture than those without NHIS. The coefficient suggests that households with NHIS invest about 32.3 percent more on Land-related Investment in agriculture. This implies that, the farming households have replaced income that will be used on catastrophic health care expenses on investing in agricultural inputs by 32.3 percent. The coefficient of Age is negative and has a significant impact on Land-related

investment at 1 percent significance level which suggest that younger household heads with NHIS invest more on Agricultural inputs than older household. Also, we observe that male headed households invest more than female headed households at a 1 percent significance level. Male headed households invest about 39 percent more on agriculture inputs as well as Married farm household heads invest more in agricultural input at a 5 percent significance level. As farming households increase their farm size, about 72 percent is invested on agricultural inputs.

The results further present that as the household size increases, investment in agriculture input also increases, this can be attributed to the fact, the more hands one has on the farm land the more productive the farm will be and the higher income could be channeled to buying more agricultural inputs Nevertheless, the coefficient for educational level of the farm household head is negative and insignificant. Finally, it is observed that, as income increases more (15.5 percent) is invested in Agricultural input, also an increase in household expenditure makes the household invest more (44.6 percent) in agricultural Investment and is significant at 1 percent significance level.

Table 4. 3: Ordinary Least Square Estimates of the Impact of NHIS on Land-related investment in agriculture.

Dependent variable: Land-related Investment in Agriculture (lnInvest)			
Variables	Coefficient	S. E	P> t
NHIS	0.324***	0.064	0.000
Age	-0.004**	0.0019	0.050
Male	0.402***	0.097	0.000
Farm Size	0.007**	0.004	0.044
Household Size	0.125***	0.035	0.000
Marital Status	0.149*	0.090	0.098
Educational Level	-0.039	0.026	0.137
Household Income	0.155***	0.027	0.000
Household Expenditure	0.446***	0.049	0.000
Constant	-0.925**	0.412	0.024
R-Squared	0.2242		
Prob> F	0.000		

*** p<0.01, ** p<0.05, * p<0.1 Source: Authors Estimation using Stata 15

Note that, these estimates are simple OLS estimates which do not control for possible endogeneity. NHIS coverage is non-random, therefore the causal interpretation should be done cautiously. Specifically, the problem of selection bias or income could be related to adoption or there may be unobservable that could affect the adoption thus OLS estimation may be bias. As a robustness check for the OLS estimates we move on to examine impact of NHIS using the matching estimates.

4.4 Estimates from Propensity Score Method

The propensity score seeks to balance the observed characteristics of pretreatment across the treated (households with NHIS) and control group (households without NHIS). This analysis adopts the psmatch and Average treatment effects approaches such as the Nearest Neighbor

matching, Kernel Matching, stratification Matching by Becker & Ichino (2002) and Leuven & Sianesi (2003) to compare the investment level of farming households that are registered under the scheme (Treated Group) with those that are not (Control group) on Land-Related Investment. Due to the underlying principles and conditions of PSM as stated by Heckman, Lalonde & Smith (1991); Augurzky & Schmidt (2001); Lechner (2001) and Bryson, Dorsett & Purdon (2002). The probit treatment model is adopted to estimate the probability of a farm households adopting NHIS. Table 4.4 presents the estimates from the probit model and marginal effects which captures the predictors that influence farming household's decision to enroll in NHIS

Table 4.4 shows the significant variables that influence the decision to get insured with NHIS. The significant factors identified to influence farm household's enrolment on NHIS are age, gender, educational level, marital status of the household head, and household expenditure. Indicating that, as the farming household head advance in age there is the likelihood to enroll on NHIS by 0.4 percentage point which confirms Bhat & Jain (2006) and Mwaura (2012) findings which suggest that advanced age increases the likelihood of enrollment in health insurance. Income is not a significant driver of farm household's NHIS enrolment decisions. Thus, interventions can easily be targeted based on demographics to address enrollment challenges among farm households. Specifically, we observe that male headed farm households are less likely to adopt NHIS by 16.3 percent which confirms Mensah et al (2010) results. Educational Level is consistent with findings from Besley et al. (1999) and Mensah et al (2010) who also found that highly educated households are more likely to enroll in NHIS. Also, we find that farm household that spend more, have a high probability of adopting NHIS.

Table 4. 4: Results of Probit Treatment Model from Propensity Score

Dependent Variable: National Health Insurance Scheme (NHIS)					
Variable	Coefficient	Std. Err	P>(t)	Margin	P>(z)
Age	0.013***	0.002	0.000	0.0048	0.000
Gender	-0.458***	0.963	0.000	-0.163	0.000
Educational Level	0.130***	0.029	0.000	0.046	0.000
Marital Status	0.0012	0.915	0.989	0.0005	0.989
Farm Size	0.010*	0.006	0.077	0.004	0.075
Household Income	0.00002	0.026	0.999	0.000008	0.999
Household Size	-0.035	0.036	0.340	-0.012	0.340
Household Expenditure	0.201***	0.049	0.000	0.0714	0.000
Constant	-1.915***	0.407	0.000		
Log Likelihood	-1220.6524				
P>chi2	0.0000				
Pseudo R2	0.0583				

*** p<0.01, ** p<0.05, * p<0. Source: Author's Compilation using Stata 15.0

With the probit treatment model results shown in Table 4.4 above, the propensity score is evaluated for households that invest in agricultural inputs. The common support option in propensity score is bounded within 0.293 to 1 for households that have enrolled and households that have not enrolled. The Graph “Distribution of the propensity score” after matching shows that the estimation of the p-score balance the insured and the non-insured group occupy. This result shows a good match between the insured and not insured across all ranges of the p-score distributions.

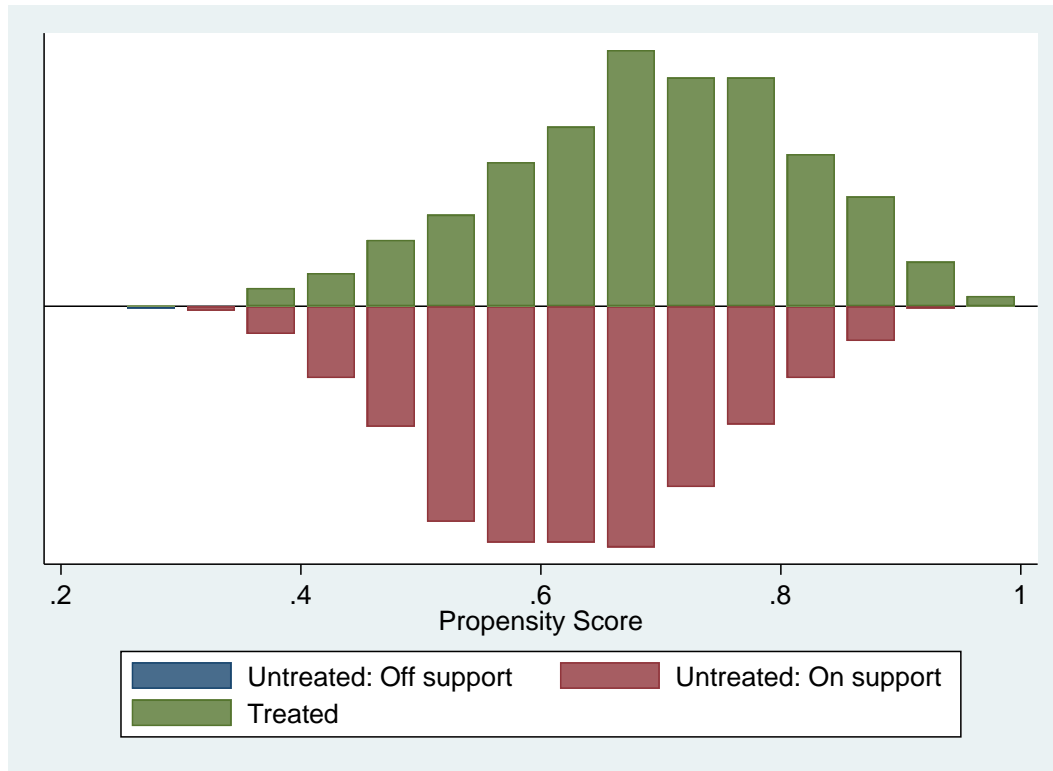


Figure 3: Distribution of Propensity Score for the Matched Samples

Table 4. 5: Indices of the Matching Quality

Variable	Pseudo R ² (Unmatched)	Pseudo R ² (Matched)	Mean bias (Unmatched)	Mean bias (Matched)	Bias reduced (%)
Land-related	0.054	0.004	18.0	2.0	51.6
Investment	(0.000)	(0.174)			

P-values in parenthesis

Table 4.5 above shows the indices of the quality of the matching process. Here, reduction in the mean absolute standardized bias between the unmatched and matched samples is used to determine the balancing powers of estimation. From table 4.5, the mean bias before and after matching is 18.0 and 2.0 respectively, shown in columns four and five. It is observed that after matching, the mean bias in the covariates is below 20 percent level of bias reduction suggested by Rosenbaum

& Rubin (1985). Hence the covariates are significantly balanced by using the propensity score matching algorithms.

The before and after Pseudo R^2 is shown in the second and third column with their respective p-values in parenthesis. The study observes that, Pseudo R^2 is fairly low and the diagnostic statistics is not significantly different from zero, after matching. This suggest that there is no significant difference between farm households enrolled in NHIS and farm households not enrolled (Pseudo R^2 before and after matching 0.054 and 0.004 respectively). The p-value reduced from a highly significant level of 0.000 before matching to an insignificant level of 0.174 after matching. Hence, there is no systematic variance in the distribution of covariates between farm household enrolled in NHIS or not enrolled. This implies that the outcome variable from the matching process is suitable in balancing the covariates between the farm households enrolled and farm households not enrolled (Sianesi, 2004).

4.4.1 Treatment Effect

To examine how NHIS impacts land-Related investment in agriculture under the propensity score estimation approach, the average treatment effect is estimated which is shown in Table 4.6 and 4.7 below. Using nearest-neighbour matching which eliminates most of the bias between the treated and the control groups, the result from table 4.6 show that farm households with NHIS invests about GHC 242.93 in agricultural investment whilst farm households without NHIS invest about GHC 171.45. This implies that, farm households with NHIS invest roughly GHC 71.48 than farm households without NHIS. This is 42 percent increase over controlled group value. The impact is

significant at a 1 percent significance level. Comparing it to the OLS estimation result which reveal that ¹farming households with NHIS enrollment invest 32 percent in agricultural inputs.

Table 4. 6: Effect of NHIS on Land-related Investment in Agriculture Input. (Nearest Neighbour Matching)

Variable	Sample	Treated	Control	Difference	Std Error	T-stats
Land-related	Unmatched	5.540	5.144	0.396	0.069	5.75
Investment	ATT	5.493	5.144	0.348	0.078	4.46

Source: Author's Estimation using stata 15

Using the Kernel Matching, the results from table 4.7 confirms that there is a positive significant effect of NHIS enrollment on agricultural inputs and significant at a 1 percent significance level. Thus, under the Kernel estimator, the results suggest that farm households with NHIS invest by GHC68.08 more than farm households without NHIS (roughly 37 percent more).

Table 4. 7: Treatment Effect of NHIS on Land-related Investment in Agriculture Input (Kernel Matching).

Variable	Sample	Treated	Control	Difference	Std Error	T-stats
Land-related	Unmatched	5.540	5.144	0.396	0.069	5.75
Investment	ATT	5.526	5.210	0.316	0.076	4.16

Source: Author's Estimation using stata 15

4.4.2 Impact of NHIS on Hired Labour

To examine how NHIS impacts hired labour under the propensity score estimation approach, the average treatment effect is estimated which is shown in Table 4.8 below. Using nearest-neighbour

¹ $\ln x$ is 5.526 and therefore x equals 242.93. Note that Log_x/m equals $\text{Log}_x - \text{Log}_m$ and not $x-m$.

matching, the result from table 4.8 show that farm households with NHIS invests about GH¢ 200.60 in hired labour whilst farm households without NHIS invest about GH¢ 146.57. This implies that, farm households with NHIS invest roughly GH¢ 54.02 than farm households without NHIS. This is 37 percent increase over controlled group value. The impact is significant at a 5 percent significance level.

Table 4. 8: Effect of NHIS on Hired Labour (Nearest Neighbour Matching)

Variable	Sample	Treated	Control	Difference	Std Error	T-stats
Hired	Unmatched	5.320	5.036	0.284	0.084	3.39
Labour	ATT	5.301	4.986	0.314	0.146	2.15

Source: Author's Estimation using stata 15

Using the Kernel Matching, the results from table 4.9 confirms that there is a positive significant effect of NHIS enrollment on hired labour and significant at a 5 percent significance level. Thus, under the Kernel estimator, the results suggest that farm households with NHIS invest by GH¢46.69 more than farm households without NHIS (roughly 30 percent more).

Table 4. 9: Effect of NHIS on Hired Labour (kernel matching)

Variable	Sample	Treated	Control	Difference	Std Error	T-stats
Hired	Unmatched	5.320	5.036	0.284	0.084	3.39
Labour	ATT	5.301	5.036	0.265	0.089	2.98

Source: Author's Estimation

Most scholars have considered how health shocks impacts agricultural productivity, and have found that health shocks have positive significant effect on agricultural productivity thus, if a farmer is indisposed it reduces their investment level on their farm due to health cost (Osei-Akoto et al., 2013). Therefore, the study here shows that health insurance is an essential tool to help farmers improve on their health as well as increase their investment level.

4.5 Additional Robustness Checks -Two Stage Residual Inclusion

The propensity score matching estimation method has demonstrated the shows the causal effect of NHIS on land-related agricultural investment that enhances the OLS estimates by controlling for observables that impacts NHIS enrollment. As indicated, as a robustness check we estimate and present the two-stage residual inclusion model which controls for all possible omitted variables and therefore improves causal interpretation and inference. We estimate a first stage regression as indicated earlier, and then include the residuals of the first stage regression in the second stage impact model, with the intention that if there are any unobservable characteristics that could bias the estimate of NHIS that is controlled for in the second stage model (Terza, Basu & Rathouz, 2008).

Table 4.10 presents both the first and second stage results for the residual inclusion model, the results from the two- stage residual inclusion model shows that, consistent with the OLS and propensity score estimates, household's with NHIS tend to invest more in land inputs than those without NHIS and this effect is significant at the 1 percent significance level.

Table 4. 10: Effect of NHIS on Agricultural Inputs (two-stage residual inclusion)

	First Stage	Second Stage
NHIS		6.796*** (2.145)
Age	0.005*** (0.0006)	-0.034*** (0.0103)
Gender	-0.143*** (0.032)	1.343*** (0.326)
Farm Size	0.00018 (0.0003)	0.0061*** (0.0015)
Household Size	-0.0082 (0.0124)	0.174*** (0.0387)
Marital Status	-0.00015 (0.0312)	0.139 (0.0919)
Education	0.043*** (0.0096)	-0.313*** (0.09457)
Household Income	0.00132 (0.0091)	0.144*** (0.0263)
Household Expenditure	0.071*** (0.0167)	-0.0034 (0.1570)
Residual		-6.475*** (2.1461)
Constant	-65.303 (48.4933)	0.191 (0.5450)
R-squared	0.0690	0.2282

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1 Source: Authors estimation using stata 15

Employing the two-stage residual inclusion model to examine the impact of NHIS on Hired labour, the results from Table 4.11 below shows that NHIS has a positive and significant impact on Hired Labour, which indicates that's household are able to hire more because they are insured with NHIS and can use their expenses spent on Health to invest more on Labour. Also, majority of male headed household invest more on hired labour than Female household heads. In addition, the bigger or larger the farm, the more labour hired, and as Household increase their income and their expenditure, more of labour is also hired. The Unobservable variables that was accumulated in the residuals causes the household to invest less in Hired Labour.

Table 4. 11: Two- stage residual Inclusion Estimation of Impact of NHIS on Hired Labour

Variables	First Stage	Hired Labour
NHIS		0.343*** (0.1214)
Age	0.0047*** (0.0006)	-0.0042** (0.0022)
Gender	-0.143*** (0.03167)	0.431*** (0.1065)
Farm Size	0.00018 (0.0003)	0.029*** (0.0045)
Household Size	-0.0082 (0.0124)	0.056 (0.0520)
Marital Status	-0.00015 (0.0312)	0.114 (0.0951)
Educational Level	0.043*** (0.0096)	-0.084** (0.0355)
Household Income	0.0013 (0.0091)	0.167*** (0.033)
Household Expenditure	0.071*** (0.0167)	0.428*** (0.061)
Residuals		-0.064 (0.499)
Constant	-65.303 (48.493)	-0.715 (0.499)
R-squared	0.0690	0.2354

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1 Source: Authors Own Compilation using stata 15

4.6 Summary

This chapter answers the research question asked in chapter one. It provides empirical analyses of the impact evaluation of Ghana’s National Health Insurance Scheme on Land-related Investment in Agriculture using the Ghana Living Standard Survey wave 6 (2012/2013).

Applying the OLS, it was found that it only explained the correlation between NHIS and Land-related Investment in Agriculture. Therefore, the Propensity Score Matching procedure was employed, the probit treatment model was used to estimate the determinant of NHIS adoption and also predict the scores, the results showed that consistent with the OLS estimates farm household

enrolled in NHIS significantly invest in their lands compared to households that are not enrolled.

Also, at 5 percent significance level, farm households with NHIS invest more on Hired Labour.

These results are similar across all estimation approaches adopted.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the major results of this study and presents the conclusions. Some recommendations have been suggested due to the key findings.

5.2 Summary of Findings

Generally, the study sought to examine the impact of National Health Insurance Scheme on land-related investment in agriculture. Furthermore, the study examined the determinants of NHIS amongst small holder farmers, the impact of National Health Insurance Scheme on agricultural inputs used in Ghana and also assessed the impact of NHIS on Hired Labour. Health Insurance has been introduced to reduce the potential financial burden on households in the event of sickness and also help households to have routine medical checks when necessary. Agriculture in Africa is well known to be labour intensive and as such health shocks or bad state of health can negatively impact productivity as well as reduce land investments.

Using the Ghana Living Standard Survey (GLSS) wave 6, this study examines the impact of national health insurance coverage on farm investment and hired labour. A number of estimation approaches including propensity score matching and the two-stage residual inclusion estimators were adopted to examine the causal impact of NHIS on farmers in Ghana. The key determinants of NHIS enrollment among farm households are age, gender, educational level, farm size and household expenditure. Specifically, age has a positive effect on farm household enrolment in NHIS, meaning older farm household heads tend to enroll in NHIS than younger ones. For gender,

female headed households enroll more than the male headed household. For farm size, farm households increase health insurance enrollment as farm size increases. It was observed that, farm households increase enrollment in NHIS as they spend more.

According to GLSS wave 6, there are 5,883 farming households. The Ordinary Least Square was employed to analyze the impact of NHIS on Land-related Investment in Agriculture. The findings show that, NHIS has a positive impact on Land-related investment in Agriculture. The characteristics of the household head indicated that, it is a significant predictor to help in the decision of investing on their farm lands. The results showed that as the farm household head advance in age, he or she invest less in agricultural inputs and male headed households are able to invest more in agricultural inputs than female headed households. The results further disclosed that the household characteristics such as household size, household income, household expenditure, farm size increases the investment level in agricultural inputs.

Due to the endogeneity problems and to check for robustness, the propensity score matching and the Two-stage Residual Inclusion estimation method is employed. With Propensity Score Matching, the probit treatment model is used to find the likelihood of farm households adopting NHIS based on the observed characteristics. The result from the probit model reveals that, Age, Gender, Marital Status, Educational Level of the farm household Head and the household expenditure have positive and statistically significant relationship that influences their decision to enroll in NHIS. All variables were balanced. The treatment effect of NHIS on agricultural inputs used showed that farming households enrolled on NHIS invest more on agricultural inputs and it is significant at the 1 percent significance level using the Nearest and Kernel Matching Algorithms. They invest about 37 percent to 42 percent in agricultural inputs. The treatment effect on Hired

Labour reveal that households with Health Insurance invests about 30 percent to 37 percent in hired labour with Nearest Neighbour Matching and Kernel Matching showing a significant impact.

With the Two-stage Residual Inclusion, results reveal that households with NHIS invest more in agricultural inputs and hired labour. Results show that households with Health Insurance invest more on hired labour which implies that with NHIS they can now hire more labour since the scheme has helped reduce their expenditure on health care.

5.3 Conclusions

National health Insurance Scheme has been in existence for more than a decade. The scheme has had significant impacts on insured individuals by reducing the financial burdens on health care services. Therefore, the study examines the impact on NHIS on Land-related investment in agriculture. Applying the Propensity Score Matching and the Two-stage Residual Inclusion techniques, the study discovered that NHIS has a positive impact on Land-related investment in agriculture which agrees with the findings of Lui (2016). Regarding hired labour, NHIS has a positive impact at the 5 percent significance level from Propensity Score Matching and 1 percent from the Two-stage Residual Inclusion estimation techniques.

The findings suggest that, NHIS contributes greatly to the economic welfare of smallholder farmers. Farm households with NHIS can channel their income for health expenses on agricultural inputs and would help promote agricultural productivity and hence increase GDP and export revenue.

5.4 Policy Recommendations

Some recommendations are made towards policy, practice and future research based on the major findings:

1. The government and the National Health Insurance Authority should make education on NHIS accessible to farm households. This will ensure that farmers understand the need to enroll on NHIS. Also, through sensitization programs, farm households can be motivated to register and if more education is done the impact of health insurance would be greater on agricultural inputs and would increase the share of GDP from agriculture.
2. Also, the government and monetary authorities should implement sound macroeconomic policies and can consider demographic factors as drivers, thus, farmers can register and stay on the scheme. The government must increase health infrastructure across the country especially the rural areas to promote improved health care service delivery to farm households enrolled on NHIS.
3. The agricultural sector launched the Ghana Agricultural Insurance Pool in 2011. The government can make policies that will improve agricultural insurance in this country. This can also improve farmers' investment level in agricultural input and will hence increase agricultural productivity and GDP.

REFERENCES

- Adhvaryu, A. R., & Beegle, K. (2012). The long-run impacts of adult deaths on older household members in Tanzania. *Economic development and cultural change*, 60(2), 245-277.
- Agyepong, I. A. & Adjei, S. (2008). Public social policy development and implementation: a case study of the Ghana National Health Insurance scheme. *Health Policy and Planning*, 23 (2), 150-160. <http://dx.doi.org/10.1093/heapol/czn002>
- Ahuja, R., & Jütting, J. (2004). Are the poor too poor to demand health insurance? *Journal of Microfinance/ESR Review*, 6(1), 2.
- Aikins, M. K. S. (1995). Cost-effectiveness analysis of insecticide-impregnated mosquito nets (bednets) used as a malaria control measure: a study from the Gambia (Doctoral dissertation, London School of Hygiene & Tropical Medicine).
- Aikins, M. (2003). Emerging Community Health Insurance Scheme/Mutual Health Organizations in Ghana—Achievement & Challenges. Accra: Sakva Company limited.
- Akazili, J. (2002). Costs to households of seeking malaria care in the Kassena-Nankana District of Northern Ghana. In *Third MIM Pan-African Conference on Malaria, Arusha, Tanzania* (pp. 17-22).
- Akazili, J., Aikins, M., & Binka, F. N. (2007). Malaria treatment in Northern Ghana: What is the treatment cost per case to households? *African Journal of Health Sciences*, 14(1), 70-79.
- "Analysis of farming systems". Food and Agriculture Organization. Retrieved 22 May 2013

- Antle, J. M., & Pingali, P. L. (1994). Pesticides, productivity, and farmer health: A Philippine case study. *American Journal of Agricultural Economics*, 76(3), 418-430.
- Arhinful, D. K. (2003). *The solidarity of self-interest: Social and cultural feasibility of rural health insurance in Ghana*. African Studies Centre, Leiden.
- Asenso-Okyere, K., Aragon, C., Thangata, P., & Mekonnen, D. A. (2010). HIV and AIDS and farm labor productivity: A review of recent evidence in Africa. *Journal of Development and Agricultural Economics*, 2(12), 406-415.
- Asenso-Okyere, K., Asante, F. A., Tarekegn, J., & Andam, K. S. (2011). A review of the economic impact of malaria in agricultural development. *Agricultural economics*, 42(3), 293-304.
- Asenso-Okyere, W. K., Osei-Akoto, I., Anum, A., & Appiah, E. N. (1997). Willingness to pay for health insurance in a developing economy. A pilot study of the informal sector of Ghana using contingent valuation. *Health policy*, 42(3), 223-237.
- Asfaw, A., & Braun, J. V. (2004). Is consumption insured against illness? Evidence on vulnerability of households to health shocks in rural Ethiopia. *Economic Development and Cultural Change*, 53(1), 115-129.
- Asher, C. J. (1987). Crop nutrition during the establishment phase: role of seed reserves [review]. [Workshop paper]. *Occasional Publication-Australian Institute of Agricultural Science (Australia)*.

- Asuming, P. O. (2013). Getting the Poor to Enroll in Health Insurance, and its effects on their health: Evidence from a Field Experiment in Ghana. *Job Market Paper–Columbia University*.
- Atim, C., Grey, S., Apoya P, et al. (2001). A survey of health financing schemes in Ghana. Bethesda, MD: *Partners for Health Reformplus*, Abt Associates Inc.
- Atim, C., Grey, S., and Apoya, P., (2003). *A Survey of Mutual Health Organizations in Ghana*. Bethesda, MD: Partners for Health Reformplus, Abt Associates Inc.
- Atim, C. & Sock, M. (2000). An External Evaluation of the Nkoranza Community Financing Health Insurance Scheme, Bethesda: *Partnerships for Health Reform*.
- Attanayake, N., Fox-Rushby, J., & Mills, A. (2000). Household costs of ‘malaria’ morbidity: A study in Matale district, Sri Lanka. *Tropical Medicine and International Health*, 5(9), 595–606
- Audibert, M., Brun, J. F., Mathonnat, J., & Henry, M. C. (2009). Malaria, production and income of the producers of coffee and cocoa: an analysis from survey data in Côte d’Ivoire. *Revue d’économie du développement*, 2(5), 107-126.
- Audibert, M., Mathonnat, J., & Henry, M. C. (2003). Malaria and property accumulation in rice production systems in the savannah zone of Cote d’Ivoire. *Tropical Medicine & International Health*, 8(5), 471-483.
- Ayansina A. D. V., Ogunshe A. A. O. & Fagade O. E. (2003). Environment impact Assessment

- and microbiologist: An overview. Proc. Of 11th annual national conf. of Environment and Behaviour Association of Nig. (EBAN), pp. 26-27.
- Ayitey, A., Nketiah-Amponsah, E., & Barimah, A. (2013). Determinants of Insurance Enrolment Among Ghanaian Adults: The Case of The National Health Insurance Scheme (Nhis). *Economics, Management & Financial Markets*, 8(3).
- Babu, B. V., Nayak, A. N., Dhal, A. S., Acharya, A. S., Jangid, P. K., & Mallick, G. (2002). The economic loss due to treatment costs and work loss to individuals with chronic lymphatic filariasis in rural communities of Orissa, India. *Acta Tropical*, 82, 31–38
- Baldwin, R. E., & Weisbrod, B. A. (1974). Disease and labor productivity. *Economic Development and Cultural Change*, 22(3), 414-435.
- Becker, S. O., & Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. *The stata journal*, 2(4), 358-377.
- Berg, A., Forman, M., & Pinstrip-Andersen, P. (1984). *International agricultural research and human nutrition*. International Food Policy Research Institute; UN Administrative Committee on Co-ordination, Sub-Committee on Nutrition.
- Berman, P., Kendall, C., & Bhattacharyya, K. (1994). The household production of health: integrating social science perspectives on micro-level health determinants. *Social Science and Medicine*, 38(2), 205-216.
- Bernal, N., Carpio, M., & Klein, T. J. (2015). The effects of access to health insurance for

informally employed individuals in Peru.

Besley, T., Hall, J., & Preston, I. (1999). The demand for private health insurance: do waiting lists matter? *Journal of public economics*, 72(2), 155-181.

Bhagat, R.M., Verma, T.S., 1991. Impact of rice straw management on soil physical properties and wheat yield. *Soil Sci.* 152, 108–115.

Bhat, R., & Jain, N. (2006). Factoring affecting the demand for health insurance in a micro insurance scheme.

Blanchet, N. J., Fink, G., & Osei-Akoto, I. (2012). The effect of Ghana's National Health Insurance Scheme on health care utilisation. *Ghana medical journal*, 46(2), 76-84.

Bloom, D., Canning, D., & Sevilla, J. (2002, June). Health, worker productivity, and economic growth. In *13th annual Health Economics Conference* (pp. 2-3).

Bloom, D. E., Canning, D., & Sevilla, J. (2004). The effect of health on economic growth: a production function approach. *World development*, 32(1), 1-13.

Böhme, L., Langer, U., & Böhme, F. (2005). Microbial biomass, enzyme activities and microbial community structure in two European long-term field experiments. *Agriculture, Ecosystems & Environment*, 109(1-2), 141-152.

Bouis, H. E. (2000). Improving human nutrition through agriculture: the role of international agricultural research. Conference summary and recommendations. *Food and Nutrition*

Bulletin, 21(4), 550-567.

Bourne, P. A., & Kerr-Campbell, M. D. (2010). Determinants of self-rated private health insurance coverage in Jamaica. *Health*, 2(06), 541.

Breuer, A., & Asiedu, E. (2017). Can gender-targeted employment interventions help enhance community participation? Evidence from urban Togo. *World Development*, 96, 390-407.

Brohult, J., Jorfeldt, L., Rombo, L., Björkman, A., Pehrson, P. O., Sirleaf, V., & Bengtsson, E. (1981). The working capacity of Liberian males: a comparison between urban and rural populations in relation to malaria. *Annals of Tropical Medicine & Parasitology*, 75(5), 487-494.

Burton, C. H., & Turner, C. (2003). *Manure management: Treatment strategies for sustainable agriculture*. Editions Quae.

Cantor, L. M. (1967). Irrigated agriculture in the Columbia basin project. *Geography*, 52(1), 67-72.

Carrin, G., Doetinchem, O., Kirigia, J., Mathauer, I., & Musango, L. (2008). Social health insurance: how feasible is its expansion in the African region? *Development Issues*, 10, 2.

Carrin, G., Waelkens, M. P., & Criel, B. (2005). Community-based health insurance in developing countries: a study of its contribution to the performance of health financing systems. *Tropical medicine & international health*, 10(8), 799-811.

Carrin, G., & World Health Organization. (2003). Régimes d'assurance-maladie communautaires dans les pays en développement: faits, problèmes et perspectives

CDC. (2013). *Agricultural safety. workplace safety & health topics*. Retrieved from: <http://www.cdc.gov/niosh/topics/aginjury/>

Chamberlin, J. (2007). Defining Smallholders Agriculture in Ghana: Who are smallholders, what do they do and how are they linked with markets?.

Chima, R. I., Goodman, C. A., & Mills, A. (2003). The economic impact of malaria in Africa: a critical review of the evidence. *Health policy*, 63(1), 17-36.

Churchill, C. F. (Ed.). (2006). *Protecting the poor: a microinsurance compendium* (Vol. 1). International Labour Organization.

Claeson, M., Griffin, T., Johnston, M., McLachlan, A., Soucat, A., Wagstaff, A., et al. (2001). Health, nutrition and population. In W. Bank (Ed.), *Poverty reduction strategy papers' sourcebook*. Washington: World Bank.

Cochran, W. G., & Chambers, S. P. (1965). The planning of observational studies of human populations. *Journal of the Royal Statistical Society. Series A (General)*, 128(2), 234-266.

Cole D. Occupational health hazards of agriculture. In: Hawkes, C., & Ruel, M. T. (2006). *Agriculture and nutrition linkages old lessons and new paradigms: understanding the links between agriculture and health* (No. 13 (4)). International Food Policy Research Institute (IFPRI). Pg. 8

Criel, B. (1998). *District-based Health insurance in sub-Saharan Africa. Part I: From theory to practice*. ITGPress.

Criel, B., & Kegels, G. (1997). A health insurance scheme for hospital care in Bwamanda district, Zaire: lessons and questions after 10 years of functioning. *Tropical medicine & international health*, 2(7), 654-672.

Croppenstedt, A., & Muller, C. (2000). The impact of farmers' health and nutritional status on their productivity and efficiency: evidence from Ethiopia. *Economic Development and Cultural Change*, 48(3), 475-502.

Damme, W. V., Leemput, L. V., Hardeman, W., & Meessen, B. (2004). Out-of-pocket health expenditure and debt in poor households: evidence from Cambodia. *Tropical Medicine & International Health*, 9(2), 273-280.

Davar, Y. P., & Gill, S. (2009). Antecedents of Households' Investment Decision-Making Process: A Study of the Indian Households. *South Asian Journal of Management*, 16(4).

Deaton, A., 1993. Intertemporal Choice and Inequality. The World Bank, Washington, DC.

Dehejia, R. H., & Wahba, S. (2002). Propensity score-matching methods for nonexperimental causal studies. *Review of Economics and statistics*, 84(1), 151-161.

Del Prado-Lu, J. L. (2007). Pesticide exposure, risk factors and health problems among cutflower

- farmers: a cross sectional study. *Journal of Occupational Medicine and Toxicology*, 2(1), 9.
- Deolalikar, A. B. (1988). Nutrition and labor productivity in agriculture: Estimates for rural South India. *The review of Economics and Statistics*, 406-413.
- Dercon, S., & Krishnan, P. (2000). In sickness and in health: Risk sharing within households in rural Ethiopia. *Journal of political Economy*, 108(4), 688-727.
- De Silva, M. J., Breuer, E., Lee, L., Asher, L., Chowdhary, N., Lund, C., & Patel, V. (2014). Theory of Change: a theory-driven approach to enhance the Medical Research Council's framework for complex interventions. *Trials*, 15(1), 267.
- Devlin, N., & Hansen, P. (2001). Health care spending and economic output: Granger causality. *Applied Economics Letters*, 8(8), 561-564.
- Dlova, M. R., Fraser, G. C. G., & Belete, A. (2004). Factors affecting the success of farmers in the Hertzog Agricultural Cooperative in the central Eastern Cape. *Fort Hare Papers*, 13, 21-33.
- Dossa, L. H., Abdulkadir, A., Amadou, H., Sangare, S., & Schlecht, E. (2011). Exploring the diversity of urban and peri-urban agricultural systems in Sudano-Sahelian West Africa: An attempt towards a regional typology. *Landscape and urban planning*, 102(3), 197-206.
- Dror, D. M., & Jacquier, C. (1999). Micro-insurance: Extending Health Insurance to the Excluded. *International social security review*, 52(1), 71-97.

- Dror, D. M., Radermacher, R., & Koren, R. (2007). Willingness to pay for health insurance among rural and poor persons: Field evidence from seven micro health insurance units in India. *Health policy*, 82(1), 12-27.
- Duku, S. K. O. (2018). Differences in the determinants of health insurance enrolment among working-age adults in two regions in Ghana. *BMC health services research*, 18(1), 384.
- Durairaj, V., Sinha, S. R., Evans, D. B., & Carrin, G. (2010). Shaping national health financing systems: can micro-banking contribute? *World Health Report*.
- Ekman, B. (2007). The Impact of Health Insurance on Outpatient Utilization and Expenditure: Evidence from one Middle-Income Country Using National Household Survey Data. *Health Research Policy and System*, 5:6. Retrieved January 25, 2008 from <http://www.health-policy-systems.com/content/5/1/6>
- Envuladu, E. A., Agbo, H. A., Lassa, S., Kigbu, J. H., & Zoakah, A. I. (2013). Factors determining the choice of a place of delivery among pregnant women in Russia village of Jos North, Nigeria: achieving the MDGs 4 and 5. *International Journal of Medicine and Biomedical Research*, 2(1), 23-27.
- Escobar, M. L., Griffin, C. C., & Shaw, R. P. (Eds.). (2011). *The impact of health insurance in low-and middle-income countries*. Brookings Institution Press.
- Ewusi, K. (1993). *Trends in the Ghanaian Economy, 1986-1988*

FAO, 1996. Towards sustainable food security: Women and sustainable food security.

<http://www.fao.org/sd/fsdirect/fbdirect/FSP001.htm>, accessed June 2008.

FAO, 1997. What is Gender? <http://www.fao.org/docrep/007/y5608e/y5608e01.htm>, accessed June 2008.

FAO (2005) Food security and agricultural development in Sub-Saharan Africa: *Building a case for more public support*. Rome.

FAO. (2013). The state of food and agriculture 2013: *Investing in agriculture for a better future*. Rome.

FAO, (2015). The state of food and agriculture 2015: *Social protection and agriculture; breaking the cycle of rural poverty*. Rome

Ferguson, J. M., Keys, R. D., McLaughlin, F. W., & Warren, J. M. (1991). Seed and seed quality. *AG-North Carolina Agricultural Extension Service, North Carolina State University (USA)*.

Friedman, J., & Thomas, D. (2008). Psychological health before, during, and after an economic crisis: Results from Indonesia, 1993–2000. *The World Bank Economic Review*, 23(1), 57-76.

Gajate-Garrido, G., & Ahiadeke, C. (2015). The effect of insurance enrollment on maternal and child health care utilization: *The case of Ghana* (Vol. 1495). Intl Food Policy Res Inst.

- GAO, 2008. International Food Security: Insufficient Efforts by Host Governments and Donors Threaten Progress to Halve Hunger in Sub-Saharan Africa by 2015. GAO-08-680. United States Government Accountability Office, Washington, DC.
- Gertler, P., & Gruber, J. (2002). Insuring consumption against illness. *American economic review*, 92(1), 51-70.
- Gertler, P. J., Martinez, S., Premand, P., Rawlings, L. B., & Vermeersch, C. M. (2016). *Impact evaluation in practice*. World Bank Publications.
- Gertler, P. & Van der Gaag, J. (1990) *The Willingness to Pay for Medical Care*. The World Bank, Baltimore: Johns Hopkins University Press.
- Ghana Health Service (2017). The Health Sector in Ghana: Facts and Figures.
- "Ghana: Geography Physical". *photius.com*. Retrieved 24 June 2013.
- "Ghana: Location and Size". *photius.com*. Retrieved 24 June 2013
- Ghana Statistical Service (GSS), Health Research Unit, Ministry of Health, and ORC Macro. 2003. *Ghana Service Provision Assessment Survey 2002*. Calverton, Maryland: Ghana Statistical Service and ORC Macro.
- Ghana Statistical Service (GSS) (2018). Provisional 2017 Annual Gross Domestic Product. Ghana Statistical Service.
- Gillespie Jr, G. W., & Johnson, S. E. (2010). Success in farm start-ups in the Northeastern United States (a). *Journal of Agriculture, Food Systems, and Community Development*, 1(1), 31.

Gillespie, S., & Kadiyala, S. (2005). *HIV/AIDS and food and nutrition security: From evidence to action* (Vol. 7). Intl Food Policy Res Inst.

Global Donor Platform for Rural Development, 2007. <http://www.donorplatform.org/content/blogsection/4/126>, accessed June 2008.

Gnawali, D. P., Pokhrel, S., Sié, A., Sanon, M., De Allegri, M., Souares, A., ... & Sauerborn, R. (2009). The effect of community-based health insurance on the utilization of modern health care services: evidence from Burkina Faso. *Health policy*, 90(2-3), 214-222.

Gobah, F. K., & Zhang, L. (2011). The National Health Insurance Scheme in Ghana: prospects and challenges: a cross-sectional evidence. *Global Journal of Health Science*, 3(2), 90.

Gollehon, N. R., Caswell, M., Ribaud, M., Kellogg, R. L., Lander, C., & Letson, D. (2001). *Confined animal production and manure nutrients* (No. 33763). United States Department of Agriculture, Economic Research Service

Goodman, C., Coleman, P., & Mills, A. (2000, May). Economic analysis of malaria control in sub-Saharan Africa. Geneva: Global Forum for Health Research.

Government of Ghana / SAPRI. (2001). Impact of Structural Adjustment Programme on availability and access to healthcare. *Draft*, April 2001.

Government of Ghana. (2003). *National Health Insurance Act, 2003* (Act 650). Accra.

Government of Ghana. (2004). *National Health Insurance Regulations, 2004* (L.I. 1809). Accra

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of*

Political economy, 80(2), 223-255.

Haggblade, S., Hazell, P. B., & Dorosh, P. A. (2007). Sectoral growth linkages between agriculture and the rural nonfarm economy. *Transforming the rural nonfarm economy: Opportunities and threats in the developing world*, 141-182.

Hawkes, C., & Ruel, M. T. (2006). *Agriculture and nutrition linkages old lessons and new paradigms: understanding the links between agriculture and health* (No. 13 (4)). International Food Policy Research Institute (IFPRI).

Hawkes, C., & Ruel, M. (2006). The links between agriculture and health: an intersectoral opportunity to improve the health and livelihoods of the poor. *Bulletin of the World Health Organization*, 84(12), 984-990.

Hayashi, F. (2000). *Econometrics*. 2000. Princeton University Press. Section, 1, 60-69

Heckman, J., LaLonde R. and Smith J. (1999). The Economics and Econometrics of Active Labor Market Programs," in *Handbook of Labor Economics Vol.III*, ed. by O. Ashenfelter, and D. Card, pp. 1865-2097. Elsevier, Amsterdam.

Holm, F. A., & Johnson, E. N. (2009). The history of herbicide use for weed management on the prairies. *Prairie Soils Crops*, 2, 1-11.

Hovorka, A., Zeeuw, H. D., & Njenga, M. (2009). *Women feeding cities: Mainstreaming gender in urban agriculture and food security*. Technical Centre for Agricultural and Rural

Cooperation.

Hsiao, W., Shaw, R., Fraker, A., Hanvoravongchai, P., Jowett, M., Pinto, D., & Ramachandra, S.

(2006). Social health insurance for developing nations. *WBI Development Studies, the World Bank, Washington DC.*

Ichino A., Mealli F. and Nannicini T. (2007). From Temporary Help Jobs to Permanent

Employment: What Can We Learn from Matching Estimators and their Sensitivity. *Journal of Applied Econometrics*, forthcoming.

Ichino A., Mealli F., and Nannicini T. (2008) From temporary help jobs to permanent employment:

What can we learn from matching estimators and their sensitivity? *Journal of Applied Econometrics*, 23: 305–327.

IFPRI, A. (1995). 2020 Vision for Food, Agriculture, and the Environment. *An International*

Initiative Sponsored by IFPRI.

ILO, 2000. Modeling the Impact of HIV/AIDS. International Labor Organization, Geneva.

ILO, (2015). ILO strategy toward universal access to health care.

IMF (2012). Ghana Shared Growth and Development Agenda: *Ghana Poverty Reduction Strategy*

Paper, 2010-2013. *Washington, D.C.*

Inwood, S. (2015). Opportunities for Extension: Linking health insurance and farm

viability. *Journal of Extension*, 53(3), 3FEA1.

- Inwood, S. M., & Clark, J. K. (2016). Farm adaptation at the rural-urban interface. *Journal of Agriculture, Food Systems, and Community Development*, 4(1), 61-78.
- Inwood, S., Clark, J. K., & Bean, M. (2013). The differing values of multigeneration and first-generation farmers: Their influence on the structure of agriculture at the rural-urban interface. *Rural Sociology*, 78(3), 346-370.
- Jackson, G., Raster, A., & Shattuck, W. (2016). An analysis of the impacts of health insurance rebate initiatives on community supported agriculture in Southern Wisconsin. *Journal of Agriculture, Food Systems, and Community Development*, 2(1), 287-296.
- Jacobs, R., & Goddard, M. (2000). Social health insurance systems in European countries. *The role of the insurer in the health care system: A comparative study of four European countries*, University of York.
- Jamal, R. Q. (2011). Herbicides Applications: Problems and Considerations, pp: 654–660.
- James, T. Y., Letcher, P. M., Longacre, J. E., Mozley-Standridge, S. E., Porter, D., Powell, M. J., ... & Vilgalys, R. (2006). A molecular phylogeny of the flagellated fungi (Chytridiomycota) and description of a new phylum (Blastocladiomycota). *Mycologia*, 98(6), 860-871.
- Jowett, M. (1999). Bucking the trend? Health care expenditures in low-income countries 1990–1995. *The International journal of health planning and management*, 14(4), 269-285.

- Jütting, J. (2001). The Impact of Health Insurance on the Access to Health Care and Financial Protection in Rural Areas of Developing Countries: The Example of Senegal. Retrieved 22 September 2007 from <http://www.zef.de>
- Jutting, J. (2001). Health Insurance for the Rural Poor? Community financing scheme in Senegal to protect against illness. *Development and Cooperation*, 6, 4-5.
- Jütting, J. (2002). *The Impact of Community-Based Health Financing on Financial Protection: Case Study Senegal*. HNP Discussion Paper, World Bank. Washington, D.C.: World Bank.
- Jutting, J. P. (2003). Do community-based Health Insurance Schemes Improve Poor People's Access to Health Care? Evidence from Rural Senegal. *World Development*, 32 (2), 273-288. <http://dx.doi.org/10.1016/j.worlddev.2003.10.001>
- Kataki, P., & Babu, S. C. (2002). *Food systems for improved human nutrition: linking agriculture, nutrition and productivity* (Vol. 6, No. 1-2). CRC Press.
- Kennedy, E. T. (1994). Agricultural commercialization, economic development, and nutrition.
- Kennedy, E. T., & Bouis, H. E. (1993). *Linkages between agriculture and nutrition: implications for policy and research*. Intl Food Policy Res Inst.
- Khaleel, R., Reddy, K.R., Overcash, M.R., 1981. Changes in soil physical properties due to organic waste application: a review. *J. Environ. Quality* 10, 133–141.
- Khandker, S. R., Koolwal, G. B., & Samad, H. A. (2009). *Handbook on impact evaluation:*

quantitative methods and practices. World Bank Publications.

Kirigia, J. M., Sambo, L. G., Nganda, B., Mwabu, G. M., Chatora, R., & Mwase, T. (2005).

Determinants of health insurance ownership among South African women. *BMC health services research*, 5(1), 17.

King, R. A. (1953). Some applications of activity analysis in agricultural economics. *Journal of Farm Economics*, 35(5), 823-833.

Kirkpatrick, D.L. (1998) *Evaluating Training Programs: The four levels*. San Francisco: Berrett-Koehler.

Lalonde, M. (1981). *New perspective on the health of Canadians a working document*. Minister of supply and services.

Lampietti, J., Poulos, C., Cropper, M. L., Mitiku, H., & Whittington, D. (1999). Gender and preferences for malaria prevention in Tigray, Ethiopia. *Policy Report on Gender and Development. World Bank Working Paper Series*.

Larochelle, C., & Dalton, T. (2005). Transient Health Shocks and Agricultural Labor Demand in Rice-producing Households in Mali.

Leighton, C., & Foster, R. (1993). Economic impacts of malaria in Kenya and Nigeria. Bethesda, Maryland: Abt Associates, Health Financing and Sustainability Project

Leuven, E., and Sianesi, B. (2003). PSMATCH2: Stata Module to Perform Full Mahalanobis and

Propensity Score Matching, Common Support Graphing, and Covariate Imbalance Testing,
version 4.0.6

Ligon, E., & Elisabeth S. (2007). “*Estimating the Effects of Aggregate Agricultural Growth on the Distribution of Expenditures.*” *Background paper prepared for the World Development Report 2008.*

Ling, T. (2012). Evaluating complex and unfolding interventions in real time. *Evaluation*, 18(1), 79-91.

Lipton, M., Kadt, E. D., & World Health Organization. (1988). Agriculture-health linkages.

Liu, K. (2016). Insuring against health shocks: Health insurance and household choices. *Journal of health economics*, 46, 16-32.

Mackenzie, M., O'donnell, C., Halliday, E., Sridharan, S., & Platt, S. (2010). Does health improvement programmes fit with MRC guidance on evaluating complex interventions? *BMJ: British Medical Journal (Online)*, 340.

McIntyre, D., Thiede, M., Dahlgren, G., & Whitehead, M. (2006). What are the economic consequences for households of illness and of paying for health care in low-and middle-income country contexts? *Social science & medicine*, 62(4), 858-865.

Makombe, G., Namara, R., Hagos, F., Awulachew, S. B., Ayana, M., & Bossio, D. (2011). *A comparative analysis of the technical efficiency of rain-fed and smallholder irrigation in*

Ethiopia (Vol. 143). IWMI.

Malaney, P., Spielman, A., & Sachs, J. (2004). The malaria gap. *The American journal of tropical medicine and hygiene*, 71(2_suppl), 141-146.

Mensah, J. (Ed.). (2006). *Understanding economic reforms in Africa: A tale of seven nations*. Basingstoke: Palgrave Macmillan.

Mensah, J. (2006). Insights into Structural Adjustment Programs (SAPs) and their Outcomes: Evidence from Ghana, 1983-2003. *Regional Development Studies*, 10, 99-127.

Mensah, J. (2008a) "World bank" In Philip O'Hare International *Encyclopedia of Public Policy-Governance in a global Age, Volume 1: Global Governance and development* (Perth: GPERU), pp 434-449).

Mensah, J. (2008b) "International Monetary Fund" In Philip O'Hare International *Encyclopedia of Public Policy-Governance in a global Age, Volume 1: Global Governance and development* (Perth: GPERU), pp 284-297).

Mensah, J. (2008c) "International Labour Organization" In Philip O'Hare International *Encyclopedia of Public Policy-Governance in a global Age, Volume 1: Global Governance and development* (Perth: GPERU), pp 434-449).

Mensah, J., & Oppong, J. R. (2007). Maternity protections and health insurance in Africa: comparative overview of Ghana, Kenya, Rwanda, and Tanzania. *External collaboration*

report for the Social Security Department of the International Labour Office. Geneva.

Mensah, J., Oppong, J. R., & Schmidt, C. M. (2010). Ghana's National Health Insurance Scheme in the Context of the Health MDGs: An Empirical Evaluation Using Propensity Score Matching. *Health Economics, 19*, 95-106.

Mihailovic, B., Cvijanovic, D., Milojevic, I., & Filipovic, M. (2014). The role of irrigation in development of agriculture in srem district1. *Ekonomika Poljoprivrede, 61*(4),989.

Mills, A. (1998). Operational research on the economics of insecticide-treated mosquito nets: lessons of experience. *Annals of tropical medicine and parasitology, 92*(4), 435-447.

Ministry of Health. (2004) National Health Insurance Policy Framework for Ghana.

Ministry of Health, Ghana. (2009). Independent Review: Health Sector Programme of Work 2008. *Draft*, April 2009, Accra.

Mishra, A. K., El-Osta, H. S., & Ahearn, M. C. (2012). Health care expenditures of self-employed farm households in the United States. *Agricultural Economics, 43*(1), 75-88.

Moock, J. L. (1973). Pragmatism and the primary school: the case of a non-rural village. *Africa, 43*(4), 302-316.

Mohsenian-Rad, A. H., Wong, V. W., Jatskevich, J., Schober, R., & Leon-Garcia, A. (2010). Autonomous demand-side management based on game-theoretic energy consumption scheduling for the future smart grid. *IEEE transactions on Smart Grid, 1*(3), 320-331.

Mundlak, Yair, "Agricultural Productivity and Economic Policies: Concepts and Measurements,"

OECD Working Paper No. 75, OECD Development Center, August 1992,

SourceOECD.org, 13 July 2007

Murwira, K. H., Swift, M. J., & Frost, P. G. H. (1995). Manure as a key resource in sustainable agriculture. In *International Conference on Livestock and Sustainable Nutrient Cycling in Mixed Farming Systems of Sub-Saharan Africa, Addis Ababa (Ethiopia), 22-26 Nov 1993*. ILCA.

Musau, S. N. (1999). Community-based health insurance: experiences and lessons learned from East Africa.

Muurinen, J. M. (1982). Demand for health: a generalized Grossman model. *Journal of Health economics*, 1(1), 5-28.

Mwabu, G. (2008). *Achieving Health Millennium Development Goal (MDGs) in Africa: The role of national health Insurance schemes*. Economic Commission from Africa: ACGS/MPAMS Discussion Paper No.2 Addis Ababa, Ethiopia.

Mwaniki, A. (2006). Achieving food security in Africa: Challenges and issues. *UN Office of the Special Advisor on Africa (OSAA)* <http://www.un.org/africa/osaa/reports/Achieving%20Food%20Security%20in%20Africa-Challenges%20and%20Issues.pdf> (Last accessed on May 9, 2010).

- Mwaura, J. W., & Pongpanich, S. (2012). Access to health care: the role of a community-based health insurance in Kenya. *Pan African Medical Journal*, 12(1).
- Nahar, S., & Costello, A. (1998). The hidden cost of ‘free’ maternity care in Dhaka, Bangladesh. *Health Policy and Planning*, 13(4), 417–422.
- Nannicini T. (2007). Simulation-based sensitivity analysis for matching estimators. *Stata Journal* 7(3): 334–350.
- National Health Insurance Authority. (NHIA). (2008). Providing Free Maternal and Neonatal Health care through NHIS. *NHIA Presentation at Health summit*, November 2008. Accra.
- National Health Insurance Authority. (NHIA). (2009). Status of NHIS and New Strategic Direction. *NHIA Presentation at Health summit*, November 2009, GIMPA, Accra.
- National Health Insurance Authority. (2010). Financial implications to achieving the MDGs: How to Meet the Costs, *NHIA Presentation at Health Summit*, November, 2010, Accra.
- National Health Insurance Authority. (2010). National Health Insurance Scheme, Annual Report 2009. Accra.
- National Health Insurance Authority. (2013). National Health Insurance Scheme, Annual Report 2013. Accra.
- NEPAD (2003) Comprehensive Africa Agricultural Development Programme, Pretoria: NEPAD
- Nguyen, H. T., Rajkotia, Y., & Wang, H. (2011). The financial protection effect of Ghana National

- Health Insurance Scheme: evidence from a study in two rural districts. *International Journal for Equity in Health*, 10(1), 4.
- Nketiah-Amponsah, E. (2009). Demand for health insurance among women in Ghana: cross-sectional evidence.
- Occupational Safety and Health Administration (OSHA), 2013. Agricultural Operations. Safety and Health Topics. Retrieved March 10, 2014. <https://www.osha.gov/dsg/topics/agriculturaloperations/index.html>.
- O'Donnell, O. (1995). Labour supply and saving decisions with uncertainty over sickness. *Journal of health economics*, 14(4), 491-504.
- OIT: Protéger les plus démunis, Guide de la micro-assurance. Compendium de Micro-Assurance Genève: Organisation International du Travail; 2009.
- Onwujekwe, O., Chima, R., & Okonkwo, P. (2000). Economic burden of malaria illness on households versus that of all other illness episodes: A study in five malaria holo-endemic Nigerian communities. *Health Policy*, 54, 143–159.
- Oppong, J. R. (1983). Structural adjustment and the health care system. *IMF and World Bank sponsored structural adjustment programs in Africa: Ghana's experience, 1999*, 357-370.
- Osei-Akoto, I. (2003). Demand for voluntary health insurance by the poor in developing countries:

Evidence from rural Ghana. Center for Development Research (ZEF). University of Bonn, Germany.

Osei-Akoto, I., & Adamba, C. (2011, June). Ethnic and Religious Diversity as Determinants of Health Insurance Uptake in Ghana. In *Fourth European Conference for African Studies (ECAS 4)* (pp. 15-18).

Osei-Akoto, I., Adamba, C., & Osei, R. (2013). The effect of health shocks on agricultural productivity: Evidence from Ghana.

Oshaug A, Haddad L. (2002.) *Nutrition and agriculture. A foundation for development*. Geneva: United Nations Administrative Committee on Coordination Nutrition/ Standing Committee on Nutrition.

Paloma, I. B. (2011). Pesticide Exposure of Farmworkers' Children, Pesticides in the Modern World - Effects of Pesticides Exposure, Dr. Margarita Stoytcheva (Ed.), ISBN: 978-953-307-454-2, InTech, DOI: 10.5772/21878. Available from:
<http://www.intechopen.com/books/pesticides-inthe-modern-world-effects-of-pesticides-exposure/pesticide-exposure-of-farmworkers-children>

Pinstrup-Andersen, P. (1981). *Nutritional consequences of agricultural projects: conceptual relationships and assessment approaches*. Washington DC: World Bank.

Prescott, N. (1999). Coping with catastrophic health shocks. Conference on social protection and

- poverty. Washington, DC: Inter-American Development Bank.
- Probert, M. E., Okalebo, J. R., & Jones, R. K. (1995). The use of manure on smallholders' farms in semi-arid eastern Kenya. *Experimental Agriculture*, 31(3), 371-381.
- Ramachandra, S., & Hsiao, W. C. (2007). Ghana: initiating social health insurance. *Social health insurance for developing nations*, 434, 61.
- Ranson, M. K. (2002). Reduction of catastrophic health care expenditures by a community-based health insurance scheme in Gujarat, India: Current experiences and challenges. *Bulletin of the World Health Organization*, 80(8), 613–621.
- Ravallion, M., Shaohua C. & Prem S. 2007. “New Evidence on the Urbanization of Global Poverty.” Background paper prepared for the World Development Report 2008.
- Rengel, Z., & Graham, R. D. (1995). Importance of seed Zn content for wheat growth on Zn-deficient soil. *Plant and Soil*, 173(2), 259-266.
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.
- Rosenbaum, P. R. and Rubin, D. B. (1985). The bias due to incomplete matching. *Biometrics* 41, 103–116.
- Rosenbaum, P. R. (2002). *Observational Studies*, 2nd Edition. Springer Verlag, New York, NY.
- Rubin, D. B. and Thomas, N. (2000). Combining propensity score matching with additional

- adjustments for prognostic covariates. *Journal of the American Statistical Association* 95, 573–585.
- Russell, S. (2001). Can households afford to be ill? The role of the health system, material resources and social networks in Sri Lanka. Ph.D. Thesis, Health Policy Unit Department of Public Health and Policy: London School of Hygiene and Tropical Medicine
- Russell, S. (2003). The economic burden of illness for households. *National Institutes for Health, Disease Control Priorities Project (DCPP), Bethesda, Md., DCPP Working Paper, 15.*
- Russell, S. (2004). The economic burden of illness for households in developing countries: A review of studies focusing on malaria, tuberculosis and human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome. *American Journal of Tropical Medicine and Hygiene*, 7(Suppl. 2), 147–155.
- Russell, S., & Gilson, L. (1997). User fee policies to promote health service access for the poor: a wolf in sheep's clothing? *International Journal of Health Services*, 27(2), 359-379.
- Sabi, W. (2005). Ghana National Health Insurance Scheme. *Unpublished MA Thesis, Department of Public Health, University of Cape Town, South Africa.*
- Sachs, J., & Malaney, P. (2002). The economic and social burden of malaria. *Nature*, 415(6872), 680.
- Saito, K. A., & Weidemann, C. J. (1990). *Agricultural extension for women farmers in Africa* (No.

103). World Bank Publications.

Sauerborn, R., Adams, A., & Hien, M. (1996). Household strategies to cope with the economic costs of illness. *Social science & medicine*, 43(3), 291-301.

Sauerborn, R., Nougara, A., Hien, M., & Diesfeld, H. J. (1996). Seasonal variations of household costs of illness in Burkina Faso. *Social Science and Medicine*, 43(3), 281–290.

Savage, E., & Wright, D. (2001). *Health insurance and health care utilization: Theory and evidence from Australia 1989-90*. CHERE.

Savedoff, W. D., & Gottret, P. E. (Eds.). (2008). *Governing mandatory health insurance: learning from experience*. World Bank Publications

Schultz, T. P., & Tansel, A. (1997). Wage and labor supply effects of illness in Cote d'Ivoire and Ghana: Instrumental variable estimates for days disabled. *Journal of development economics*, 53(2), 251-286.

Scott, C. A., Faruqui, N. I., & Raschid-Sally, L. (Eds.). (2004). *Wastewater use in irrigated agriculture: Confronting the livelihood and environmental realities*. CABI.

Schneider, P., & Diop, F. P. (2001). *Impact of prepayment pilot on health care utilization and financing in Rwanda: findings from final household survey*. Partners for Health Reformplus, Abt Associates.

Sekyi, S., & Domanban, P. B. (2012). The effects of health insurance on outpatient utilization and

- healthcare expenditure in Ghana. *International Journal of Humanities and Social Science*, 2(10), 40-49.
- Sianesi, B. (2004). An evaluation of the Swedish system of active labor market programs in the 1990s. *Review of Economics and Statistics*, 86(1), 133-155.
- Singh, I., Squire, L., & Strauss, J. (1986). A survey of agricultural household models: Recent findings and policy implications. *The World Bank Economic Review*, 1(1), 149-179.
- Singleton, J. L. (2006). *Negotiating Change: an Analysis of the Origins of Ghana's National Health Insurance Act*. Department of Sociology, Macalester College.
- Slater, R., & Wiggins, S. L. (2005). *Responding to HIV/AIDS in agriculture and related activities*. London: Overseas Development Institute.
- Smith, J. A., & Todd, P. E. (2005). Does matching overcome LaLonde's critique of nonexperimental estimators? *Journal of econometrics*, 125(1-2), 305-353.
- Sredojević, Z., Gajić, B., & Živković, D. (2006). *Ekonomski parametri optimalne strukture proizvodnje u uslovima navodnjavanja*.
- Strauss, J. (1986). Does better nutrition raise farm productivity? *Journal of political economy*, 94(2), 297-320.
- Sulzbach, S. (2008). Evaluating the Impact of National Health Insurance in Ghana. *Accra: Health Systems*, 20, 20.

- Sulzbach, S., Garshong, B., & Owusu-Banahene, G. (2005). Effects of the National Health Insurance Act in Ghana: Baseline Report, Bethesda, M. D. Partners for Health Reformplus, Abt Associates Inc.
- Terza, J. V., Basu, A., & Rathouz, P. J. (2008). Two-stage residual inclusion estimation: addressing endogeneity in health econometric modeling. *Journal of health economics*, 27(3), 531-543.
- Timmer, P. (2005). Agriculture and pro-poor growth: an Asian perspective.
- Townsend, R. M. (1995). Consumption insurance: An evaluation of risk-bearing systems in low-income economies. *The Journal of Economic Perspectives*, 9(3), 83-102.
- Unnevehr, L. (Ed.). (2003). *Food safety in food security and food trade* (Vol. 10). Washington, DC: International Food Policy Research Institute.
- US Dept. of Labor. (2010). *National agriculture workers survey*. Retrieved from: <http://www.doleta.gov/agworker/naws.cfm>
- Vandemoortele, J., Broun, D. D & Knippenberg, R., (1997). Epilogue. International WHO, UNICEF and UNFPA. Geneva: World Health Organization.
- Van Doorslaer, E., O'Donnell, O., Rannan-Eliya, R. P., Somanathan, A., Adhikari, S. R., Garg, C. C., ... & Karan, A. (2006). Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data. *The lancet*, 368(9544), 1357-1364.

- Venkatesh, P., & Nithyashree, M. L. (2014). Institutional Changes in Delivery of Agricultural Inputs and Services to Farm Households in India. *Agricultural Economics Research Review*, 27(2014).
- Wagstaff, A. (2007). Health insurance for the poor: initial impacts of Vietnam's health care fund for the poor. *World Bank Policy Research Working Paper*, (4134).
- Wagstaff, A., & Pradhan, M. P. (2005). Health insurance impacts on health and nonmedical consumption in a developing country.
- Walker, P., Rhubart-Berg, P., McKenzie, S., Kelling, K., & Lawrence, R. S. (2005). Public health implications of meat production and consumption. *Public health nutrition*, 8(4), 348-356.
- Wang, H., Yip, W., Zhang, L., Wang, L., & Hsiao, W. (2005). Community-based health insurance in poor rural China: the distribution of net benefits. *Health policy and planning*, 20(6), 366-374.
- Wang, H., Zhang, L., & Hsiao, W. (2006). Ill health and its potential influence on household consumptions in rural China. *Health Policy*, 78(2), 167-177.
- Weisbrod, B. A., & Helminiak, T. W. (1977). Parasitic diseases and agricultural labor productivity. *Economic development and cultural change*, 25(3), 505-522.
- Welch, R. M. (1999). Importance of seed mineral nutrient reserves in crop growth and development. *Mineral nutrition of crops: fundamental mechanisms and implications. Food*

Products Press, New York, 205-226.

Whitehead, M., Dahlgren, G., & Evans, T. (2001). Equity and health sector reforms: can low-income countries escape the medical poverty trap?. *The Lancet*, 358(9284), 833-836.

Witter, S. & Garshong, B. (2009). Something old or something new? Social health insurance in Ghana. *BMC International Health and Human Rights*, 9, 20. [Online] Available:

<http://www.biomedcentral.com/1472-698X/9/20>.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.

World Bank (1993) *World Development Report*, New York: Oxford University Press.

World Bank, (2007). Agriculture and development. *World Development Report 2008*. The World Bank, Washington, DC.

World Bank, (2017). <https://data.worldbank.org/country/Ghana>

World Health Organization. (1999). *The world health report: making a difference*. Geneva: World Health Organization.

World Health Organization. (2000). *The World Health Report 2000*. Health systems: Improving performance. World Health Organization, Geneva.

World Health Organization. (2002). *Improving health outcomes of the poor: the report of Working Group 5 of the Commission on Macroeconomics and Health*.

World Health Organization. (2002). *The world health report 2002: reducing risks, promoting*

healthy life. World Health Organization.

World Health Organisation. (2005). *World Health Report 2005*. World Health Organisation, Geneva,

World Health Organization. (2007). *Everybody business: strengthening health systems to improve health outcomes*. WHO's framework for action.

World Health Organization (2018). *Health Financing for Universal Coverage: What is Voluntary Insurance?*

World Health Organization, & Research for International Tobacco Control. (2008). *WHO report on the global tobacco epidemic, 2008: the MPOWER package*. World Health Organization.

Xu, K., Evans, D., Carrin, G., Aguilar-Rivera, A. M., Musgrove, P., & Evans, T. (2007). Protecting households from catastrophic health spending. *Health Affairs (Millwood)*, 26, 972-983.

<http://dx.doi.org/10.1377/hlthaff.26.4.972>

Wyss G. S., & Muller-Scharer, H. (2001). Effects of selected herbicides on the germination and infection process of *Puccinialagenophora*, a biocontrol pathogen of *Senecio vulgaris*.

Biological Control, 20, 160-166

Xu, K., Evans, D. B., Kawabata, K., Zeramdini, R., Klavus, J., & Murray, C. J. (2003). Household catastrophic health expenditure: a multicounty analysis. *The lancet*, 362(9378), 111-117.

Yudkin, J. S. (1999). Tanzania: still optimistic after all these years? *The Lancet*, 353(9163), 1519-1521.

Zeza, A., & Tasciotti, L. (2010). Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. *Food policy*, 35(4), 265-273.

Appendix

Appendix 1

OLS Estimation of The Impact of NHIS on Hired Labour.

Dependent variable: Hired Labour (HLabour)			
Variables	Coefficient	S. E	P> t
NHIS	0.295***	0.080	0.000
Age	-0.004*	0.0021	0.083

Male	0.390***	0.108	0.000
Farm Size	0.029***	0.005	0.000
Household Size	0.056	0.052	0.282
Marital Status	0.111	0.095	0.242
Educational Level	-0.081**	0.035	0.021
Household Income	0.166***	0.033	0.000
Household Expenditure	0.432***	0.061	0.000
Constant	-0.734	0.497	0.140
R-Squared	0.2352		
Prob> F	0.000		

*** p<0.01, ** p<0.05, * p<0.1 Source: Authors Estimation using Stata 15

Appendix 2. Treatment Effect of NHIS on Some Agricultural Inputs (using psmatch)

Treatment effect of NHIS on Fertilizer

Variable	Sample	Treated	Control	Difference	Std Error	T-stats
Fertilizer	Unmatched	5.315	4.998	0.317	0.086	3.67
	ATT	5.299	4.953	0.347	0.143	2.43

Source: Author's Estimation using stata 15

Treatment Effect of NHIS on Irrigation

Variable	Sample	Treated	Control	Difference	Std Error	T-stats
Irrigation	Unmatched	5.27	5.098	0.172	0.0847	2.03
	ATT	5.266	5.124	0.141	0.150	0.94

Source: Author's Estimation using stata 15

Treatment Effect of NHIS on Chemicals Used (herbicides, pesticides, insecticides)

Variable	Sample	Treated	Control	Difference	Std Error	T-stats
Chemicals Used	Unmatched	5.184	4.977	0.207	0.056	3.72
	ATT	5.180	4.999	0.181	0.110	1.64

Source: Author's Estimation using stata 15

Treatment effect of NHIS on Purchased Seedlings

Variable	Sample	Treated	Control	Difference	Std Error	T-stats
Purchased Seedlings	Unmatched	5.331	5.067	0.264	0.085	3.10
	ATT	5.37	5.175	0.142	0.142	1.00

Source: Author's Estimation using stata 15

