UNIVERSITY OF GHANA, LEGON

DEPARTMENT OF ECONOMICS

THE EEFECT OF HOUSEHOLD WASTE DISPOSAL ON HOUSEHOLD HEALTH EXPENDITURE IN GHANA

BY

WISDOM WISSI

(10469289)

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DECLARATION

This is to certify that this thesis is the result of a research undertaken by Wisdom Wissi, under the supervision of Prof. Daniel K. Twerefou and Prof. Edward Nketiah-Amponsah, towards the award of a Master of Philosophy (MPhil) Degree in Economics at the Department of Economics, University of Ghana. I hereby declare that apart from the references made to other studies, which I have duly acknowledged, this thesis is entirely my own work under the guidance of my supervisors and has not been presented in part or whole for another degree elsewhere.

29th September, 2020

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WISDOM WISSI DATE

(10469289)

8th October, 2020

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PROF. DANIEL K. TWEREFOU DATE

(SUPERVISOR)

30th September, 2020

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PROF. EDWARD NKETIAH-AMPONSAH DATE

(SUPERVISOR)

ABSTRACT

Improper disposal of household waste induces diseases such as malaria, diarrhoea, cholera, typhoid among others which have consequences on healthcare expenditure in a developing country like Ghana. This study investigated the effect of household waste disposal on household health expenditure in Ghana and as well examined the socio-economic and demographic factors that influence healthcare expenditure among Ghanaian households.

The study employed the Tobit estimation technique and data from the 7th Round of the Ghana Living Standards Survey conducted in 2016/2017 for all analysis. Our findings showed that relative to households that properly collect their refuse (solid waste) for final disposal by the local/district/waste management authority, households disposing off their refuse via burning, indiscriminate dumping and public dumping are more likely to spend on healthcare services. The findings also revealed that households with no toilet facility, households using pit latrine, KVIP and public toilet are more likely to spend on healthcare services compared to households using water closet. The study identified household income, age of the household head, household head's years of education, household head's illness reporting, hospitalisation of household head and gender of household head as significant factors predicting or influencing household health expenditures in Ghana.

Based on the findings, the study recommends policy options be geared at providing and improving waste disposal and management facilities in households and communities alike via strong government and private collaboration, as well as implementing a more sustainable pro-poor and pro-aged healthcare financing policies, educational and awareness programmes on good health practices. Also, environmental health and sanitation policies such as the National Building Regulations 1996 (LI 1630) among others must be revisited and implemented.

DEDICATION

I dedicate this work to the Almighty God, my family, and all households in Ghana.

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1. CHAPTER ONE

INTRODUCTION

1.1. Background

Globally, the issue of improper waste disposal and its health implications have become a major problem facing the world, especially the developing economies (Ziraba et al., 2016). World Bank (2019a) reported that about 2.01 billion tonnes of waste was generated in 2016 worldwide, translating into 0.74kg of waste generated on average per person per day. This figure is expected to rise to 3.40 billion tonnes per day of waste generation by the year 2050 due to rapid population growth and urbanisation, without commensurate housing and waste disposal access provision (World Bank, 2019b). With poor solid and liquid waste disposal practices in especially the developing countries as compared to developed countries that have proper and well-functioning waste management and sanitation facilities and services (Montgomery & Elimelech, 2007), Africa and for that matter, Ghana faces many challenges particularly with respect to health. This is evident in the World Health Organisation's 2020 World Health Statistics Report, which indicated that whiles about 93-99 percent of populations in the industrialised world have access to improved sanitation, only 33-45 percent of populations in the developing worlds (particularly Africa and South-East Asia) live in improved sanitary conditions such as proper solid waste disposal and improved toilet facilities.

It has been noted that the fast pace of urbanisation and rural-urban migration, in the face of rapid population growth without corresponding public policies on waste management and facility provision, is responsible for the indiscriminate waste disposal in developing countries such as Ghana (Auler et al., 2014). This phenomenon leads to the outbreak of waste-related diseases (such as cholera, diarrhoea and malaria), soil and water pollution, environmental degradation and global

warming, all of which have adverse effects on human health and life (Sankoh et al., 2013; WHO, 2012). Improper solid and liquid waste disposal and poor sanitary conditions have been attributed to inadequate and poor waste management infrastructure and facilities in the developing worlds, including Ghana (Boadi & Kuitunen, 2005). It is estimated that about 37 percent (roughly 2.6 billion people) of the world's population still live under poor sanitary conditions (Mara et al., 2010; WHO, 2015). These conditions have created worrying situations such as emergence and spread of diseases such as malaria, diarrhoea, cholera among others that affect human life (World Bank, 2019a).

The rapid growth of Africa's populations, its transformation in towns, cities and villages coupled with weak institutional capacities and inadequate human and capital resources have resulted in poor waste management and waste management practices (WHO, 2012). Diseases such as cholera, malaria, diarrhea among others, which have been endemic in developing countries such as Ghana, have led to many deaths and continue to kill many. These diseases have been identified to have resulted from poor waste management and sanitation in the households (WHO, 2014).

The form of improper waste disposal (both solid and liquid waste) has varying health implications for residents in a household. Improper waste disposal causes diseases that threaten human health and well-being. This is therefore a major concern to bodies such as the United Nations, UNICEF, WHO, among others. It is believed that, in Africa, poor waste disposal conditions are severe, where about 65 percent of the population (790 million people) poorly dispose of waste, resulting in deaths from cholera, malaria and diarrheal diseases that are higher than any other region of the world (Godfrey et al., 2019; Montgomery and Elimelech, 2007, World Bank, 2019a).

The UN, as part of its Millennium Development Goals, set out a target (Target 7B) to halve by the year 2015, the proportion or percentage of the world's population living without access to sustainable drinking water and basic sanitation (United Nations, 2000). As of 2012, the progress on drinking water and sanitation update report by the United Nations indicated that only 63 percent of the global population use improved sanitation services, with over 35 percent still living in poor sanitation. It is obvious that many countries, especially in the sub-Sahara African and Asian regions, were off-track in achieving the MDG sanitation target (UNICEF/WHO, 2012). It can therefore be established that majority of the people in developing countries risk being exposed to poor solid and liquid waste -disposal related diseases, with city slum dwellers being the most affected (WHO, 2015). Poor waste disposal consequences are most endemic in sub-Sahara Africa, where about 67% of the population live in poor sanitation, resulting in diseases such as malaria, diarrhoea, cholera among others and their associated mortalities (WHO, 2015).

To further deepen its commitment and readiness to bring global attention and resources to the issue of ensuring proper waste disposal and sanitation for all, the UN, again, in Goal 6 of the Sustainable Development Goals, sought to ensure availability and sustainable management of water and sanitation for all people on earth by the year 2030. Whiles all the 17 goals are interconnected, proper waste disposal and sanitation connects more to most of the goals including goals 1 (attaining no/eliminating poverty), 3 (good health), 4 (quality education) and 5 (gender equality). Goal 6.2 specifically seeks to achieve by 2030, adequate and equitable sanitation and hygiene for all and end open defecation, with special attention to the needs of women and girls and those in vulnerable situation (UNDP, 2015). Improper disposal of waste degenerates into adverse sanitary conditions which lead to illnesses and their associated health expenditures. It is estimated that about 35

percent of waste-related problems in the Sub-Saharan African (SSA) region comes from households' improper waste disposal (WHO, 2015).

On average, it is estimated that the African continent produces about 108 million tonnes of waste annually, out of which only 10 percent is collected and recycled (National Waste Information Baseline Report, 2013). Of this volume of waste, 62 million tonnes is generated in the SSA region, spanning between 0.09 to 3.0 kg (with an average of 0.65 kg) per person per day. This is evident in the UNICEF and WHO reports of worst performing countries in the world regarding improper waste management practices. Statistics available indicates that Ghana, on average, generates about 0.5kg/person/day of waste (Miezah et al., 2015; World Bank, 2006), which translates into about 13,521 tonnes and 14,807 tonnes of waste generated daily using the 2015 and 2018 population figures of 27,043,093 and 29,614,337 respectively. Whiles Ghana's population has been rapidly growing (from 14.8million in 1990 to over 19.3 million in 2000 and further to 24.7 million in 2010, with 2018's projections of 29.6 million) (Ghana Statistical Service, 2000; GSS, 2013; GSS 2019), provision of proper waste disposal access for households has been poor (World Bank, 2006).

It is evident that less than one-third of waste generated in Ghana is collected and properly disposed of, with the remaining left in the open, burnt or dumped into drains or gutters, all of which come to cause diseases to households. (World Bank, 2007). The 2017 Joint Monitoring Programme Report of the WHO/UNICEF shows that only 14 percent of Ghana's population have access to proper solid and liquid waste disposal facilities. It is reported that only between 10 percent-30 percent of Ghanaian households have toilet facilities/latrines and that about 4.5 million people have no access to latrines and therefore defecate in open areas (WHO/UNICEF, 2017). Adubofour et al. (2013) contended that inadequate solid and liquid waste disposal facilities and improper

waste management practices is the principal cause of the outbreak and spread of diseases in Ghana such as diarrhoea, cholera and malaria.

According to WHO (2015) and WHO (2014), cholera is the most reported infectious disease in Africa (31 percent), far ahead of Ebola (13 percent) which became so epidemic in the region between 2013/2014. For instance, it was revealed that in 2014, the region reported 101,987 cholera cases and 1,881 fatalities, of which 243 fatalities occurred in Ghana (Mireku-Gyimah et al., 2018). Some of the most common waste-related diseases that have affected many and resulted in several deaths in Ghana are diarrhea, cholera, and malaria. According to the 2006 GCEA Report, about 56 percent of all reported diseases were related to poor waste disposal and management practices. The form of refuse and liquid waste disposal by a Ghanaian household has consequences on the occurrence or prevalence of waste-related diseases. This may directly or indirectly affect household health expenditures.

1.2. Problem Statement

Environmental and human health is one of the most important conditions for human growth and development, both at the household and national levels. Good health positively impacts education, productivity, life expectancy and economic growth (Grossman, 1972; Mankiw et al., 1992; Xu et al., 2003). Health is in part affected by environmental and household waste disposal and sanitation practices (Abdul, 2010; Grossman, 1972; Wagstaff, 1986). Health and proper waste-management have been of primary concern to governments and agencies such as the World Bank, the United Nations, the World Organisation, African Union, African Development Bank, among others, all the world over, including Ghana (WHO, 2012; WHO, 2015).

In Ghana, efforts by successive governments to promote proper waste disposal practices under various programmes and policies through the Ministry of Local Government and Rural Development, Ministry of Sanitation, Ministry of Works and Housing, Ministry of Finance, Ministry of Health, Ministry of Education, Ministry of Environment, Science and Technology, Community Water and Sanitations Agency, Metropolitan, Municipal and District Assemblies, local and traditional authorities among others have not yielded significant results (Adzawla et al., 2019). On a whole, Ghana is estimated to generate over 13,521 and 14,807 tonnes of waste per day (Miezah et al., 2015; World Bank, 2007). According to the 2018 Policy Brief on Smart Enforcement of Sanitation By-Laws in Ghana, sanitation provision in Ghana is mandated by many policies and laws, but poor implementation remains a great challenge (Urban Sanitation Research Initiative Ghana, 2018). Even though some studies have found that ensuring proper waste disposal and improved sanitation is one of the least expensive means of improving household and public health (Montgomery & Elimelech, 2007; Water and Sanitation Program Africa, 2012), it is reported that only 14% of Ghana's population and households have access to some basic waste disposal and sanitation facilities(WHO/UNICEF, 2017).

Numerous studies have found that poor and improper household waste disposal have health implications (Addo & Acheampong, 2015; Amfo-Otu et al., 2012; Awunyo-Vitor et al., 2013; Boadi & Kuitunen, 2005; Montgomery & Elimelech, 2007; Oteng-Ababio et al., 2013; Siqueira et al., 2017; Whittington et al., 1991). Montgomery & Elimelech, (2007) noted that poor household waste disposal does not only bring about diseases and their associated health expenditures, but it also limits the socio-economic development of households through lost wages/incomes arising from lost economic activities due the sick days and the effect that sick days have on education among other activities , particularly in developing countries such as Ghana.

Findings indicated that improper waste disposal and management accounts for about 10 percent of the global burden of diseases (WHO/UNICEF, 2004; World Bank, 2012). Substantial evidence exists to confirm that improper waste practices are pathways of exposure to diseases that affect human health. World Bank (2013) reported poor waste disposal practices as one of three factors (the other two being poor water sources and hygiene) that globally account for about 700,000 premature deaths yearly, of which malaria ranks high. Statistics from the 2018 National Malaria Control Programme of Ghana indicates that the country witnessed about 2.3 million malaria cases (one causes of which is poor waste disposal) in 2017 alone, making malaria the most reported outpatient cases (Tetteh et al., 2018). Malaria forms about 40 percent of all outpatient cases, 36 percent of hospital admissions and constitute about 13 percent of all deaths–25 percent of child mortality and 9.4 percent deaths of pregnant women (Amoatey et al., 2008). This means, that an average of 6,301 cases were reported daily, representing a 1.18 percentage-points increase over the 2016 cases of 2.2 million and resulted in over 143 deaths, of which 74 occurred among children. This phenomenon has been attributed to poor household waste disposal practices such as improper disposal of refuse–creating breeding grounds for mosquitoes, the transmitting vector of the disease (De & Debnath, 2016; Suleman et al., 2015; United Nations Human Settlement Programme, 2010). Anyorikeya et al. (2016) found that in 2011, Ghana recorded about 113,786 diarrhoea cases. Tetteh et al. (2018) revealed that about 17,740 diarrhoea cases were reported in the Jasikan District of Ghana between 2012 and 2016.

Ahmed et al. (2020), Esrey et al. (1991) and Rego et al. (2005) pointed out that the incidence, prevalence, and severity of diarrhoea and other waste-related diseases reduced significantly among households that dispose off waste properly. Also, in a meta-analysis of the effect of water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries, Fewtrell &

Colford (2005), found that households' access to improved sanitation and proper form of waste disposal substantially led to a 32-percent reduction in diarrheal diseases among households. With these enormous pieces of evidence, it can therefore be established that poor household disposal of solid and liquid wastes adversely affects household health and, for that matter, the amount of healthcare expenditures.

In an attempt to maintain good health and reduce mortality, households spend substantial portions of their income to seek treatment to waste-related diseases, a situation which could result in catastrophic health expenditures, particularly in Africa, where the annual national budget per capita health allocation is as low as $135 (WHO, 2014). This, coupled with long distances to health facilities to access healthcare and the self-incurred cost of drugs in some circumstances means increased healthcare expenditures due to waste-related diseases, resulting from poor waste disposal.

In 2018, Ghana's population was projected to stand at 29,614,337. This clearly shows that Ghana's population has increased significantly compared to the 2010 figure of 24,658,823. The reported annual growth rate also rose from 2.5 percent in 2010 to 2.93 percent in 2018 (GSS, 2019). GSS (2013) reported that Ghana's population density rose from 79 people per square km in 2000 to 103 per square km in 2010 and this is projected to further increase to 130 per square km in 2019 (GSS, 2019). These population increases, however, do not occur without challenges such as rapid urbanisation and rapid growth of slums (Abalo et al., 2018). Poor urban planning and housing, insufficient waste collection and management facilities ultimately result in improper waste disposal (Kanhai et al., 2019).

World Bank (2012) estimated that Ghana was losing about US$290 million (GHS553.9 million)[1], equivalent to about 1.6 percent of its GDP and US$79 million, annually due to poor waste management and sanitation, and open defecation. Larger share of this cost is estimated to come from the annual premature death of 19,000 Ghanaians, mainly due to poor waste disposal and sanitation conditions (Knott & Commentary, 2018). That is, 13,900 adults and 5,100 children under age 5, die every year in Ghana due to waste-related diseases (WSP, 2012). It was also reported that the number of cholera cases recorded particularly in the Greater Accra Region of Ghana, due to poor waste practices has been alarming; 9,174 cases in 2011 and 9,566 cases in 2012 (Dzotsi et al., 2014).

Indiscriminate solid and liquid waste disposal poses critical health challenges in Ghana especially when it comes to health expenditures. Yet, no study has been undertaken to examine its effect on health expenditure at the household level. Studies on solid and liquid waste disposal-health phenomenon in Ghana have been skewed either towards the household's demand for improved waste disposal/sanitation systems, households' willingness to pay for improved waste disposal services and health implications of household solid waste management or covered some parts of and not the whole of Ghana (Whittington, et al, 2010; Atuahene, 2010; Spencer, 2012; Amfo-Otu, et al 2012; Suleman et al., 2015; Owusu-Boadi et al, 2005; Asante & Asenso-Okyere, 2003; Addo & Opoku-Acheampong, 2015; Oteng-Ababio et al, 2013, Obiri-Danso et al, 2015; Bowan & Anzagira, 2018). However, Rego et al. (2005), Siqueira at al., (2017) and Ahmed et al. (2020) the effect of poor waste handling and sanitation on incidence of diarrhoea and household healthcare expenditures in Brazil and middle-income countries, respectively. Using data from the 7th round

[1] This amount is based on the 2012 Cedi: Dollar Rate

of the GLSS, this study seeks to investigate the effect of household disposal of solid and liquid wastes on its health expenditures among Ghanaian households.

1.3. Objectives of the study

The overall objective of the study is to empirically assess the effect of solid and liquid waste disposal on health expenditures of Ghanaian households.

Specifically, the study seeks to:

I. Investigate the effect of household waste disposal on health expenditures in Ghana
II. Examine the socio-economic and demographic factors that significantly influence household healthcare expenditure in Ghana.

1.4. Research Questions

The underlying and broad goal of this study is to examine the effect of household waste disposal on health expenditures in Ghana. From the problem statement and objectives, the following specific research questions will be answered;

I. What is the effect of household waste disposal on household health expenditures in Ghana?
II. What are the socio-economic and demographic factors influencing household healthcare expenditures in Ghana?

1.5. Significance of the study

This study, which seeks to investigate the effect of households' solid and liquid waste disposal on household health expenditures will add to existing knowledge. Findings of this study will help

government agencies, policy makers, and other stakeholders to design and tailor policies to tackle household waste management and disposal. Agencies such as the metropolitan, municipal and district assemblies and community will find this study useful in their call and fight the call for proper disposal of solid and liquid wastes. Recommendations based on this study's findings will offer the Government of Ghana directions and policy options to make some savings from its huge budgetary allocation to Zoomlion Ghana Limited for waste collection and management in the country. Health institutions, communities, and civil society organisations will be further informed on the need to reform and realign their strategies and programmes at curbing improper waste practices and its related challenges in the Ghanaian society. The effects of policy variables like education, income and health insurance coverage will aid government in tailoring suitable educational and awareness creating policies, income-generating and poverty reduction strategies and more targeted pro-poor and suitable healthcare financing policies for more effective healthcare delivery in the country.

International bodies and agencies such as the UN, the World Bank, WHO, USAID among others would find this study useful in aligning their plans and programmes aimed at promoting development in general and good health, not only in Ghana, but in other developing regions where management of solid and liquid waste has become a challenge. A prominent programme at the heart of the world that will benefit from this study will be the UN in its Sustainable Development Goals 6 – that seeks to achieve sustainable water and sanitation for all by 2030. Attaining the goal is fundamental to other goals such as goals 1 (attaining no poverty), 3 (good health), 4 (quality education) and 5 (gender equality). This study therefore will offer insights and knowledge that will help drive the collective success of the above goals.

1.6. Organisation of the Study

The study is organised into six chapters. Chapter one, which is the introduction consists of the background, problem statement, the objectives of the study, research questions, significance of the study and organisation of the study. The overview of the study is contained in chapter two. The review of literature, both theoretical and empirical, is captured in Chapter Three. Chapter four presents the methodology of the study. This chapter outlines in detail the theoretical framework, empirical model, the estimation technique employed for the data analysis and the source of data employed. Analyses of data, interpretation and discussion of results is done in Chapter five with Chapter six providing a summary, conclusion, policy recommendations and limitations of the study.

2. CHAPTER TWO

OVERVIEW OF WASTE DISPOSAL AND HOUSEHOLD HEALTHCARE EXPENDITURE IN GHANA

2.1. Introduction

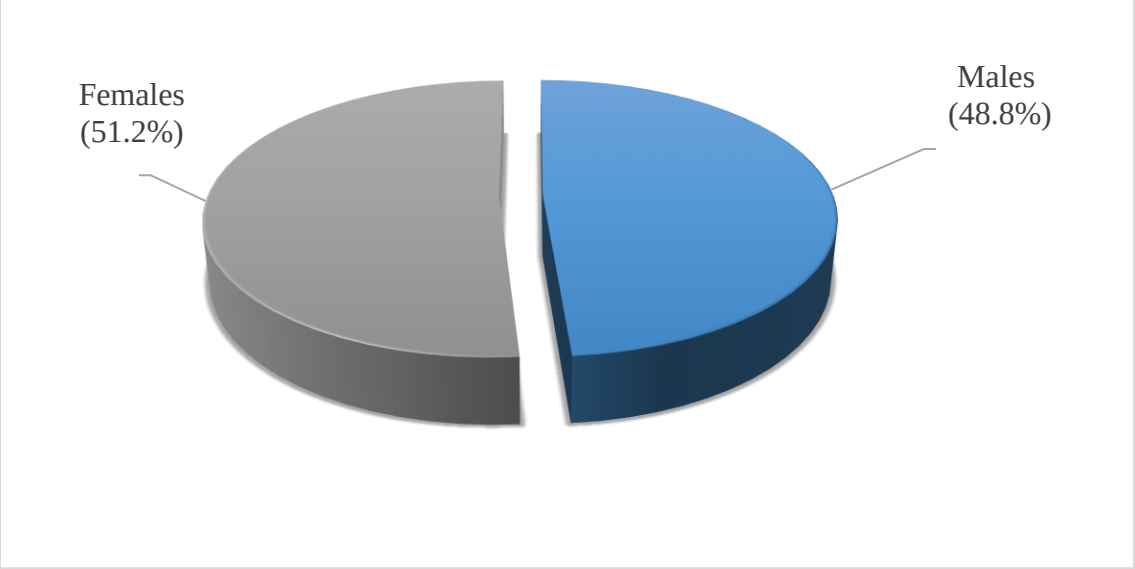
This chapter presents an overview of Ghana's waste management policies and healthcare financing polices in Ghana. The focus is on waste management policies and/or programmes developed and adopted by the government and other stakeholders to ensure proper management and disposal of solid and liquid wastes in Ghana. The concepts of solid and liquid waste are also explained in this chapter.

2.2. Overview of the Ghanaian Economy

Being the first Sub-Saharan African country to gain independence from British rule in 1957, Ghana's population has increased over 268 percent, rising from 6.7 million in 1960 to 24.66 million in 2010. This is further projected to rise to 30.56[2] million in 2019. Of these figures, the population of males is expected to increase from 12.03 million (48.8 percent) in 2010 to 14.89 million (49.2 percent) in 2019, whiles that of females is projected to increase from 12.63 million (51.2 percent) in 2010 to 15.39 million (50.8 percent) in 2019 according to Ghana Statistical Service (2019). Based on the rural-urban decomposition, Ghana's population is 50.9 percent urban (12.55 million) and 49.1 percent rural (12.11 million) rural, in 2012.

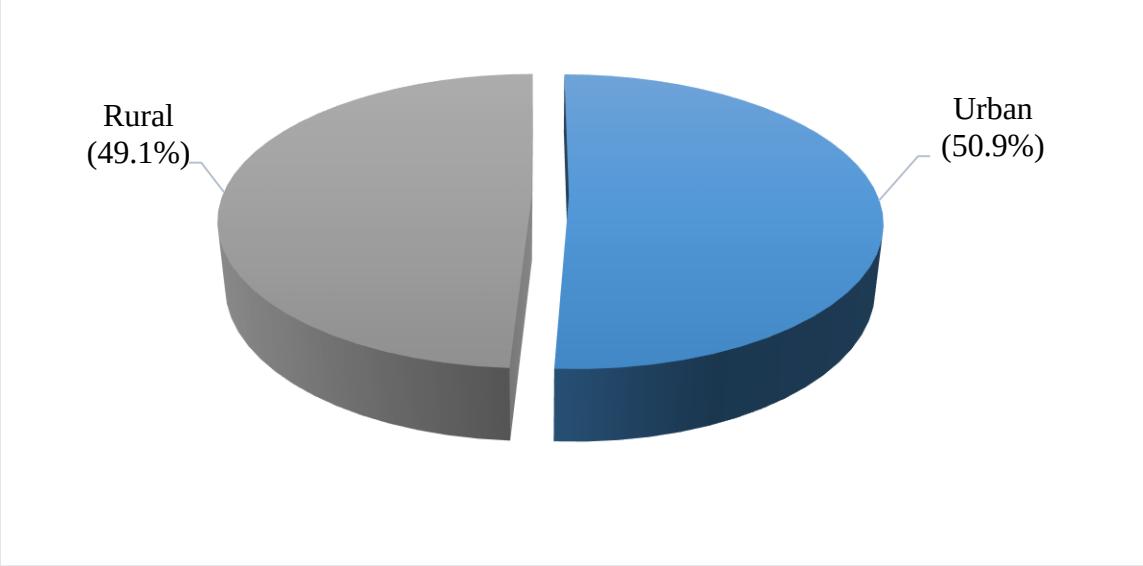
[2] 2019 Projections by the Ghana Statistical Services at https://statsghana.gov.gh/

Figure 2.2.1: Percentage share of Population by Sex (2010)



Source: Author's construction from the Ghana Statistical Service (2012)

Figure 2.2.2:Percentage share of Population by location (2010)



Source: Author's construction from the Ghana Statistical Service (2012)

2.3. Household Healthcare Expenditures in Ghana

In Ghana, health or healthcare expenditure of the household includes all monetary payments made for healthcare services. This covers costs of in-patient and out-patient services, drugs, among others. A household total healthcare expenditure covers expenses such as consultation fees, costs of drugs and other curative healthcare expenses directly made by the household to the healthcare provider. Even though the implementation of the NHIS (whose subscription has been increasing: from 17 percent in 2008 to 67.6 percent in 2014 and to further to 77.7 percent in 2019) was expected to reduce individuals' and households' healthcare expenditures, the average healthcare payments made by the Ghanaian households have been increasing. The reports of the 6th and 7th Rounds of the Ghana Living Standards Surveys show a trend of increasing burden of healthcare costs/expenditures on households. For the 2012/2013 period, about 55 percent of total healthcare payment was borne by the household, with NHIS accounting for 42 percent of the costs (GSS, 2014). In the 2016/2017, the burden of healthcare financing on the household members increased rapidly to 72.8 percent, whilst the health insurance covered only 16.7 percent of the medical expenses of household members. The other source of medical expenses was relatives (10.3 percent) (GSS, 2019). The reports further indicated that average health expenditure of households has increased by about 78 percent between 2012/2013 and 2016/2017 (GSS, 2014; GSS, 2019).

2.4. Waste Management Policies in Ghana

In Ghana, policies on household waste disposal generally fall under community waste disposal policies and laws, which are largely delegated to and carried out by the Metropolitan, Municipal and District Assemblies (MMDAs), in consultation with the Regional Coordinating Councils, as established in the Local Government Act, 1993 (Act 462). This law officially empowers the health and waste management departments of the local government authorities (MMDAs) to design, implement, enforce, and maintain proper waste management and disposal practices in Ghana. Generally, policies to manage disposal of household wastes (solid and liquid) primarily falls under the broader umbrella of sanitation programmes. The National Environmental Sanitation Policy (ESP), which was formulated in 1999 and revised in 2009 serves as the only comprehensive waste management policy in Ghana.

2.4.1. The National Environmental Sanitation Policy (Revised)

The National Environmental Sanitation Policy was the first comprehensive policy geared at sanitation and waste management in Ghana. It was initiated by the Government of Ghana in 1999, through the Ministry of Local Government and Rural Development (MLGRD), in consultation with the Ministry of Health, Ministry of Works and Housing, Ministry of Education, Ministry of Environment, Science and Technology, the Community Water and Sanitation Agency (CWSA), MMDAs, the private sector and other stakeholders, with funding from WHO (LU/WEDC, 2005). The policy was revised in 2009, in line with the Millennium Development Goals and approved by the Government of Ghana on advice of Cabinet Sub-committees on Health, Local Government, Environment, and Industry. The policy (revised) assessed the causes of poor waste disposal and sanitation, designs the basic principles and objectives for ensuring proper waste collection, disposal, and management, as well as the institutional responsibilities for realising these objectives.

The policy covers all aspects of household, community and environmental waste collection and disposal, with strong focus on promoting and ensuring proper liquid (excreta) and solid waste disposal in Ghana. This was in line with Ghana's decentralisation programme at the time and the need to put in place policies that ensured local participation and promotion of waste management and good health. In sum, this policy vested MMDAs, through their waste management departments (WMDs) and environmental health and sanitation departments (EHSDs) with the responsibility of ensuring proper household waste management and disposal practices, environmental monitoring and all planning required for efficient and healthy population. However, the responsibility for developing the needed environmental, community and domestic infrastructure such as toilets rested with communities and households. Key priority areas of the policy are:

- Collaboration between the Ministry of Local Government & Rural Development, Ministry of Environment, Science & Technology, and the Ministry of Finance to design modalities on drawing funds from the consolidated fund to implement sanitation programmes and projects.
- Broadening the "polluter-pays" principle and applying suitable regulations to generate revenue for funding sanitation projects.
- Development of appropriate communication strategy by the Ministry of Information, Ministry of Local Government & Rural Development, and other key partners, for disseminating the policy.
- Prepare a National Environmental Sanitation Strategy and Action Plan (NESSAP) and Strategic Environmental Sanitation Investment Plan (SESIP) to ensure the policy's effective implementation.

- Building and enhancing the capacity of frontline environmental health and sanitation workforce whiles designating environmental sanitation as an essential service towards achieving middle income status.

2.5. Waste Disposal in Ghana

2.5.1. Solid Waste

Generally, solid waste is classified into organic and inorganic and it includes wastes from households/residential waste, non-hazardous wastes from commercial and institutional establishments and non-processed industrial wastes (Tchobanoglous, (2009) as cited in Boamah, 2011). The 2009 Ghana Environmental Sanitation Policy (Revised) and the Urban Development Series-Knowledge Papers define solid wastes to comprise all solid waste materials generated by residential units (households), institutions (including hospitals and clinics), commercial and industrial establishments, and discharged from such premises for collection; all litter and clandestine piles of such wastes; street sweepings, drain cleanings, construction wastes, dead animals among others. Examples of solid wastes are food scraps, bottles, plastics, cans, tins, appliances (white goods), broken glass and glass wares, paper, and metallic waste among others. In Ghana, household solid wastes generation and disposal have evolved over the years in response to population growth, attitudes, policies and urbanisation.

Post 1985, solid waste management and disposal in Ghana has evolved rapidly in line with increasing population in both rural and urban areas. The rapid urbanisation and the growing rural-urban movements, coupled with poor housing, has made efficient solid waste collection and disposal challenging.

Whereas population has increased by over 66 percent, from 14.85 million in 1989 to 24.66 million in 2000, provision of solid waste disposal facilities has not matched the increase in population (GSS, 2012; Akyere et al, 2019). The GLSS 7 Report (2019) indicates that public dump is the commonest refuse disposal in Ghana, with about 48 percent of households disposing of their refuse at public dump, whiles about 20 percent and 11 percent of households resort to burning and indiscriminately dumping of refuse respectively. Only 21 percent of households have their refuse properly collected. In Ghana public dumping of refuse is more predominant among the rural (53 percent) than urban (44 percent) households (GSS, 2019). However, the current situation represents an improvement over the situation five years ago (2014), where more than 52 percent of households disposed of their solid waste through public dumping, with about 18 percent having their refuse collected whiles about 29 percent of households jointly burnt and indiscriminately disposed of refuse and nineteen years ago (2000), where about 91 percent of the population faced unsafe method of disposing solid waste (World Bank, 2007).

Yoada et al. (2014) observed that solid waste generated and disposed in Ghana in the 1920s were less complex and toxic than today. It has been well noted that poor waste management and disposal, particularly in Ghana have led to the high incidences of waste-related diseases/illnesses such as cholera, malaria, typhoid fever, intestinal worms, skin diseases among others particularly in urban areas (Yoada et al., 2014). Ghana generates over 12,700 tonnes of solid wastes daily, of which 4,000 tonnes jointly comes from the two largest cities, Accra, and Kumasi alone (Miezah et al., 2015; Abalo et al., 2018). This waste comprises mostly food debris and plastics which are usually disposed at public dump sites or disposed of indiscriminately (Yoada et al., 2014). Majority (more than 85 percent) of urban households, especially those in Accra have been

observed to dispose of waste at communal collection points, open spaces or in water ways (Boadi and Kuitunen, 2005).

Further, the 2010 Ghana Health Service Report (2010) showed that six (6) of the top ten (10) diseases in Ghana are caused by and link to poor handling of waste, and for that matter improper solid and liquid waste disposal and management. The report also stated that malaria, diarrhoea and typhoid fever jointly make up about 70 percent-85 percent of out-patient cases at health facilities across the country. (Ghana Health Service, 2010).

2.5.2. Liquid Waste

Globally, liquid waste disposal and management is undoubtedly a growing major public health concern of which Ghana is no exception. According to the Environmental Protection Agency (EPA), liquid waste is defined as any waste material that passes the definition of a ‘’liquid’’. Unlike the solid wastes, liquid wastes cannot be easily picked up and removed from an environment. Considering the myriad liquid wastes generation in Ghana over the years particularly in the urban areas, its improper disposal and management, especially human excreta, poses a threat to public health and the environment.

Generally, liquid waste includes sewage as well as wastewater from industrial processes such as food and agricultural processing and manufacturing and it includes waste from households, wastes from commercial and institutional establishment and industry. In Ghana, liquid wastes include human excreta, kitchen wastes and bathwater, among others. In Ghana, institutional arrangements for disposal, collection and removal of liquid waste from households, particularly in the urban areas, differ such as cesspit emptying service for private households with a water carriage system,

public toilets' dislodgement for septic tank latrines, KVIPs, and water closets. Domestic wastewater in Ghana is mostly discharged directly into drainage systems that empty into water bodies such as rivers, lagoons, and streams.

By the year 2000, about 80 percent of sewage treatment facilities in Accra were not functioning thus placing a lot of pressure on the receiving streams and rivers in the city (EPA, 2000). The extent of pollution especially in the Odaw River in Accra was so intense, leading to drastic decline in desirable aquatic organisms. It is also estimated that the Chemu and Korle Lagoons jointly receive over 3million m^3 discharges per day from industries in the catchment area.

Historically, the government of Ghana has developed various strategies and solutions including Policy, Legal and Institutional Frameworks to address the challenges of wastes disposal and management including liquid wastes which are still relevant. In urban Ghana however, liquid wastes disposal and management has broken down at all levels of management, particularly, collection, transportation, and disposal due to a lack of human, logistics, and financial resources. Although huge capital investment has been made to meet the challenges of effective liquid wastes disposal and management in Urban Ghana, there is little evidence that such efforts are having their expected effects (Yoada et al., 2014). It is against this backdrop that Sewerage Systems Ghana Limited, a waste company, has put up a Septage tank treatment plant, the Lavender Hill and Mudor-Fecal Treatment Plant, in Accra as a scientific approach to ensure proper and efficient sewerage disposal. The $40 million ultra-modern plant with a lifespan of 20 years has the capacity to receive 80 per cent of the entire human waste generated in Accra with the capacity of receiving between 200 and 250 trucks of human waste daily. Prior to its construction in 2013 and commissioning in 2016, the city practiced primitive method of disposing of faecal waste where

cesspit emptiers are directly emptied into the ocean, posing both health and environmental problems (Ghanaweb, 2018).

Table 2. 1: Household Refuse disposal and Toilet Facility Type

	Percentage (%) of Households
Household Refuse Disposal	
Collected	15.28
Burned by household	23.43
Public dump	43.16
Dumped indiscriminately	18.12
Household Toilet Facility Type	
No facilities (bush/beach/field)	27.68
Water Closet	13.51
Pit latrine	19.32
KVIP	12.09
Bucket/Pan	0.34
Public toilet	27.00
Other	0.06

Source: Author's construction from GLSS 7 (2017/2018)

From Table 2.1, of the total households sampled, majority (43.16 percent) dispose of refuse through public dumping. This was followed by the number of households that burn their refuse (23.43 percent) and those that do indiscriminate dumping (18.12 percent). However, only a little over 15 percent of households properly collect their solid waste, which is considered the most appropriate method of disposing of solid waste. On aggregate terms, it means most households (85 percent) in Ghana dispose off solid waste into open spaces. This goes to confirm the poor solid waste disposal practices among Ghanaian households. Compared to findings of Boadi and Kuitunen (2005), proper solid waste disposal among Ghanaian households remains a challenge.

On household's toilet facility type, the data reveals that more than half (54.90 percent) of households in Ghana do not have toilet facility in their homes and therefore resort to open defecation and/or use public toilet. Specifically, whiles more than 27 percent dispose of human excreta through open defecation (beach/bush/filed), a little over 27 percent rely on public toilet. On aggregate, half the population (45.17 percent) of Ghanaian households have some type of toilet facility; water closet (13.51 percent), pit latrine (19.23 percent) and KVIP (12.09 percent) and bucket/pan (0.34 percent). With respect to WHO's WASH programme, this means that sanitation coverage, and for that matter disposal of liquid waste in Ghana remains largely unimproved and poor.

Table 2. 2: Household refuse disposal and type of toilet facility by location

	Location (%) of Households	
	Urban	Rural
Household Refuse Disposal		
Collected	29.74	4.39
Burned by household	16.78	28.44
Public dump	48.34	39.26
Dumped indiscriminately	5.13	27.91
Household toilet facility type		
No facility (bush/beach/field)	9.37	41.46
Water closet	27.43	3.02
Pit latrine	11.58	25.14
KVIP	15.59	9.46
Bucket/Pan	0.35	0.34
Public toilet	56.70	43.30
Others	0.03	0.09

Source: Author's construction from GLSS 7 (2017/2018)

2.6. Healthcare Financing Policies in Ghana

Over the years, healthcare financing policies in Ghana have been handled at different levels of policy and decision making by various governments, policy makers and other stakeholders.

Nonetheless, healthcare financing policies in Ghana post-independence have always been designed to suit a government's political ideologies and manifestos (Owusu-Sekyere & Chiaraah, 2014). Before independence, access to healthcare and healthcare services in all public health facilities in Ghana, under the British colonial government was purely out-of-pocket payments (Akazili et al., 2014). People had to either pay user fees for public health services or make direct payments to private health providers before accessing health services (Akazili et al., 2014, 2017). However, after independence, access to healthcare and public health facilities was made free to the public with full tax-financing policy put in place by the Government of Ghana (Owusu-Sekyere & Chiaraah, 2014). However, this tax-financing policy could not support the free healthcare policy implemented by the government of Ghana (in the 1980s) and therefore became inviable due to general tax revenue shortfalls and budgetary constraints (Owusu-sekyere & Bagah, 2014).

As a result, the government of Ghana in 1985 implemented the structural adjustment with support from the World Bank and the International Monetary Fund (IMF). Following SAP's conditionalities, the user fees (cash and carry) system was re-introduced by the government for accessing public healthcare (Akazili et al., 2017). The user fee was re-introduced to help recover 15 percent of government's recurrent expenditure on health (Asenso-Okyere, 1995). However, a number of health studies conducted in Ghana noted that the re-introduction of the user fee financially burdened the poor, particularly the rural poor, reduced access to health services and led to plummeting health indicators (Akazili et al., 2014, 2017; Arhin-Tenkorang, 2001; Asenso-Okyere, 1995; Nyonator & Kutzin, 1999). This resulted in inequalities in healthcare access and usage (Owusu-Sekyere and Bagah, 2014).

Prior to 1990, health insurance was considered by the Government of Ghana through the Ministry of Health, as a feasible alternative for addressing the difficulties that characterised the cash and carry system. This initiative led to the advent of a community-based health insurance scheme targeted at increasing accessibility, usage and affordability of healthcare in Ghana (Atim, 1998; Akazili et al., 2014). Atim (1998) recognised that the community-based health insurance scheme was well accepted and worth sustaining. This served as the bedrock and guarantee for the introduction of the pro-poor Ghana National Health Insurance Scheme (NHIS) by the Government of Ghana through the Ministry of Health in 2003. Initially, the scheme was tax-financed, primarily via the value-added tax (2.5%), but was later opened up and augmented by annual budgetary allocation by the government as well as individual premium payments due to its expansion and growth in coverage (Akazili et al., 2014).

The NHIS, a pro-poor home-grown social intervention programme, initially was to be financially driven by premium payments based on the socio-economic status of Ghanaian subscribers. However, the difficulty in the identification and categorization of subscribers on their relative socio-economic status has made the premiums generally flat for all. To widen coverage, majority of the Ghanaian population is exempted from premium payment; children under 18 year of age, pregnant women, the elderly (age 70 and above), SSNIT contributors, SSNIT pensioners, LEAP beneficiaries, persons with mental disorder and the core poor. However, financial challenges coupled with corruption, poor administration of the scheme and politicisation have significantly affected and threatened the smooth operation of the health insurance scheme and its success (Owusu-Sekyere & Bagah, 2014). Delays in release of funds by the National Health Insurance Authority for timely reimbursement of health providers and pharmacies, have sometimes forced particularly private and mission health providers to demand out-of-pocket payment from NHIS

card holders at the point-of-service. These have resulted in high private spending for healthcare in Ghana such that about 40 percent of total expenditure on healthcare in Ghana is private, of which 92 percent constitutes out-of-pocket spending (USAID, 2016).

This chapter briefly reviews some solid waste management policies implemented in Ghana. A brief discussion on solid and liquid wastes, and healthcare financing policies in Ghana are also looked at. The main healthcare financing policies implemented in Ghana were therefore identified as out-of-pocket payments (cash and carry system), free healthcare and health insurance policy according to Atim et al. (1998), Owusu-Sekyere and Bagah (2014), USAID (2016), Akazili et al. (2014) and Ampaw et al. (2018).

3. CHAPTER THREE

LITERATURE REVIEW

3.1. Introduction

This chapter seeks to review relevant literature on the effect of waste disposal within the household on health expenditures. The chapter covers two aspects. First, it provides theoretical literature on health demand and health expenditures and two, it gives an empirical literature review on determinants of health expenditures, prominent to the study and its objectives. A household's or an individual's demand for healthcare and other medical inputs (such as drugs) is treated or viewed as a derived demand from the basic demand for health (Grossman, 1972).

3.2. Theoretical Literature

3.2.1. The Theory of Demand for Health

The health demand theory was developed by Grossman in 1972. Basically, the theory treats health as a consumption and investment good that provides utility to individuals or households. According to the model, the household produces and consumes health. The model recognises environmental, socioeconomic, and demographic factors, and medical care as important inputs into the production of health. Thus, the household produces and invests in health by combining its own time, income, and other resources with medical inputs. The household consumes health and other goods. In the model, Grossman explained that health–which is defined to encompass longevity and illness-free-healthy days in a given year–is both demanded and produced by individuals (households). Grossman (1972) formulated this theory or model under the orthodox static utility-maximisation framework. He posited that households or people consume or demand

healthcare not because they necessarily value healthcare itself, but that it improves their health stock, make them feel better and serves as a productive resource.

Grossman (1972, 2000) argues that health care services is demanded by the consumer or household for two main reasons – for pure consumption and investment purposes. First, as a pure consumption commodity, health care directly enters the utility function of the consumer or household provided that its returns is mainly psychic by making people feel satisfied when healthy or by reducing the disutility of fewer sick days. This, according to Wagstaff (1986), means that sick days generate a disutility (negative utility) to individuals and households. This further comes to confirm that illnesses (diseases) affect health. And second, as a pure investment good, it means that health care increases the total amount of time available to the household to participate in market and non-market activities. That is, health as an investment commodity determines the amount of work and leisure time available to the individual or household. Hence, the lower the number of sick days, the greater the healthy days an individual or household has for consumption and, for work and leisure. This therefore means when an individual invests in his/her health, the returns gained is the monetary or pecuniary value due to fewer sick days.

The Grossman approach recognises health stock as one component of human capital and that a person, when born, inherits an initial health stock that depreciates (diminishes) with time (age) but can be supplemented or augmented by that individual through investments. This is a further to the underlying assumption that the individual is a producer of health. It then becomes prominent to view health investment as encapsulating all forms of health-promoting behaviours (consuming balanced diet, proper medical care, proper waste (solid and liquid)-disposal practices and to view health-damaging behaviours (improper waste-disposal practices, smoking, alcoholism among

others) as affecting the depreciation rate of health stock of individuals (Wagstaff, 1986). This novel assumption by Grossman (1972) indicates that the individual or household combines several inputs such as medical care, health facility utilization, diet, exercise, income, health status, distance among others in producing health. This means that households or individuals derive utility from being healthy and also, health increases labour income available to the household. Thus, according to Grossman, a stream of healthy days enjoyed by the individual or household directly increases their utility. This means that reduction in sickness allows for higher consumption of good health as well as investment in it. This model has become a widely used concept in health studies and health economics and several writers/authors have further modified and expanded it.

The Grossman model has since its formulation been expanded to account for other demographic and socio-economic factors that influence individuals' demand for health care and making health expenditure – both for consumption and investment purposes. The model has seen wide extensions, modifications and simplifications. Cropper (1977), Muurinen (1982), Muurinen & Le Grand (1985), Wagstaff (1986), Dardanoni & Wagstaff (1987), Grossman (2000) and Case and Deaton (2005) have all expanded the model to explore a variety of socio-economic and demographic phenomena related to health and health expenditures and inequalities in healthcare by individuals and households.

Cropper (1977) expanded the Grossman theory to account for illness. He undertook this extension to examine the effect of illness on health demand and its expenditure – accounting for the disutility that illness (sickness) imposes on the health of people. Cropper (1977) used this framework to examine the differences between the demand for preventive and curative care. He pointed out that illness imposes a negative utility (disutility) on the health of people – affecting the consumption

and investment uses of health, hence individuals will demand healthcare (being it preventive or curative) in order to regain good health. Novel to his extension is that the depreciation of health stock is attributable to illness. His main conclusion was that consumers with higher income maintain higher health stock than do the poor. Hence, the probabilities of illness and making health expenditures, at the time, were lower among higher income households.

On his work on the consumption and investment nature of health, Muurinen (1982) extended the Grossman model to investigate the comparative effects of age, wealth, and education on health demand as a mixed consumption-investment good. His extension operated with perfect certainty and treats healthy time and all other goods as two commodities in the utility function of the household. He further assumes that these two commodities are perfect substitutes and showed that the health stock of a consumer is inversely related to his age. This means that health stock depreciates as one ages. Thus, the health stock of an older individual declines faster than that of a younger person. This makes an older person increase demand for medical or health care services to augment his/her health – old people incur higher health expenditures. Muurinen (1982) therefore, emphasised that age has a positive influence on health as consumption good but on health as an investment good, it has negative effect.

Later treatments of the Grossman model under uncertainty have assumed a risk-averse utility function for the household. This assumption is relevant so that such a utility function (expected utility function) – exhibiting diminishing marginal utility of current and future consumption – can be maximised. Employing two time-period models in which current utility function depends only on current period consumption, Dardanoni and Wagstaff (1987), Selden (1993), and Chang (1996) all showed that uncertainty arises in the second period utility because the income-generating

function in that period contains a random variable. This random variable captures risks such as sickness/illness, accident among others which affect the health status and health stock of individuals negatively. Adopting the linear, multiplicative and additive utility functions respectively in their specifications, Dardanoni and Wagstaff (1987), Selden (1993), and Chang (1996) concluded that an increase in household's assets (wealth) causes health and medical care demand and health expenditures to have a positive, negative or ambiguous change under the pure investment model. Under the pure consumption model, they opined that increases in the variance of risk increase health demand and health expenditures, respectively.

In their approach to the health demand theory, Zweifel and Breyer (1997) developed a health demand function to demonstrate how a person's health status is affected by his wage/income. Following the Grossman model, they classified health as both a pure consumption and investment good. Zweifel and Breyer (1997) demonstrated that a higher lifetime wage of an individual decreases his/her demand for health as a consumption commodity but increases his marginal incentive to hold health as an investment good. That is, given a higher wage, an individual will substitute spending on health as a consumption for spending on health as an investment good since being healthy–one is able to work for more hours–increases earnings (labour income) through higher productivity. Thus, the wage effect on health/health expenditure when treated as a pure consumption good is negative but on health as pure investment commodity, the effect is positive.

Furthering their analysis on the effect of formal schooling/education on health, Zweifel and Breyer (1997) concluded as that arrived in the wage scenario. On health as a consumption good, the effect of education/formal schooling is negative. This, they explained, was due to the fact that an educated person did not like to be sick, considering the amount of wages or market income that

will be lost when sick. In this regard, educated people are cautious and do not live risky lives. Their model asserts that formally schooled people are careful with health issues that affect rates of depreciation of their health stock. On health as a pure investment commodity, Zweifel and Breyer (1997) recognised that educated people spend more to invest in their health so as to remain healthy at all times. Thus, accounting for the positive relationship between education and health as investment good health as an investment good and education.

Contributing to the discussion on the demand for health theory, Wagstaff (1986) presented some new estimates of the pure consumption and pure investment models for health demand. His presentation centred on the parametric estimates for both reduced and structural demand for health care equations. His work, though based on the Grossman model, adopted the Heckman model to correct for the observability which he believed the Grossman model and its extensions had. His main argument was that the Grossman model contains two main unobservable terms; health stock at time and shadow price of assets. That is, he opined that the health stock of an individual at a particular time as well as the shadow price of household assets (which he said depends on initial asset, lifetime wages/income, rates of interest and time preference and the time profiles of other variables) are not directly observable. Using the Heckman model, Wagstaff (1986) estimated reduced and structural equations for health demand both as an investment and consumption good. His central conclusion is that estimates obtained are unbiased and consistent as compared to the inconsistencies seen between previous model and data.

Also, Galama & Kapteyn (2011) expanded the Grossman model and relaxed its assumption that individuals can always adjust their stock of health to a new optimum without any adjustment cost. Estimating a generalised solution of the Grossman model, Galama and Kapteyn (2011) arrived at

the same prediction made by the original Grossman model that, demand for medical care increases when one is ill/unhealthy – thereby raising health expenditures. Also critical in their theoretical exploration is the relationship between age and health demand/expenditure. They noted that age has an ambiguous effect on health demand/expenditure if wage increases with work experience. But when disaggregated, age had a positive effect on health expenditure under health being a pure investment good but as a pure consumption good, it has a negative effect.

3.2.2. Health Care Utilisation Concept

This concept was formalised by Anderson (1995). He categorised the entire health system into structure, process, and outcomes. First, he argues that health structure comprises of environment (made up of healthcare system and the external environment) and population characteristics. Secondly, that health process encapsulates personal health practices and use of health services. And thirdly, health outcomes concerns perceived/evaluated health status and consumer satisfaction. Drawing on this, Anderson (1995) modelled the health care services utilisation and health seeking behaviours among individuals/households. The concept assumes that a household's or an individual's health seeking behaviour is influenced by environmental, socio-economic and demographic factors, among others. The concept assumes that a person's use of health or medical care services is contingent on or determined by three major factors namely predisposing, enabling and need factors. Predisposing factors relate to social structure (occupation, education), belief system (culture, religion) and demography (location, sex, marital status etc) that influence an individual's health care services utilisation. Second is the enabling factors which encapsulate the availability and accessibility of health care facilities or services, income, equity, cost of health services and quality of medical services. For the need factors, Anderson (1995) contended that it encompasses diseases or sicknesses that make it necessary for the individual or household to use

health or medical care services. The model therefore states a household's utilisation of health as a function of these three factors. This concept is widely used particularly in the public health and medical fields.

3.3. Empirical Literature Review

3.3.1. Health Expenditure versus solid/liquid waste nexus

Siqueira at al. (2016) showed that poor waste handling and sanitation have consequences on health care expenditures of residents in Porto Alegre, Brazil. With funding from the Brazilian National Health System, Siqueira and colleagues researched on the occurrence, characteristics and health expenditures associated with poor waste management and sanitation practices in the Metropolitan Region of Porto Alegre, Brazil between 2010 and 2014. Their findings proved that waste-related diseases such as diarrhoea, malaria, yellow fever, skin diseases, among others led to high morbidity which increased hospitalisation in the study area. This situation, they noted caused many deaths and increased health expenditures of households. It was also observed was the fact hospitalisation and medical expenditure increased particularly more among younger and older age groups.

Olasehinde & Olaniyan (2017) undertook a study examine the determinants of household health expenditure in Nigeria, using the 2010 Harmonised Nigerian Livings Standards Survey. Factors considered included education, income, age, gender of household head, household size, religion, availability of flush toilet. Adopting the Engel curve and employing the ordinary least square estimation technique, the study found availability of flush toilet as a significant negative predictor of household health expenditure among Nigerian households. This means that a household using flush toilet (water closet) relative to a household using other toilet types paid less for health

expenses. The reason being that availability of flush toilet in a household ensures proper liquid waste disposal which eliminates or lowers significantly, the incidence and transmission of diseases such as cholera, dysentery, diarrhoea among other waste-related diseases.

Bowan et al. (2019) in a research on the solid waste disposal in Wa Municipality conducted a survey to assess the effect of age, sex, and education on solid waste disposal practices in the Wa Municipal Assembly of Ghana. Questionnaire administration, interviews and personal observations were undertaken in six residential areas: Kambale, Dondoli, Dobile, Airport, SSNIT and Jdzedayiri-Tampalepani residential areas. Using descriptive statistics and simple correlation analysis, and performing tests of significance, their findings reveal that about 38 percent of the respondents dispose of waste improperly through burning or throwing into a bush whereas 45 percent did dump waste into the communal container. It was found that sex, age, and educational level had significant influences on households' solid waste disposal. Specifically, both male and female heads dispose of waste indiscriminately. They noted that indiscriminate waste disposal increases the chances, transmission, and prevalence of diseases such as malaria, typhoid, and cholera among others which have consequences on health care payments for treatments.

The GLSS 6 and 2014 GDHS Reports indicate that disposal of rubbish and liquid waste, as well as type of toilet facilities, affect the health and for that matter healthcare expenditures of households. The GLSS 6 reported that whiles more than half (52.4%) of Ghanaian households dispose of rubbish at public dump sites, only 18.2 percent have their rubbish properly collected and disposed of. On liquid waste, about 73.7 percent of all households surveyed dispose liquid waste into open areas/gutters. This practice is particularly common among rural households where close to 93 percent dispose of liquid waste into open spaces. The 2014 GDHS Report shows only 14 percent of Ghanaian households have improved toilet facilities, with 17 percent having no toilet

facility and hence defecate in bushes and open areas. It noted that about 29 percent of rural households have no toilet facilities compared to the 9 percent recorded in urban areas. This has implications for the occurrence and prevalence of diseases such as malaria, diarrhea, cholera, and typhoid among others within the households.

Addo & Opoku-Acheampong (2015) investigated the implications of solid waste management on the health of residents in the Kumasi Metropolis of Ghana. It was observed that about 55 percent of the residents in the metropolis disposed off waste indiscriminately either by burning, burying, or dumping into open gutters and open spaces. Households and communities that engage in improper waste disposal experienced high incidence and burden of diseases such as typhoid fever, diarrhoea, cancer, intestinal worms, chest pains, dysentery, and cancer among others leading to high rate of morbidity. Malaria, for instance, was the most common disease among residents surveyed – affecting about 62.9 percent of respondents. This was followed by intestinal worms (10.2%), typhoid fever (5.8%) and then cancer (3.9%). A separate study by Suleman et al. (2015) of the implications of solid waste disposal on community health of residents in the Sawaba Township of the Asokore Mampong Municipality of Ghana arrived at similar conclusions. Using primary data, they found that about 61% of respondents dispose of waste poorly. Accordingly, they pointed out that the incidence of malaria, skin infections among others were high among residents due to poor waste disposal and sanitation practices as well as residents living close to dumpsites.

3.3.2. Demographic Characteristics

The age of an individual influences his/her expenditure on health. It has been established that there exists a positive association between age (ageing) and health expenditures. This is because as individuals grow older, their health stock depreciates or deteriorates faster and therefore tend to demand more medical care to augment the falling level. This increases their health spending. Grossman (1972) found that age influences the health demand of individuals, where he considered health as a durable capital stock that depreciates with time. He established that advancement in age is accompanied by faster deterioration in health stock and that there exists a minimum health stock below which death occurs. This makes the aged demand more healthcare, which eventually increases their health spending. Folland et al (2003), in their study, also noted a positive association between age and health expenditure. They observed that aged individuals demanded more medical care and therefore incurred higher health expenditures than their younger counterparts.

Olasehinde & Olaniyan (2017), in a cross-sectional study on the determinants of household health expenditure in Nigeria, found that individual characteristics such as age, and education and household features such as income, size and headship were significant determinants of household health expenditure in Nigeria. Using the ordinary least square estimation (OLS), their results show that age had a significant positive effect on household healthcare expenditure in Nigeria. Their findings showed that households with relatively older people (aged 60 and above) made higher healthcare payments than did households with averagely younger members – implying that as one ages, his/her expenditure on health care increases.

Likewise, a study using the 2010 Bangladesh Household Income and Expenditure Survey data on the impact of age and sex on healthcare expenditure of households in Bangladesh undertaken by

Sarker et al. (2014), established a significant positive relationship between age and household health expenditures. Their analysis showed that household healthcare expenditure was significantly age-dependent, and that the association is negative. Sarker et al. (2014) observed that households with relatively aged members incurred higher healthcare costs as compared to households with younger members. This finding is consistent with those of Olasehinde (2014), and Aregbeshola & Khan (2017), which separately found age to be an important determinant of household health care expenditure in Nigeria.

Also, in an empirical testing of the Grossman model, Hartwig & Sturm (2018) used macroeconomic panel data on twenty-nine (29) OECD countries, between 1970 and 2010, to analyse the determinants of health/medical spending. The study was based on the microfoundations of macroeconomics and sought to test the statistical significance of the main factors identified by Grossman to influence healthcare and for that matter healthcare expenditure. Hartwig and Sturm (2017) adopted the Extreme Bound Analysis (EBA), which enabled them to check the robustness of the variables suggested by Grossman, as well as those contained in the literature to influence healthcare expenditures. Their results proved that ageing (age) is positively related to health expenditures and that the relationship is significant.

The area of residence or location of a household plays a major determining role in its health conditions, morbidity, and expenditure. There exist significant and tremendous differences in rural-urban health conditions and health expenditures due to availability and provisions of social and economic amenities, lifestyles, culture and environmental factors and demographic make-ups. Consequently, urban households are more likely to have access to socio-economic and health-related factors that improve health and lower health expenses than their rural households. Using

the 2008 Ghana Demographic and Heath Survey (GDHS) data, Nkansah (2014) examined the factors associated with child health in Ghana. He proxied for child health using under-5 diarrheal morbidity. The 2008 GDHS data covered all ten regions of Ghana with a sample of 11,778 households. Findings from the logistic regression that the probability of under-5 diarrheal morbidity decreased for rural households. This has a consequence on health expenditure of such households.

In a study to investigate the main determinants of health expenditures among Iranian households, Fazaeli et al. (2015) estimated an econometric Bayesian logit model using the 2010 Household Budget Survey Data collected by the Iranian Statistical Centre. Their results show that the location of a household was the most significant predictor of health expenditure among Iranian households. It was revealed that a rural household was 21 percent more likely to incur healthcare expenditure compared to an urban household. Higher education, having a job and being female were also found to significantly reduce the likelihood of spending on health care.

Employing a representative panel data on 800 households in Nouna Health District, for the year 2000-2001, Su et al. (2006) embarked on a study to identify factors that influence illness reporting, provider choice and health expenditures among households in Burkina Faso. Their findings show that health expenditures were higher for female-headed households compared to male-headed households. This conclusion concurs with the findings of Phipps et al. (1992), which found that a household headed by females spent more on healthcare than did male-headed households. Other significant determinants of household health expenditures in Burkina Faso include marital status, the season of illness (rainy or dry), education and type of illness.

3.3.3. Household Socio-Economic Characteristics

The income of a household influences its health expenditure. It is believed that a household with a higher income can afford better or balanced diet, sanitation, and hygiene services among others and thus, spend less on healthcare. Whiles some studies have found a negative relationship between income and health expenditures, others have concluded on a positive relationship. Torres da Silva et al. (2015) studied the determinants of household out-of-pocket health expenditure on children in the city of Pelotas, State of Rio Grande de Soul in Brazil. They obtained data from a 2004 birth cohort study and proxied for health expenditure using expenditure on medicines. Results from their panel data Tobit estimation with random effects demonstrate that income is a positive and significant determinant of health expenditure on children. This means increase in income raises the amount of health expenditure incurred on children in the city of Pelotas.

In a study on the influence of income and education on household health expenditure; the case of tribal Orissa in India, Rout (2006) examined the relative roles of income and education on household health expenditures. A total sample of 125 households was employed using the random sampling technique based on an October 1999 primary data collected in the Nawarangpur district, to investigate the disparities in health expenditures among households with differing income and educational levels. Using descriptive statistics and the ordinary least square regression analysis, Rout (2006) found a significant positive influence of household income on per capita health expenditure. His results show that increases in income of households raise health expenditure by about forty-three (43) percent – meaning that higher income-households spend more on health care. Another significant determinant of household health spending in tribal Orissa is the household head's education. It was therefore concluded that income plays a major role in household per capita health expenditure and that the observed differences in health spending

among households in tribal Orissa show the importance of income in determining the health status of people.

The results of Parker & Wong (1997)and Rous & Hotchkiss (2003) also confirm these findings. Parker and Wong (1999), in their probit and two-stage least squares estimation of household income and health expenditures in Mexico, using economic and demographic characteristics as covariates, found income to be a sensitive determinant of household out-of-pocket health expenditure. Their result shows that the probability of making health expenditure as well as the amount of health expenditure incurred was greater for high-income households. However, the elasticity of health expenditure was higher for low-income households. This, according to them suggests that low-income or poorer households are more vulnerable and susceptible to making higher health spending and that in times of economic crises, such households cut down their health spending by higher degree. In a similar study in Nepal in 2003, Rous and colleagues reported income as a positive and significant determinant of health expenditures.

Dash & Mohanty (2019), however, maintained that household health expenditure negatively relates to its income level. The study used data from the 71st round of the Social Consumption of Health Survey of India to examine whether poor people in the poorer states pay more for health in India. Factors considered include sex, religion, residence (urban, rural), poverty/income-level and health care utilisation, disease and insurance, among others. Employing the log-linear regression and Tobit models, Dash and Mohanty (2019) observed that poorer households (located more in poorly developed environments) make greater use of public health facilities and as such incur higher health expenditures compared to the economically empowered households. This was due to poor hygiene and nutrition in such households, making disease transmission and incidence common, coupled with the absence of subsidised and free medical care in public health facilities.

Their results show that the average health spending of poorer households was far higher and that households in poorer states incur about eighty percent (80%) of the direct cost of health as against twenty-four (24%) incurred by households in economically developed states.

Similarly, findings of Azzani et al. (2019) in their systematic review on the determinants of household catastrophic health expenditure in low- to high-income countries revealed household economic status (income) as one common significant factor influencing household health care spending. This, according to them, suggests that economic inequality plays a vital role in the burden of catastrophic health expenditures all over the world. They pointed out that poor or low-income households face a higher risk of financial hardship from healthcare payments. That is poor households spend substantial portions of income on health care – this makes them worse off in accessing other needs. Other factors that were found to significantly influence catastrophic household health expenditures included incidence of hospitalization, presence of an elderly or a disabled member in a household and household member with chronic sickness/illness.

Using cross-country analysis, Xu et al. (2003), in a multi-country studies, employed household survey datasets on fifty-nine (59) countries, for which the necessary data were available, to examine factors influencing household catastrophic healthcare expenditure. They define expenditure as being catastrophic if a household spends above 40 percent (as opposed to the 15 percent threshold reported by previous studies) of its income to finance its healthcare after basic needs such as food, shelter and clothing have been met. Results from their multivariate ordinary-least-square regression and the double-logarithmic model show that even though a number of factors influence household catastrophic health expenditures across the 59 countries studied, the share of out-of-pocket spending from income played a more significant determining role. Other factors such as health-facility access and use, poverty and failure of social schemes to pool

financial risks contributed significantly to the disparities in catastrophic health expenditure across countries studied.

Education is one important factor that affects the production of health and as such, influences health expenditures of individuals and households. The role played by education in influencing health demand and its related expenditures cannot be underestimated. Education exposes people to know the consequences of risky health behaviours such as smoking, alcohol abuse, poor sanitation, unsafe sexual affairs inter alia and thus, avoid them. Education comes with long-term goals, which requires good health to attain. This means educated people may at times spend more on their health to remain healthy to achieve long-term goals. The effect of formal schooling on the utilisation of medical care was studied by Currie & Gruber (1996) in their paper on the health insurance eligibility, utilisation of medical care, and child health in USA. They found that education of a household member influences health-related behaviours of other members of the household, such as their health care utilisation which account for and influences health expenditure.

Employing secondary data from the 2009/2010 Harmonised Nigeria Living Standards Survey (HNLSS), Aregbeshola and Khan (2017) assessed the determinants of household catastrophic health expenditures in Nigeria. Using bivariate and multivariate logistic regression, factors examined included household and individual characteristics which comprised of age, education, insurance, zone of residence, visiting a private health facility, among others. Their results demonstrated that education significantly influenced household health expenditures. It was found that having low education increased most the risk of incurring catastrophic health expenditure among Nigerian households. A rise in the level of education from primary to secondary was observed to lower substantially the risk of catastrophic health spending among households. This

is because higher level of education exposes people to the benefits of sanitation and hygiene, nutrition, and risky behaviours such as unsafe sex and smoking others – all of which improve healthy practice and living. Visiting private facility, lack of insurance and non-chronic illnesses were other significant factors associated with rising household health expenditures in Nigeria.

In a related study, Olowolabi (2014) investigated the determinants of household health expenditures in Kenya using data from the 2004/2005 Kenyan Household Income and Expenditure Survey (KHIES). Household and socio-economic factors investigated included education, settlement, age, household size, gender, and income. Household health expenditure served as the dependent variable and it comprised private spending on over-the counter drugs, medical supplies, outpatient services and inpatient services. Findings from the multiple regression estimates revealed education as the most significant determinant of health expenditure among Kenyan households but the effect varied across households. Specifically, it was found that an increase in the household's level of education (say from primary to secondary) induced approximately KSHS159 ($2) fall in its health expenditure. Also found to be a significant determinant of household health spending is location of household. Although, all other factors examined affect Kenyan household health expenditures, they were all insignificant.

However, findings of Sen & Rout (2007) contradict the conclusion made by Aregbeshola and Khan (2017) on the influence of education on household health expenditures. Rout (2006) in their assessment of the determinants of household health expenditure in Urban Orissa, India, used primary data collected from Bhubaneswar and Cuttack. Their OLS regression estimates pointed out that in both urban and rural areas, educated persons on average spend slightly more on health than the uneducated. This suggests that irrespective of being in the rural or urban area, the influence

of education on household health expenditure is positive and significant. Also found to significantly and positively affect household health expenditure was income.

Aryeetey et al. (2016) examined the effect of health insurance on out-of-pocket expenditure (OOP), catastrophic expenditure and poverty. Results from the probit regression showed that health insurance reduces the health expenditure of a household by 86 percent. It was also found that health insurance significantly reduces the probabilities of household witnessing catastrophic health expenditures as well as falling into poverty. Other significant variables found to affect a household's probability of making health payments include health status, type of health services, education, unemployment, and household size. They concluded that health insurance is a significant factor that influences household's out-of-pocket and catastrophic health expenditure.

In a similar study, Yeboah-Mensah (2015) researched on the socio-economic factors that affect the utilisation of health care services by the exempt groups under the national health insurance scheme (NHIS) in Ghana. Employing the ordinary least square regression to both secondary and primary household data on three districts; Kwaebibirim, Asutifi and Savelugu-Nanton representing the coastal, forest and savannah agro-ecological zones respectively, Yeboah-Mensah (2015) found health insurance as a positive and significant factor influencing the utilisation of health services by the exempt group. This finding is consistent with that of Blanchet, Fink and Osei-Akoto (2012), who, using the propensity score matching, showed that individuals in Ghana enrolled on the national health insurance scheme are more likely than the uninsured to seek formal treatment when sick. Also, in consonance with this conclusion is the study of Schieber at al. (2012) who contended that being insured positively and significantly affect the utilisation of formal health care services which lowers health expenditures, particularly among low-income earners. Other variables found

to influence health care utilisation include age, religious affiliation, employment, and type of illness.

In a cross-sectional study, Qosaj et al. (2018) used the 2014 Kosovo Household Budget Survey dataset to examine the effect of insurance on health expenditure (catastrophic health expenditure) and its consequences on household poverty levels by estimating poverty head counts and gaps before and after out-of-pocket health payment. It was found that only 6.87 percent of household heads were covered by health insurance, whereas 8.33 percent of households surveyed in Kosovo had at least one member covered by health insurance. Their regression results showed that insurance coverage significantly reduced health expenditures among insured households (particularly the poor). This indicates that health insurance ownership is a significant and negative predictor of the probability of a Kosovan household experiencing lower health expenditures, especially among low-income (poor) households. Other factors found to significantly predict higher probability of witnessing catastrophic health payments are age of household head, household size and having disabled and aged household members. The conclusions of Mathauer & Carrin (2010) also posited the same negative relationship between health insurance and health expenditure. He noted in his study on the roles of institutions and organisations in designing healthcare financing systems for universal coverage, that insurance coverage is an important means of reducing financial barriers and out-of-pocket expenditure on health care-seeking.

In a study on the determinants of demand for health care services and their implications on health care financing: the case of Bure town, Ethiopia, Asteraye (2002) examined the relative roles of individual/household and choice-specific factors influencing people's medical treatment seeking behaviour of illness and the demand for health care. A statistical sample of residential areas of Bure town, a small woreda town in western Gojjam administrative zone was employed in order to

investigate disparities in seeking medical treatment and demand for health care among households with differing socio-economic and demographic conditions. Applying the binomial logit estimation, Asteraye (2002) found that there was a statistically significant negative association between household size and the probability of seeking medical treatment and demanding health care. Moreover, while sex, monthly income, distance to health facility and length of days of illness produced significant effects on the probability of seeking treatment and demanding health care, variables representing the educational level of household head, age and marital status of patients were found to be insignificantly related to the probability of demanding health care and seeking medical treatment. The study concluded that the observed disparities in the probabilities of seeking medical treatment in times of illness and its related expenditures among households in Bure town show the importance of household size and other factors.

Evidence from Okunade et al. (2010) on the determinants of Thailand household health expenditures, however, contradicts the negative effect of household size on healthcare demand and its expenditure found by Asteraye (2002). Employed the Thailand Socio-economic Surveys, comprising of 98,632 household observations from 1994 to 2000 and using the double-hurdle regression model, it was found that the probability of making health expenditure was highly significant and positive for household with relatively larger members. This is because the demand for preventive and curative care increased as number of people in a household increases, since each person must remain healthy and seek treatment in situation of illness. Specifically, their results show that the probability of a household making out-of-pocket health expenditure increases by 17.2 percent with the addition of one more member to the household. Moreover, whereas households with college-educated heads were observed to experience a lower probability of

incurring health expenditure, those with more aged people saw increased probability of making health expenditure since fewer years of remaining life is associated with deteriorating health.

The health status of an individual, measured by illness reporting, influences one's health expenditure. A person who is ill is classified to have poor health is likely to incur higher health expenditure than an individual who has not reported any illness. This is because a person with poor health status, in his effort to regain good health, must seek care and seeking care comes with a cost. Łyszczarz (2018) in his paper concludes health status is a crucial and an important factor influencing household health expenditures. The study, based on a panel regression, assessed the effects of a households' socio-economic factors on households' health expenditures in Poland, using data from the Poland's Statistical Office for the periods 1999–2015. It was found that poor health status of the household head positively and significantly influenced health expenditure. The rationale behind this is that a household in which a person reported illness had to seek for care to regain good health and this comes with cost. Thus, the disparities in health expenditures among Polish households are due to differences in health status.

You & Kobayashi (2011) investigated the determinants of out-of-pocket health expenditure in China, using the 2004 China Health and Nutritional Survey data. With a subsample of 9,860 adults aged 18 and above, they found that the average out-of-pocket health expenditure in China was $12.2. The results established severity of illness and self-reported poor health status as the two most significant determinants of household out-of-pocket health expenditure in China. Controlling for health insurance, other factors found to positively and significantly influence out-of-pocket health expenditures included increasing age, higher income and residing in urban areas.

The above discussions clearly show that even though a number studies have explored the effects of household demographic and socio-economic factors on household health expenditure, as well as the health risks associated with poor waste handling/disposal, evidence the effects of solid and liquid waste disposal on households' health expenditures in the health and environmental economics literature remains inadequate, particularly in the developing countries. Variables such as ethnicity, religion and caste are ignored because they are more sociological rather than economic determinants of household health expenditures (Jandhyala, 2002). This study, following the Grossman model, adopts the Tobit estimation technique employed by Mugisha et al. (2002), Torres da Silva et al. (2015) and Abeldano (2015) to investigate whether there exists a statistically significant relationship between household solid and liquid waste disposal and household health expenditures, and to examine socio-economic factors that influence household health expenditures in Ghana.

4. CHAPTER FOUR

METHODOLOGY

4.1. Introduction

This chapter presents the methodological approach adopted in achieving the objectives of this study. It outlines the theoretical and empirical frameworks, estimation technique employed to investigate the effect of household solid and liquid waste disposal on household health expenditures in Ghana, and the source of data. It further provides definition of variables, expected signs of the independent variables and the justification for using Tobit model.

4.2. Theoretical Framework

This study is based on the Grossman (1972) theory of demand for health. This theory has been extensively used for healthcare expenditure studies (Rous & Hotchkiss, 2003; Malik & Syed, 2012; Titus & Galama, 2011). The theory assumes that households derive utility or satisfaction from consuming two goods; health (H) and all other goods (Z). The model proposes that the household serves as the basic unit for all microeconomic analysis. Following Rous and Hotchkiss (2003), we assume in this study that, the utility function of each household consists of the utility function of every member of the household.

Based on this, we follow the frameworks developed by Rous and Hotchkiss (2003), and Parker and Wong (1997), in estimating the effects of household economic and demographic factors on household health expenditures in Mexico and Nepal, respectively. The models applied in these studies assume that households generate satisfaction (utility) from consuming health and other commodities. The household utility function is therefore a function of health and other commodities, as represented below;

$$U_i = u(H_i, Z_i), \ i=1,2,3,\ldots,n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where, U_i = households' utility; H_i = household members' health and Zi = all other goods consumed by the households.

To consume health, households produce it by combining inputs such as healthcare services *(HS)* and household's time *(T)*. This means the use of healthcare services by the household is a demand, derived from the demand for health. Thus, health consumption is a function of health services and time. This is specified as follows;

$$Hi = h(HS, T), \quad i=1,2,3,\ldots\ldots,n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Substituting equation (2) into equation (1) gives us a household utility function comprising of health services and household members' time as one of its arguments via all other goods:

$$U_i = f[u(HS, T), Z], \; i=1,2,3,\ldots\ldots\ldots,n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

However, the household faces monetary (income) and time constraints of $P_{HS}HS + P_ZZ + T \leq Y$ in the production and consumption of health.

Based on the goal of this study, we modify the framework adopted by Parker and Wong (1997), by treating household's utilisation of healthcare services as an element derived from the demand for healthcare. This framework concurs with the Grossman model, which sees health care services usage as a demand derived from the demand for health. This is because consumers/households do not derive utility from using or consuming health services per se, rather they generate utility from gaining good health that these healthcare services provide, in combination with time and income. That is to say that households derive utility from consuming "good health", because being healthy makes them feel better, since it produces healthy days, or put differently sick days are a source of disutility to the households.

Thus, the derived demand for healthcare could be expressed via a simplified utility function that is representative of all household members, on the premise that household derives utility from consuming health and other commodities. In other words, households' utility function depends on overall consumption and health, conditional on demographic factors and constrained by its socio-economic factors.

The maximisation problem facing the household is therefore formulated as follows;

$$Max\ U\ [u(HS, T), Z]\ st.\ P_{HS}HS + P_Z Z + T \leq Y \ldots\ldots\ldots\ldots\ldots (4)$$

Where P_{HS} and P_Z represent the prices of health services and all other goods respectively and Y is household income. Following Karimu (2015), we normalise the prices of all health and other goods and household members' time to one (1). This is to avoid data distortion because prices of health services are not truly observable nor available in the data. The solution to the maximisation problem stated above then gives the household demand for health (V) as;

$$V_i = v(P_{HS},\ Y),\ i=1,2,\ldots\ldots,n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where Vi is the household's demand function for health. We then incorporate household solid and liquid waste disposal (M) and social and demographic variables (Q) into Equation (5). The augmented demand equation for health is therefore expressed as follows;

$$V_i = v(P_{HS}, M, Y, Q),\ i=1,2,\ldots\ldots,n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Equation (6) is now the household's derived demand for health and it is a function of price of health and preference for health relative to other goods, household waste disposal, income level, social and demographic variables.

4.3. Empirical Framework

To study the relationship between household solid and liquid waste disposal and household health expenditures, we estimate a model with household's form of solid and liquid waste disposal as independent variables and control for other household variables. This is done, following Grossman (1972), Parker and Wong (1997), Okunade et al. (2010), Molla et al. (2017) and Qosaj et al. (2018). In this light, the household derived demand for healthcare now becomes a function of household demographic and socio-economic characteristics.

From the above theoretical expositions, our health expenditure function will be a function of household's solid and liquid waste disposal, and household's socio-economic and demographic factors. Our health expenditure equation is therefore mathematically expressed as;

$$HHE_i = f(X),\ i=1,2,3,.....,n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

Where HHE represents household health expenditure and X represents a vector of independent variables that affect or influence healthcare spending of households.

To properly model the relationship between health expenditure and set of household social, economic, and demographic characteristics, we employ the Tobit (also known as Censored Regression) Model for the analysis. This is because healthcare expenditure is censored in the sense that whereas we have complete observations for all explanatory variables, we only know the true values of healthcare for a restricted range of observations. This means there is a significant clustering of health expenditure – resulting in truncation. Hence, to model the relationship between the observed healthcare expenditure and the exogenous variables, we consider a latent variable Y^*

for Y, with the condition that a change in X affects Y only through the effect of X on Y^*. Thus, the dependent variable is modelled using the Tobit model.

To establish a relationship between household's solid and liquid waste disposal, in addition to socio-economic and demographic factors and health expenditure, our study specifies a health expenditure equation of the form;

$$Y_i^* = \beta + M_i\alpha_i + X_i\gamma_i + \varepsilon_i, \qquad i=1,2,.....,n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(8)$$

Where Y^* is a latent (unobserved) variable representing the observed variable (health expenditure), M_i consists of the treatment variables (household solid and liquid waste disposal); X_i is a vector of observed household social economic and demographic variables that explain or influence the outcome variable Y^*; β_i are the parameters of solid and liquid waste disposal and γ_i are the coefficients of the control variables that measure or describe the marginal effects of explanatory variables on the latent dependent variable, Y^*; β_0 = Constant and ε = the normally distributed random error term. Following the Tobit regression model, we define the observable household healthcare expenditure, Y_i as;

$Y_i = Y^*$ *if* $Y^* > 0$
0 *if* $Y^* \leq 0$
Where Y^* is a latent variable

From the above, two empirical models are estimated as follows;

$$lnHHE = \beta_0 + \beta_1 SWD_i + \beta_2 LWD_i + \varepsilon, \; i=1,2,...., n.....(9)$$

$$lnHHE = \beta_0 + \beta_1 SWD_i + \beta_2 LWD_i + \beta_3 HSED_i + \varepsilon, \; i=1,2....,n.....(10)$$

Where, *HHE* denotes household expenditure on healthcare; SWD_i represents household disposal of solid waste; LWD_i denotes household disposal of liquid waste; $HSED_i$ represents household's

socio-economic and demographic characteristics such as income, household size, location, household head's age, sex, health insurance status, illness reporting and hospitalisation.

The logarithmic transformation of the dependent variable (healthcare expenditure) in this study is aimed at resolving the problem of heteroscedasticity. The log transformation of household healthcare expenditure resulted in a problem, where zero (0) healthcare expenditures were observed for large number of households. To resolve this problem, we follow You and Kobayashi (2011), Okunade et al. (2010) and Yeboah (2018) by assigning the value of one (1) in place of zero (0) household healthcare expenditure. By this, we still have the original zero household health expenditures in the dataset after the log transformation. We then estimate Equations (9) and (10) with the Tobit model, which is a maximum likelihood estimation (MLE) technique. Stata version 15 is the econometric software used for analysis in this study.

4.4. Definition of Variables and Expected Signs

4.4.1. Dependent Variable

Household Health Expenditure

To examine the effect of household solid and liquid waste disposal on health expenditure, the study makes use of household total expenditure on health as the outcome variable. Total health/healthcare expenditure of the household captures expenditures on hospital services such as hospitalisation, outpatient services, and medical products incurred by the household. The household health expenditure designates all monetary health expenditures incurred by the household over the period, excluding health insurance. The total household healthcare expenditure is captured as a continuous variable and it is measured in Ghana Cedi. Household total health

expenditure covers expenses such as consultation fees, costs of drugs and other curative and preventive healthcare expenses directly made by the household to the healthcare provider.

4.4.2. Independent Variables

Household Size (HS)

The size of a household influences its resource allocation and play an important role in its health care spending decisions. Generally, household size captures the number of persons or members reported to be living in a household. Whiles some studies observed a positive association between household size and household health expenditures, others found a negative relationship. For instance, a study by Olasehinde and Olaniyan (2016) in Nigeria found that household size positively affects household health expenditure. This conclusion is consistent with the results of Rous and Hotchkiss (2003), Su et al. (2006), and Okunade et al. (2010), who in their separate papers in Nepal and Thailand respectively observed household size to positively influence health expenditure of the household. However, Brown et al. (2014) established that households with more members spent less on healthcare than household with less members. They explained that a household with more persons diminishes the distribution of resources, hence the probability of spending on healthcare decreases. This same conclusion was arrived at by Asteraye (2002) and Olowolabi (2014) who found a negative association between household size and expenditure on healthcare. Our study therefore expects this variable to be positively or negatively related with household health expenditure.

Household Income (HI)

The income of a household has been found to play a significant role in their health spending decisions. Grossman (2000) emphasised that income of an individual or household is a positive

determinant of healthcare spending in that increases in income induces the individual to spend more on healthcare. In his paper, Rout (2006) showed that a rise in household income increases its per capita health expenditure – confirming that household income is a positive predictor of its health spending. Consistent with this finding is the results of Parker and Wong (1997) and Torres da Silva et al. (2015) which found income as a positive determinant of household healthcare expenditure.

Conversely, Dash and Mohanty (2019), in their study found household income to negatively determine its health expenditure. Also, Azzani et al., (2018) in their systematic review concluded negative effect of household income on health expenditure. In this paper, household income will be proxied for or represented by household expenditures. This is because not only is information on incomes of the households in a growing economy such as Ghana difficult to report and measure, but also such information is usually underreported as compared to that of expenditures. People tend to report their expenditures more accurately than their incomes (Brown et al., 2014). The GLSS 7 dataset contains information on household total expenditures, and it is rational to assume that the household spends what it earns. In this study, it is expected that income be positively or negatively related to health expenditure.

Household Head's Years of Education

Education is one important factor that influences the healthcare spending of the household. Grossman (1972) and Grossman (2000) believed that higher education raises the likelihood of higher health expenditure of the household. He explained that higher education raises people's knowledge of negative health practices. Also, associated with higher education is higher income via better paid jobs. These make well-educated people to spend more to remain healthy in order to

achieve short and long-term goals. Qosaj et al., (2018), Currie and Gruber (1996) and Abeldano (2015), in their studies reported that highly educated household heads spent more on household healthcare compared to household heads with no or less education. This finding is in line with studies by Sen and Rout (2007).

On the other hand, Aregbeshola and Khan (2017) in their paper revealed that a rise in the household head's years of education reduces substantially out-of-pocket expenditure on healthcare. This same conclusion was made by Olowolabi (2014), who observed that household heads with higher years of schooling (education) spent less on healthcare relative to households with no or less years of schooling. In this study, education is captured as a continuous variable and it is measured in years of formal schooling. We expect its effect on household health expenditure to be positive or negative in this study.

Household Head's Age

The age of an individual, and for that matter a household head has been proven to influence one's expenditure on healthcare. Grossman (1972) and Grossman (2000) recognised that age influences healthcare spending positively because as one ages, his/her health deteriorates (depreciates). This leads to increased demand for healthcare resulting in higher healthcare expenditure. A study by Sarker et al. (2014) in Bangladeshi acknowledged this fact. This positive association is further supported by the studies of Folland et al (2003), Rout and Hotchkiss (2003), Olasehinde and Olaniyan (2016), Olasehinde (2014), Aregbeshola and Khan (2017), and Hartwig & Sturm (2017). Haque & Barman (2010), however noted a negative relationship between household head's age and healthcare expenditure among Bangladeshi households. In this study, we anticipate age of household head to be positively or negatively related to household health expenditure

Sex of Household Head

Many studies have noted the critical place occupied by sex of the household head in household healthcare spending decisions. Mugisha et al. (2002) found health expenditure to be higher for male headed than female headed households. A similar study by Rous and Hotchkiss (2003) revealed that male-headed households spent more on healthcare than female-headed counterpart households. This assertion is further supported by the evidence of Sarker et al. (2014) whose results indicated that overall health care expenditure was higher in male than female-headed households. Malik & Syed (2012) on the other hand observed that male-headed households spent relatively less on healthcare than their counterparts in female-headed households. Haque and Barman (2010), Abeldano (2015), and Aryeetey et al. (2016), in their respective studies in Argentina, Bangladesh and Ghana respectively also observed that being in male-headed households negatively determine health care expenditure, hence this variable is expected to affect healthcare expenditure positively or negatively in this study. Our study treats sex of the household head as a dummy variable and categorise it into Male or Female, with male serving as the point of reference for analysis.

Location of Household

The influence of household location on household health expenditure has been emphasised in the literature. The location of a household defines the place of residence of the household or the place where the household is cited or situated. It is also called place of residence in some studies and categorised into Rural and Urban, with rural serving as the reference point for our analysis. Household location can significantly influence household healthcare expenditure positively or negatively, particularly in a developing country like Ghana where the distribution of facilities that improve life and health is disproportionate between rural and urban areas. In their paper, Rous and

Hotchkiss (2003) disclosed that relative to rural households, urban households spent less on healthcare services. Parker and Wong (1997) estimated that the probability of making cash payment for healthcare services was higher among rural than urban households. They explain that this was due to unavailability of health facilities in rural areas at which free or subsidised services could be obtained. The results of Yazdi-Feyzabadi et al. (2018), confirm that healthcare expenditure was higher for Iranian rural households than witnessed in urban households. But in contrast, Mugisha et al. (2002), established that being in urban households is indicative of higher healthcare spending. Molla et al. (2017), in their study also found a negative relationship between rural households and healthcare expenditure. The expected sign for this variable in our paper is positive or negative.

Illness Reporting of Household Head

Illness influences the health expenditure of the household. The healthcare spending decisions of a household can be substantially dictated by illness. This is because in times of illness, individuals must visit health facility or consult medical practitioner for treatment. This has consequences on health spending of the household. In this study, household head's illness reporting is treated as a dummy variable, Yes or No, with No as the reference point for analysis. From the data employed for this paper, a household head that consulted a health facility or health practitioner indicates the presence of illness within the household and this means increased health expenditure among such household members. That is, a household head that consulted or visited a health facility positively influences household health expenditure. This explanation is in line with the findings of Buigut et al. (2015), You and Kobayashi (2011), and Yazdi-Feyzabadi et al. (2018). This study expects a positive or negative sign for this variable.

Hospitalisation of Household Head

Hospitalisation is one major driver of health/medical expenditures. In situation of illness, a person who is hospitalised faces the probability of incurring higher healthcare costs. Hospitalisation increases the length of stay in healthcare facility, ensuring that a patient is given closer attention. Hajizadeh & Nghiem (2011) found admission to hospital (hospitalisation) as one major and significant driver of medical expenditures of the household. A related study by Sharma et al. (2017) found that hospitalisation as a major predictor of out-of-pocket health expenditure. Findings of Kastor & Mohanty (2018) also explained that overnight stay in a hospital or health facility increases the amount incurred in health expenditure. In this study, hospitalisation is defined to as the admission of the household head to a hospital or health facility for at least one night on account of illness and we treat it as a dummy, with 0=not hospitalised and 1=hospitalised and hospitalised will be the reference point for our analysis. This variable is expected to have a positive or negative effect on healthcare expenditure.

Health Insurance Status of Household Head

The role played by health insurance coverage in household health spending decisions has been recognised and emphasised in the literature. Health insurance, be it in urban or rural area, has been noted to lower out-of-pocket health spending of households, particularly the poor (Aryeetey et al. 2016). In this study, household's insurance status is captured as a dummy variable and categorised into a Yes or No - where yes denotes households with insurance coverage and no for otherwise. Yes, will be the reference point for our analysis. Ghana has a universal health insurance coverage that is open to all residents. It is rational therefore to assume that households in Ghana that have national health insurance coverage will face lower healthcare costs relative to households that are not covered by the national health insurance. This is because insured households enjoy health

benefits and exemptions which reduce their healthcare spending as compared to uninsured households. Aryeetey et al., (2018) in their paper noted that health insurance coverage significantly reduced the healthcare costs borne by the households. This finding is in line with that of Abeldano (2015), Parker and Wong (1997), Yeboah-Mensah (2015), and Qosaj et al. (2018). This study therefore expects a negative or positive sign for this variable.

Form of Solid Waste Disposal (FSWD)

Household form of refuse disposal enters the model as a categorical variable to capture the effect of household disposal of solid waste on household health expenditure. The household form of refuse disposal is chosen premised on the information contained or provided in the GLSS VII dataset. Thus, this variable is generated from the question: "How does your household dispose of refuse?" The responses to this question are: "Collected", "Burned by household", "Public Dump", "Dump Indiscriminately". Based on the objective of this study, the form of household solid disposal is coded as; 0= Collected; 1= Burned by household; 2= Public Dump; and 3= Dump indiscriminately. In this paper, household solid waste disposal can influence negatively or positively healthcare expenditure of the household depending on how the household disposes off refuse or the form of refuse disposal in the household. Siqueira at al. (2016), using micro data demonstrated that poor waste handling by households has a significant positive effect on out-of-pocket expenditures on hospitalisation. Also, Suleman et al. (2015), Fening & Edoh (2009), Owusu-Sekyere et al. (2015), Addo & Acheampong (2015) and Yoada et al. (2014), in their studies on health literature pointed out that household improper solid waste disposal affect household health negatively, which in turn has implications for household healthcare expenditure in that substantial amount of household income would have to be spent treating illnesses resulting from

diseases contracted from poor solid waste disposal. This study therefore expects the relationship between household health expenditure and household form of refuse disposal to be positive or negative.

Form of Liquid Waste Disposal (FLWD)

The type or form of household liquid waste disposal can influence household expenditure on healthcare. For our study, household form of liquid waste disposal is treated as the type of toilet facility used by the household and this enters the model as a categorical variable. The household type of toilet facility variable is chosen based on the information provided in the GLSS 7 dataset, international standards, and as treated in some studies. For instance, in the WASH program of WHO/UNICEF, sanitation and liquid waste are used interchangeably. Hence the type of toilet facility used by a household serves as a proxy for household liquid waste disposal. Further, Issah-Bello (2011), EPA-Australia[3], Geest & Obirih-Opare (2008), Geest & Obirih-Opareh (2002), all defined or treated household liquid waste as the type of facility used for excreta/human waste disposal. Based on these pieces of evidence and the dataset employed for this study, our variable is generated from the question: "What type of toilet facility is usually used by the household?" The responses to this question are: "No facility", "Water closet", "Pit latrine", "KVIP", "Bucket/Pan", "Public toilet" and "Other (Specify)". To realise the objective of this study, the form of household liquid waste disposal is coded as; 0=water closet; 1=No facility; 2= Pit latrine; 3= KVIP; 4= Public toilet. Papers of Geest & Obirih-Opare (2008), Geest & Obirih-Opareh (2002) and Allotey (2012) in the health literature have acknowledged the effects of proper/improper disposal of human waste/excreta on health and its consequences on healthcare spending. We

[3] www.epa.sa.gov.au

expect household form of liquid waste disposal to have positive or negative influence on household health expenditure.

Table 4. 1: Summary and measurement of variables and their expected signs

DEPENDENT VARIABLE	DESCRIPTION	EXPECTED SIGNS
Household Health Expenditure	Continuous	
INDEPENDENT VARIABLES		
Household form of refuse disposal (a proxy solid waste disposal)	Categorical (0=Collected; 1=Burned; 2=Public Dump; 3=Dump indiscriminately)	+/-
Household type of toilet facility (a proxy for household form of liquid waste disposal)	Categorical (0=Water closet; 1=no facility; 2=Pit latrine, 3=KVIP, 4=Public toilet)	+/-
Household Size	Continuous	+/-
Household Income	Continuous	+/-
Years of education of household head	Continuous	+/-
Age of household head	Continuous	+/-
Sex of household head	Dummies (0=male, 1=female)	+/-
Location of household	Dummies (Urban=1, Rural=0)	+/-
Household head Illness reporting	Dummies (0=Did not illness, 1= Reported illness)	**+/-**
Hospitalisation of household head	Dummies (0=not hospitalised, 1=hospitalised)	**+/-**
Health insurance status	Dummies (0 = Covered, 1 = Not Covered)	**+/-**

Source: Author's a priori Expectation based on the extant literature, 2020

4.5. Source of Data

In our attempt to investigate the effect of solid and liquid waste disposal on health expenditures among rural and urban households in Ghana, the paper employs the Ghana Living Standards Survey, 7th round data. The GLSS 7 is the most recent national household survey data collected, having been conducted by the Ghana Statistical Service in the year 2016/2017 after the sixth edition in 2012/2013. The GLSS is a periodic countrywide cross-sectional household survey undertaken by the Ghana Statistical Service since 1989, when the first round was conducted. It is a nationally representative survey of all regions and residence locations for households sampled out of enumeration areas (EAs). The GLSS 7 covered over 14,000 households with over 59,000 individuals. The dataset contains detailed household information on key areas including income, housing conditions, occupation/employment, health, education, expenditure, migration, among others. For this research, the GLSS 7 dataset also has information on households' forms of solid and liquid waste disposal and health expenditures. Information is also available on the educational level of household head, age of household head, sex of household head, household size and location of household.

4.6. 4.5 Justification for Employing the Tobit Model in this Study

The Tobit model also called the censored regression model is an econometric estimation technique proposed and designed by James Tobin in 1958 to estimate the relationship between censored non-negative dependent variable and a set of independent variables. Several studies undertaken on the determinants of household health expenditures have employed different estimation techniques to estimate health expenditures. For instance, Torres da Silva et al. (2015), Mugisha et al. (2002) and Abeldano (2015) employed the Tobit regression model to estimate health expenditures in their

respective studies. However, Malik & Syed (2012), Olowolabi (2014), Sen & Rout (2007), Molla et al. (2010), Sarker et al. (2014), and Olasehinde & Olaniyan (2016) employed the ordinary least square (OLS) technique in their separate estimations. This was possible because the datasets employed for the respective studies had healthcare expenditure reported for about 90-99 percent of the observations.

This study employs the Tobit regression model to estimate health expenditures among Ghanaian household while using the Ordinary Least Square (OLS) technique to check for robustness of the results. This is because the Ordinary Least Square (OLS) regression is more suitably applied when the dependent variable does not contain zero observations for health expenditure or the dependent variable exhibits a positively skewed distribution such as healthcare expenditures (Malik and Syed, 2012). In the GLSS 7 (2016/2017) dataset the variable healthcare expenditure contains many zero observations, such that health expenditure is only observed for households that reported positive expenditures, otherwise zero. This makes health expenditure a latent variable. It is a limited continuous dependent variable and ignoring these zero observations and using the OLS will generate or produce biased and inconsistent estimates due to censoring. Also, the linearity assumption of the OLS is broken by the zero nature of this cross-sectional data thereby rendering the use of the OLS incongruous (Torres da Silva et al., 2015).

Due to the above challenges with the use of OLS, we adopt the Tobit regression technique for our analysis. The Tobit model, as compared to the OLS, is more suitable and appropriate for censored variable like household health expenditures (Mugisha et al., 2002; Abeldano, 2015). This technique also limits the issue of heteroscedasticity (Azorliade, 2019). Besides, the use of

the Tobit model in this study will provide more useful, insightful, and specific policy-oriented results unlike the OLS which only gives a generalised outcome.

5. CHAPTER FIVE

DISCUSSION OF RESULTS

5.1. Introduction

This chapter first presents the descriptive statistics of the variables employed in the study. The chapter also discusses the estimated results from the Tobit regression.

5.2. Descriptive Statistics of Variables

Tables 5.1 and 5.2 present summaries of descriptive statistics of all variables, both dependent and independent, employed in this study. All variables were based on the GLSS 7 (2016/2017) dataset with household healthcare expenditure as the dependent variable and the independent variables comprising of total household expenditure (proxy for household income), household head's years of education, sex of household head, household head's illness reporting, insurance status of household head, location of household, household size, household form of solid waste (refuse) disposal, household form of liquid waste disposal (toilet facility type) and region of residence of household.

Table 5. 1: Descriptive Statistics of Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Household Health Expenditure	13,952	81.81537	306.6813	0.5	10307.6
Household Size	13,952	4.200043	2.865972	1	28
Total Household Expenditure/income	13,952	10430.26	10297.37	81.1	232614.7
Household Head's Years of Educ.	9,597	9.415234	3.735501	1	19
Age of Household Head	13,923	46.23695	15.90161	15	99
Sex of Household Head	13,923	1.311714	0.4632105	0	1
Illness Reporting of Household Head	13,862	1.892584	0.3096525	0	1
Hospitalisation of household head	13,750	1.916655	0.2764137	0	1
Insurance Status of Household Head	10,033	1.356723	0.4790559	0	0
Location of Household	13,952	1.570313	0.4950492	0	1
Household Refuse Disposal	13,952	2.640267	0.9476097	0	3
Household Toilet Facility Type	13,952	3.243478	1.936448	0	4
Region of Residence of Household	13,952	5.527523	2.826341	0	9

Source: Author's Construction from GLSS 7 (2016/2017)

Table 5.1 reveals that on average, household health expenditure was about GH¢81.81 annually, with a minimum of GH¢0.50 and a maximum of GH¢10,307.6 for the 2016/17 period. The mean size of Ghanaian households is about four (4) people, with a standard deviation of approximately 2.9, confirming that of GLSS 7 main report and a study by Adzawla et al, 2019). Although the household size was averagely four (4) people, there were homes with as high as 28 persons sharing same household resources.

From Table 5.1, the average household expenditure (a proxy for household income) in Ghana is about GH¢10,430, with a standard deviation of 10297.37. This means that there exist huge

variations/dispersions in expenditures among households across the country. This is confirmed by the minimum and maximum expenditures of GH¢81 and GH¢232,615, respectively. This is indicative of the wide consumption/income inequality in the country.

Also presented in Table 5.1 is the average age of household head, which is about 46 years and has a standard deviation of approximately 16. With respect to household head's years of education, it was observed that the mean years of education of a household head was 9.4 years. This has implication for making healthcare payments, because on average, all households have gained quite satisfactory education and therefore have some knowledge to safeguard their member's health.

Table 5. 2: Sample Distribution of Selected Variables

Variable	Frequency	Percentage	Cumulative
Sex of Household Head			
Male	9,583	68.83	68.83
Female	4,340	31.17	100
Total	13,923	100	
Health Insurance Status			
Covered	6,454	64.33	64.33
Not Covered	3,579	35.67	100
Total	10,033	100	
Illness Reporting			
Illness Reported	1,489	10.74	10.74
No Illness Reported	12,373	89.26	100
Total	13,862	100	
Hospitalisation status			
Hospitalised	1,146	8.33	8.33
Not hospitalised	12,604	91.67	100
Total	13,750	100	
Household Location			
Urban	5,995	42.97	42.97
Rural	7,957	57.03	100
Total	13,952	100	

Source: Author's Construction from GLSS 7 (2016/2017)

Table 5.2, close to 69% (68.83%) of the respondents were males, with the remaining (31.17%) being females. This means that majority of households were headed by males. Household head's insurance status in Table 5.2 indicates that a larger proportion of Ghanaian households (64.33%) are covered by the national health insurance scheme as compared to the 35.67% of respondents that face the full costs of healthcare services. This phenomenon is expected to significantly affect healthcare spending among the two divides.

Household head's illness reporting for 2016/17 period as demonstrated in Table 5.2 depicts a trajectory where larger proportion of households (89.26%) did not report illness or consulted medical/health practitioner, as compared to the 10.74% that reported to have experienced illness or consulted a health professional. It is indicated in Table 5.2 also that majority of households (91.76%) did not report any case of hospitalisation. That is, close to 92 percent of households did not have a member staying overnight in a hospital or health facility on the account of illness.

With respect to location of household, a higher proportion (57.03%) of households are rural residents with the remaining 42.97% located in the urban areas of the country.

5.3. Diagnostic Test

5.3.1. Test for Multicollinearity

To check for multicollinearity (correlation among the continuous explanatory variables), we perform a variance inflation factor (VIF) test. From Table 5.3, the VIF values for all our variables are less than ten (10), with 1/VIF values above 0.1. We conclude therefore that our model is free from multicollinearity, following the rule of thumb, which states that variables with VIF values

greater than ten (10) or 1/VIF values less than 0.1 suffer from multicollinearity (Malik and Syed, 2012; Molla, Chi & Mondaca, 2017).

Table 5. 3: Test for Multicollinearity

Variable	**VIF**	**1/VIF**
Age_squared	1.02	0.97893
lnYears of education	1.15	0.87321
lnHousehold income	1.30	0.76783
lnHousehold size	1.24	0.80489
Mean VIF	**1.18**	

Source: Author's Construction from GLSS 7 (2016/2017)

5.4. Results from the Tobit Estimation

To investigate the effect of household solid and liquid waste disposal on household healthcare expenditure, responses from the GLSS 7th round data were subjected to a Tobit model regression analysis in two separate models. This first model is a simple model with household's from of solid and liquid disposal as independent variables. The second model controls for household head characteristics and socio-economic and demographic characteristics of the household. Our estimated results reported on the marginal effects (same as coefficients), just like what the OLS does, of household solid and liquid waste disposal, and other socio-economic and demographic factors on healthcare expenditure. Results from the Tobit regression are presented in Tables 5.4a and 5.4b. Coefficients (which are same as marginal effects), standard errors and t-statistics are reported. The estimations were performed with the application of Stata 15 software package.

Table 5. 4: A Tobit estimates of the effects of wastes disposal on household healthcare expenditure (without controls)

	Model 1		
lnHousehold health expenditure	Marginal effect	Standard Error	t
Household refuse disposal			
Burned	0.3654550*	0.1952514	1.87
Public dump	0.1077174	0.1735440	0.62
Dumped Indiscriminately	1.1649930***	0.2131333	5.47
Household toilet facility type			
No facilities	0.7597151***	0.2063518	3.68
Pit latrine	0.2233136	0.2087846	1.07
KVIP	0.7296375***	0.2221929	3.28
Public Toilet	0.5499251***	0.1929497	2.85
Constant	-2.3008310***	0.1788029	-12.87
Number of observations = 13,952			
Log Likelihood = -20816.075			
LR chi2(7) = 108.12			
Prob > chi2 = 0.0000			
Pseudo R2 = 0.0026			

***Significant at 1%; **Significant at 5%; *Significant at 10%

Number of left-censored observations at ln(Total healthcare Care Expenditure) < = 0: 8,900

Number of uncensored observations = 5,052

Source: Author's Computation from GLSS 7

Table 5. 5: Model 2 – A multivariate tobit estimates for household health expenditure

Model 2			
lnHousehold health expenditure	Marginal effect	Standard Error	t
Household refuse disposal			
Burned	0.759239***	0.271665	2.79
Public dump	0.495505**	0.233411	2.12
Dumped Indiscriminately	1.871397***	0.339087	5.52
Household toilet facility type			
No facilities	1.587453***	0.318638	4.98
Pit latrine	1.024707***	0.280843	3.65
KVIP	0.899057***	0.276011	3.26
Public Toilet	0.979804***	0.248782	3.94
lnHousehold Income	1.933538***	0.133678	14.46
lnHousehold Size	0.049413	0.130479	0.38
Age	-0.112411***	0.031946	-3.52
Age Squared	0.001222***	0.000323	3.78
Sex of Household Head			
Female	0.294467*	0.170451	1.73
lnYears of Education	-0.423824***	0.031946	-3.52
Illness Reported			
Reported illness	1.236450***	0.231450	5.34
Hospitalisation Status			
Hospitalised	1.662528***	0.258248	6.44
Health Insurance Status			
Not Covered	0.236785	0.161910	1.46
Location			
Urban	-0.034573	0.180405	-0.19
Constant	-18.104900***	1.373933	-13.18
Observations = 6,931			
Log Likelihood = -9972			
LR chi2(17) = 409.51			
Prob > chi2 = 0.0000			
Pseudo R2 = 0.0201			

***Significant at 1%; **Significant at 5%; *Significant at 10%

Number of left-censored observations at ln(Total healthcare Expenditure) < = 0: 4,508

Number of uncensored observations = 2,423

Source: Author's Computation from GLSS 7

5.4.1. Effect of Household Solid and Liquid Waste Disposal on Household Healthcare Expenditure

This section discusses the effect of household solid and liquid waste disposal on household healthcare expenditure, using collected and water closet, which are considered safe means of solid and liquid waste disposal, as reference categories, respectively. Results from Table 5.4a produced a positive relationship between improper disposal of household solid and liquid waste disposal and healthcare expenditure of the household.

From Table 5.4a, it is indicative that relative to households that collect their refuse for final disposal by waste management or local/city authorities, households that dispose of their refuse indiscriminately (in the open, water bodies and drains) and at public dumps have positive and statistically significant effect on their healthcare expenditures. Specifically, the result indicates that households that practice indiscriminate and burning of solid waste are 116.50 percentage points and 36.55 percentage points respectively, more likely to spend on healthcare services and these are significant at 1 percent and 10 percent, respectively. Public dumping of refuse by the household was however found to be insignificant. This finding is line with the studies of Medina (2011), WHO Meeting Report (2015), Addo & Acheampong (2015), Suleman et al. (2015) ,which found that burning and indiscriminate dumping of household refuse have varying adverse and significant effects on health and consequently on healthcare expenditures. One reason behind these results is that burning, indiscriminate and public dumping of refuse (solid waste) are considered improper, unhygienic and a threat to health (Bowan et al., 2019; Addy, 2013; and Sankoh et al., 2013) have been found to be major drivers of diseases (such as malaria, cholera, diarrhea, skin infections, typhoid fever, cancer, respiratory infections inter alia) which affect the health of

individuals and thus, their healthcare services demand and usage (Chengula et al., 2015; Boadi and Kuitunen, 2005; Owusu-Sekyere et al., 2015, Mattiello et al., 2013; WHO, 2015b; and Bowan et al., 2019). The UN-HABITAT (2010) recognises that good and proper solid waste management is like good health, implying that an improper and poor disposal of solid waste is synonymous to poor health as it fosters disease transmission, prevalence and morbidity particularly in developing countries like Ghana. Also, strongly related to poor health is higher cost of seeking healthcare, which influences healthcare expenditures.

On the effect of household toilet facility type (a proxy for liquid waste disposal), we found that households that have no toilet facility, use of KVIP, and Public toilet have direct and statistically significant relationships with healthcare expenditure. Specifically, we found that relative to households with water closet, households with no toilet facility, those with KVIP and households using public toilet are 75.97 percentage points, 72.96 percentage points and 54.99 percentage points more likely to spend on healthcare and these are significant at 1 percent respectively. This means the likelihood of a household making healthcare expenditure is statistically significant and higher among households that have no toilet facility (75.97%), followed by households using KVIP (72.97%) and public toilet (54.99%). The use of pit latrines, however, had an insignificant effect on healthcare expenditure. These results corroborate the findings of Olasehinde & Olaniyan (2017) which found that there was a negative likelihood of incurring healthcare expenditure for a household using flush toilet (water closet) relative to a household using other toilet types. Studies of Nkansah (2015), Owusu (2010), Mongtgomery & Elimelech (2007), Fening & Edoh (2009), and, Siqueira et al. (2016) also established that households with poor toilet facility types face higher risks of sanitation-related diseases such as diarrhoea, cholera, typhoid fever, hepatitis A,

yellow fever among others. Specifically, Nkansah (2015) found that households with no toilet facility, those with pit latrine and KVIP face higher probability of diarrhoea infection, transmission and prevalence, particularly among children. This affect their health and ultimately the healthcare expenditure expenditures of the household.

The introduction control variables increased the likelihood of incurring healthcare expenditures by a households that disposes off solid waste poorly (burning, public dump and indiscriminate dumping) and uses unimproved toilet facilities (no facility, pit latrine, KVIP and public toilet) relative to households that collects and properly disposes off its refuse and households that use water closet. This is evident in table 5.4b where the marginal effects (same as coefficients) are larger for the treatment variables as compared to the result in table 5.4a. The marginal effects (same as coefficients) in model 2, compared to results in table 1 are larger due to the effects manifested other variables influencing healthcare expenditure of the households.

5.4.2. Effect of Socio-economic and Demographic Factors on Household Healthcare Expenditures

Presented in the Tobit estimation results in Table 5.4b are also the socio-economic and demographic factors of the household that influence its healthcare expenditure.

As indicated in Table 5.4b, total expenditure of the household (a proxy for income) demonstrates a positive and statistical significance influence on household healthcare expenditure. As income rises, the amount dedicated to healthcare services also increases. This is justified by Torres da Silva et al. (2015), which explained that increases in household income raises the amount of expenditures incurred on goods and services consumed by a household, among which is healthcare or that the household is able to afford better healthcare – which comes at a higher cost. Specifically,

from Table 5.4b, it is evident that a (10) percentage point increase in household total expenditure (a proxy for income) leads to an increase in household healthcare expenditure by 1.93 (19.3) percentage points. Our finding is in line with studies of Molla et al. (2017), Rout (2006), Parker and Wong (1999), Rous & Hotchkiss (2003), Haque & Barman (2010), and Olasehinde & Olaniyan (2017), which found that increases in income of a household allows members to seek better and quality healthcare.

On the effect of education, our result from Table 4.5 shows a negative and significant (1 percent level) influence of household head's years of education on household healthcare expenditure. It is clear from our results that, at 1 percent significant level, a (10) percentage increase in household head's years of education results in a 0.42 (4.2) percentage point decrease in household total healthcare expenditure. This means that higher educated household heads are less likely to spend on healthcare as opposed to household heads with low education. The possible explanation is that higher education raises people's knowledge of negative health practices and therefore tend to avoid risky health behaviours such as smoking, alcohol abuse, poor sanitation, unsafe sexual affairs, among others. This explanation is in line with Grossman (1972) which noted that higher education improves the efficiency with which people produce investments in health and other goods. This finding supports the works of, Rous & Hotchkiss (2003), Aregbeshola & Khan (2017), Olowolabi (2014), Okunade et al. (2009), but however contradicts studies of Qosaj et al. (2018), Abeldano (2015), Rout (2006), Sen & Rout (2007) which indicated a positive association between household head's years of education and healthcare expenditure. This is because education promotes proper health practices and nutrition which significantly good health and reduces illnesses.

In terms of age of the household head, our resulted showed a significant (1 percent) effect of age of the household head on healthcare expenditure. Age of the household head has a negative

relationship with healthcare expenditure which means that healthcare expenditure decreases with increase in age. Results from the table reveal that increase in age of the household head by an additional year is accompanied by a 11.24 percentage point less likelihood of incurring healthcare expenditure. However, overtime as the individual grows older his health stock depreciates faster leading to increased demand for healthcare resulting in higher expenditure as shown by the positive and significant coefficient of age squared. This is due to the fact health stock of younger persons depreciates slowly as against older individuals whose health stock depreciates faster, where further increase in age is associated with a 0.12 percentage point likelihood rise in healthcare expenditure. Hence, the elderly tends to purchase higher amount of health/medical care thus higher amount of healthcare spending. This assertion is in harmony with Grossman (1972a, 1972b, and 1999) and is supported by the works of Sarker et al. (2014), Hartwig & Sturm (2017), Olasehinde (2014), Folland et al. (2003), Olasehinde & Olaniyan (2016), and Molla et al. (2017).

Household head's reporting illness is shown in Table 5.4b to be significantly (at 1 percent) related to healthcare spending of the household. It is clear from our result households with heads who reported illness are 123.65 percentage points more likely to incur expenditure on healthcare services than households whose heads did not report illness. This is because the presence of illness in a household denoted poor health status which goes with increased visits to healthcare facility or consultation of health practitioner for medical care and this implies higher health expenditures. This submission conforms to studies of Buigut et al. (2015), You & Kobayashi (2011), and Yazdi-Feyzabadi et al. (2018), which observed household healthcare expenditure to decrease for households with no illness reported relative households with reported illness.

The result in Table 5.4b demonstrates that hospitalisation of a household head significantly (1 percent) increases healthcare expenditure of the household. It is evident that a household that have

its head hospitalised on account of illness is 166.25 percentage points more likely to make healthcare expenditure than a household where the head had not been hospitalised. The possible explanation is that admission of a household head or member to a hospital or health facility for at least one night on account of illness will positively and significantly drives healthcare expenditure. This finding is consistent with findings of Hajizadeh & Nghiem (2011), Sharma et al. (2017) and Kastor & Mohanty (2018) which explained that hospitalisation increases the amount of expenditure incurred on medical or healthcare.

On the effect of sex of the household head, our result points to a positive and statistically significant (10 percent) relationship between health expenditure and being in a female headed household relative to female headed household. We find that relative to male-headed households, female-headed households face a 29.4 percentage point more likelihood of spending on healthcare. This possible explanation for this is the fact that females differ from males in health seeking behaviour which influences their patterns and use of medical/healthcare and these have consequences on healthcare expenditure. This result is congruent with studies by Su, et al., (2006), Malik & Syed (2012), Haque & Barman (2010), Abeldano (2015), and Aryeetey et al. (2016) which rather showed that female-headed households paid more attention to the general health of their members and particularly child health and therefore incurred higher healthcare expenditures.

5.5. Chapter Summary

This chapter presented the methodology and discussion of the results from our Tobit regression estimates. The results from both models, though demonstrated similarity in terms of signs and directions, the marginal effects are greater in model 2 (with controlled variables). It is shown in this study that households that dispose off refuse by burning, indiscriminately and at public dumps (in model 2) are more likely to incur healthcare expenditure as compared to their counterpart

households that collect their refuse for proper disposal. Also, relative to households that have and use water closet, households that have no toilet facility, households using KVIP, public toilet and pit latrines (in model 2) are more likely to spend on healthcare services. Key among socio-economic and demographic factors found to significantly influence household healthcare expenditure are total household expenditure (a proxy for income), age of the household head, years of education of the household head, illness reporting of household head, hospitalisation of household head and sex of household head.

6. CHAPTER SIX

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

6.1. Introduction

This chapter summarises the study and presents the conclusions and recommendations for policy consideration. The final section of the chapter highlights the limitations encountered during this research and suggests possible areas of consideration for future studies.

6.2. Summary of Findings

The study sought to contribute to the growing body of environment and health economic literature, by first investigating the effect of household solid and liquid waste disposal on household healthcare expenditure. It also examined the effect of household socio-economic and demographic factors on healthcare expenditure of Ghanaian households, using the 2016/17 GLSS survey data of the Ghana Statistical Service. Grossman's (1972) theoretical model, which was based on a simplified household utility function, was adopted as the model for healthcare expenditure for this study. Our empirical framework followed the frameworks advanced by Parker and Wong (1997), Okunade et al. (2010), Molla et al. (2017) and Qosaj et al. (2018) where healthcare (the dependent variable), which was centered at zero, was estimated within the Tobit regression model. Our specified and estimated household health expenditure model included explanatory variables such as household form of solid waste disposal, type of toilet facility used by the household, household's socio-economic and demographic factors and household head's characteristics. Data from the 7th round of the Ghana Living Standards Surveys, which was conducted in 2016/2017 by the Ghana Statistical Service, was the basis for our analysis.

6.3. Conclusions

Household waste disposal

The first objective of this study was to investigate the effect of household waste disposal on healthcare expenditure among households in Ghana. To meet this objective, we categorised household waste disposal into form refuse (solid waste) and type of toilet facility (liquid waste) disposal. Form of refuse disposal was then categorised into collected, burned, public dump and indiscriminate dumping with collected serving as the reference point. Water closet, pit latrine, KVIP, public toilet and no facility (bush/beach) were used as the type of toilet facility used in a household (a proxy for liquid waste disposal) respectively.

The findings from the analysis in model 1 show that relative to a household that collects it refuse, burning, public dumping and indiscriminate dumping of refuse by a household positively induce household healthcare expenditure in Ghana, with the effect of burning and indiscriminate dumping being statistically significant. Specifically, our result indicated that households that dispose off refuse indiscriminately and burning are 116.50 percentage points and 36.55 percentage points respectively, more likely to spend on healthcare. Although public dumping of refuse also increases the likelihood of making healthcare payment by 10.77 percentage points, this was insignificant.

With respect to the type of toilet facility used in a household, our findings revealed that households with no toilet facility, a household using pit latrine, KVIP and public toilet (all of which are considered improper per the UN-HABITAT criteria and WHO-WASH programme) are more likely to incur higher healthcare expenditure as compared to a household using water closet. Specifically, it was seen that households with no toilet facility, a household using KVIP, public toilet and pit latrine are 75.97 percentage points, 72.96 percentage points, 66.35 percentage points,

54.99 percentage points, and 22.33 percentage points respectively, more likely to spend on healthcare.

In model 2 with control variables, the direction of effects of all forms of refuse disposal and type of toilet facilities used in a household were same as in model 1. However, the marginal effects were greater in model 2 with all categories of refuse disposal forms and toilet facility type being statistically significant. Specifically, indiscriminate dumping, burning and public dumping of refuse are 187.14 percentage points, 75.92 percentage points, and 49.55 percentage points respectively, more likely to spend on healthcare services relative to households that collect its refuse. Also, a household with no toilet facility, household using pit latrine, KVIP and public toilet face 158.74 likelihood, 102.47 likelihood, 89.91 likelihood, and 97.98 likelihood respectively of incurring higher healthcare expenditure relative to a household using water closet.

Socio-economic and Demographic Factors Influencing Household Health Expenditure.

The second objective is to examine household's socio-economic and demographic factors influencing healthcare expenditure in Ghana. This objective was achieved by classifying the factors into household head's characteristics and household's socio-economic and demographic characteristics. The results from our analysis identified household income, the age of the household head, sex of the household head, household head's years of formal education, household head's illness reporting and household head's hospitalisation as key predictors found to be significant drivers of household healthcare expenditure in Ghana.

6.4. Policy Recommendations

Based on the findings from this study, the following recommendations are proposed for policy consideration:

Firstly, findings from the study show that burning, indiscriminate dumping and public dumping of refuse by household and the absence of no toilet facility in a household, the use of pit latrines, KVIPs and public toilet (all of which are classified poor and improperly kept in Ghana) are linked with higher healthcare expenditures. This means that ensuring proper household refuse disposal in addition to households' use of improved toilet facility will go a long way to ensure sound health and lower the risk of incurring healthcare expenditures among all households and people in Ghana. Hence policy should be geared and targeted at providing improved and proper solid waste disposal and toilet facilities at the household level, both in the urban and rural areas. This must be pursued in conjunction with the enforcement of laws and other state conventions/by-laws, and implementation of policies that will make it possible for the provision and use of proper and improved solid waste disposal and toilet facilities at the household levels the towards. The activities of waste management departments (WMDs) and environmental health and sanitation departments (EHSDs) of the MMDAs and CWSA should be supported, improved and strengthened to enable them carry out fully their functions of proper waste management at the household and community levels in the country. The National Building Regulations 1996 (LI 1630) of Ghana, which requires every building, being it for residential, commercial, industrial, civic and/or cultural purposes to have waste disposal facilities approved by the district assembly, should be fully revisited for its full enforcement and implementation by the MMDAs to avert poor waste management. Additionally, strong coordination and collaboration be built and adequate resources (technical, human and financial) be made available to the Ministry of Local Government and Rural

Development, Ministry of Finance, Ministry of Works and Housing, Ministry of Health, Ministry of Science, Technology & Innovation, Town and Country Planning Department among others in carrying out their duties. One effective way to do is for government to release budgetary funds on time and in full for the agencies to execute their proposed programmes and initiatives.

Further, there is the need for public-private partnerships between the government and households heads to subsidies or share the costs of providing appropriate refuse disposal and improved toilet facilities to households, in particularly rural and slummy urban communities since the costs involved in providing such facilities cannot be fully afforded or borne by some households.

Household income has a strong positive and significant effect on household healthcare expenditure, which means that healthcare expenditure is determined by household incomes. This study therefore recommends that the Government of Ghana undertake employment and poverty reduction strategies to raise the incomes of individuals which will aggregately increase household income. Some of these strategies may include raising the daily minimum wage and matching this equally with productivity increases via appropriate policies to avert unemployment/lay-off. The GoG through the Ministry of Finance and Ministry of Health should implement a more pro-poor healthcare financing policies taking into households with higher financial burden. This is important because under the current NHIS policy, poor household's heads and individuals are not even able to afford subscription fees, thereby exposing them to higher financial burden in seeking healthcare which pushes them further into poverty.

Besides, the study revealed that higher educational attainment of the household head has a negative and statistically significant effect on healthcare expenditure. This makes it important for the sustenance and strengthening of the universal free basic and senior high educational system in the

country. This will produce individuals that will be more informed on good health practices which will go a long way to lower the probability of incurring healthcare expenditure. This study therefore recommends special nation-wide educational and awareness programmes must target household heads and individuals above school-going age on the negative effects of improper disposal of refuse and use of unimproved toilet facilities on health and environment. This will translate into proper Behavioural patterns towards household's proper waste management and disposal.

Finally, this study recommends a more pro-poor healthcare financing insurance scheme targeted at offering financial protection to the aged, females and in-patients (those hospitalised) and this scheme must be implemented based on the socio-economic status of households. The reason being that, first aging comes with greater deterioration/depreciation in health stock and to augment their health status, the aged incur higher healthcare costs. Secondly, the health needs of females (particularly with respect to antenatal and postnatal health needs), coupled with their roles in caretaking, child-raising among others require greater healthcare services which consequently affect their healthcare costs. Thirdly, being hospitalised demands greater healthcare services. The likelihood of making higher healthcare payments is particularly high for households not covered under the NHIS. It will therefore be useful to have in place a healthcare financing scheme that targets these situations.

6.5. Limitations of the Study

Even though the GLSS is a major provider of household information, the dataset is limited to households whose heads reported illness and households whose heads were hospitalised two weeks prior to the survey. Households with heads who reported ill and/or were admitted to hospital before

the two weeks to the survey or after the survey were left out. Also, information on variables such as prices of healthcare services and diseases related to solid and liquid waste are important factors that can influence household healthcare expenditure, but the dataset did not capture such variables hence our model excluded these variables.

Further, the scope of household healthcare expenditure in this study is limited to expenses on curative care, leaving out expenditure on preventive and rehabilitative care. This is because the 7th Round of the GLSS dataset only contained expenses on curative care.

Despite the above limitations, the results of this study are still valid and could serve as a basis for policy formulation. In addition, this study contributes to the body literature on household waste disposal effect on healthcare expenditure in Ghana in health and environmental economic studies.

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