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**MICRO DETERMINANTS OF HEALTH
A CASE STUDY OF WINNEBA; THE DISTRICT CAPITAL OF THE
EFFUTU-EWUTU-SENYA DISTRICT IN THE CENTRAL REGION, GHANA**

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***THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF M.Phil
DEGREE IN (ECONOMICS).***

AUGUST 2002

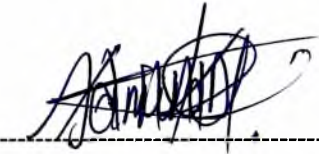
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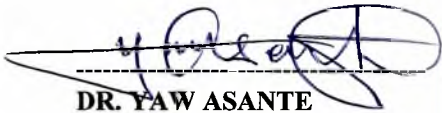
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DECLARATION

I, SAMUEL KOBINA ANNIM, hereby declare that with the exception of references to other people's work which have been duly acknowledged, this thesis is entirely my own work and that no part of this publication or the whole has been presented for another degree elsewhere.

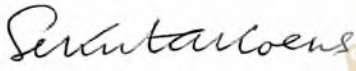


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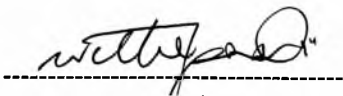
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DEDICATION

This thesis is dedicated to my parents, siblings and Fiancée for their unflinching financial, moral and spiritual support towards my academic pursuit.



ACKNOWLEDGEMENT

Unquestionably, I am bankrupt when it comes to indebtedness since many people have contributed directly and indirectly to the successful completion of this work. Among the lot however, the contributions of some inexorable personalities cannot go without mentioning.

To begin with, I am most grateful to the LORD almighty for bringing me this far. Life would just have been meaningless had it not been the abundant mercies and grace of the Most High God.

Secondly, I would like to express my sincere gratitude to my three supervisors; Dr. Yaw Asante, Dr. S.K.K Akoena and Mr. William Baah-Boateng and the entire team of lecturers of the Economics department, University of Ghana for their guidance and constructive criticism without which this work would not have materialized.

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I will be highly ungrateful if I place a blind eye on the financial assistance of the African Economic Research Consortium, Nairobi. The training offered by the AERC (JFE 2001) at Nairobi, Kenya and the thesis grant have been instrumental to the successful completion of this work. I cannot forget the wonderful M.Phil class of 2002 for their co-operation and love, which necessitated a peaceful academic co-existence. I also appreciate all the efforts of the staff of the General office in the economics for the congenial atmosphere created.

Finally, I humbly accept that I am not above reproach and therefore assume responsibility for the errors that will inevitably remain in this work.

SAMUEL KOBINA ANNIM

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Evans and Stoddart (1990,1994) provide a clear model for describing disease, health and well-being and their determinants. In their model, disease influences health that functions to influence well-being, of these three medical care is related most naturally, only to disease. Other variables considered were economic prosperity, individual behaviour, biology and genetic endowment as well as the physical and social environments. Frank (1995, 233-237) asserted that medical care is not necessarily the best investment in a society's health and productivity. Certain factors including the following were identified. Firstly, macro socio-economic and cultural factors that influence population health; for example, unequal distribution of income could be related to health. Secondly, micro level factors in individuals' immediate social environment that influences health such as social position, socio-economic status, stress and/or coping skills. Thirdly, new biologic pathways for socially mediated health effects, for instance, if an individual's position in the social hierarchy is related to many different types illness, then perhaps there are generic biologic causal mechanisms or pathways that translate social environmental inputs into adverse body responses. Lastly, the importance of early childhood development was incorporated into the analysis, arguing that, how children are cared for at an early age influences basic capacities and thus health, through out their life cycle. These additional factors (socio-economic and cultural changes affecting household's and community's health status) have paved the way for social scientists to undertake an in-depth research into the determinants of health. Social scientists have developed volumes of material on human societies, with much of it peripheral to health or other programmatic interventions. However, in most African countries, of which Ghana is no exception, there exist clearly, a gap in accessibility and applicability between

these expansive multi-faceted studies of human behaviour and the immediate focussed needs of disease control programs and other health and welfare activities.

Within the social sciences, approaches range from highly technical structured quantitative models of economics to the flexible “grounded theory” of anthropologists.

These different spheres of analysis will help us to attain a more definitive approach to health issues. The ideal approach will be an attempt to propose a program of applied studies to understand the process by which inputs to households become outcomes in terms of health improvements.

There are several socio-economic and cultural factors that serve as household inputs in the undertaking of a decision when the issue of good health crops up. It can be deduced that households contribute to the production of health. This can be summed up as the dynamic behavioural process through which households combine their (internal) knowledge resources and behavioural norms and patterns with available (external) technology, services, information and skills to restore, maintain and promote the health of their members. The realisation has been affirmed in the last few years that health is determined by many factors among of which medical care is only one. Other determinants such as lifestyle, education, household characteristic and environment play an equal or even more important roles than medical care.

To emphasise on this point, another school of thought has gone further to argue that very little is known about the effectiveness of much modern medicine. Such evidence that exist indicates that modern sophisticated techniques are often less effective than the simpler techniques they replace. Some go further and argue that medical care

frequently impairs health rather than improving it. This presupposes that there is a junk of unresolved issues in the study of demand for health.

Emphasis being given to the WHO definition of health, it will be realized that the point of departure is from curative to preventive measures of sustaining an individual's health. The argument asserted is that one of the most effective and efficient ways to achieve further improvement in the quality and length of life in the developing world, for example, in Ghana, is the need to concentrate efforts on trying to ensure a switch from health-endangering to health-enhancing consumption patterns,

Fusing economic theory with the above health analysis will emanate from a number of assumptions.

- First, the indifference curve that the consumer as an individual faces is characterized by diminishing marginal returns. This means that given a simple market model with two commodities thus health denoted by "Y" and the other by a bundle of other goods denoted by "X". The individual will be faced with a combination of these two goods that will yield the same level of satisfaction on the indifference curve.

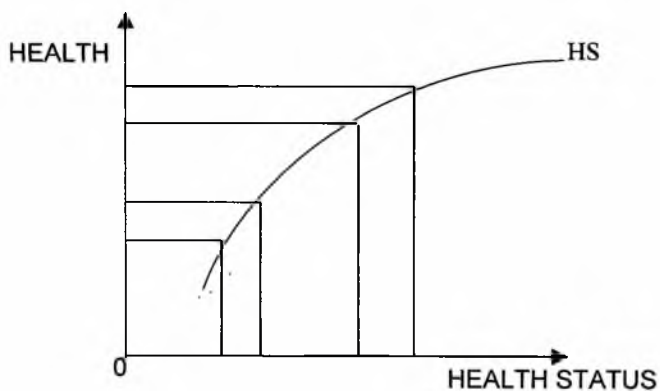
This argument surfaced at the individual level because if people valued their health above all, they would not endanger themselves in a certain lifestyle that is health hazardous. The indifference curve slopes downwards from left to right because people value health and consumption of other bundles of goods, but do not view being on the good health as so important that it takes priority over everything else. The farther away the indifference curve is from the origin, the

higher the level of satisfaction derived from the combination of the two set of commodities.

- The second assumption, which falls directly under the purview of our analysis, is the health production function. This emanates from the notion that the individual exerts a relatively high degree of control over his health-affecting consumption patterns, his health care utilisation and his environment. In economics, production means the process of assembling inputs together and transforming them or using them to produce the final product. Therefore, the individual from the first assumption combines the health inputs of which medical care is only one to produce output, which in our case is the state of being healthy.

This can be depicted diagrammatically as shown in **fig. 1** below.

PICTORIAL PRESENTATION OF THE HEALTH PRODUCTION FUNCTION



The diagram in figure 1 has as its output (health) on the vertical axis and the health inputs on the horizontal axis. From the above we realise that as more units of health inputs are used successively it results in smaller rate of increase in health.

- The third assumption is the budget constraint. This assumption is as a result of the fact that both health and the consumption of other goods involve cost.

However, an individual has limited resources at his disposal to meet the cost of health and the other bundle of commodities. The simplest interpretation to this assumption is that individuals have given income with which to finance their health production and consumption activities. As such the most vital underpinning theory of economics, which talks about the allocation and distribution of scarce resources, evolves in this argument.

These three assumptions place this research paper in a position to apply economic theory to the concept of health. This means that given the objective function as better health status, how will it be maximised subject to our constraints? In a nutshell, what factors can effectively be combined to serve as health inputs in order to produce good health? The following may be considered to include some of the factors that might tend to influence the decision making process: level of household income, gender of the head of household, household size, average level of household education, marital status, lifestyles, environmental conditions. Decision-making is the fundamental task the household faces and for this to be undertaken with expediency it requires operating under certain key assumptions in order to establish relationship between these socio-economic factors and health. These assumptions will be explained in the course of the subsequent chapters.

1.1 PROBLEM STATEMENT

Health Economists over the years have made series of attempts to evaluate the economic benefits of increasing medical care expenditure to the health status of the population. As yet no one has answered in a satisfactory way the very basic

question, "what is the contribution of medical services as opposed to environmental factors¹ to changes in the health of the population?"

Earlier studies have used either just one or a few variables at a time to measure its' impact on the health of the individual and also such a study is yet to be carried out in Ghana. The main proponent of this study, Thomas Mckeown (1976), studied the trend of mortality rate in England and Wales from 1750 to mid 1970's and observed that the fall in mortality rate and the rise in population was as a result of controlled air and water pollution and better nutritional intake. His argument was that this was the period prior to the availability of effective medical intervention. Barbara Wolfe (1986), who used alcohol and cigarette smoking as a measure for lifestyles studied trends of medical expenditure and lifestyles in several industrialized countries and asserted that there is little or no significant effect of medical expenditure, but by controlling for lifestyles, she demonstrated a positive relationship between lifestyles and health status. Some health economists (1969-1998), used elasticity to measure the marginal contribution of different health inputs. Among them are Sickles and Yazbeck (1998), who used data on individual and measured health by how active and mobile an individual has been over a period of time. They considered four explanatory variables, schooling, environment, lifestyles and race and evidenced that these factors contribute more to the health status of the individual.

Due to the high growing concern to capture many of the variables that enhance a program of health improvement and accessing its' impact, especially, in developing

¹ The term "environmental factors" is used to refer to all factors other than medical care that determines an individual's health status.

nations, this study aims at identifying the most important socio-demographic variables that determine the health status of an individual.

1.2 OBJECTIVES OF THE STUDY.

- The main objective of this research paper is to estimate the most important determining factors of the health status of an individual in Ghana using an econometric model.
- This research paper will also provide a descriptive statistics of medical care sought by individuals and a host of other socio-demographic factors that determine the health status of individuals within the sample area.
- To provide further evidence of the degree of significance of medical care as a determinant of health status.

1.3 SIGNIFICANCE OF THE STUDY.

- To provide an idea to Government and the Ministry of health on the set of factors that contributes to the improvement in health status.
- To serve as a guide to efficient intra-sectoral allocation of resources to factors that really account for improvements in the health status of the population.
- To provide bases for further research in both production and demand for health on a national basis.

1.4 EXPECTED RESULTS

The study envisages ascertaining the following findings upon completion of work.

Firstly, the impact of wealth, which in our model is a proxy to the level of income, is expected to relate to health positively. This is based on the perception that

individuals with higher income tend to consume higher-quality goods, better housing, better nutritional intake, et cetera, which may favourably affect their health status. However, another school of thought will argue that due to the fact that wealthy people can normally take care of themselves in the event of illness, they will not bother much about keeping a check on their health consumption pattern. Secondly, the impact of schooling (education) is also expected to have a significant impact on the level of health status. This is because higher number of years in school is perceived to be associated with a relatively more medical care at preventive stages. Thirdly, as Ostro first asserted in 1983, individual exposure to environmental hazards such as air, water and sanitary pollution is likely to lead to a less healthy society. Lifestyles in our model will go a step forward than the criteria normally used by previous researchers that are alcohol and smoking. The researcher will incorporate exercises as one of the indicators of lifestyles. It is expected that health enhancing practices such as avoidance of smoking and excessive alcohol intake as well as the habit of exercising will have a positive impact on the health status of an individual. The excessive intake of alcohol, persistent smoking and lack of exercises will lead to a faster depreciation in the health status of an individual. Also, it is expected that favourable household characteristics, such as size of the household, gender of the head of household, marital status et cetera will have a favourable impact on the household. The age of an individual is expected to have an inverse relationship to the health status of an individual. This means that as one ages his or her stock of health depreciates. Lastly, it is hypothesized that higher quality of medical care is associated with a more healthy society.

The major objective of this research paper, which is, geared towards the verification of whether medical care is the only or the most influential determining factor of an individual's health status or it is expected to show otherwise. At least the researcher envisages finding that environment, lifestyles, wealth and schooling of an individual influence health more than medical care.

1.5 ORGANIZATION OF THE STUDY

This Study is divided into six chapters the first chapter comprises of introduction, problem statement, objectives, and significance of the study, expected results and finally the organisation of the study. The second chapter is mainly the review of related literature, which is divided into historical perspective, and present studies of the determinants of health. The third chapter is the conceptual framework consisting of the theoretical model, empirical model, and model variables. The fourth and fifth chapters are data collection, data analysis and presentation and discussion of empirical results and analysis. The final chapter focuses on conclusions, recommendations and limitations of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 INTRODUCTION

The broad philosophical concepts of the determinants of health do change periodically. At certain times socio-economic factors, and how people live, have been thought particularly significant and figured predominantly in analysis and policy. At other times the emphasis has been largely on identifying the causes of disease and treating the sick. The theories about the determinant of health and the definition of health, necessarily affect how illness is defined, what public policies are initiated and how resources are allocated. Recently, there has been a renewed interest in how socio-economic factors influence health, leading to an extensive debate about the relative importance of medical care, the limits to traditional public health measures, appropriate health policies and the relationship among economic growth, prosperity, health and the well being of the population.

Micro level determinants of health place the household at the centre in the quest to improving health status of the population. Basically, this looks at the relationship between health inputs and health outputs. This literature will capture the measurement of health status and the inputs that will maintain or improve the health capital of an individual. The concept of health as stated in the introduction is difficult to define and measure. Over the past decades it has been greatly associated with the activities of medical doctors. However, it is only indirectly associated with the activities of the doctor, that is, medical treatment. Medical doctors, primarily, deal with disease and not with the promotion of health in any positive way. The knowledge of

medicine is a catalogue of disorders implying that when none is present people are healthy, however, the concept of health goes beyond this catalogue of disorders, and it incorporates the promotion of health that involves the prevention as well as maintenance of a particular standard of health status. Health status will therefore seek to identify factors that seek to protect it or put it at risk. It will be agreed that at the personal level it is relatively easier to distinguish between being healthy or not basically on subjective grounds, however one will bear with me that it is not easy converting subjective knowledge into a standard measure that will apply to the whole population. This boils down to the fact that individuals have differential threshold of pain and different expectations about what counts for an abnormal symptom. The complexities surrounding the measurement of health status will be further discussed in the conceptual framework chapter.

2.1 HISTORICAL TREND OF HEALTH INDICATORS AND ITS CAUSES

The beliefs that health influences policy and resource allocation, comes from the history of the National Health Services in the United Kingdom. One of the strong beliefs at the time the National Health Services was introduced in 1948 was that the gradient in health across the social classes (those in the highest social class had the lowest mortality rates, while the mortality rates for each successive class down the social scale were higher) would be decreased if the financial barriers to health care were removed. It is of interest that similar arguments were used when Canada introduced its national insurance program for health care services nearly two decades later. In the 1970s the Merrison Royal Commission on The National Health Service in the United Kingdom was surprised to find that the gradient in mortality across social classes had actually widened even though mortality rates had

continued to fall. The Labour government established, in 1977, a research-working group to look more broadly at the factors influencing health, under Douglas Black the Chief Scientist in the Department of Health and Social Security. A major conclusion of this compelling report, often referred to as the "Black Report", was that while health care contributed to improved health and well-being there were socio-economic factors of equal or greater importance in determining health and well-being, and these factors were primarily causing the gradient in health across social classes. The relative importance of investments in health care versus investments in other factors that determine health is still an unresolved issue, partly because of our incomplete understanding of the determinants of health. The "Black Report", recent population-based epidemiology studies and new insights from medical science have begun to give us a better understanding of how socio-economic factors in changing economies influence the health and well-being of the population.

The historical evidence is of interest because it allows examination of how economic and social factors, over time, influence health and well-being. Human beings, like most members of the primate species, are social animals. Our biological responses are related to millions of years of survival in interactive environments of 50 to 100 individuals. It is not surprising therefore that health and well-being, in our modern social environment, is influenced by the quality of support and interaction we achieve in our complex environments. Some quite striking perspectives have emerged from recent studies of the records in Western countries over the last 300 years. The early period of our history provides some insights about our changing social environments and health.

McKinley and McKinley (1977) affirmed Mckeown's assertion with data provided for the United States from 1900 to 1973, they found that the pattern of several infectious disease showed a considerable decline before the availability of effective medical technology and skills. One of the most important changes in mortality in the twentieth century was the decline in infant mortality. Does this type of mortality follow the same pattern? A highly readable account of the modern historical pattern of infant mortality is offered in Victor Fuch's "Who Shall Live"? (1994). He noted that infant mortality rates in New York city improved markedly from 1900 to 1930 and that this decline was due significantly to declines in deaths from "pneumonia-diarrhoea" complex. Fuch's concluded as follows, it is important to realise that medical care played almost no role in this decline. While we do not know the precise causes, it is believed that rising living standards, the spread of literacy and education as well as a substantial fall in the birth rate all played a part. The nineteenth century accounted for a tremendous growth in the number of hospitals in Britain; however, it was difficult to assess the impact of this increase in the number of hospitals on the health of the individual due to lack of data. However, we can get some of the contribution of the hospitals by estimating the adequacy of their methods of treatment in the light of present day knowledge. Proceeding in this way Mckeown (1976), is led to the conclusion that hospitals could not have made an appreciable impact on the population health before the twentieth century. Techniques of surgery were very primitive by modern standards and death rate from it was very high. Like heart transplants in the present day, surgical intervention, in the absence of anaesthesia and anti septic methods, was a rather experimental affair and only attempted when the patient was likely to die anyway. At this time too, what Illich (1975), has called iatrogenic conditions that is sickness brought about by medical treatment itself, were

widespread. Doctors ignorant of the risk of infection, examined patients with hands smothered with the debris of post-mortem examinations. This led to Mckeown (1974), conclusion that "On the balance the effect of hospital work in this period were probably harmful... anyway patients faced the risk of contracting a lethal infection up to the second half of the nineteenth century...and it was not until much later that hospital patients could be reasonably certain of dying from the diseases with which they were admitted". Following these assertions by both Mckeown (1976), and Fuch (1994), it was realized that the medical interventions was not the major contributing factor to health, hence the question is what other factors contribute to health. It will be recalled that in Mckeown's analysis it was airborne as well as waterborne diseases, which accounted for the greatest decline in the mortality rate. This led him to argue that better nutrition and better hygiene contribute to the reduction in mortality rates. The idea of nutrition came into the argument because he realized that the introduction of two American foods- corn and potatoes may alone have made significant contribution. Agriculture experienced large advances, including new crops, crop rotation, seed production winter-feeding and improvement in farm implements. The connection between improved nutrition and infectious disease is fairly clear. Infectious disease creates a relationship between host and agent of disease. While control of the agent is directly helpful in reducing the incidence, the condition of the host helps determine its resistance to disease. A person, who is better housed, better rested and better fed will be more resistant and less likely to die subsequent to exposure.

These issues have pre-empted health economists over the past years to delve into other factor that accounts for being healthy. Some of these factors include lifestyle,

environment, education, income levels, and demographic factors such as age, sex, marital status and even certain cultural factors. However some other school of thought have come with the arguments of whether these factors really have an impact on the health status of a population. On the impact of lifestyle and environment, Barbara Wolfe (1986) and later work by Hitiris and Posnet (1992) evidenced that better lifestyle has a positive relation to being healthy. Barbara Wolfe investigated the trends in health status in several industrialised countries and looked at the trends in medical expenditures and lifestyle factors such as cigarette and alcohol consumption. Previous international studies indicated little or no significant effect of medical expenditures, but by controlling for lifestyle she demonstrated a positive relationship between lifestyle and being healthy.

Victor Fuch in 1974 as well studied two states in the United States; Nevada and Utah. These two states primarily had many things in common such as income levels and medical care. Nevertheless, average death rates in Nevada were much in excess of those in Utah. He argued that the explanation for this substantial difference surely lies in life style, "Utah is inhabited primarily by mormons, whose influence is strong throughout the state. Devout Mormons do not use tobacco or alcohol and in general live stable quiet lives. Nevada on the other hand, is a state with high rate of cigarette and alcohol consumption and very high indexes of marital and geographical instability. Current statistics have even gone to affirm this assertion, that is, for the period between 1994-1996, Utah was a national leader in health whiles Nevada's mortality rate was much higher (555.2).

Recently, (1969-1998), some health economists have empirically tested the marginal contribution of different health inputs. The bases of the measurement were to use

elasticity of health with respect to expenditure on health care inputs. The outputs of their findings, generally, were that health care spending is beneficial to health improvements at the margin. Some of the earlier studies suggested that lifestyle and environmental expenditures could provide marginal benefits per dollar of cost than health care: among the particular effort to improve schooling or reduce cigarette smoking offered appealing trade-offs with health care spending. Environmental issues such as air pollution have some relation with population health. Ostro (1983) regression coefficients suggested that there exist a positive influence of air quality on the number of restricted activity days. In analysing the connection between air quality and health state, the concept of health production by the individual comes into play. By avoiding tobacco consumption the individual can improve his air quality substantially. The most striking feature of this argument is that in the event of smoking both smokers and non-smokers are exposed to the risk of air pollution.

Mullahy and Portney (1990) applied the generalised methods of moments (GMM) to the sample as Ostro (1983) and also showed that tobacco consumption is a highly significant determinant of health, apparently they demonstrated that smoking of a few cigarettes a day seemed to have a positive impact on health but beyond about "16" cigarettes the negative effects on the respiratory tract became very predominant. Other studies on environmental pollution have postulated that both water and air pollution causes ill health and subsequently, death in individuals. The most vulnerable are the elderly people with respiratory disease. Cropper et al 1997 and Schwartz and Dockery (1992), evidenced that pollution effects on health are sizeable and statistically significant in both industrialised and lesser-developed nations.

Health economists have opted to use schooling instead of education in examining its impact on health, the reason being that, education encompasses three spheres; formal, informal and non-formal and to a large extent it is difficult to capture the informal and non-formal components in the analysis. Empirical work has revealed that health status is significantly correlated with schooling. Consequently, the argument posed by this school of thought is that if the marginal product of health care is truly small as evidenced earlier, then perhaps it is reasonable to reduce public health expenditure on health care at the margin and transfer the expenditures to education. However, this policy advocate has been subjected to debates due to counter arguments by other school of thought on the role of schooling. The work of Michael Grossman's (1972a, 1972b), on the theory of demand for health, has education as the most determining factor of health. His assertion was that better educated persons tend to be economically more efficient producers of health status. Better-educated people understand the technology or have the know-how needed to stay healthy. They also know better, how to use medical and other market inputs and their own time to produce health. Under this view the marginal transfer of resources makes good sense. Other health economists have put forward hypothesis under which schooling and health status are correlated only because they are both related to one or more other factors. Berger and Leigh (1989) examined data on thousands of individuals in two samples. They found that years of schooling for an individual is related to several demographic factors such as age, race, ethnic background, family characteristics and intelligence quotient. They also developed a measure of the effect of unobserved factors, which include personal time preference. They also posed the question: Does schooling improve health status directly? They revealed that

schooling improves health status measures but no significant effect results from unobservable such as time preference.

In contrast, to the earlier study, Behrman and Wolfe (1989) also carried out a study to verify whether schooling made women better nourished and healthier. This study was relatively better because they made an effort to control other variables that influence both health and schooling. At the end of their study they concluded that the estimated positive health impact of women's schooling is largely representing schooling per se rather than unobserved fixed endowment so that, the woman's schooling does seem to make woman healthier. Further argument to this effect has risen in the quest of studying the impact of these educated women on the health status of their children. The expected result is that the children of these educated women would have relatively better health status than that of uneducated women's children. However studies by Wolfe and Behrman (1987) have cast serious doubts. They carried out a study in Nicaragua for sisters and their results revealed that once childhood background is controlled for, a mother's education has no significant effect on her children's health status. However, this area remains under researched due to the fact that not all pieces of work fit this pattern.

The work of Michael Grossman (1972) is inevitable in a researcher's quest to examine the determinants of health. He built a model, which thoroughly exhibited variables such as age, education, income and other factors in the production of health through the demand for health capital. Grossman's model perceived health as both an investment good and a consumption good. As an investment good, health is desired because it increases the number of healthy days available to work and thus

earn income, whereas as consumption good, health is desired because it makes people feel better. He argues that production of health (using time and other resources) creates a capital stock of health that generates a flow of healthy days. This stock of capital according to him wears down due to ageing but can however, be increased by investment in health through healthy diet, healthy care service, healthy habits of exercising and others. His notion about health as an investment good introduced the concept of marginal efficiency of investment (MEI), which is the same as the demand for health capital. His assertion was that any shift in the MEI could be caused by any of the following factors; age, wage, education and uncertainty, whereas any movement along the MEI would be influenced by cost of health capital which is the rate of depreciation plus the rate of interest. According to him, the health of older people is likely to deteriorate faster than the health of younger people, the higher the wage rate, the higher one is healthy, the higher the level of education the higher the MEI and lastly the less level of risk the higher the MEI. The Grossman model was built within the framework of the neo classical model (expected utility theory) and it should be noted that uncertainty in the expected utility theory is defined in rather constrained terms thus synonymous to risk. Grossman's most powerful pedagogic message is that it is wrong to emphasise effect of health care as a determinant of health and neglect other factors. Although, his model has been the building block for most subsequent researches, some health economists such as Usher (1975) and Murinen (1982) have criticised it. The most striking one is his perception of health as both an investment and a consumption good. Murinen's argument is that perceiving a dichotomy in health benefits is wrong and rather ideal to see the consumption and investment components of health as compliments instead of substitutes.

However, she agreed with this distinction on analytical grounds and not on conceptual grounds. McKinley et al (1989), concludes by revealing two surprising facts on the minimal impact of modern medicine in health status. One, it was evidenced in the United States that the number of lost workdays per person as well as the frequency of long term health related limitations of customary activities have been increasing since the 1950s. Two, while life expectancy did grow between 1964 and 1985 by around 4.4 years for men and 4.5 years for women, in the United States, the irony about this was that life years free of handicap did not grow. This in a nutshell means that in the wake of highly improved technology in the medical industry, there are still unresolved complexities about the efficacy of medical care in health improvement as measured by the health indicators such as mortality and morbidity. In the 1960s cardiovascular diseases were the highest causal agent of death in the United States. High blood pressure, high lipid concentrations in the blood and tobacco consumption were suspected to constitute the decisive risk factors. Houston (1989 PP.928 &929) in his extensive survey came out with the conclusion that drug therapy has no definite influence on mortality as far as cardiovascular are concerned. He further argued that even certain form of drug therapy can undermine the success of diet.

This overview has led to the realisation that health has multiple determinants, besides health care services, suggesting the need to delve into other producers of health besides the medical practitioner. Our literature presupposes that the individual cannot be ruled out when it comes to the issue of health improvement. Grossman in his model of demand for health postulates that the individual is a demander for health and a supplier of health simultaneously. The dual perception of the individual's role in

health and health related issues have been topical on the minds of health researchers. The objective is to investigate into the causal activities between the socio-demographic characteristics of an individual and his or her health status.

CHAPTER THREE

METHODOLOGY

3.0 CONCEPTUAL FRAMEWORK

This chapter seeks to develop a framework for the measurement of health through the building up of a model and identification of variables that are to be incorporated in the health measurement model. Researchers have faced extreme difficulties in the measurement of health as stated in the previous chapters, as a result of the complexities surrounding health such that it being evaluated mostly on subjective bases. In the immediate past, health economists have relied on some indicators in the measurement of health. For the purposes of this research we will pick only two and briefly discuss their strength and weakness comparatively and choose the most suitable one.

In spite of the difficulties in the measurement of health most surveys of health rely on one or the other health indicator such as mortality or morbidity. Morbidity can be defined as the state of sickness hence it is not an indicator of being healthy but its absence. Morbidity is simply, the incidence of disease. It is measured either through self reported illness in health surveys, from statistics of time off work and or subjective perception on an individual's personal health status over a period of time. Alternatively, it may be constructed from the records of consultation between doctors and patients. The statistics of morbidity in any of these forms represent health negatively as a state of illness at one point in time. As such they tend to convey the impression of ill health in episodic terms that is something that happens suddenly and goes away, rather than a continuous dimension of experience. These pose a

number of problems of interpretation when applied for the purpose of comparing health experience within a population. Self-reported sickness has the shortcoming already mentioned as it is being based strictly on subjective judgement.

The second indicator, mortality, provides information about the risk of death at any state in life and from any particular cause. Its great limitation is that it only represents forms of ill-health that are ultimately fatal and not all those other forms of pain and suffering that do not result in loss of life. It is worth noting that it is not subjected to the subjective component of the morbidity indicator rather it is a more objective measure. Mortality captures the positive dimension of health and it avoids the trap of presenting ill health as an episodic event.

In spite of the comparative objectivity advantage that mortality has over morbidity the researcher opted for morbidity since he relied on primary questionnaire and wanted to know the health status of the respondents.

3.1 THEORETICAL MODEL

This paper will seek to review the work of prominent health economists and adopt one of the models suitable for this research work. The first economist to present a formal model on the determinants of health was Grossman (1972a,b). Drawing on the theory of Becker (1965), Grossman constructed a model where individuals use medical care and their own time to produce health. Individuals were assumed to invest in health production until the marginal cost of health production equalled the marginal benefits of improved health status. The health status was assumed to affect

utility both indirectly through raising labour income and directly by assuming that individuals value good health per se.

The model of Grossman dubbed "A Stock Approach to the Demand for Health" uses the inter temporal utility function as its basis.

$$U = U(\Phi_0 H_0, \dots, \Phi_n H_n, Z_0, \dots, Z_n) \quad (1)$$

Where;

H_0 = Inherited stock of health

H_i = The stock of health in the i^{th} time period

Φ_i = The service flow per unit stock

$h_i = \Phi_i H_i$ = Total consumption of "Health Services"

Z = The total consumption of another commodity in the i^{th} period.

The stock of health in the initial period (H_0) is given, but the stock of health at any age is endogenous. The length of life as of the planning date (n) is also endogenous. In his model he argued that death will take place when the stock of health at age t or in time period t is less than or equal to H_{\min} ($H_t \leq H_{\min}$). In sum the length of life is determined by the quantities of health capital that maximise utility subject to production and resource constraint. Health capital in his analysis is determined also by the net investment one puts into health and this is ascertained by deducting depreciation from gross investment.

$$H_{t+1} - H_t = I_t - \delta_t H_t, \quad (2)$$

Where I_t is gross investment in health and δ_t is the rate of depreciation during the t^{th} period ($0 < \delta_t < 1$). The rates of depreciation are exogenous but depend on age. We will later find out that the rate of depreciation is affected by a host of other variables. As indicated earlier on the household will produce gross investment in health and the

other commodities in the utility function according to a set of household production functions.

This can be mathematically denoted by;

$$I_t = I_t(M_t, TH_t, E) \quad (3)$$

$$Z_t = Z_t(X_t, T_t, E) \quad (4)$$

Equation (3), forms the gross investment in health function where M_t is a vector of health inputs purchased in the market, TH_t is the time element exhausted in the production of health and E is the stock of human capital besides health capital such as education that contribute to the household (consumers) production of gross investment. Equation (4) on the other hand is the production of other commodities besides health as indicated in the consumers' inter-temporal utility function in equation (1). Where, X_t is a vector of goods input that contribute to the production of other goods and T_t is the time element involved and E is the human capital exclusive of health capital. In his analysis the human capital is assumed to be exogenous. Grossman in his equation (3) associated the vector of inputs purchased in the market for the production of health with medical care only. He however, acknowledged the fact that this is not true and as such there are other goods on the market that influence health. Some of these include housing, diet, recreation, cigarette smoking, and excessive alcohol use.

In this study emphasis will be on these other factors that influence health. Both market goods and own time are scarce resources. The goods budget constraint equates the present value of outlays on goods to the present value of earning income over the life cycle plus initial assets (discounted property income). The individual will

first have his budget constraint as being less than or equal to his level of income and this will be represented in equation (4) as follows.

$$\sum_{t=0}^n \frac{P_t M_t + Q_t X_t}{(1+r)^t} \leq \sum_{t=0}^n \frac{W_t T W_t}{(1+r)^t} + A_0 \quad (5)$$

Then following the strict assumption of non-satiety where the individual prefers more to less then the equality between the budget constraint and the income level will be ascertained as shown in the equation below.

$$\sum_{t=0}^n \frac{P_t M_t + Q_t X_t}{(1+r)^t} = \sum_{t=0}^n \frac{W_t T W_t}{(1+r)^t} + A_0 \quad (6)$$

Where P_t and Q_t are the prices of M_t and X_t , W_t is the hourly wage rate, $T W_t$ is hours of work, A_0 is initial assets, and r is the market rate of interest. The total amount of time, which is denoted by Ω is also constrained. Since this is apportioned into hours of work ($T W_t$), time spent on producing health ($T H_t$), time spent in producing other goods (T_t), and time lost from market and non-market activities due to illness and injury ($T L_t$). Where sick time is inversely related to the stock of health. $\frac{\partial T L_t}{\partial H_t} < 0$.

$$T W_t + T H_t + T_t + T L_t = \Omega \quad (7)$$

From the inter-temporal utility function, in equation (1), $\Phi t H_t$, which is the total consumption of health service, can be denoted by h_t . Then h_t equals the total number of health hours in a given year.

Then from equation 6, Ω can be expressed as,

$$h_t + T L_t = \Omega$$

Which implies that $T L_t = \Omega - h_t$ (8)

Then the assumption now is that the variable h_t in the utility function coincides with healthy time. By substituting for hours of work ($T W_t$) from equation (6) into equation

(5), one obtains the single “full wealth” constraint.

$$\frac{\sum_{t=0}^n P_t M_t + Q_t X_t + W_t (TL_t + TH_t + T_t)}{(1+r)^t} = \sum_{t=0}^n \frac{W_t \Omega}{(1+r)^t} + A_0 \quad (9)$$

The equilibrium quantities of H_t and Z_t can now be found by maximizing the utility given by equation (1) subject to the constraints given by equation (2), (3) and (8).

Since the inherited stock of health and the rates of depreciation are given, the optimal quantities of gross investment determine the optimal quantities of health.

This study will use the Grossman analysis as the backbone, but will shift emphasis to the other factors other than medical care that determine an individual health status through a subjective basis.

This calls for the use of the Johannesson (1995) theoretical model of demand for health, which introduced a vector of variables affecting the rate of depreciation. It is assumed that the individual behaves as if he/she maximizes utility in each of T periods, utility being a function of private goods, leisure time and health. The utility function is assumed to be separable in time and is written as:

$$U = \sum_t p^{t-1} U_t (Z_t, L_t, H_t) \quad (1)$$

Where $p = (1 + \theta)^{-1}$ is a discount factor, θ is the rate of time preference, Z_t is time in period t , L_t is the leisure time in period t and H_t is the health status in period t . The utility function is strictly measured in each of its arguments. At time 0 the individual inherits an initial stock of health capital H_0 and the health status then evolves over time according to the relationship:

$$dH_t = I_t - \delta_t (A_t) H_t \quad (2)$$

where, dH_t is the net investment in health in period t , I_t is the gross investment in health in period t , δ_t is the rate of depreciation of health in period t , and A_t is a vector of exogenous variables that affect the rate of depreciation such as age, sex, and environmental variables. The gross investment is assumed to be produced using medical care (M) and own time (L_{Ht}) as inputs, which gives rise to the following health production function:

$$I_t = I_t(M_t, L_{Ht}, E_t) \quad (3)$$

Where E_t is the exogenous education level that is assumed to affect the productivity of producing health. The individual is assumed to have access to a perfect capital market, allowing him or her to freely transfer income between the periods at a fixed market rate of time preference. This leads to a budget constraint:

$$\sum_t p^t (Y_t = W_t(L_{tot} - L_{Ht} - L_{st})) = \sum_t p^t (p_t Z_t + P_t M_t)$$

where Y_t is the non-wage income in period t , W_t is the exogenous wage rate in period t , L_{tot} is the total time per period, L_{st} is the sick time in period t , p_t is the price of private goods in period t , and P_t is the price of medical care in period t . Sick time in period t (L_{st}) is a function of health status in period t and is defined as the amount of time in period t that the individual is unable to work due to illness. Maximisation of the lifetime utility function subject to the health production function and budget constraint yields the following demand-for-health function at time t :

$$H_t = H_t(p, P, Y, W, A, E, \theta, H_0) \quad (5)$$

Where p is the vector of prices of private goods in periods $1, \dots, T$, P is a vector of medical care prices in periods $1, \dots, T$, W is a vector of wage rates, Y is a vector of non-wage incomes in periods $1, \dots, T$, A is a vector of variables affecting the rate of depreciation, and E is a vector of education levels in periods $1, \dots, T$, θ is the rate of time preference and H_0 is the initial inherited stock of health capital at time 0 .

3.2 EMPIRICAL MODEL

In our model, "A" (vector of variables affecting the rate of depreciation of health) will not be treated as a composite variable but will be divided into lifestyles, environmental factors, marital status, age, household size and these will be analysed with schooling, wealth and medical status. Estimation of the model will not follow the traditional least square (LS) econometric regression analysis due to the binary outcome response characteristic of our dependent variable health. Thus, in measuring health, the study will seek to adopt the morbidity measure which distinguishes between two states of health, one, state of being healthy and two, state of not being healthy (ill state). This means that there will be an unobserved (latent) variable that is the propensity of being healthy or not inherent in every individual that generates a healthy state or an ill-health state. This calls for the use of the Qualitative Response Model (QRM) due to the inherent problems in the use of the Least Square Econometric estimation method when dealing with a binomial model. The variable observed and to be explained is denoted by "Y" and as said earlier this will be generated from the latent variable "Y*" The observed variable will take on values of either 1 or 0 representing healthy state and an ill-health state respectively and this is said to be a dummy variable which is based on probabilities. The probability that it will take on the value of 1 will be estimated by the logistic regression representation of the logit model.

The latent equation;

$$Y^* = \beta X_i + \mu_i \quad (1)$$

Where

$$\mu_i \sim N(0,1)$$

β = is the coefficients of the explanatory variable

X_i is the set of the explanatory variables ; 1,2,3.....N

The observed variable will be generated from the latent variable as follows;

$$Y_i = 1 \quad \text{if } Y^* > \tau$$

$Y_i = 0$ if Y^* otherwise, where; τ is the threshold of the propensity of being healthy.

Thus the observed variable health, denoted by Y will be generated from the latent variable, which is the propensity of being healthy denoted by Y^* . Y will take on the value of 1 if the propensity of being healthy is above a certain threshold denoted by " τ " and it will take on the value of 0 if otherwise. The latent variable is dependent on the explanatory variable in order to ascertain the dependent variable.

The logit model as mentioned earlier on will be derived from the transformation of the above expression into odds and taking its logs.

Therefore the expression:

$$\Pr .(Y = 1/X) = \frac{\exp .(\beta\chi)}{1 + \exp (\beta\chi)}$$

Which implies;

$$\frac{[\Pr .(Y = 1)]}{[1 - \Pr .(Y = 1)]} = e^{\left(\sum_{k=1}^k \beta_k \chi_k \right)}$$

Where "e" is the base of the natural logarithms. The parameter β_k of the model will be estimated using the maximum likelihood method.

The empirical model to be used in this paper will be expressed as;

$$\Pr ob .(Y = 1) = \frac{e^Z}{1 + e^Z}$$

Where; "z" is the linear combination of the independent variables, that is;

$$\left[\sum_{k=1}^k \beta_k \chi_k \right]$$

Thus the linear combination of the independent variables in our model will be;

β_1 wealth + β_2 schooling + β_3 lifestyles + β_4 environment + β_5 age + β_6 marital status + β_7 medical care + β_8 sex + β_9 household size. We will also have " β_0 " representing the constant term.

Where:

β_0 = Intercept

β_1 = Change in log odds of being in a healthy state for a one unit increase to a higher wealthy state.

β_2 = Change in log odds of being in a healthy state for a one year increment in schooling.

β_3 = Change in log odds of being in a healthy state for living health-enhancing lifestyles.

β_4 = Change in log odds of being in a healthy state if a household is at least affected by any form of pollution.

β_5 = Change in log odds of being in a healthy state for a year increment in age.

β_6 = Change in log odds of being in a healthy state for being married.

β_7 = Change in log odds of being in a healthy state for undergoing medical care.

β_8 = Change in log odds of being in a healthy state for being a male.

β_9 = Change in log odds of being in a healthy state for a one unit increase in the household size.

The coefficients of the logit model are estimated by the maximum likelihood estimation. The likelihood function "L" gives the joint probability density function, or

likelihood, of observing the sample. Also the coefficient estimates are the values that maximise the log likelihood function $\log L$. Solution is obtained by a numerical algorithm. To begin with we set some starting values for the coefficients. A desirable approach is to set all slope coefficients to zero. In this case, the probability that the dependent variable denotes the sample proportion estimates one S/N (the binomial estimate), where S is the number of successes (observations at one) observed in the N sample observations. The starting value for the intercept, denoted by β_0 , is then obtained by solving:

$$\frac{1}{1 + \exp(-\beta_1^{(0)})} = S/N$$

It is worth noting that, for the logit model, the estimated coefficients do not have a direct economic interpretation hence emphasis will be placed on the signs. Measures that are familiar to economists are the marginal effects and elasticities.

The syntax used for estimation of the marginal effects for logit model using "Stata" is currently not available to the researcher and this calls for the use of the probit model in finding the marginal effects of the explanatory variables. It has been proven that the "probit" is not significantly different from the "logit" model Gujarati (1992).

The marginal effects of the explanatory variable on the response probability is obtained from:

$$\frac{\partial P(Y_i = 1 / X_i)}{\partial X_k} = \text{scale} \beta_k \quad \text{Where, scale} = \frac{\exp(X_i \beta)}{[1 + \exp(X_i \beta)]^2}$$

Estimates of the marginal effects are calculated by rescaling the coefficients. The scale factor varies with the observed values of the explanatory variables. For reporting purposes, the scale factor is normally evaluated at the sample means of the

explanatory variables. Greene (2000,p.816) notes that a preferred method may be to obtain a scale factor by evaluating the expression at every observation and then taking the average. He comments that in “large” samples, by applying the Slutsky theorem, this result will be similar to the result obtained by evaluating the scale factor at the sample means. However, some extent of caution is necessary when interpreting the marginal effects as discussed above. The formula derived is only associated with explanatory variables which are roughly continuous, such as income and it is not applicable in determining the magnitude of the partial effect from changing a dummy variable from zero to one. Suppose the explanatory variable is a zero to one dummy variable; the change in the probability of a success ($Y=1$) that results from changing the explanatory variable from zero to one, holding all other variables at some fixed values, denoted by “ X^* ” is given by the difference:

$$P(Y=1/ X_k=1, X^*) - P(Y=1/ X_k=0, X^*)$$

Values must be set for X^* . An approach is to set values to represent a “typical case”, A “typical case” can be defined by setting all dummy variables to their modal values and all other variables to their, mean values

3.3 MODEL VARIABLES

The left-hand side of the model will be the dependent variable, which in this case will take on the values of either 1 or 0 representing healthy state and ill-state respectively. This type of health measure has been shown to capture important information about the individual’s health. (Connelly et al.1989) and also as an important predictor of mortality, (Wannamethee and Shaper 1991; Kaplan and Camacho 1983;Idler and Kasl 1991).

The right hand side of the equation will basically, comprise of the explanatory variables. In this study, nine explanatory variables will be analysed. First the impact of wealth on health will be examined. Wealth will be used as a proxy for income due to the complexities involved in estimating or deriving information on individual's level of income. Certain household asset possession will serve as the basis for analysis. Secondly, it will be recalled in the literature review that certain researchers have postulated that there is a positive relation between education and health. In this paper schooling will be used instead of education which restricts us only to the formal education. The basis for assessment with this variable will be the number of years an individual has spent in school and it's relative impact on the individual's health status. Thirdly, household exposure or individual exposure to certain environmental factors will be considered such as air, water and sanitary pollution. As revealed by Ostro (1983), there exist some relation between air quality and health. It is one of the aims of this paper to reassess this assertion and affirm it or disapprove it. Fourthly, household characteristics, such as, tastes and norms, size of the household, gender and marital status, and household staple food intake to capture partially, the nutritional intake and as well the source of household drinking water. Another variable to consider is the individual's lifestyles. The review of the related studies indicated that several studies have been done on the impact of lifestyles on health in most developed countries. The indicators that were used to capture these variables are smoking and alcohol intake. In addition to these two factors this research paper will factor in certain hygienic practices that are health hazardous and also look at the culture of exercising as a determining factor of an individual's health status in Ghana. Also, this study will consider the variable age which has been researched into by many health economists including the main proponent of this work Michael

Grossman. Obviously, medical care will be assessed to establish its relative impact in health promotion program. To simplify the depiction of medical care as a determinant of health improvement measure, we will reduce all medical care inputs into one scale. Individuals who have sought medical care over the last four weeks will be interviewed to comment on the effectiveness of medicinal intake.

CHAPTER FOUR

DATA COLLECTION AND DESCRIPTIVE ANALYSIS

4.0 INTRODUCTION

The empirical analysis of micro determinants of health is based on data from a probability sample of Winneba, the district capital of the Effutu – Ewutu Senya district in the Central Region. The full sample consists of “760” individuals from “180” households. The researcher targeted the heads of the households to be one of the respondents of the questionnaire. However, in the instance where the head of the household was not available any elderly person in the household represented the head of the household. As stated earlier, the structured interview was employed in administering the questionnaire so as to ensure clarification and accuracy in responding to the questions.

The researcher employed four other research assistants to help in administering the questionnaire. Data on household was sought from Ghana Statistical Service to select households to be interviewed before embarking on the fieldwork. A systematic sample comprising “200” households was drawn from the list of households obtained from the Ghana Statistical Service for the purpose of this study. The selected sample included every “10th” household with a random starting point. After selection, the households were visited and the head or any other adult was interviewed using the structured interview instrument for the questionnaire administration. The rationale was to avoid bias and ensure randomness, with an equal probability of each household being selected. The sample from the district capital is to a considerable extent representative of the district capital’s population notwithstanding the set of

limitations that the researcher faced including financial and time constraints. The response rate of the respondents on the other hand, was about 90 percent, which was very encouraging. The researcher and his team used about two weeks in collecting the data from the field after which it took the researcher a week to do data editing. Data editing was very important and the rationale behind was to ensure consistency, accuracy, uniformity and completeness. These four attributes of data editing ensured the smooth coding and imputation of data and to remove all possible contradictions at the data analysis stage. The survey contains data on issues like morbidity, medical care and different socio-economic variables. Further details of the specific endogenous and exogenous variables are discussed in the succeeding sections of this chapter.

4.1 DESCRIPTIVE ANALYSIS OF VARIABLES

DEPENDENT VARIABLE:

HEALTH STATUS (HS)

The dependent variable is the stock of health, which is measured on a subjective basis. Respondents are allowed to access their health status on a two-point scale over the past four weeks that is whether they have fallen ill over the past four weeks or have been absent in the performance of their normal daily duties as a result of health reasons. The researcher went further allowing the respondents to assess themselves whether they have generally been healthy or not over the past four weeks. The subjective nature of this response cannot be fully relied upon. However, it has been shown to capture important information about the individual's health (Connelly et. al 1989) and also as an important predictor of mortality (Wannamethee & Shaper 1991). The two point scale used was "1" representing an individual being

healthy over our sample period of four weeks and “0” denoting otherwise that is an individual not being healthy over the four weeks period. It was realised in the process of data collection that some of the respondents failed to perform their normal daily duties not as a result of a specific illness but felt they needed psychological rest as a result of possibly some sort of stress at work or home. Tables 4.1.1 and 4.1.2 give a primary summary statistics of the health status of our sample. It revealed a frequency of “162” individuals not being healthy out of the “760” in our sample. This means that a greater percentage of our sample respondents were healthy over the four week period by a margin of “57.36” percent. It explains why our mean is skewed towards “1” (.7868421) since it is the state being healthy of healthiness which is in the majority. Although the skewness and the kurtosis are reported we will not delve into its interpretation since our variable is a dichotomous variable.

DESCRIPTIVE TABULAR PRESENTATION OF HEALTH STATUS

TABLE 4.1.1

H. STATUS	Freq.	Percent (%)	Cum (%)
0	162	21.32	21.32
1	598	78.68	100
TOTAL	760	100	

TABLE 4.1.2

Variable	Obs	Mean	Std. Dev	Min	Max	Variance	Skewness	Kurtosis
H/Status	760	.787	.409	0	1	.1679426	-1.400807	2.962261

INDEPENDENT VARIABLES:

The researcher was able to capture nine explanatory variables consisting of medical care and a host of demographic and socio-economic variables.

WEALTH

Tables 4.2.1 and 4.2.2 summarise the primary statistics on the health status of the "760" individuals interviewed. Wealth stood in as a proxy for income levels of the respondents. The reason for the introduction of this proxy is the unwillingness on the part of the respondents to reveal their income level for the fear of taxation and also their incapability to account for the actual income earned at the end of the month. The reason for this is that most of them are self-employed and do not keep day-to-day accounts of their transactions. Based on this the researcher collected information on the ownership of certain assets, such as land, car, telephone et cetera and as well the quantity of these items owned. To ensure accuracy at the editing stage the researcher attached weights to these assets with reference to the market prices of these properties on the Ghanaian market. Households that owned assets with higher prices such as land, cars and other properties in this range were considered as very wealthy and it followed downwards to the least wealthy household in that order. This give reasons to why we have four categories of wealth status of the "180" households interviewed. Least wealthy households fell within the first category (1) followed by the fairly wealthy households in the second category (2), then the satisfactorily wealthy households in the third category (3), then finally the very wealthy households in the fourth and final category (4). The summary statistics showed that most of the respondents fell within the satisfactorily wealthy category with a percentage of 30.53 followed by the very wealthy households with "27.11"percent, then the least wealthy

households with “23.55” percent and finally the fairly wealthy households with “18.82” percent. Based on this it has been concluded that most of the households were appreciably wealthy (categories 3 and 4), since a greater percentage of approximately of “57.64” percent fell within that category. As a result of this the mean in table 4.2.2 shows a numeric figure of “2.611842”, which is skewed towards the satisfactorily wealthy and very wealthy category. Wealth status of the head of households was used as the wealth status of the other members of the household at the analysis stage.

DESCRIPTIVE TABULAR PRESENTATION OF WEALTH

TABLE 4.2.1

Wealth	Wealth Category	Freq.	Percent (%)	Cum. (%)
1	Least Wealthy	179	23.55	23.55
2	Fairly Wealthy	143	18.82	42.37
3	Satisfactorily Wealthy	232	30.53	72.89
4	Very Wealthy	206	27.11	100
TOTAL		760	100	

TABLE 4.2.2

Variable	Obs	Mean	Std. Dev.	Min.	Max	Variance	Skewness	Kurtosis
Wealth	760	2.612	1.12	1	4	1.252297	-.2048326	1.681158

LIFESTYLES

A dummy was introduced to capture the effect of lifestyles on the health status of individuals. Following the indicators used by earlier researchers to capture lifestyles in the analysis of demand for health, the study took into consideration alcohol intake and smoking. However, the researcher took a step further to look at the impact of

health improvement activities on health. His definition for health improvement activities is the extension of lifestyles to cover exercises, diet, work schedule etc. In the process of the questionnaire administration the study realised that exercising took the form of jogging, walking, games, fasting etc. The role of exercising as a component of individuals' lifestyle was emphasised by Prof. A. B Akosa in the National Daily Graphic, dated May 21, 2002, of the Ghanaian newspaper. He said, "Communicable diseases continue to exert its toll as the major killer among children and young adults. These are diseases of poor environmental sanitation, personal hygiene, poor water supply and poor social housing policy. Some of these are completely outside the scope of the individual. Non-communicable diseases, however, are the diseases of lifestyle for which most people can exercise a substantial level of control. The key word in the control of such diseases is exercise. Lifestyle issues also include diet, work schedule, leisure activities, drinking, smoking habits etc." He re-emphasised in his article that Ghana has a high prevalence of hypertension, diabetes, obesity, and hyperlipidemia in both our rural and urban population. Ironically, it is surprising to find our children/students of the present generation inheriting this lack of exercising culture till they become adults. The study denoted health-endangering activities (Bad Lifestyles) by "0" and health promoting activities (Good Lifestyles) by "1". Respondents were asked series of questions on their smoking habits, drinking of alcohol, diet and other forms of exercising lifestyles. About 90 percent of the respondents were very reluctant on the question of smoking and drinking. This could partially be due to the negative perception of Ghanaians on those who drink and smoke on religious and moral grounds or partially due to the fact that smoking and drinking is more pronounced in the temperate regions than in the tropical regions.

In tables 4.3.1 and 4.3.2 it was observed that about “57.63 percent of the respondents engaged in health promoting activities. This was reflective of the respondents who had never taken in alcohol or smoked cigarette to the extent of being hospitalised or the respondent who engage themselves in a form of exercise as described by Prof. A.B Akosa.

DESCRIPTIVE TABULAR PRESENTATION OF LIFESTYLES

TABLE 4.3.1

LS	Freq.	Percent (%)	Cum. (%)
0	322	42.37	42.37
1	438	57.63	100.00
Total	763	100.00	

TABLE 4.3.2

Variable	Obs	Mean	Std. Dev	Min	Max	variance	Skewness	Kurtosis
Lifestyle	760	.5763	.484	0	1	.2444976	-.3088823	1.095408

ENVIRONMENT

Issues of environmental pollution have been proven by earlier studies to be a very strong determining factor on the health status. Based on this the researcher captured the effect of all possible pollution such as air, water, sanitary, and noise pollution on the health status of the sample selected in the Winneba township. The measurement of the effect or extent of pollution was based on subjective perception of the respondents, instead of the standardised scientific measurement, such as the measurement ensuring air quality within certain geographical areas. Respondents

were not able to explain extensively whether air or noise pollution endangered their health status. With water pollution because about 99 percent had pipe borne water for household activities they were all of the opinion that it is clean and hygienic. The only setback with environmental problems was sanitary pollution, which they attributed to the bad toilet sewage system within some areas in the district capital. A dummy was introduced to capture this variable, where "0" was used to denote households which were not affected by any form of pollution and "1" representing households which were affected by a form of pollution at least one. Tables 4.4.1 and 4.4.2 indicate that "51.32" percent of the households were affected by at least some form of pollution and 48.68 percent were affected by some form of pollution. Since the difference was not that much the mean value was slightly above "0.5" for households which are not affected by any form of pollution.

DESCRIPTIVE TABULAR PRESENTATION OF ENVIRONMENT

TABLE 4.4.1

ENV	Freq.	Percent (%)	Cum. (%)
0	370	48.68	48.68
1	390	51.32	100.00
Total	760	100.00	

TABLE 4.4.2

Variable	Obs	Mean	Std.Dev	Min	Max	Variance	Skewness	Kurtosis
ENV.	760	.5131	.500156	0	1	.250156	-.0526498	1.002772

AGE (AGECAT)

Data was collected on the ages of the respondents and it was found that the age range of our respondents was between “1” and “84”, with a greater percentage of respondents falling below the age of “20” To enhance a comparative measurement of the age variable a categorical measurement of the age variable was introduced in tables’ 4.5.1 and 4.5.2. Those aged “20” years and below fell within the first category, between “21” years and “40” years inclusive in the second category, between “41” years and “60” years inclusive in the third category, between “61” years and “80” years inclusive in the fourth category, and finally above 81years in the fifth category. The cumulative frequency statistics evidenced that about “82” percent of our sample size were “40” years and below giving reason for the mean age being “35.57895”. The study at the analysis stage found the square of ages to enhance the verification of the effect of increasing age on the health status of individuals within our sample.

DESCRIPTIVE TABULAR PRESENTATION OF AGE**TABLE 4.5.1**

Age (categorical)	Freq.	Percent (%)	Cum. (%)
20	333	43.82	43.82
40	287	37.76	81.58
60	116	15.26	96.84
80	23	3.03	99.87
100	1	0.13	100
TOTAL	760	100	

TABLE 4.5.2

Variable	Obs	Mean	Std. Dev	Min	Max	Variance	Skewness	Kurtosis
"Agecat"	760	35.578	16.4	20	100	270.2836	.812521	3.0296

MARITAL STATUS

Table 4.6.1 gives summary statistics of the marital status of individuals in the sample. In the questionnaire, marital status was categorised into five categories with "1" symbolising never married, "2", denoting "In marriage, "3" meaning separated, "4" representing divorced and lastly "5" denoting widowed. The statistics revealed that "58.89" percent of the "760" individuals had never married and 35.18 are in marriage. In table 4.6.3, the statistics is reduced only to two instances, that is whether the individual is married or not. In the table, "0" represents not married which comprises of never married, separated, divorced and widowed and "1" representing married. Obviously from the previous statistics this revealed that "64.62" percent of the individuals were not married.

DESCRIPTIVE PRESENTATION OF MARITAL STATUS**TABLE 4.6.1**

MARITAL STATUS	Freq.	Percent (%)	Cum. (%)
1	447	58.89	58.89
2	267	35.18	94.07
3	11	1.45	95.52
4	16	1.98	97.50
5	19	2.50	100
TOTAL	760	100	

TABLE 4.6.2

Variable	Obs	Mean	Std. Dev	Min	Max	Variance	Skewness	Kurtosis
M.ST.	760	1.5401	.083	1	5	.6972617	2.267058	9.16110

TABLE 4.6.3

MARRY	Freq.	Percent (%)	Cum. (%)
0	491	64.61	64.61
1	269	35.39	100
TOTAL	760	100	

HOUSEHOLD SIZE

Tables 4.7.1 and 4.7.2 revealed that the range of household sizes was "1" to "13" in the one hundred and eighty households interviewed. The definition of household in this study is the number of persons within a particular house who depend or consume from the same basket of income. The frequencies indicated that most household were five in number and the percentage showed that households totalling five constituted 21.97 percent out of the "13" different household sizes. This gives a good reason as to why the mean of the household size is "5.21".

DESCRIPTIVE TABULAR PRESENTATION OF HOUSEHOLD SIZE**TABLE 4.7.1**

H/H SIZE	Freq.	Percent (%)	Cum. (%)
1	16	2.11	2.11
2	54	7.11	9.21
3	95	12.50	21.71
4	161	21.18	42.89
5	167	21.97	64.87
6	72	9.47	74.34
7	84	11.05	85.39
8	40	5.26	90.66
9	36	4.74	95.39
10	10	1.32	96.71
12	12	1.58	98.29
13	13	1.71	100
TOTAL	760	100	

TABLE 4.7.2

Variable	Obs	Mean	Std. Dev	Min	Max	Variance	Skewness	Kurtosis
H/H Size	760	5.217	2.36	1	13	5.6142	.9875055	4.289093

SEX

Gender of members of household showed that female constituted the majority and that perfectly reflects a true picture of the Ghanaian population with a greater percentage of the population being female. Tables 4.8.1 and 4.8.2 displays this summary, with "0" denoting female and "1" representing male. The table showed that three hundred and ninety eight of the "760" individuals were of the female sex and

the rest, three hundred and sixty two were of the male sex. The difference between the male and the female were not the very significant.

DESCRIPTIVE TABULAR PRESENTATION OF SEX

TABLE 4.8.1

Sex	Freq.	Percent (%)	Cum. (%)
0	398	52.37	52.37
1	362	47.63	100
TOTAL	760	100	

TABLE 4.8.2

Variable	Obs	Mean	Std. Dev	Min	Max	Variance	Skewness	Kurtosis
Sex	760	.4763	.499	0	1	.2497677	.0948433	1.008995

SCHOOLING

Schooling in this study is used as a proxy for education and the reasons for doing that have been outlined in the previous chapter. This variable captured the number of schooling years that have been completed, formal, informal and non-formal. Individuals who had had schooling between one and five years inclusive were classified into the first category "1", within six and ten years inclusive were classified into the second category "2", within eleven and fifteen years inclusive were classified into the third category "3", within sixteen and twenty years inclusive were classified into the fourth category "4" and finally above twenty years of schooling were classified into the fifth category "5". In tables 4.9.1 and 4.9.2 individuals who had completed schooling between the year bracket of six to ten constituted the majority with a frequency of "292" and a percentage of "38.42" out of the five different

categories. The mean year of schooling is "2.173684" and this fell within the six to ten years of schooling bracket. The reason that most of the individuals within the sample with age thirty and above completed the middle school in those days and never continued. At the analysis stage a dummy was created for the schooling categories since that will give us the effect of specific years category of the health status of the individual.

DESCRIPTIVE TABULAR PRESENTATION SCHOOLING

TABLE 4. 9.1

Schooling	Freq.	Percent (%)	Cum. (%)
1	208	27.37	27.37
2	292	38.42	65.79
3	196	25.79	91.58
4	48	6.32	97.89
5	16	2.11	100
TOTAL	760	100	

TABLE 4. 9.2

Variable	Obs	Mean	Std. Dev	Min	Max	Variance	Skewness	Kurtosis
School	760	2.173	.972	1	5	.9447611	.61215712	3.017114

MEDICAL CARE

The final tables 4.10.1 and 4.10.2 of this chapter give a summary statistics of medical care. This variable was captured from the questionnaire on the basis of the individuals who fell ill over the last four weeks and as well sought medical care. In the process of administering the questionnaire it was revealed that out of the "760" individuals, only "115" reported that they fell ill over the last four weeks and malaria

constituted about "90" percent of this "115" individuals who fell ill. It was however, observed that about forty-seven individuals in our sample although did not fall ill were not in the position to perform their normal daily duties due to health reasons, specifically stress. These individuals did not seek medical care at all. Also individuals who had sought medical care in the past and felt that it had an impact on their illness were further interviewed to assess the effectiveness of medical care on their health. Respondents who undertook preventive measures were further questioned into knowing whether they undertook the preventive measures based on medical practitioners advice, educational grounds, or any other reason. A dummy was introduced to capture the medical care, that is "0" for those who did not seek medical care in the event of illness or had no confidence in the medical care system at all and "1" for those who sought medical care in the event of illness or had confidence in the medical care system. It was revealed that "50.43" percent of the "115" who fell ill sought medical care and "49.57" did not seek medical care. Those who did not seek medical care relied on self-medication, prayers, traditional medicine or allowing time to take care of the illness. Those who relied on self-medication did not seek the advice of any medical practitioner; they either relied on their knowledge or advice from relatives and friends in the event of illness.

DESCRIPTIVE TABULAR PRESENTATION OF MEDICAL CARE

TABLE 4.10.1

Med Care	Freq	Percent (%)	Cum. (%)
0	57	49.57	49.57
1	58	50.43	100
TOTAL	115	100	

TABLE 4.10.2

Variable	Obs	Mean	Std. Dev	Min	Max	Variance	Skewness	Kurtosis
M/Care	115	.5043	.050	0	1	.2521739	-.017392	1.000302

CHAPTER FIVE

ESTIMATION OF MODEL, PRESENTATION OF RESULTS AND DISCUSSION

5.0 INTRODUCTION

The study in discussing the methodology outline certain inherent problems characterizing the usage of the least squares in cross sectional analysis. As a result, the study opted to use logit analysis. Since logit models are non-linear, no single approach to interpretation can fully describe the relationship between a variable and the outcome probability. Based on this the study searched for an elegant and concise way to summarize the results that do justice to the complexities inherent in non-linear models. A more basic difference is found in the outcome being modelled. While most programs model the probability of the dummy as “1” some programs for example, “SAS” model the probability of the dummy as “0”. However, this issue becomes trivial if the researcher is fully in the know of what the program is doing.

For the binary response model;

$$\Pr (Y_i = 0/X_i) = 1 - \Pr (Y_i = 1/X_i) = 1 - F (X_i^1 \beta) = F (-X_i^1 \beta)$$

Where the last equality follows from the symmetry of the probability density function implying that all the coefficients will have the opposite sign.

It should however be noticed that this will not be the case for the complementary log-log model since it is asymmetric.

It will be recalled in the third chapter of this research paper that the model for

$$\Pr ob.(Y = 1) = e^z / 1 + e^z$$

estimation was expressed as;

Where; “z” is the linear combination of the independent variables that is in our model;

β_1 wealth + β_2 schooling + β_3 lifestyles + β_4 environment + β_5 age + β_6 marital status + β_7 medical care + β_8 sex + β_9 household size. We will also have " β_0 " representing the constant term.

5.1 INTERPRETATION AND DISCUSSION

In the methodology, the logit model was discussed in detail and it will be recalled that the purpose of iteration is to apply an updating rule to update the starting values to a new set of coefficient estimates till convergence is achieved. It is normally achieved at the 4th or 5th iteration. The argument is that once the iteration is less than "10" there is no danger of multicollinearity¹. From tables 5.2 and 5.3 in the appendix, the highest point of convergence is iteration four, which is a good indicator of no possible multicollinearity. From table 5.2, in the appendix, value of the log likelihood function when all slope coefficients are zero is "-393.76413". It will be evidenced that the value of the log likelihood function increases at each iteration to a final value of "-374.78626", this gives some idea that the log-transformation variables postulates a better fit.

It should be noticed that when using cross sectional data as in our case the "Durbin Watson statistic, the serial correlation statistic and the ARCH statistic are meaningless. These diagnostic test looks for relationships between successive points, therefore, given that there is no obvious ranking of data points in cross sectional data these tests tends to be uninformative. The statistical properties for the maximum likelihood estimator are established for large samples (asymptotically). This means that the asymptotic "t" statistic has an approximate normal distribution in

¹ *Multicollinearity occurs when one or more independent variables can be approximately determined by some other variables in the model.*

large samples. This calls for the use of the estimation results in table 5.6, in the appendix, which gives an output result of the “t” statistic. Also it is worth noting that another feature of table 5.6 is that it is a post estimation output which gives the “F” Statistic showing a probability value of “0.0”. This is however, not very important to us because of the maximum characteristics of our estimation.

The sign of an estimated coefficient gives the direction of an effect of a change in the explanatory variable on the probability of a success (an observation at one implying that the individual is in a healthy state). For instance, the positive estimated coefficient on schooling suggests that it is more likely that an additional year of schooling will lead to an individual being healthy. A test of the null hypothesis that the schooling coefficient is zero against the alternative hypothesis that the schooling coefficient is positive has a “t” test statistic of “0.812”. For a one sided test the approximate “5%” critical value is “1.645”. Since the critical test statistic exceeds the calculated we fail to reject the null hypothesis that the coefficient of schooling is zero. It is worth noting that, for the logit model, the estimated coefficients do not have a direct economic interpretation hence emphasis will be placed on the signs. Measures that are familiar to economists are the marginal effects and elasticities. The probit model will be used in finding the marginal effects. In table 5.2, in the appendix, the output results are expressed in the “log odds” and this makes the explanation seem not to be very intuitive. This is because unlike the linear probability model or ordinary least square regression where the slope coefficients, are the rate of change in “Y”(the dependent variable) as “X” (the explanatory variable) changes, now the slope coefficient is interpreted as the rate of change in the log odds as “X” changes. An interpretation of the logit coefficient which is usually more intuitive (especially for

dummy dependent variable) is the “odds ratio” which is the exponential of the “ β ”. The odd ratio is simply the probability of the event divided by the probability of the non-event. This is expressed in table 5.4 and 5.5, in the appendix. An important issue worth noting is that logistic regression calculates changes in the log odds of the dependent and not changes in the dependent variable itself as ordinary least square regression does.

Table 5.2, in the appendix, explicitly, shows that the number of observations under discussion is “760” as denoted in the descriptive statistics followed by the “LR chi2 (10) which denotes the log likelihood ratio test. The “LR” test is chosen as an alternative test to the Wald and lagrange multiplier test. The Wald Adjusted Test is, however, reported in table 5.7, in the appendix. It is used to test the significance of individual logistic regression coefficients for each independent variable (that is to test the null hypothesis in the logistic regression that a particular logit (effect) coefficient is zero). It is the ratio of unstandardized logit coefficient to its standard error. Not Much emphasis was laid on the Wald statistic because it is sensitive to the violations of large sample (large sample sizes are those greater than thirty) assumptions underlying logistic regression as in our model. Menard (p.39) warns that for large logit coefficients, standard error is inflated, lowering the Wald statistic and leading to Type II errors (false negatives: thinking the effect is not negative when it is). That is, there is a flaw in the Wald statistic such that very large effects may lead to very large standard errors and small Wald chi square values. For models with large logit coefficients or when dummy variables are involved, it is better to test the difference in model chi-squares for the model with the independent and the model without that independent, or to consult the log likelihood test. The log likelihood ratio test is used

to test the joint restrictions on coefficients that is whether certain parameter restrictions are supported by the data. The “LR” test, which is invariant to reparameterization, is carried out by computing both the unrestricted model and the restricted model (imposing the non-linear restrictions) and compares the log likelihood values. It is assessed by comparing the log likelihood of the unconstrained model, $\ln(\beta_U)$, to the log likelihood of the constrained model, $\ln(\beta_C)$. If the constraint significantly reduces the likelihood, then the calculated value which is a chi square distribution is calculated as follows $-2[\ln(\beta_C) - \ln(\beta_U)] \sim \chi^2_m$, where, m , (number of restrictions), should be greater than the critical chi square value. The likelihood test ratio with a figure of “40.21” as found from our table, tests the null hypothesis that the “ β ’s” in our model are equal to zero, consequently, once the calculated value is greater than the critical value which is reflected in the probability value of “0.0”, then it can be said that at least one variable is significantly different from zero. The likelihood ratio test seem to be more difficult to apply but it is very desirable when large samples are in use as in our case, because it need not require an assumption of normality.

Logit estimators as noted earlier on are non-linear, with a non-linear estimator, therefore the traditional “ R^2 ” measure can lie outside the [0,1] interval. Along with other problems, this makes the “ R^2 ” measure unsuitable for non-linear estimators. To measure the goodness of fit with a qualitative dependent variable, accuracy can be judged either in terms of the fit between the calculated probabilities and the observed response frequencies or in terms of the model to forecast observed responses. For individual data as in our case, we compute the indirect McFadden “ R^2 ”, which is derived from the likelihood–ratio test. Note that the predicted value is a probability,

whereas the actual value is either “0” or “1” Morrison (1972) therefore, studied the correlation between a binary dependent variable and a probabilistic predictor. Morrison argued that the low “ R^2 ” value that one obtains as in our estimation (0.05), when calculating correlation between a binary dependent variable and the predicted probabilities need not imply that the model is not good. A tabular and pictorial exposition depicting the fit of our model is further showed in table 5.1, figure 1.0 and figure 2.0. Much emphasis will not be laid on this exposition to enhance brevity of analysis. Table 5.1, in the appendix, depicts that the correctly specified model is approximately “79.21%” and this under an “ROC” curve of “0.6522”. This is accepted since it is greater than 0.5. Lastly with figure 2.0 we evidence that the sensitivity and specificity interaction of the model is geared towards one.

DISCUSSION OF THE EXPLANATORY VARIABLES

The odds ratio indicates the amount of change expected in the odds ratio when there is a “1” unit change in the predictor variable with all of the other variables in the model held constant. An odds ratio close to 1.0 suggests that there is no change due to the predictor variable. Alternatively, if the odds ratio is greater than one it suggests that for every one unit change in the predictor variable with all other variables in the model held constant, there will be an increase in the dependent variable and the alternative holds.

WEALTH

Generally thought, higher wealth (income) will result in more control at the preventive stages and discretion and that such a control is a key influence on health. We use dummy variables as discussed in the descriptive statistics rather than a continuous

wealth variable to avoid making assumptions about the functional relationship between wealth as a proxy for income and health status. From our table the odds ratio for wealth which is a proxy for income is "1.16". This depicts that a "1" unit change in the wealth status of an individual will lead to a "1.163" increase in the health status of the individual given that all other variable in the model are held constant.

In interpreting sample data coefficients emphasis is placed on the method adopted in coding the variable in question. In the previous chapter it will be recollected that wealth was measured on a four point scale ascending from the least wealthy individuals through to the fairly wealthy individuals then to satisfactorily wealthy individuals then finally the very wealthy individuals. Since it has the same inclination with the dependent variable then, expressing the odds ratio into a percentage increase, then it can be interpreted that an additional increase in wealth increases the odds of being healthy by "16%" controlling for other variables. (Obviously, this is the same as saying that the health status odds increases by "116%", or noting that one multiplies the health status odds by "1.16" Alternatively, a decline in wealth will affect health negatively. This supports the argument by Case, (2001) that a decline in income will negatively affect health status through the increase in psychosocial. The "z" test in our output results allows us to carry out a hypothesis test involving a single coefficient. Specifically, it allows us a test in which the null hypothesis is that the coefficient of interest is equal to some specified value "k" and the alternative hypothesis is that the coefficient is not equal to that value. However, as argued earlier the magnitude of the coefficients of the logit model has no direct economic interpretation hence reference will not be made to the "z" value and its probability

values. This does not allow us to put much emphasis on the level of significance of the variables, though from our estimation wealth in our table is significant at “10%”. This called for the use of the probit model to estimate the marginal effects of the independent variables. The Marginal effect from table 5.8, in the appendix, for our wealth variable is “. 023”, interpretation of this should be done with much caution since its computation is quite different from the normal rough continuous income variable. It will be recalled in the third chapter that the computation of a rough continuous variable is quite different from a discrete variable as in our case. It therefore can be said that using a linear extrapolation of the estimated coefficients, then it is “0.2%” more likely that very wealthy individuals will be healthier than the least wealthy individuals, all other things being equal.

The study found it very important to find the marginal effects of the explanatory variables since that will help achieve its prime objective as to whether medical care is the most important determinant of the health status of an individual or otherwise. Comparing the magnitude of the wealth variable to medical care (hos1) we realise that wealth has a higher value than medical care, which presupposes that wealth is a stronger determinant than medical care. It was necessary to look at the impact of extreme wealth status. It was found that if an individual falls within the least wealth category then it will have a negative impact on health and alternatively if the individual fell within the very wealthy category then it is more likely that the individual will be healthy. This is evidenced in table 5.9 as “w1”(least wealthy) and “w4”(very wealthy) respectively.

SCHOOLING

The second variable under consideration in the model is education, which was measured by years of schooling. Literature has shown that there should be a positive relationship between years of schooling and the health status of the individual. In conformity to that, our estimation has showed a positive relationship between the years of schooling and the health status of our respondents. The argument put across is that, higher years of schooling increase efficiency with which individuals or households produce health and consume health care. From our logit estimation the logistic table gives an odds ratio for schooling as "1.04" This means, if the years of schooling of an individual increases by one year, the odds that the health status of that individual =1, will increase by a factor of "1.04" when the other explanatory variables are held constant. Expressed as a percentage, it can be interpreted that, an additional year of schooling increases the odds of being healthy by "4%", controlling for other variables in the model. It will be recalled that its' coefficient at the "Z" distribution is not in the least significant, but this is not really a matter of concern to us since we are dealing with the probabilities. To have an idea about the magnitude we use the marginal effects of the probit model from our table. It shows a value of ".007", meaning that, using linear extrapolation of the estimated coefficients, it is "0.06%" more likely that individual with higher years of schooling will be healthier than the individuals with lower year of schooling, all other things being equal. This marginal effect helps us to compare the magnitudes of our explanatory variables; hence, the study found that schooling like the wealth variable has a higher coefficient than our focal explanatory variable, medical care. Ranking these three explanatory variables, wealth had the highest magnitude followed by schooling then medical care

giving the researcher an idea that wealth and schooling have a greater impact on the health of the individuals within our sample than medical care.

On the issue of schooling, other health Economists have put forward hypothesis under which schooling and health status are correlated only because they are both related to one or more other factors. The problem can be seen as the familiar self-selection problem. Do people who self-select to choose higher levels of education have an unobserved characteristic that also makes them likely to be healthy? This argument was, however, challenged by Behrman and Wolfe (1989) who undertook studies in Nicaragua. They took steps to control for the influence of other factors that affect both schooling and health. In particular, they controlled for the women's childhood background factors and concluded that the estimated positive health impact of the woman's schooling is largely representing schooling per se rather than unobserved fixed endowments. Therefore, the woman's schooling does seem to make the woman healthier. This literature helps to clarify the possibility of any causal effect between health and schooling.

LIFESTYLES

Lifestyles, in this study, were measured using smoking, alcohol intake and exercises as the indicators. The questionnaire was structured in such a way to collect information on the diet pattern of the individuals so as to make the measurement of lifestyles more comprehensive. Although, the respondents were willing to give such information, it was too general since their eating pattern did not follow a particular pattern in the household. The study, however, deduced that the calorie level in their

meal was generally low, primarily, due to the fact that fish was highly taken unlike meat. In our estimation, the coefficient of the lifestyle variable had a positive sign which means that individuals that engaged in health enhancing activities such as, exercising, no smoking and avoided excessive drinking of alcohol were more likely to be healthier than individuals that engaged in health endangering activities. A thorough discussion about the estimated coefficients was done in the preamble of this chapter and emphasis was laid on the difficulty in interpreting dummy variables. The reason was attributed to the fact that for a dummy variable since our estimates is in probabilities then the change (from "1" to "0") is very significant in terms of probabilities. Also because the logistic regression is not linear an extrapolation of the estimated coefficient for the change from "0" to "1" will be less accurate. This means that in discussing the variables that are denoted by dummies such as lifestyles, environment, sex etc, emphasis will not be placed on the coefficients instead the marginal effects will be used. Literally, the odd ratio of lifestyles means that, if an individual's lifestyle improves, the odds that the health status of that individual = 1, will increase by a factor of "1.25" The marginal effect from our probit estimation shows that, using a linear extrapolation of the estimated coefficients, individuals who engage in health enhancing activities are "0.3%" more likely to be in a better health state than individuals who engage in health endangering activities all else equal. Again a comparison of the magnitude of the marginal effects depicts that lifestyles has the strongest influence on the health status of individuals as compared to schooling, wealth and the least amongst them medical care.

The directional impact of lifestyles is in conformity with the literature but it is quite intriguing because in most of the studies emphasis was laid on smoking and alcohol

intake. For instance, the study by Victor Fuch and Barbara Wolfe strictly used alcohol and smoking as proxies for the measurement of lifestyles; however, in this study, respondents were very reluctant to respond to questions on smoking and alcohol intake so the main factor affecting the lifestyle variable was exercising. The role of exercising in lifestyle has been of great importance to the health status of Ghanaians and this was made known by Prof. A. B. Akosa. In the Tuesday, May 21 2002, edition of the Daily Graphic, Professor A. B. Akosa said, "Ghana has a high prevalence of hypertension, diabetes, obesity, hyperlipidemia in both our rural and urban adult population now and I hate to think of what it will be like if the children/students of today continue the lack of exercise culture till they become adults. A good dose of exercise, which can be a 30 minutes brisk walk and a fruit each day, will surely keep you away from the doctor. The exercise rejuvenates the body. It produces hormones, which give the body tissues a sense of well being within which to thrive". This assertion makes our positive directional impact of lifestyle on the health status quite realistic.

ENVIRONMENT

The impact of environmental factors on the health status of individuals was also estimated by the use of a dummy variable. Interpretation of this variable is very crucial since the expected sign had a reverse coding to the dependent variable. Healthy environments was denoted by "0" whereas unhealthy environments (that is households' that is at least affected by one form of pollution) was denoted by "1". This gives reason as to why the study in the preamble emphasised that in interpreting cross sectional analysis one should take into cognisance the coding manual. The negativity of the coefficient will mean that it is less likely for a household that is affected by at least one form of pollution to have its members being healthy.

Otherwise stated, households that are not affected by any form of pollution are more likely to have its members being healthy. Though, much emphasis is not laid on the coefficients of the logit estimation the “Z”-test for the coefficient was “1%” significant. Using the odd ratio then it is possible to say that if an individual stays in an unhealthy environment then it is less likely for that individual to be healthy. Mathematically, the probability that an individual who moves to an unhealthy environment will stay healthy is “.30/.70”. Alternatively, it can be stated that it is more likely (“.70/.30”) that if an individual stays in a healthy environment he/she will be healthy.

Earlier studies of determinants of health that incorporated environment as one of their variables (Cropper et. al., 1997; Schwartz and Dockery 1992) used an objective measure in the measurement of health. For instance the “Total Suspended Particulate” (TSP) within a geographical area was used to measure the effect of pollution on the residents within the geographical catchment area. A recent study in Philadelphia suggest that reducing the pollution level there by “100micrograms per cubic meter would reduce deaths by more than “6 percent” in the general population and nearly “10 percent” for the elderly. The study initially considered of embarking on such an objective measure but was constrained financially and by the lack of available data from the Ministry of Science and Environment. However, the directional results obtained from this subjective measure are consistent with the results obtained with the objective measure. The marginal effect from our probit estimation shows that, using a linear extrapolation of the estimated coefficients, individuals who live in healthy environment that is those who are not affected by any form of pollution are “1.363%” more likely to stay healthier than those who live in an unhealthy environment holding all the other variables at a constant. The most

fascinating aspect of this parameter estimate is that among all the variables under consideration environment seem to have the highest magnitude. This suggests that within the specified model environment is the strongest determining factor of health. This helps to diffuse the long-standing stereotyped notion that medical care is the most influential factor that determines an individual health status.

MARITAL STATUS

The other socio-demographic factor that has not received much importance is marital status. Most researchers have most often dropped this variable in their analysis due to its complex nature. The argument has been that mans' control over this variable is determined by other factors (minimal). In the descriptive statistics it was found that about "64.61%" of our respondents were not married. This fell within the category of those who had never married before, those that were separated, divorced or widowed. The estimation showed a negative sign hence based on our coding it was revealed that staying unmarried was more likely to lead to a healthier state than staying in marriage. This is quite strange but recent studies seem to be having this kind of results. A study conducted in Sweden by "Oleksiy Ivaschenko (2001), on the topic, Health, Income and Economic Transition: An Econometric Analysis, Using Micro-Level Data, in October 2001 revealed, "Being married has turned out to have no significant effect on health. However the 2SLS parameter estimate on the marital status is marginally significant and it suggests, rather surprisingly, that married people tend to have worse health. Living in a single-person household does not appear to be crucial determinant of health when the model is estimated by the 3SLS". This and other research work have in a way shelved the role of marital status on the health status of an individual. Ironically, if one examines the table for marginal effects

estimation it will be realised that marital status come second to environment in the terms of the factors that strongly influences the health status of an individual. Using a linear extrapolation of the estimated coefficient, individuals who are not staying with their spouses are "0.4%" percent more likely to stay healthier than those who live with their partners, holding all the other variables at a constant.

SEX

Gender from our literature showed that on the average women live longer than men, however, this does not presuppose that if one uses morbidity to measure health as in this case then women will be healthier than men. The general assertion is that vulnerability to health risks such as physical and sexual violence, sexual transmitted diseases; environmental hazards and inappropriate clinical interventions vary between men and women. Many of the differences are socially constructed arising from differences in traits, attitudes, behaviours and roles that society ascribes to men and women. Following the method of coding that was done, (Men = "1"; Women = "0"), and looking at the odd ratio for the sex variable in our table it can be said that it is less likely for a man to stay healthier than a woman. Table 5.4, showed an odd ratio of " .95" which means that the probability that a man will stay healthy as compared to a woman is (0.48/ 0.52). Using the marginal effects to determine the strength of gender as one of the determinants of an individuals health status table 5.2 showed the magnitude of the marginal effect as "-.01". This value although small, comparatively, is higher than the magnitude of medical care. From the table, if we rank the variables in order of the most important determining factor of an individual health status using the marginal effects then gender will be the sixth out of the nine

variables in our model. Using a linear extrapolation of the estimated coefficients, then it is ".099%" less likely that if you are a man you will be healthy.

HOUSEHOLD SIZE

Household size from the descriptive statistics averaged about five persons per each household. This figure is consistent with the average household size in Ghana. It however, showed up to have a positive relationship with an individual health status. Thus, it is more likely to have a better health status if there is a unit change in the household size. Its "Z" value however was significant at "5%" The logistic estimation showed that household size had an odd ratio of "1.1", which can be interpreted by saying that there is a probability of (.53/.47) that an additional increase in the household size will lead to a healthy state of the members of the household. To have an idea about the magnitude we use the marginal effects of the probit model in table 5.3. It shows a value of ".015", then using linear extrapolation of the estimated coefficients, it is "0.16%" more likely that an additional increase in the size of a household will lead to better health status, holding all the other variables constant. This marginal effect helps us to compare the magnitudes of our explanatory variables and it was found upon a careful examination that household size is the fifth determining explanatory variable of the set of factors that determine an individual's health status in our model all other variables held constant.

AGE

The age variable was categorised as discussed in the descriptive statistics. However, in contrast with the literature it depicted a positive relationship with the health status

of an individual. This actually prompted the researcher to find the square of the ages and run the logit model. When this was done, it showed the normal inverse relationship between age and health status. Thus an increase in age simultaneously reduces the health status of an individual. Trying to assign a reason as to why the actual ages had a positive relationship with health status the researcher looked at the mean age which showed up to be around the age of "35" and about "80%" of the respondent were below the "60 age bracket". The work of Michael Grossman used age as the pivot for the depreciation factor that account for the fall in the stock of health capital. In his work he calculated the trend of depreciation and concluded that "70 percent" of the initial stock would depreciate by the age of "58", "80 percent" by the age of "77" and "90 percent" by the age of "96"¹ This analysis of Grossman accounted for the inverse relationship between age and the stock of health capital. Unlike our sample the age bracket was concentrated between the "30 years age bracket and this could possibly account for the positive relationship. Murinen (1982) and Wagstaff (1986) later confirmed this assertion. The odd ratio of the "agecat" (Age Categorized) variable is "1.01" means that an additional increase in age will lead to a likelihood ratio of about (.51/.49), more likely for that individual to be healthy. Conversely, the "agesq" square of the ages showed that an increase in the age of an individual will lead to a likelihood ratio of (.49/.51), less likely that the individual will be healthy. Using the linear extrapolation of the estimated coefficients, the marginal effects of the age variable means that " for a 10 percent increase agecat variable, the estimates suggests that there will be a " .02 percent" increase in the probability that an individual will be healthy, whereas, for a "10 percent" increase in the agesq, the estimates suggests that there will be a "0.0 percent decrease in the probability that

¹ It should be noticed that the sample set used by Michael Grossman, was that from a developed nation and the life expectancy is higher than that of a developing nation like Ghana. This will obviously have an impact on age.

an individual would be healthy all else equal. It should however, be noticed that comparing the magnitudes of the marginal effects it is the *agesq* variable that has the least figure meaning that it least explains the health status in our model.

MEDICAL CARE

Lastly, medical care as usual showed a positive relationship with the health status, which is in conformity with the literature reviewed. Medical care was measured based on those individuals who sought medical care during the past four weeks prior to the fieldwork in the event of illness. Also individuals who had sought medical care in the past (As far as their memory could recollect) and felt that its impact on the ill state or health in general were further interviewed to assess the effectiveness of medical care on their health. Respondents who undertook preventive measures were further questioned into knowing whether they undertook the preventive measures based on medical practitioners advice, educational grounds, or any other reason. These questions helped the researcher to capture the medical care variable. It should, however, be made mentioned that the medical care (*HOS1*) variable in our model was significant at “5%” The odds ratio of medical care showed a figure of “1.0”, which means that the likelihood ratio is almost (.50/.50) for there to be an improvement in health status given a small change in medical care. The marginal effects for medical care also showed that using the linear extrapolation of the estimated coefficients then medical care is “.001 percent” more likely to lead to an improvement in the health status of an individual all other exogenous variables in the model held at a constant .

CHAPTER SIX

CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS OF STUDY

6.0 Conclusions

In this study, we have estimated a binary qualitative response model of the socio-demographic determinants of health using micro-level data from the household survey conducted in Winneba, the District Capital of the Effutu- Ewutu Senya District in the Central Region of the Republic of Ghana. The main research objective of this study has been to investigate the most important determining factor of an individuals' health status at the household level. The health status of an individual was measured on a two-point scale based on a subjective perception as to whether an individual has been generally healthy over a certain time frame or not. This precipitates the use of a latent variable to measure the outcome (health status), hence the use of a binary qualitative response model (Logit and Probit model) using the Maximum Likelihood Estimation.

The results from the estimation, showed that wealth, schooling, health enhancing lifestyles, healthy environment, medical care and household size are more likely to improve the health status of an individual given a "unit" increase in these variables. Age initially, took a different turn, however, upon finding the square of the age variable it proved otherwise and confirmed the review of related literature, depicting a fall in the health status of an individual as the individual ages with time. Marital status on the other hand showed that, staying unmarried or being single which in our model represents those who had never married before, divorced, separated or widowed is

more likely to lead to an individual being healthy than those married. This deduction has, however, been made in a recent study by Ivaschenko (2001), in Sweden.

The upsurge of gender sensitivity rekindled an interest into the study of which of the gender is healthier. The trend showed an inclination towards healthier female than male. Though the probability difference is not that much, it is worth making concluding since we are dealing with probabilities. In Ghana, another health status indicator (life expectancy) have shown that female have longer life span, averagely, than their male counterparts. These results are in conformity with the predictions of the variables that determine an individual's health status.

Categorising, the predictors into two main headings ("nature-determined" status such as sex and to some extent marital status and "man-determined" status such as wealth, schooling, environment and lifestyles), it was revealed that the latter impacted more on the individual's health status than the former. In relation to the main objective of the study it can be concluded that, to a considerable extent the individual is an architect of his or her own health status. Based on these research findings the most pedagogic message of this study is that the onus of maintaining a desired or an appreciable stock of health lies primarily on the individual and not otherwise.

6.1 RECOMMENDATION

The finding of this study is a platform for future studies in a health promotion programme. Health promotion as defined by the Ottawa Charter, refers to the process of enabling people to increase control over, and to improve, their health. The implementation of this definition requires that health promotion initiatives should be

empowering, participatory, holistic, intersectoral, equitable, sustainable and multi-strategy.

This document has provided a subjective analysis of the factors that influence the health status of the respondents and it was found by the estimation results that the most important determining factor of the health status of an individual is its environmental condition. Within our sample the major contributing factor for bad environmental condition is the terrible conditions of the toilet sewage system, hence an “all-in-all” selfless approach is advocated to be adopted in combating this health-deteriorating factor. Lifestyles, alongside schooling and wealth, in this study, proved to have greater influence on the health status of an individual than medical care hence it is suggested that public campaign is very necessary to place the entire population in a well informed position on how to maintain or improve upon the desired health stock level.

Allocation of resources in a governmental quest to enhance a healthy population should be distributed with due cognisance to the factors that really determine the health status of an individual. This argument goes to support the reason why the United States of America is not the nation with the highest or best health indicators. The argument has been that it is the nation that pumps most resources in its health sector (medical care). Ironically, other nations that spend relatively less have better health indicators than the United States of America.

This study provides a baseline for future academic in the area of demand for health in Ghana. The reason being that it has provided an econometric framework different

from the main originators work (Michael Grossman) for analysing the socio-demographic determinants of health in Ghana.

6.2 LIMITATION

Finally, it is important to note some limitations of the study. One limitation concerns the fact that there may be some omitted variables which affect the demand for health that were not included in the model due to reasons beyond the researcher's control or it was merely an oversight. Some variables that were left out from the model due to financial and time constraints are the nutritional level of the respondents and the biological and genetic characteristics of the respondents. This could lead to omitted variables bias. Another limitation concerns causality. For some variables there could be some problems with reversed causality, for example, the health status affects wealth and schooling rather than the other way round. If this is the case, the estimated effects of wealth and schooling will be biased, along with the effects of all other correlated regressors. Unfortunately, the lack of instruments precludes any formal tests of endogeneity. Lastly, but not the least, one can not preclude the fact that there could be errors in the measurement of the variables, that is, the right procedure and questions were not adopted to coax the respondents in giving the exact responses. The likelihood of sample selection bias could also not be precluded. In spite of these limitations the study produces interesting results and provides some important evidence on the determinants of health model in the community studied.

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APPENDICES**APPENDIX 1****DEFINITION OF VARIABLES AND CODING MANUAL USED FOR ESTIMATION.**

VARIABLE	DEFINITION
Health Status (hs)	Self-assessed health status on a two-point scale: 1- Good Health and 0 – Bad health.
Wealth	Assessed on a four point scale, based on the prices of the assets owned on the Ghanaian market and the quantum of the assets owned: 1 – least wealthy households, 2 - fairly wealthy households, 3 – satisfactorily wealthy households and 4 – very wealthy households.
Environment (env)	A dummy variable that equals 1 if a person is affected by any form of pollution (bad environment), and 0 otherwise.
Lifestyle (ls)	A dummy variable that equals 1 if a person engages in health enhancing activities, and 0 otherwise
School (Sch)	Years of schooling completed and categorised into a five-point scale; 1- completed less than or equal 5years of schooling, 2- between 6 and 10years (inclusive) of schooling completed, 3 – between 11 and 15 years (inclusive) of schooling completed, 4 – between 16 and 20years (inclusive) of schooling completed and 5 – above 20years of schooling completed
Marital Status (marry)	A dummy variable that equals 1, if a person is married or cohabiting, and 0 otherwise
Sex	A dummy variable that equals 1 for men and 0 for women
Household Size (hhsiz)	Number of the members of household currently resident.
Medical care (hos1)	A dummy variable that equals 1 for successful impact of medical care and 0 otherwise.
Age (agecat, agesq)	Respondent's age in years at the time of the interview, with age cat representing the categorised age and the agesq representing the square of ages of the respondents.

APPENDIX 2

**ESTIMATION RESULTS OF OUR BINOMIAL QUALITATIVE MODEL USING
"STATA 6.0"**

TABLE 5.1 – MEASURES OF GOODNESS OF FIT WITH SENSITIVITY AND SPECIFICITY ANALYSIS

Logistic model for Health Status

----- True -----

CLASSIFIED	D	~D	Total
+	598	158	756
-	0	4	4
TOTAL	598	162	760

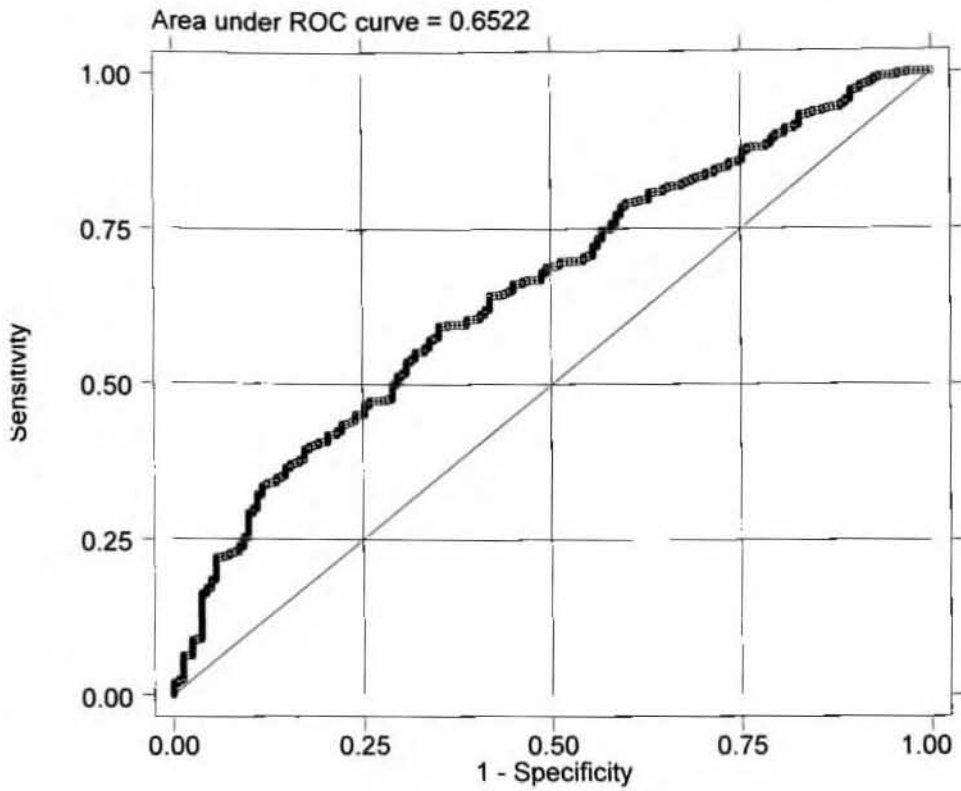
Classified + if predicted $\Pr(D) \geq .5$

True D defined as $hs \sim = 0$

SENSITIVITY	Pr (+/D)	100.00%
SPECIFICITY	Pr (-/~D)	2.47%
POSITIVE PREDICTIVE VALUE	Pr (D/+)	79.10%
NEGATIVE PREDICTIVE VALUE	Pr (~D/-)	100.00%
FALSE + RATE FOR TRUE ~ D	Pr (+/~D)	97.53%
FALSE - RATE FOR TRUE D	Pr (- D)	0.00%
FALSE + FOR CLASSIFIED (+)	Pr (~D +)	20.90%
FALSE - FOR CLASSIFIED (-)	Pr (D -)	0.00%
CORRECTLY CLASSIFIED		79.21%

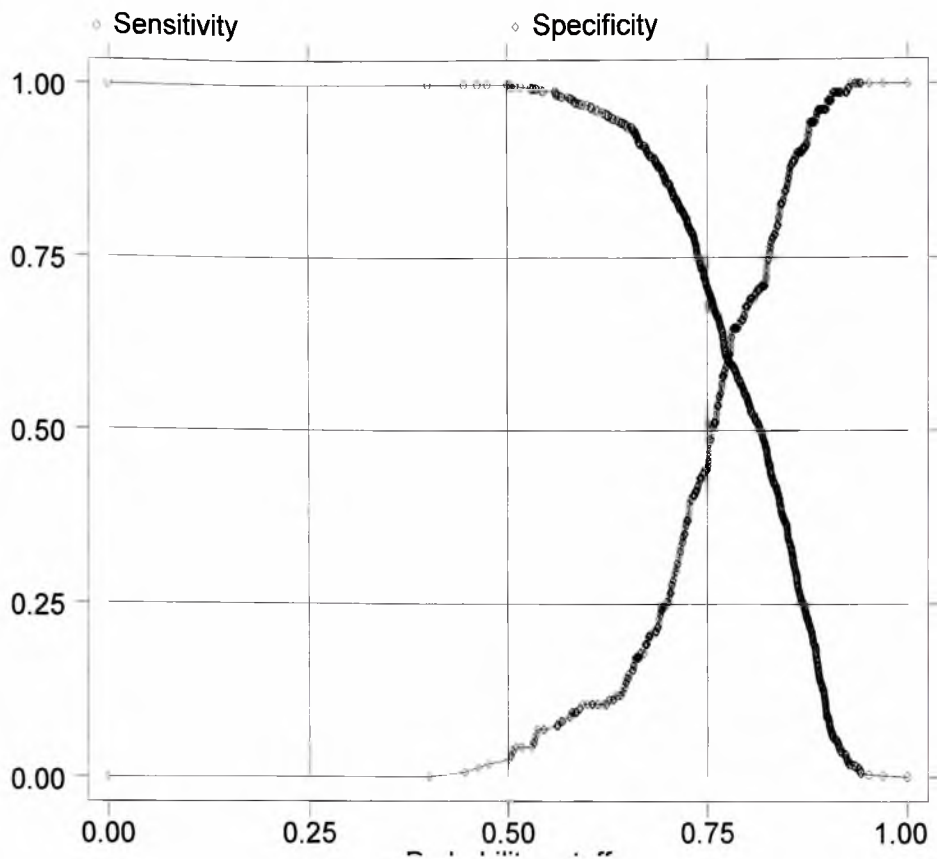
APPENDIX 3

FIGURE 10: FICTITIOUS PRESENTATION OF THE SPECIFICITY AND SENSITIVITY ANALYSIS



APPENDIX 4

FIGURE 2.0 - PICTORIAL PRESENTATION OF THE SPECIFICITY AND SENSITIVITY ANALYSIS



APPENDIX 5

TABLE 5.2 - LOGIT ESTIMATION

logit estimation of hs on wealth, hhszize, env, ls, sch, sex, marry, hos1, agesq, and agecat						
Iteration 0: log likelihood = -393.76413			Number of observation = 760			
Iteration 1: log likelihood = -374.26435			LR chi2(10)		= 40.21	
Iteration 2: log likelihood = -373.66251			Prob. > chi 2		= 0.0000	
Iteration 3: log likelihood = -373.6615			Pseudo R2		= 0.0511	
Iteration 4: log likelihood = -373.6615			Log likelihood		= -373.6615	
hs	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
wealth	.1517983	.0892899	1.700	0.089	-.0232068	.3268033
hhszize	.0977287	.0436222	2.240	0.025	.0122308	.1832266
env	-.8457626	.1957954	-4.320	0.000	-1.229514	-.4620108
ls	.2214533	.2046311	1.082	0.279	-.1796163	.622523
sch	.0412828	.110161	0.375	0.708	-.1746288	.2571945
sex	-.0530805	.185669	-0.286	0.775	-.4169851	.3108241
marry	-.244585	.2470602	-0.990	0.322	-.7288142	.2396442
hos1	.0007022	.0002369	2.964	0.003	.0002379	.0011666
agesq	-.0001323	.0000812	-1.629	0.103	-.0002914	.0000268
agecat	.0110517	.0075354	1.467	0.142	-.0037174	.0258208
cons	-.0417788	.539544	-0.077	0.938	-1.099265	1.015708

APPENDIX 6

TABLE 5.3- LOGIT ESTIMATION WITH DUMMIES CREATED FOR WEALTH AND SCHOOLING

. Logit estimation of hs on w1 w4 hhsiz env ls edu5 edu2 sex marry hos1 agesq agecat

Iteration 0: log likelihood = -393.76413	Number of observation = 760
Iteration 1: log likelihood = -374.25101	LR chi2(10) = 40.35
Iteration 2: log likelihood = -373.59229	Prob. > chi 2 = 0.0001
Iteration 3: log likelihood = -373.58856	Pseudo R2 = 0.0512
Iteration 4: log likelihood = -373.58855	Log likelihood = -373.58855

hs	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
w1	-.2331944	.2318319	-1.006	0.314	-.6875766	.2211879
w4	.1391318	.228556	0.609	0.543	-.3088298	.5870933
hhsiz	.0896382	.0430219	2.084	0.037	.0053168	.1739597
env	-.8337314	.1962019	-4.249	0.000	-1.21828	-.4491827
ls	.2079508	.2026408	1.026	0.305	-.1892179	.6051195
edu5	1.008261	1.061722	0.950	0.342	-1.072676	3.089197
edu2	.0269985	.1949691	0.138	0.890	-.3551339	.409131
sex	-.0654698	.1859868	-0.352	0.725	-.4299972	.2990577
marry	-.2497298	.2465216	-1.013	0.311	-.7329033	.2334437
hos1	.0007056	.0002365	2.983	0.003	.000242	.0011692
agesq	-.0001294	.0000814	-1.590	0.112	-.000289	.0000301
agecat	.0110427	.007299	1.513	0.130	-.003263	.0253484
cons	.4812016	.4175497	1.152	0.249	-.3371807	1.299584

APPENDIX 7

TABLE 5.4 – LOGISTIC ESTIMATION

Logistic estimation of hs on wealth, hhsiz, env, ls, sch, sex, marry, hosl, agesq, agecat.

Number of observation		= 760				
LR chi2(10)		= 40.21				
Prob. > chi 2		= 0.0000				
Pseudo R2		= 0.0511				
Log likelihood		= -373.6615				
hs	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
wealth	1.163925	.1039268	1.700	0.089	.9770604	1.386529
hhsiz	1.102664	.0481006	2.240	0.025	1.012306	1.201087
env	.4292299	.0840412	-4.320	0.000	.2924345	.6300155
ls	1.247889	.2553569	1.082	0.279	.8355908	1.863624
sch	1.042147	.114804	0.375	0.708	.8397687	1.293297
sex	.9483037	.1760706	-0.286	0.775	.6590307	1.364549
marry	.7830294	.1934554	-0.990	0.322	.4824808	1.270797
hosl	1.000702	.0002371	2.964	0.003	1.000238	1.001167
agesq	.9998677	.0000812	-1.629	0.103	.9997086	1.000027
agecat	1.011113	.0076191	1.467	0.142	.9962895	1.026157

APPENDIX 8

TABLE 5.5 - LOGISTIC ESTIMATION WITH DUMMIES CREATED FOR WELATH AND SCHOOLING

Logistic estimation of hs on w1 w4 hhsiz env ls edu5 edu2 sex marry hos1 agesq agecat

Number of observation = 760
 LR chi2 (10) = 40.35
 Prob. > chi 2 = 0.0001
 Pseudo R2 = 0.0512
 Log likelihood = -373.58855

hs	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
w1	.7919996	.1836108	-1.006	0.314	.5027931	1.247558
w4	1.149276	.2626738	0.609	0.543	.7343057	1.798752
hhsiz	1.093779	.0470565	2.084	0.037	1.005331	1.190008
env	.4344252	.0852351	-4.249	0.000	.2957383	.6381495
ls	1.231153	.2494818	1.026	0.305	.8276061	1.831471
edu5	2.74083	2.909999	0.950	0.342	.342092	21.95944
edu2	1.027366	.2003047	0.138	0.890	.7010796	1.505509
sex	.9366274	.1742003	-0.352	0.725	.6505109	1.348587
marry	.7790113	.1920431	-1.013	0.311	.4805119	1.262942
hos1	1.000706	.0002367	2.983	0.003	1.000242	1.00117
agesq	.9998706	.0000814	-1.590	0.112	.9997111	1.00003
agecat	1.011104	.00738	1.513	0.130	.9967423	1.025672

APPENDIX 10

TABLE 5.7 – SURVEY WALD TEST WITH THE PEARSON CHI-SQUARE

Svytest wealth env hhszise ls sch marry sex hos1 agesq agecat1

Adjusted Wald test

(1) wealth = 0.0

(2) env = 0.0

(3) hhszise = 0.0

(4) ls = 0.0

(5) sch = 0.0

(6) marry = 0.0

(7) sex = 0.0

(8) hos1 = 0.0

(9) agesq = 0.0

(10) agecat1 = 0.0

F(10, 750) = 4.06

Prob > F = 0.0000

Logistic model for hs, goodness-of-fit test

Number of observations = 760

Number of covariate patterns = 752

Pearson chi2(741) = 745.82

Prob > chi2 = 0.4434

APPENDIX 11

TABLE 5.8 – PROBIT ESTIMATION FOR MARGINAL EFFECTS

MARGINAL EFFECTS USING PROBIT ESTIMATION

dprobit hs wealth env hhszise ls sch marry sex hosl agesq agecatl

Iteration 0: log likelihood = -393.76413

Iteration 1: log likelihood = -373.70875

Iteration 2: log likelihood = -373.54226

Iteration 3: log likelihood = -373.54221

Probit estimates Number of obs = 760

LR chi2(10) = 40.44

Prob > chi2 = 0.0000

Log likelihood = -373.54221 Pseudo R2 = 0.0514

hs	dF/dx	Std. Err.	z	P>z	[95% C.I.]
wealth	.0230042	.0143727	1.60	0.11	-.005166 .051174
env*	-.1363983	.03036	-4.39	0.000	-.195903 -.076894
hhszise	.0157323	.0068501	2.29	0.022	.002306 .029158
ls*	.037854	.0337932	1.13	0.259	-.02838 .104087
sch	.00671	.0178135	0.38	0.706	-.028204 .041624
marry*	-.0424586	.0411229	-1.05	0.294	-.123058 .038141
sex*	-.009567	.0299899	-0.32	0.750	-.068346 .049212
hosl	.0001162	.0000396	2.93	0.003	.000039 .000194
agesq	-.0000212	.0000133	-1.59	0.112	-.000047 4.9e-06
agecatl	.0017932	.0012069	1.48	0.138	-.000572 .004159

(*) dF/dx is for discrete change of dummy variable from 0 to 1, z and P> Z are the test of the underlying coefficient being 0.

APPENDIX 12

TABLE 5.9 – PROBIT ESTIMATION WITH DUMMIES CREATED FOR WEALTH AND SCHOOLING

MARGINAL EFFECTS USING PROBIT ESTIMATION

Probit estimates

Number of obs = 760

LR chi2(12) = 40.33

Prob > chi2 = 0.0001

Log likelihood = -373.6009

Pseudo R2 = 0.0512

hs	dF/dx	Std. Err.	z	P>z	[95% C.I.]
w1*	-.0296318	.0400758	-0.76	0.450	-.108179 .048915
w4*	.0232795	.0354733	0.65	0.519	-.046247 .092806
env*	-.1365508	.0303814	-4.39	0.000	-.196097 -.077004
hhsz	.0147452	.0067739	2.17	0.030	.001469 .028022
ls*	.0412505	.0338513	1.23	0.220	-.025097 .107598
edu2*	-.0106533	.0324368	-0.33	0.742	-.074228 .052922
edu4*	-.0642681	.0744887	-0.92	0.357	-.210263 .081727
marry*	-.0353253	.0410197	-0.87	0.383	-.115722 .045072
sex*	-.0094966	.0300186	-0.32	0.752	-.068332 .049339
hos1	.000122	.0000397	3.07	0.002	.000044 .0002
agesq	-.0000202	.0000133	-1.51	0.131	-.000046 6.0e-06
agecat1	.0020295	.0011782	1.72	0.086	-.00028 .004339

(*) dF/dx is for discrete change of dummy variable from 0 to 1, Z and P>Z are the test of the underlying coefficient being 0