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DETERMINANTS OF HEALTH IN NIGERIA: A CASE STUDY OF NSUKKA L.G.A., ENUGU STATE.

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A minor dissertation submitted to the School of Economics / Health Economics Unit – University of Cape Town, in partial fulfilment of the requirements for Master of Social Science degree in Health Economics.

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To My Parents

Prof. & Mrs. A. E. Okorafor

University of Cape Town

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TERMS OF REFERENCE

This research report was prepared for the school of Economics and Health Economics Unit of the University of Cape Town in partial fulfilment of the Master of Social Science degree in Economics.

The objective of this study is to identify the factors that determine the health status in Nigeria, with a view to inform health policymaking.

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I certify that this research report has been prepared by me

Signed.....

Okorafor Okore Apia.

ABSTRACT

The primary aim of this study is to identify the major determinants of health status in Nigeria. This is done with a view to inform policy making in the health sector. Because of time and financial constraints, the study was limited to a particular geographic area – Nsukka L.G.A. The study makes use of regression-based analysis to determine those factors that affect health status of individuals. Health status was measured as a categorical variable with a finite number of outcomes; this necessitated the use of the logit and multinomial logit models for estimation of the models used in the study. The selection of potential health determining factors included in the study is based on international literature on the subject. The literature supporting the study cut across different disciplines, such as: Epidemiology, Social Sciences, Economics and Health economics. The study is unique in the sense that it not only takes into account the effect of individual and household choices on health status, but also the effects of government intervention. In this light, some of the variables used for the study measure the effect of individual choices, some household, and the rest, government policies.

The study is organised in seven chapters. The first chapter gives a brief introduction to the subject, an overview of Nigeria and the specific objectives of the study. Chapter 2 reviews international literature on 'determinants of health' and related subjects. The third chapter provides a detailed discussion on the development of the models used in the study and the problems associated with the measurement of health status. In addition to developing models to estimate health status, a model is developed to attempt to identify the factors that influence the incidence of water-borne diseases.

Chapter 4 describes the data collection process, and the methods employed to achieve this. The fifth chapter provides descriptive statistics of the data collected from the sample site. The results of the models used for the study are presented in chapter 6. The results suggest that age, place of residence (urban or rural) and education for the younger members of the population have the most effect on health status of any individual within the sample location. Interestingly, the results show that increases in age and years of education for children aged 0 –18 years has a positive effect on their health, while an increase in age for those over 18 years of age has a negative effect on

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their health. Secondly, those who live in the rural areas are healthier than those who live in the urban areas. Also, the results show that people who get their drinking water from natural sources are more likely to suffer from a water-borne disease than those provided with potable drinking water. The results of the general models – to explain health status – also show that the government intervention had little or no impact on the health status of the people in the area.

Chapter 7 reviews the past and current health policy thrust of the Nigerian health sector. The current health policy in Nigeria is very broad, and covers just about all the major health issues. The areas of priority in health are the prevention of HIV/AIDS, and the immunisation of infants/children. The results of this research suggest that the encouragement of enrolment of younger members of the population into schools, improvement of the living conditions in the urban areas and the provision of safe water to those people who depend on natural sources of water should be included as priority areas in policy-making in order to effect the efficient and effective improvement of the health status of the Nigerian population.

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CHAPTER 1
INTRODUCTION

1.1 Background Information

There is consistent evidence throughout the world that people at a socio-economic disadvantage suffer a heavier burden of illness and have higher mortality rates than their better-off counterparts (Whitehead, 1989; Illsley et al, 1990; Mielk and Giraldez, 1993). These socio-economic inequalities in health are a major challenge for health policy, not only because most of these inequalities can be considered unfair (Whitehead, 1990), but also because a reduction in the burden of health problems in disadvantaged groups offers great potential for improving the average health status of the population as a whole (Mackenbach and Kunst, 1996). Recognising this, the Member states of the World Health Organisation (WHO) in the European Region adopted a strategy for Health for All (HFA) that has its first target:

> *By the year 2000, the differences in health status between countries and between groups within countries should be reduced by at least 25%, by improving the level of health of disadvantaged nations and groups (WHO, 1990).*

Though an ambitious target, the target gives a clear focus to health policy and promotes the monitoring of quantitative changes over time in socio-economic inequalities in health, which is essential to assess the effects of health policy interventions (Mackenbach and Kunst, 1994).

The incidence of inequality in health exists in practically every nation today, but the degree varies from country to country. In virtually every society in the world, disparities in social advantages are reflected by socio-economic, geographic, gender, ethnic and age differences (Braveman, 1998). There seems to be wide agreement that socio-economic factors play a key role in determining the health status of individuals. The question then is: "what are the key determinants of health?". For any country, the answer to this question (in the context of the country) is highly instrumental in informing health policy. Most importantly, the answer to this question should be the basis for policies aimed at improving health status of the population.

Striving towards equity in health, and the improvement of the health status of any given society can be viewed as almost the same. Trying to achieve equity

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involves the reduction of the differences between the health status of the healthier group and that of the least healthy group. Of course, the most reasonable path to achieving this goal is to improve on the health status of the group that is worse off. Clearly, bridging this gap by compromising the health status of the healthier group is not the best alternative; though in the process of achieving equity may be unavoidable. Intuitively, one can see that achieving equity in health must have as it's primary focus, the improvement of health status, either of one group or several. Equity in health has become a primary target for most countries (including Nigeria). However the focus of this study is not directly targeted at equity, but on presumably the most important aspect of attaining equity in health – improving health status. A lot of emphasis is put on equity in health as that can be seen as the ultimate goal, which the Nigerian health sector is trying to achieve, this study only tries to achieve an intermediary goal, which is of immense importance in achieving this final goal. Identifying the determinants of health and how they affect health status will be a major step towards achieving equity in health.

Equity in health is operationally defined as minimising avoidable disparities in health and its determinants – including, but not limited to health care – between groups of people who have different levels of underlying social advantage (WHO, 1996). Inequity in health has been a growing concern to both governmental and non-governmental organisations. Most developed countries have made efforts to attain equity in health over the years (with positive results, in general), but developing countries seem to have perpetually maintained high rates of inequality. There is evidence that in developing countries:

- Inequalities in health outcomes within and between countries are growing.
- Despite improving average health indicators within many countries, there are large and increasing disparities between social groups.
- Increasing number of people are living in poverty.
- There is increased awareness that globally, we have the resources and tools to make major improvements in equity if we choose to do so. (HDR 1996/97, Verhasselt 1993, Kunst 1994)

Nigeria is not an exemption. The strive towards equity in health status advocates preferential disposition towards groups deemed to be disadvantaged, with a view to reduce (and hopefully eliminate) the extent of health inequality that exists between

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groups. These groups have usually been defined by many socio-economic criteria: income levels, educational level, gender, age, occupation, geographic location, employment status etc. The use of these characteristics have often been the basis for determining the level of health inequalities in countries and hence the basis for policy formulation in this regard.

Obviously, the reduction in health inequalities (based on any socio-economic group) is more appealing where the health status of the more advantaged group is not compromised. Looking at the problem from this perspective, achieving equity in health means, "improving the health status of the disadvantaged people". Clearly, this requires knowledge of what determines the health status of the people and of course increased expenditure on health. Unfortunately, the slow (sometimes stagnant or negative) economic growth of most developing economies does not allow them the capacity to approach the problem in such a manner – which is probably the only feasible way to tackle the problem. This makes the plight of achieving equality in health for developing countries an even more daunting task. Nigeria, a country in West Africa is one of such developing countries, and is thus faced with this problem.

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1.2 An Overview of Nigeria

Africa is a host to a number of major disease vectors. Their transmission is aided by a warm, tropical climate and variable rainy seasons. Africa's struggle to overcome illness and disease over the past quarter century has had mixed results. On the positive side, the infant mortality rate has been cut by more than one-third, and average life expectancy has increased by more than ten years. At the beginning of the period, only about 14% Africans was supplied with safe drinking water, whereas twenty-five years later, about 40% of the African population was obtaining drinking water from a safe source. By the end of the 1980s, around half of all Africans were able to travel to a health facility within one hour (UNICEF, 1992).

On the negative side, however, life expectancy in Africa in 1991 was only 51 years, compared with 62 years for all low-income developing countries and 77 years for the industrialised countries. Africa's infant mortality rate is almost 50% higher than the average for all low-income countries and at least ten times higher than the rate in the industrialised countries (World Bank, 1994).

Although the major causes of death and illness vary by age group, certain health problems affect Africans at every stage. Perinatal, infectious, and parasitic illnesses

are responsible for 75% of infant deaths. Infectious diseases and parasitic afflictions are also responsible for 71% of the deaths of children age 1 – 4, and 62% of the deaths of children ages 5 – 14. Child health in Africa is threatened particularly by diarrhoea, acute respiratory infections, malaria and measles (World Bank, 1994).

Malaria is Africa's largest and most persistent disease problem. Pregnant women, foetuses, and, and young children are particularly susceptible to malaria infection. WHO estimates the global number of malaria cases per year at 110 million, with nearly 80% of them occurring in Sub-Saharan Africa and only 1,100 cases in North Africa. A review of more than 400 studies on the subject suggests that malaria accounts for 20 to 50 percent of all admissions to African health services per year, although an estimated 8 to 25 percent of persons with malaria visit health services. Malaria now appears to be worsening in much of Africa as malaria parasites become more resistant to chloroquine and other malaria drugs (Brinkman and Brinkman, 1991).

The incidence of tuberculosis is also rising in Africa, due in part to the interaction between TB and AIDS and in part to a breakdown in surveillance and management of cases. By some estimates there are approximately 171 million TB carriers in Africa, and 10% of all deaths from TB occur in children under age five (WHO, 1991). AIDS is the most dramatic new threat to health in Africa (The World Bank, 1994).

Nigeria lies on the west coast of Africa. It occupies approximately 923,768 square kilometres of land, stretching from the Gulf of Guinea on the Atlantic coast in the south to the fringes of the Sahara Desert in the north. The Republics of Niger and Chad define the territorial borders in the north, the Cameroon Republic on the east, and the Republic of Benin in the west. Nigeria is a federal republic consisting of 36 states and a Federal Capital Territory. The states are subdivided into 774 administrative units of unequal size called Local Government Areas (LGAs).

There are about 374 identifiable ethnic groups, but the Igbos, Hausas, and Yorubas, are the major groups. The total population of Nigeria is reported in the 1991 census as 88,992,220. Using a growth rate of 2.9% per annum, the National Population Commission (NPC) estimates the current population of Nigeria to be about 115 million.

Nigeria is one of Africa's most endowed economies, with an abundance of both natural and human resources. Its citizens are noted for their high degree of

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resourcefulness and entrepreneurial skills. Ironically, the country's per capita income of US$ 350 in 1999 is one of the lowest in the world (NDHS, 2000).

Nigeria's GDP figures for 1995, 1996 and 1997 were $33.568, $35.715 and $37.117 billion respectively (dollar at 1987 prices), and per capita income of between $200 and $300 for the past five years. Between 1991 and 1997, 32% of the entire population were living below two-thirds of the national population mean per-capita income. Within the same period, 67% of household income was spent on food alone. Income distribution from 1986 to 1995 was such that the richest 20% of the population had 49.3% of total income, while the poorest 20% had only 4% of total national income. The situation in Nigeria for the past 15 years has been one of rapid decline in most major economic indicators. Per capita income (at fixed prices) fell from $860 in the early 1980s to below $300 in the early 1990s (Pearce and Falola, 1994). Political instability within these years brought insecurity and reduced social welfare to unbearable levels. Also, social infrastructure maintained steady deterioration.

Between 1990 and 1995, only 1.4% of GDP was spent on public health. Per-capita expenditure on health for the same period was $5. Population per physician and hospital bed was 5,208 and 599 respectively from 1990 to 1994. Also, only 67% of the total population had access to health services (ADI, 1998/99).

The situation in Nigeria is not a very encouraging one. Obviously, the poor condition (socio-economically and otherwise) under which the general populace of the country lives has an adverse effect on their standard of living, and arguably, their health status. Data on infant and child mortality rates, and other social indicators show that the general health status in Nigeria is rather low.

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Table 1.1 Mortality Rates In Nigeria

Years	Infant mortality	Under- five mortality
1995 - 1999	75.2	140.2
1990 – 1994	66.2	125.8
1985 - 1989	77.0	142.3

Source: NDHS, 2000

The figures for both infant and under-five mortality rates show that there has been no marked reduction in mortality rates over the past 15 years. The under-five

mortality rate of 140.2 per 1,000 live births is quite high even by African standards (NDHS, 2000). Life expectancy is still a meagre 49 for males, and 53 for females (SID and WDR, 1993).

The improvement of health status of the general populace has in recent years gained a more prominent position in policy agenda. This is evidenced by its strive to achieve "health for all by the year 2000". A national health policy was consequently adopted in 1998. Its goal is to provide a formal framework for the direction of health management in Nigeria. The objective is to provide the population with access not only to primary health care, but also to secondary and tertiary care, as needed, through a functional referral system. It defines the roles and responsibilities of the three tiers of government, as well as of civil society and non-governmental organisations.

In general, the provision of health services is the responsibility of federal, state, and the local government as well as religious organisations and individuals. The services are organised in a three-tier health care system:

- Primary health care is largely the responsibility of local governments, with the support of the State Ministry of Health
- Secondary health care, which provides specialised services to patients referred from the primary health care level and is the responsibility of the state government
- Tertiary health care, which provides highly specialised referral services to the primary and secondary levels of health care delivery system and is in the domain of the federal and state governments.

The national health policy regards primary health care as the framework to achieve improved health for the population. Primary health care services include health education; adequate nutrition; safe water and sanitation; reproductive health, including family planning; immunisation against five major infectious diseases; provision of essential drugs; and disease control. The policy document requires that a comprehensive health care system delivered through the primary centres should include maternal and child health care, including family planning services. Whether the objectives of the health sector are equity-targeted or not, the important thing is that the government seeks to improve the health status of the population, and thus this work is done with the more general objective in mind.

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1.3 Statement of the Problem

The pitiable state of Nigeria described above helps one to appreciate magnitude of the task facing the country in a bid to improve the health of the people. With the "new realisation" of the importance of health, the government has in recent years adopted several programmes and policies aimed at improving health delivery services. For example, the Fourth National Development plan (1981-1985) established a government commitment to provide adequate and effective primary health care that was to be promotive, protective, preventive, restorative and rehabilitative to the entire population by the year 2000.

Given the visible commitment of the government to improve the health of the people, it is still surprising that there has been little or no change in the health status of the people. One probable cause of this lack of change can be attributed to political instability. Over the past two decades Nigeria has experienced many military governments, and all came into power forcefully. Each time there was a new military government, the tendency was for them to dump the projects of the old regime and adopt a new one. This lack of continuity has plagued all sectors of the Nigerian economy, and thus stands out as a major deterrent to the success of past health policies, where previous health policies were neither continued nor reviewed, but dropped.

There are other probable reasons for the apparent ineffectiveness of health policies in Nigeria. They are:

- The ideology that health inequalities are directly and strictly related to the distribution of health care facilities and income, without taking into consideration other factors that may significantly affect health status. This is readily applicable to Nigeria, where most health policies have emphasized the provision of health facilities as though that alone would solve all the health problems.
- Lack of (or insufficient) information on the determinants of health. Hence, adopted policies on health are based on wrong premises. This alone can ensure that even if the policies were well implemented, the desired impact on the people will not be achieved.
- Poor implementation of the policies.

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The list is probably longer, but for the purpose of this paper, we are more concerned with the most basic of the problems – information on the determinants of health. The other problems are beyond the scope of this paper.

Whether the provision of health facilities is the most important step to take in improving health status can only be answered if one has information on the determinants of health, their impact on health, and the magnitude of such impacts. Given the current economic state of the country, it is imperative that only the most efficient of policies should be adopted. In this light, whatever resources made available to the health sector should be used in such a way as to bring about optimal results. The only way to compare the relative efficiency of any given number of policies is to know what impact the individual policies will have; and that stems from the knowledge of the factors, which influence health, how they influence health, and the magnitude of their influence.

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1.4 Objectives of the Study.

The overall objective of the research is to identify the determinants of health in Nigeria, and the extent/direction of influence of these determinants. The motive being to inform health policy targeted at improving the health status of the population and health inequality. It is hoped that an understanding of the determinants of health and the individual (or joint) effect of these determinants on health will help to inform more efficient health policies. This is particularly important as Nigeria is a developing country and faces resource constraints associated with most developing countries, so the efficient utilisation of scarce resources should be a priority. Specifically, the research aims at accomplishing the following:

1. Identifying, in general, the determinants of health in Nigeria.
2. Identify those determinants of health that are somewhat directly dependent on government policies. In other words, those determinants that can be readily influenced by government policies.
3. Identify the determinants of health that are to some extent a result of household and individual choices.
4. Identify the factors, which influence the incidence of water-borne diseases.
5. Evaluation of the current health policy in Nigeria aimed at promoting health, with a view to ascertain if these policies are in line with the results of the research.

6. Proffer alternative policies and or redirecting the focus on the priority areas for health sector policies should the current focus of the Nigerian health sector prove contradictory to the findings of this study.

1.5 Justification of the Study

The importance of this study has already been made obvious in the preceding sections of this chapter. However, we shall go ahead to make it more clear-cut. The results of the study will provide a basis for comparing alternative health policies. For example, if the results show that household income/expenditure has more effect on health than the provision of health facilities, then a policy which has the effect of increasing household income should be preferable to that which emphasizes the provision of health services (assuming both are of equal cost to the government). That does not mean that the two policies cannot be combined in some way, but with limited resources, any policy maker must be able to recognise the most efficient and effective way of achieving specified objectives.

The second justification for the study is closely related to the first, and can be viewed as a follow-up to the first. The results of the study inform policy-making on the available routes to the improvement of health status. For instance, the study may show that there are three prominent determinants of health (three major factors which affect health). Based on this, policies should then revolve around altering the levels of any of these factors (or a combination of them) to bring about the desired effect on health status. Without knowledge of factors that affect health, policymaking would just be a matter of guesswork. In such a situation, there are higher chances that the "wrong" factors will be manipulated to bring about no significant changes in health outcomes. With the current economic state of Nigeria, the country should not entertain such inefficiencies. Policy makers have no alternative but to find out these determinants of health.

1.6 Limitations on Data Collection

Because of time and financial constraints, the study is limited to Nsukka Local Government Area, in Enugu State. This is in the southeastern part of Nigeria. The study site is also within the Igboland. Given the size of Nigeria and numerous ethnic groups, the study may not be an accurate representation of the country. Therefore the results may not be generalised to the rest of Nigeria.

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Also information about health status obtained from the interviewed households is limited to the period – from three months prior to the interview. This was necessary because going beyond three months may jeopardise the accuracy of the data, as people tend to forget things that occurred after a very long period. As a result, one cannot ascertain for sure if the health status of the people within the past three months has been the status quo for a long time, or if the health status of the people at the time was a new improvement, or a seasonal occurrence. This may have a negative effect on the predictive power of our results.

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CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

In this section of the paper, we will review various literature directly and indirectly related to the subject - determinants of health. We shall look at various ways in which several authors have tried to find what factors influence and determine health outcomes and health differences. The review shall incorporate studies and literature from authors of several disciplines; epidemiology and the social sciences; economics and health economics. Also, we will look at literature on the effects of government intervention (provision of certain infrastructure) on the health outcomes of the people.

The earlier sections of this chapter will look at the more general literature (from all over the world), while the later section will focus more on the health situation in African countries. This will give an added insight into the nature of the problem that the Nigerian health sector faces.

What is clear is that ill health does not happen by chance or through bad luck. The factors, which affect health, can be grouped into:

- Genetic factors which determine an individual's predisposition to disease.
- Biological factors in which disease is caused by bacteria or viruses.
- Lifestyle factors in which health behaviours such as smoking contribute to disease.
- Environmental factors such as housing or pollution
- Social factors connected with the membership of particular social groups (class, gender, ethnicity, age), which may influence the other factors (Naidoo and Wills, 1994).

These groups basically cover all the possible areas from which any thing can affect health. Other factors such as religion and culture can be conveniently grouped under "social factors". At this point, it becomes very important to mention that the aim of this paper is to inform policymaking in Nigeria, so we will restrict the review of literature to those written on factors which can be influenced by government policies, household choices and individual choices, or any of their possible combinations. In this light, the genetic and biological factors may not receive

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attention. Genetic factors are largely given and what limited scope there is for intervention lies strictly in the medical field (Naidoo and Wills, 1994).

2.2 Epidemiology and The Social Sciences

In trying to determine what affects health, social scientists and epidemiologists will seek to compare at least two variables: firstly, a measure of health, or rather ill health, such as mortality or morbidity; and, secondly, a factor such as gender or occupation that could account for the differences in health. Most research, which has sought to identify the major determinants of health and ill health, has focused on the links between social class and health (Naidoo and Wills, 1994).

Investigation of health inequalities by social groups is probably the earliest and most widely used approach. The social forces affecting health are expressed in class terms. This division into classes encompasses economic, political and cultural differences, all of which may affect health (Marmot G. et al, 1991). The earlier studies on the subject were done in mostly England and Wales, since they have over 70 years of data in the area (Marmot, G. 1991); and there we shall start our review of literature.

In England and Wales in the 1970s, it was estimated that children born to professional families outlived – by as much as seven years or more – their peers born to parents who were unskilled and in manual jobs. Babies surviving the first month of life had four times the risk of death before reaching their first birthday when born to families of unskilled, compared to professional parents. Young men entering employment as unskilled labourers had only two-thirds the chance of drawing their retirement pensions at age 65 as did young men entering a profession. These patterns are typical of those seen in developed countries. In the post-war era it was assumed that such health inequalities would have diminished, if not disappeared, as a result of the development of the Welfare State. This belief was supported by the rapid decline in mortality rates and the consequential increase in life expectancy. However, it is now recognised in many countries that differences between social groups have in fact been increasing since the 1930s. Inequalities widened as major diseases of poverty, tuberculosis and infectious diseases were in decline. But the demise of these diseases was offset by new epidemics, including those of cancer, circulatory disease, accidents and violence.

The new epidemics have not affected all sections of society equally. Proportionately, more early deaths have occurred due to each of these causes among

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unskilled than professional workers. Young men, aged 25-44, in unskilled occupations have four times the risk of dying from lung cancer, ischaemic heart disease and stroke than young men in professional occupations. For accidents, the relative risk is threefold. In childhood an overall relative risk of three for accidents and violence conceals differences of tenfold or more for deaths from falls, fires and drowning (Power, C., et al, 1991).

In 1980 a report was published of a Department of Health and Social Security working group on inequalities in health (Townsend and Davidson, 1982). The report, which is known as the Black Report after the group's chairman, Sir Douglas Black, provided a detailed study of the relationship between mortality and morbidity, and social class in England. The terms social class, socio-economic status and occupation are often used interchangeably. Social class derives from the Registrar General's scale of five occupational classes ranging from professionals in class 1 to unskilled workers in class 5. Because people are allocated to social classes on the basis of occupation, the classification is more suited to men of working age than the elderly or the unemployed. Married women are allocated to the social class of their husbands and therefore not properly represented either. As an indicator of social status, social class must be treated with some caution. However, class is not simply a classification of occupation, but also serves as an indicator of the way of life and the living standards experienced by different groups. It correlates with other aspects of social position such as income, housing, education and working and living environments. The main findings of the Black Report were:

- At every stage of life those in lower social classes had higher death rates than those at the top of the social scale.
- Children born into the lower social classes had lower birth weights and a shorter stature.
- All the major diseases affected social classes 4 and 5 more than social classes 1 and 2.

A later report commissioned by the Health Education Authority (Whitehead, 1988) confirmed many of these findings and found that the class differentials in health were becoming more marked and that other aspects of disadvantage such as unemployment and housing were also having an effect on health. More recent studies

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have used more complex indicators of social class and have also found marked health inequalities (Davey Smith *et al.*, 1990; Phillimore *et al.*, 1994).

As observed, most of the early studies on health inequalities used occupation mainly, as a proxy for social status. Such studies on social group differences in health have proved to be of immense use in the sense that they revealed some trend in health outcomes across groups. In general, people of higher social class are healthier than people of lower social class.

Diverse explanations have been put forward for differences observed between social classes and the widening inequalities over time. Explanations have tended to be of four broad types: artefact, social selection, cultural/behaviour and materialistic/structural.

The artefact explanation argues that the widening gap in mortality figures between the social classes is not real, but an effect of the way in which class and health are measured. Because there have been changes in the classification of occupations and in the structure of social classes, it makes it impossible to make comparisons over time. Establishing a relationship between social class and health, particularly over time, is difficult. However, a considerable amount of research supports the view that the relationship is a real phenomenon and not merely an artefact of the data. When other indicators of disadvantage are used such as housing, access to a car, education, household possessions and income, they all show a similar pattern of social inequalities between the top and bottom of the social scale (Goldblatt, 1990).

Social selection theory argues that the relationship between class and health is a causal one, but that it is health which determines people's class and not vice versa. The healthy experience upward social mobility and mortality rates are kept low in the upper classes. People with higher levels of illness drift down the social scale and thus inflate the rates of death and disability among lower social classes.

The third argument suggests that the social distribution of ill health is linked with differences in risk behaviours (lifestyle). These behaviours – smoking, high alcohol consumption, lack of exercise, high fat and sugar diets – are more common among lower social classes.

Finally, some writers claim that there are cultural differences between social groups in their attitudes towards health and protecting their health for the future. Thus giving up cigarettes as a form of deferred gratification is more likely to appeal to

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middle-class people, who may have a stronger locus of control and may believe that they determine the course of their life. Working-class people who may have to struggle to get by each day do not make long-term plans and have a fatalistic view of health, believing it may be a matter of luck. This phenomenon is referred to as the "culture of poverty" or "cycle of deprivation" (Naidoo and Wills, 1994).

More recently, studies on health inequalities incorporate variables such as education, behaviour, socio-economic circumstances, attitudes, culture, etc into the definition of social groups, though with similar results. As a result the term 'socio-economic differences in health' is now preferred to 'social class differences in health'. In general, the results of these studies are in line with the conclusion of the previous – people of a lower socio-economic status suffer a heavier burden of disease and illness than those of higher status. In addition, later studies now relate mainly to "health" rather than mortality (in measuring health differences), as was previously the case. It is now being recognised that, as a consequence of increased life expectancy, health and morbidity should assume more prominence in the investigation of health inequalities (Carr-Hill, 1987; Blaxter, 1989).

Statistics Netherlands has conducted a continuous, national health interview survey since 1981. It is conducted among a random sample from the non-institutionalised population of nearly 10,000 respondents each year and contains questions on a number of health indicators as well as on such socio-economic characteristics as level of education, occupation and household income (Netherlands Central Bureau of Statistics, 1988; 1992). The health indicator used is perceived general health. This indicator is based on a single item question included in the Netherlands' Interview Survey since its start in 1981: "How is your health in general", after which the respondent may choose between "very good", "good", "fair", "sometimes good, sometimes poor" and "poor". Analysis of the data, over time has shown that the percentage rating health as less than "good" declined regularly with increase in educational level.

Some of the sex differences in morbidity have been attributed as an artefact of measurement of the use of health services. Women are more likely to report illness as they are less likely to be in full-time employment or because they are more inclined to take care of their health resulting in increased consultation rates. However, this does not explain the sex difference in mortality. The natural selection of genetic explanation suggests that women are more resistant to infection and benefit from a

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protective effect from oestrogen accounting for their lower mortality rates. Paradoxically, female hormones and the female reproductive system are claimed to render women more liable to physical and mental ill health. Biological explanations are unable to account for the social class difference in women's health whereby women in social-class 1 and 2 experience better health than women in social-classes 4 and 5. Lifestyle explanations argue that women are socialised to be passive, dependent and sick. Women readily adopt the sick role because it fits with preconceived notions of feminine behaviour. Men, by contrast are encouraged to be aggressive and risk-taking both at work and in their leisure time (Naidoo and Wills, 1994). Another explanation offered by feminist sociologists is that patriarchy or male power affects women's health experience. So it is argued that the medical profession is more inclined to label women as ill. Women's biological and psychological attributes are made pathological because they are seen as inferior to those of men. Women are seen as inherently sick and frail (Ehrenreich and English, 1976).

The role of water supply and sanitation in improving health is a widely studied field of research. Improved water supply and sanitation is very effective against bacillary dysentery, cholera and other diarrhoeal diseases (Azurin and Alveron, 1974). Hence, it is assumed that the higher the proportion of the population with an acceptable standard of water supply, the lower will be the level of infant mortality *ceteris paribus*.

Studies on health differences based on income levels have brought about similar results. Several reports have shown that variations in ill health and premature mortality reflect differences in levels of income and material deprivation (Wilkinson, 1986; British Medical Association, 1987; Townsend *et al.*, 1988). Low income may be the result of unemployment or ill-paid hazardous occupations; it can lead to poor housing in polluted and unsafe environments with few opportunities to build social support networks; and in turn such conditions lead to poor health. Lack of money can make it difficult for households to implement what they may know to be healthy choices (Naidoo and Wills, 1994). Blaxter (1990), analysing data from the largest health and lifestyle survey completed in the UK, found that the health of low-income groups improves substantially as income increases.

Other socio-economic variables have also been used to explain differences in health status. We shall not go on to describe all of them, but it is worth mentioning that they all point out that in general there is a discernable trend in health differences

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between health outcome and the following: income, education, occupation, housing conditions, gender, living environment and geographic location. Differences in health and in prevalence of diseases by social classes at least indicate the importance of the social environment (Marmot, G., *et al*, 1991).

These studies on socio-economic differences in health (including class differences in mortality) have been of substantial help in informing health policy. The recognition that in general, people of lower socio-economic status suffer a heavier burden of illness and have higher mortality rates than their better-off counterparts has become a pointer in the drive for improving the health status of any population. However, these studies have also come under heavy criticism.

According to Marmot (1991), some writers are of the opinion that though the study of social class differences are important, it nonetheless precludes a better understanding of the factors which determine health status. Attaching too much importance to these studies is likely to draw attention away from what should probably be a more important issue. The large social differences in mortality in many societies make analysis by social class crucial, but the largely unthinking use of social class is unfortunate. It may not only contribute little to, but actually retard the understanding of the factors affecting health and disease.

The problem with the measurement of health inequalities by socio-economic groups is that they say nothing about causation and the extent of causation. The fact that people living in rural areas have a relatively lower health status than those living in urban areas does not tell us why this is so (this is observed mostly in less developed countries). In the same line of argument, the fact that the top 10% of the income group have a higher health status than the bottom 10% of the income group by, say a factor of 2.5, does not say conclusively that income level affects health outcomes, and even if it does, nothing is known of the extent. Increasing the income level of the poorer group may even worsen their health status if they are other factors that affect their health status that could be affected by income levels. For example, if most of the poorer people are cigarette smokers and consumers of large quantities of alcoholic drinks, an increase in income may very well increase their consumption of these goods. This could result in the worsening of the health status of the people. It then becomes imperative that the determinants of health for any given population be identified, and the extent of their influence on health be analysed before health-

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promotion targeted policies are implemented, irrespective of the basis for measuring health inequalities.

Also, studies using socio-economic status do not readily lend themselves to uniformity and thus comparison across different societies or countries have proven to be very difficult. The attempts to compare countries have highlighted the problems of such comparisons (Fox, 1989). Even if similar schemes of classification are used in the different countries, the industrial, occupational and social structures vary greatly. There are probably other criticisms, but we shall not discuss them, as they do not have a direct bearing on our study.

In summary, although there is a clear pattern linking social class and health, there is no consensus on the most important factor of social class that affects health. Those factors most commonly cited are income, housing or employment (Naidoo and Wills, 1994). It must be noted that these factors are based on research undertaken in high-income countries, there are likely to be a range of additional factors influencing health status in low and middle-income countries. Probably, not all epidemiological or social science studies in this subject focus on socio-economic differences in health, though most do. In this paper, we have only selected studies and literature that (in the writer's opinion) would afford the reader a better understanding of the perspective held by the two disciplines about the subject; it so happens that they are all literature based on socio-economic differences.

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2.3 Economics and Health Economics

Grossman's (1972) human capital model of the demand for health has been argued by some to be one of the major theoretical innovations to have emerged from health economics. The central proposition of Grossman's "demand for health" model is that health can be viewed as a durable stock that produces an output of health time. It is assumed that individuals inherit an initial stock of health that depreciates with age and can be increased by investment. Gross investments in health capital are produced via the household production functions whose direct inputs include own time of consumer, and market goods such as medical care, diet, exercise, recreation and housing. The production function also depends on certain "environmental variables"; the most important which is the level of education of the producer that influences the efficiency of the production process. Also, producers are assumed to be rational in that they try to maximise their health production given available inputs. Wagstaff

(1986) showed that there are three basic components of the model: The first is the health production function, which defines the ratio of health inputs to the realised units of health. The production function is such that increases in technology and education cause a more efficient production of health outcomes. The health production function is considered endogenous as individuals can determine to a large degree their health status. Second is the indifference map, which describes various indifference curves that represent various combinations of 'health units' and 'consumption' that yield the same amount of utility to the consumer (Grossman conveniently distinguishes between two types of consumption goods, namely: "health units" and "consumption". Health units are as it reads – units of health, and 'consumption' refers to "other things in life" - any other goods apart from health). The third is the budget constraint, which defines all possible combinations of 'health units' and 'consumption' an individual can purchase given a finite level of income. These three components are jointly used to construct a "Welfare Possibility Frontier" (WPF). The WPF defines all the possible outcomes (health units) realisable from a given budget constraint, and production function. The highest utility level attainable, given the WPF is the point of tangency between the WPF and the individual's indifference curve. It is assumed that every individual is rational and hence a utility maximising entity. Effectively, the health status of any given individual would depend on his age, the quantity of various inputs possessed, his level of education and lifestyle. One prediction of the model is that if the rate of depreciation (of health) increases with age, at least after some period in the life cycle, then the quantity of health capital demanded would decline over the life cycle. A second prediction is that a consumer's demand for health and medical care would be positively correlated with his wage rate. A third prediction is that if education increases the efficiency with which gross investments in health are produced, then the more educated would demand a larger optimal stock of health. Probably, the single most outstanding strength of the Grossman model is that it provides a systematic framework for determining the factors that influence the demand for health and health, and more importantly, how and the extent to which these factors affect them.

In his article 'Health and Economic Growth: Theory, Evidence and Policy' Behrman (1993) suggests that, "economists view health as result of a production function or relationship in which the output (i.e., the 'health' of an individual) is determined by the quantities of a number of inputs (e.g., nutrients, genetic

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endowments), given the technological-biological relationship. Thus, health is 'produced' by inputs and technology, say, to the production of rice by inputs such as land, seeds, water and chemicals and the rice production technology. Since the production of health in this way closely reflects individual or household activities and conditions, health production is often referred to as one example of a household production function, which can be written as:

$$H^i = H(N^i, C^i, C^p, I, S^i, S^m, T^i, T^m, E^i, M, \ldots),$$

Where $\mathbf{H^i}$ is the health of household member **i**; $\mathbf{N^i}$ is the nutrient intake of the $\mathbf{i^{th}}$ household member; $\mathbf{C^i}$ is the consumption of household member **i**, superscript p referring to household pure public goods; **I** is the number of individuals in the household; $\mathbf{S^i}$ is the education of the $\mathbf{i^{th}}$ household member (superscript m referring to the person, often the mother or wife, who makes critical health related decisions, and implements them within the household); $\mathbf{T^i}$ is the use of time of the household member **i**; $\mathbf{E^i}$ is the endowment of the $\mathbf{i^{th}}$ household member; and **M** is the endowment of the household.

For most individuals in developing countries, the health impacts of $\mathbf{N^i}$ are positive, although overeating can have negative effects on health. Other consumption items ($\mathbf{C^i}$, $\mathbf{C^p}$) include goods and services with direct effects on health (e.g., medical visits, drinking alcohol, driving vehicles, housing). The household size (**I**) is included to represent possible effects of scale and congestion. The individual's use of time ($\mathbf{T^i}$) is included because occupation, the amount of leisure time and the time devoted to health-related activities may have important health effects. An individual's use of time and the nature of occupational and other activities, for instance, affect energy use and thus the health impact of nutrient intake. The individual's education ($\mathbf{S^i}$) and that of the key person in the household concerned with health-related decisions and implementation ($\mathbf{S^m}$) may affect health practices, access to information and health-related inputs (e.g., better-educated cooks may prepare food in more nutritious ways, better educated mothers may know the benefits of and procedures of growth monitoring). Individual endowment ($\mathbf{E^i}$) and household endowment (**M**) differ from other variables in that they are not household choices during the period being studied. Examples of such endowments include an individual's age, initial health and genetic make-up and the natural environment of the household (Behrman, 1993).

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These two models are 'health production functions' and are based on the premise that changes in any of the production inputs: income, nutrition, education, recreation, age, etc, have an effect on the health outcome of the individual. From that point of view these inputs can be considered as important in determining the health status of an individual. Though Behrman's model is a household model, the same deductions can also be made. Also, both models recognise income as a major constraint in maximising health outcomes.

The major problem in the use of such models in analysis is that most countries do not have the data requirements. Also most developing countries may not have the capacity to generate them. Even when they do, measuring and identifying small increments in health is almost impossible. This is important as these models view health as a continuous variable.

One major difference between the framework of these models and that employed in this study is that while theirs uses variables (independent variables) that are largely influenced by only household and individual choices, this study attempts to incorporate also those factors that are influenced by government policies.

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2.4 Government Intervention and Health Outcomes

Several studies have emphasized the importance of other factors (apart from those described in the two economic models), which are largely affected by government policies. Some government policies have been assessed to have significant influence on the health of the population. These factors can be viewed in some ways as environmental factors. Factors such as access to clean water, sanitation, sewage facilities, overcrowding, etc, have been identified. Results of an investigation presented at a WHO seminar showed that there existed a strong positive relationship between measures of social input such as the proportions of the populations in developing countries that had water supply and sanitation, and the health status/outcome of the population (Cumper 1980).

More recent studies have also acknowledged the effect of governments' provision of certain infrastructure on the health of the population. A recent study in Mexico used the Marginality Index, which was developed by the Mexican government for general analysis of marginality or depreciation, to evaluate health inequalities between small areas/countries (Lozano et al, 2000). Some of the parameters that make up the index are the percentage of households in each country/area which:

- Have no running water, electricity, sewage facility and a proper floor in their dwelling; and
- Are over-crowded.

A review (Esrey, *et al*, 1991) of findings from 144 studies revealed that improved water supply and sanitation often reduces child diarrhoeal mortality by 50%, and sometimes as much as 80%, depending on the type of intervention and on the presence of risk factors such as poor feeding practices and maternal illiteracy. Improvements in the rural water supply in Africa have resulted in a remarkable reduction in the number of cases of Guinea worm. In Nigeria, for example, 640,000 cases were reported in 1989; this number declined to 282,000 in 1991 as a result of improved water supply and treatment and education.

A study (Bradley, et al, 1992) comparing infection with helminths in an urban slum in Lagos, Nigeria, with infection in a rural district showed that 95% of school children in the urban study area were infected, compared with 55% in the rural area. Differences were attributed to the urban area's higher population density, lower level of hygiene, inferior drainage, and absence of excreta disposal facilities.

It is quite clear that the provision of certain basic infrastructure as cited above have a significant positive effect on the health outcomes of any population. It is becoming quite clear that there are so many factors that affect health status of any population, and that the provision of health services is just one out of many.

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2.5 Comments

We have in this chapter reviewed literature from different authors and disciplines that are in any way related to the subject. It is clear from this chapter that there are quite a number of factors that could affect the health status of individuals. Social scientists and epidemiologists have tried to show that illness and diseases do not affect all social groups proportionately; that the lower social groups usually carry a heavier burden of illnesses and diseases than the more well off group. Economists and health economists have used 'production function' type models to explain health outcomes, where the individual is assumed be a utility maximising unit. Basically a constrained optimisation problem where the health outcome of the individual is to be maximised, subject to the levels of certain inputs such as income, education level, etc.

This may be an appropriate juncture to point out that this study is a unique one, and does not follow directly from any of the reviewed empirical literature. The aim of the chapter however, was to furnish the reader with a general understanding of the subject. This study does not try to develop a health production function, nor does it try to identify some socio-economic inequality in health. Rather, the study is aimed at analysing data collected from a defined geographical area on both health status and perceived determinants of health (as informed by literature review), with a view to identify those that have significant effect on the health of the people. The results of the analysis will then be used as a guideline in the prescription of health promotion policies to be adopted in Nigeria.

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CHAPTER 3

THE CONCEPTUAL FRAMEWORK

3.1 Introduction

In the preceding chapter, we reviewed various literature and studies that gave us some insight into what factors determine health outcomes. As already stated, this study focuses on those factors whose values or quantities can be altered by government policies, household and individual choices. In this chapter, we will use information gathered from the theoretical literature and empirical findings from the previous chapter in the construction of regression-based models. These models will enable us estimate the relationship between these factors and health.

Health status has been measured in different ways, though not necessarily for regression purposes. One of the common ways (as already mentioned) has been to use a proxy – mortality levels. Another method is to measure health as perceived by the individual(s) in question. He or she is asked to describe his/her current health status as either 'good' or 'bad'. Some studies go further to break the number of outcomes to four or five: 'very good', 'good', 'not bad', 'bad' and 'very bad', though not necessarily in those words. The problem with this method is that the measurement of health status is subjective. Two people may be on the same level of health, but perceive their health status differently. However, the choice of measurement or classification of health may well depend on the nature of the study being carried out.

For this study, we shall measure health status in a manner that is less subjective. Respondents of the interview carried out are asked whether they have been sick or injured in the last three months, and the nature of the sickness. The different sicknesses are then classified according to the following types: 'mild', 'injury', 'acute' and 'chronic'. Those who have not been sick will be classified as healthy. Clearly, the type of measurement / classification of health status will to a large extent determine the type of regression model that will be used.

For this study, we shall use three different types. First, we will use the above-mentioned classification in which they are five outcomes 'mild'... etc. This will necessitate the use of a multinomial logit model.

The second is to condense the outcomes into just two: those who reported suffering no illness/injury and those who reported that they had suffered any illness or

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injury (irrespective of the classification). This two-outcome type measurement will necessitate the use of a binary response model. In our case we will use the logit model.

Thirdly, in a bid to determine the direct effect of government provision of portable water, we would differentiate the health outcomes into three categories: those who are 'healthy' (referring to those who reported that they did not suffer any illness/injury), those who reported that they suffered from water borne diseases, and those who reported that they did not suffered from non-water borne diseases. Based on this classification, we would use the multinomial logit model.

In addition, these models will be run using individuals, though allowing for the influence of the household. Because there is no *a priori* established functional form between health status and any of the perceived determinants of health, we will run the model with the linear values of each perceived determinant (to be referred to as variables henceforth).

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3.2 The Logit Model

The logit model is a binary response model (BRM), which is preferred over the conventional Ordinary Least Squares (OLS) regression, when dealing with binary dependent variables. This is because using OLS regression (otherwise called 'Linear probability model'- LPM) for binary dependent variables violates several assumptions of the LRM (linear regression model)[1].

The binary response model can be developed in a number of ways:

- As latent dependent variable models;
- As non-linear probability models; and
- As discrete choice models.

We will develop the BRM (in particular, the logit model) as a latent dependent variable model, as this has a certain appeal to the study. Health status can be viewed as an unobserved variable, whose value is only observed above or below a threshold point. Above this point, we observe an individual as healthy, and below – sick. As with the LPM, we have an observed y. Suppose, that there is an unobserved or latent variable y^* ranging from $-\infty$ to ∞ that generates the observed y's.

[1] See Long (1997) "Regression Models for Categorical and Limited Dependent Variables. Thousand Oaks: Sage Publishers, California" for detailed discussion.

Those who have larger values of y^* are observed as $y = 1$, while those with smaller values are observed as $y = 0$. The latent y^* is assumed to be linearly related to the observed x's through the structural model:

$$y_i^* = \mathbf{x}_i\beta + \varepsilon_I$$

The latent variable y^* is linked to the observed binary variable y by the measurement equation:

$$Y_i = \begin{cases} 1 \text{ if } y_i^* > \tau \\ 0 \text{ if } y_i^* \leq \tau \end{cases}$$

where τ is the threshold or cut-off point.

Since y^* is continuous, the model avoids the problems encountered with the LPM. However, since the dependent variable is unobserved, the model cannot be estimated with OLS. Instead, we use Maximum Likelihood (ML) estimation, which requires assumptions about the distribution of the errors. Most often, the choice is between normally distributed errors, which result in the *probit* model, and the logistically distributed errors, which result in the *logit* model. As with the LPM, we assume that $E(\varepsilon \mid x) = 0$. Since y^* is not observed, we cannot estimate the variance of the errors. In the logit model, we assume that $\text{Var}(\varepsilon \mid x) = \pi^2/3 \approx 3.29$. The specific value assumed for the variance is arbitrary in the sense that it cannot be disconfirmed by data. In the logit model, the errors are assumed to have a standard logistic distribution with mean 0 and variance $\pi^2/3$. This unusual variance is chosen because it results in a particularly simple equation for the probability density function (pdf):

$$\lambda(\varepsilon) = \exp(\varepsilon)/[1 + \exp(\varepsilon)]^2$$

and an even simpler equation for the cumulative density function (cdf):

$$\Lambda(\varepsilon) = \exp(\varepsilon) / [1 + \exp(\varepsilon)]$$

The cdf indicates the probability that a random variable is less than or equal to a given value. The pdf (normal distribution) is bell shaped, and the cdf is an S-shaped curve. This curve is the well-known S-curve associated with the BRM (Long, 1997).

In specifying the BRM (the logit model in this case), we make three identifying assumptions:

1. The threshold value is 0: $\tau = 0$;

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2. The conditional mean of ε is 0: $E(\varepsilon \mid x) = 0$;
3. The conditional variance of ε is a constant: $\text{Var}(\varepsilon \mid x) = \pi^2/3$

These assumptions are arbitrary in the sense that they cannot be tested, but they are necessary to identify the model. Identification is an issue that is essential for understanding models with latent variables. Since a latent variable is unobserved, its mean and variance cannot be estimated.

The magnitude of the slope depends on the scale of the dependent variable, so if we do not know the variance of the dependent variable, then the slope coefficients (βs) are not identified. Since the β's are unidentified without assumptions about the mean and variance of ε, the β's are arbitrary in this sense: if we change the identifying assumptions regarding $\text{Var}(\varepsilon \mid x)$, the β's also change (we see only β/σ). Accordingly, the β's cannot be interpreted directly since they reflect both: (1) the relationship between all the x's and the y^*; and (2) the identifying assumptions. While the identifying assumptions affect the β's, they do not affect **Pr**(y = 1|x). More technically, **Pr**(y = 1|x) is an estimable function (Long, 1997).

Since the BRM is non-linear, no single approach to interpretation can fully describe the relationship between a variable and the outcome probability. Interpretation of the coefficients is not as simple as interpreting those of the linear probability model. Since the model is non-linear, the change in **Pr**(y = 1|x) changes as any given x assumes different values. One common way is to interpret the β's as the change in probability from discrete or unit changes of any of the **x**'s holding all other **x**'s at their means.

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3.3 The Multinomial Logit Model

The multinomial logit model (MNLM) can be thought as simultaneously estimating binary logits for all possible comparisons among the outcome categories. In this sense, multinomial logit is a simple extension of the binary logit model. However, the extension is made difficult by the large number of comparisons that are involved. With three outcomes, the MNLM is roughly equivalent to running three binary logits comparing outcomes 1 to 2, 1 to 3, and 2 to 3. With four outcomes, you must add three more comparisons: 1 to 4, 2 to 4, and 3 to 4 (Long, 1997). In making use of the multinomial logit model, one outcome is by default a comparison outcome.

Therefore, in the case of a four-outcome exercise, we see the results for the chances of obtaining any of the three outcomes versus the default outcome.

The MNLM can be expressed as an odds model, a discrete choice model, or a probability model. We shall describe it as an odds model. The choice of the odds model is because interpretation of the coefficients using Stata 6.0 is quite similar. Consider an event with two outcomes *m* and *n*. The odds of outcome *m* versus *n* given **x** is indicated by $\Omega_{m\backslash n}(\mathbf{x})$, equal:

$$\Omega_{m\backslash n}(\mathbf{x_i}) = \frac{\Pr(y_i = m\backslash \mathbf{x_i})}{\Pr(y_i = n\backslash \mathbf{x_i})} = \frac{\frac{\exp(\mathbf{x_i}\beta_m)}{\sum_{j=1}^{j}\exp(\mathbf{x_i}\beta_j)}}{\frac{\exp(\mathbf{x_i}\beta_n)}{\sum_{j=1}^{j}\exp(\mathbf{x_i}\beta_j)}} = \frac{\exp(\mathbf{x_i}\beta_m)}{\exp(\mathbf{x_i}\beta_n)}$$

Combining exponents leads to the odds equation:

$$\Omega_{m\backslash n}(\mathbf{x_i}) = \exp(\mathbf{x_i}[\beta_m - \beta_n])$$

Taking logs shows that the MNLM is linear in the logit:

$$\ln\Omega_{m\backslash n}(\mathbf{x_i}) = \mathbf{x_i}(\beta_m - \beta_n)$$

The difference $\beta_m - \beta_n$, called a contrast, is the effect of **x** on the logit of outcome *m* versus outcome *n*. Since the model is linear in the logit, it is simple to compute the partial derivative:

$$\frac{\delta \ln\Omega_{m\backslash n}(\mathbf{x})}{\delta x_k} = \frac{\delta \mathbf{x}(\beta_m - \beta_n)}{\delta x_k} = \frac{\delta \mathbf{x}\beta_m}{\delta x_k} = \frac{\delta \mathbf{x}\beta_n}{\delta x_k} = \beta_{km} - \beta_{kn}$$

This allows us to interpret $\beta_{km} - \beta_{kn}$ as:

- For a unit increase in x_k, the logit of outcome m versus outcome n is expected to change by $\beta_{km} - \beta_{kn}$ units, holding all other variables constant. Since $\beta_1 = 0$, the equation for the comparison with outcome 1 simplifies to:

$$\ln\Omega_{m/1}(\mathbf{x_1}) = \mathbf{x_i}(\beta_m - \beta_1) = \mathbf{x_i}\beta_m$$

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Therefore, given the identifying constraint that $\beta_1 = 0$, β_{km} is the effect of x_k on the logit of outcome m relative to outcome 1:

- For a unit change in x_k, the logit of outcome m versus the outcome 1 is expected to change by β_{km} units, holding all other variables constant.

The interpretation of β_{km} is simple since the effect of a unit change in x_k on the logit does not depend on the level of x_k or on the level of any other variable. Unfortunately, it is hard to convey the substantive meaning of a change in the log of odds.

3.4 Definition of Variables and the Model

As already mentioned, there are quite a number of variables that are deemed to affect health status. From our literature review, the following are potential determinants of health: lifestyle, housing condition, gender, age, occupation, culture, education, income, living environment, location, (geographically, and urban/rural) employment status, nutrient intake, sewage disposal, household size, access to health services, recreation, exercise, source of water (drinking and non-drinking).

With a list of these variables, one could very well be tempted to collect data on them, and throw all of them into the right hand side (RHS) of the equation, with a measure of health on the left hand side (LHS) and then run a regression. However, this may not be the best thing to do because it is quite clear that most of these variables have an influence on one another. Therefore there is a very high risk of **multicollinearity** in the model. For example, income has an effect on most of the other variables. Income affects the level of nutrient intake of any individual; low-income households tend to eat less fruit and vegetables and more refined foods higher in fat and sugar. Income also determines the type of housing in which people live (Naidoo and Wills, 1994). Other factors such as education, water supply and access to health services are largely dependent on their provision by the government since the cost of health care and education are largely subsidised by the government. Therefore income has a much less influence on them as otherwise would have been the case.

Education influences the behaviour of individuals and is likely to affect household size. An educated couple is more likely to plan their family size with respect to present and expected future income, than would an uneducated couple. In this connection, a more educated couple will probably have a smaller family, all other factors held constant. A much stronger relationship is likely to exist between

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education and income. The more educated individuals are likely to bet better paying jobs and hence higher incomes, while at the same time, higher incomes allow for better quality education. In the extreme case, without any income (or very little) one cannot pay for education. These are a few of the more obvious relationships between the perceived determinants of health. In fact, it is quite possible to find some plausible relationship between any and all the determinants – of course aside from age and sex.

In the light of this realisation, one may resort to using only the more 'primary' determinants (income, education, access to health services, access to clean water, age, sex, lifestyle and location) as the independent variables. The results however may be misleading. For example, income may take the credit for the effect of nutrition and or housing condition on health status. Subsequently, any conclusion drawn from the analysis may also be misleading.

The available data was collected on the following factors: location, household size, monthly expenditure, assets, toilet facility type, housing condition, source of health care, access to health care, source of drinking water, electrification, age, sex, and lifestyle and of course health status. Therefore our variables will be restricted to available data. We may have more than one variable for some of these factors. Wagstaff (1986) used a similar approach in his estimation of the 'pure investment model' of the demand for health – a Grossman-type approach. The independent variables consisted of different measures of education, family size, work environment, access to hospital facilities, wage, marital status, urbanisation, age, sex, and doctor availability and cost. The choice of variables for the model was based on the theoretical underpinnings of the Grossman model. Wagstaff's model does not take into consideration, directly, the effect of the provision of 'health promoting' infrastructure by the government. We shall also run each of our models without including those variables representing levels government intervention (or provision of certain infrastructure, previously described) and then compare the results with his (Wagstaff's) results, and also with the results from our models which include these variables. We should note though, that Wagstaff's model was based on research in a more developed country and so there may be some differences in the factors influencing health status in Nigeria and that of Wagstaff.

Now, let us clearly define the most obvious cases of a possible relationship between our health factors. Theoretically, income should have an effect on housing conditions, education and to some extent the environment in the case of sewage

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disposal. Education should have an effect on income, as the more educated are likely to get better jobs and hence higher wages. It also affects household size as previously discussed. The other variables: age, sex, access to clean water and health services, and lifestyle can be considered (for the purpose of this study) as independent of both income and education. The government is largely responsible for the provision of water and health services in the area. However, information collected on assets such as ownership of a television, radio, and telephone will not be included in the model because they are a direct consequence of income and availability of electricity.

Now, it may well be that for this particular study, there may not exist such relationships as we have described (though the chances are slim). If that is the case, then condensing the variables prior to running the model will result in loss of information and of course unreliable results. So, we first test for multicollinearity within the variables before running the model. Should there exist a strong relationship between these factors (as we have just stated), we shall drop the more secondary factor. Subsequently, the effect of the more secondary factor is assumed to be captured by the more primary factor. For instance, should there be a strong relationship between incomes and housing conditions, we will drop 'housing conditions' and assume that the effect of income on health status incorporates the effect of housing condition on health status. So we will then conclude, based on theoretical justification that a positive change in income will be followed by better housing condition for the individual.

The factors and variables to be used in this study are enumerated below. For reasons to be explained in the next chapter, expenditure is used as a proxy for income.

Table 3.1 List of Variables.

Factors	**Variables**	**Variable Name**	**Expected sign**
Education	Number of years of education	YRSED	+
	Number or years of education of household head	HHH_ED	+
	Average household educational level	AVG_EHL	+
Expenditure	Average monthly expenditure, per household member	AVMEXP	+
Housing Condition	Number of persons per sleeping room	PPS_ROOM	-
	Type of toilet facility used	TOIL_FAC	+

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	Whether the house is electrified	ELECTRIC	+
Household size	Number of people per household	HH_SIZE	-
Gender	Sex of individual	GENDER	-
Age	Age of individual	AGE	-
	Age-squared	AGESQ	-
Access to health care	Type of health facility individual goes to if he/she had malaria	H_FAC	+
	Time it takes to get to this health facility	HEALTH_S	-
	Amount of time waited before attended to at health facility	WAIT_T	-
Access to clean water	Source of drinking water	D_WATER	+
	Source of non-drinking water	ND_WATER	+
Lifestyle	Whether the individual is a cigarette smoker	SMOKER	-
	Whether the individual consumes alcohol regularly	ALCOHOL	-
	Whether the individual engages in regular exercise or sporting activity	EXERCISE	+
Urban	Place of residence	URBAN	+
Health Status	The health status of the individual	H_STATUS	

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The signs for the dummy variables such as T_FAC, ELECTRIC, H_FAC, D_WATER, and ND_WATER depend of course on how they are measured and classified. A more detailed explanation of the variables is done in the next chapter. The variable AGESQ is introduced to capture any non-linear relationship that may exist between age and health status. The expected signs for the variables listed above illustrate the general direction of the expected effect of changes in the independent variables on health status. This clarification is important because of the use of the multinomial logit model, where the outcomes for health status are categorised according to different classifications of diseases. The signs for the respective variables may differ across different outcomes.

CHAPTER 4
DATA COLLECTION METHOD

4.1 Introduction

In this chapter, we describe the process of collecting the data that is used for this study. The principles and rationale for guiding the decisions taken before and during the collection process are also be explained. Finally, we discuss measurement and categorisation with respect to the data collected for the various variables.

4.2 The Survey Site

The data used for the study was collected via a household survey conducted by the researcher in Nsukka Local Government Area (LGA). The household survey was conducted within the period: January to March 2001. The area was selected for the survey because of the researcher's familiarity with the location and a good understanding of the local language spoken in the area.

Nsukka LGA is located in the northernmost part of Enugu State, which is in the South-eastern region of Nigeria. Nsukka is within Igbo land, one of the three major ethnic groups in Nigeria. Below is a table showing the communities that comprise Nsukka LGA and their respective populations. The LGA spans an area of about 1,200 km squared. In comparison to other towns within Nigeria, Nsukka is relatively poor. The majority of the population engages in farming, crafts, small scale trading and other rural occupations. Nsukka town itself is a semi-urban town in which the University of Nigeria is situated.

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4.3 The Sample Size

Sample sizes vary widely depending on the purpose of the survey, on the size of the population in the country being surveyed, and on the degree to which regional or other specific sub-samples are required. Sample sizes of around 10,000 are frequently encountered which would correspond to a sampling fraction of 1:500 in a population of 5 million households, or perhaps 25 million people (Deaton, 1998). Ours is not a national survey, and the population size is rather small, therefore the ratio was pushed as high as 1:80. With a population of about 255,000 living in about 44,000

households, approximately 550 households were included in the sample. The sample size collected for each community corresponded with the actual proportion of the population in each community to the entire population of Nsukka LGA.

Table 4.11991 Population figures for Nsukka LGA.[2]

S/NO	LOCALITY	MALES	FEMALES	BOTH-SEXES	1996 PROJECTION
1.	Anuka	271	401	672	776
2.	Okutu	1,651	1,833	3,484	4,022
3.	Ibagwa Agu	548	582	1,130	1,304
4.	Okpuje	3,968	4,053	8,021	9,259
5.	Ibagwa Ani	3,754	4,427	8,181	9,443
6.	Okpaligbo	954	1,212	2,166	2,500
7.	Obukpa	7,954	9,421	17,375	20,056
8.	Alor-Uno	2,528	3,129	5,657	6,530
9.	Edem	6,712	7,722	14,434	16,661
10.	Obimo	5,294	5,754	11,048	12,753
11.	Lejja	6,287	6,989	13,276	15,325
12.	Ede-Oballa	5,760	6,687	12,447	14,368
13.	Opi	10,000	11,991	21,991	25,384
14.	Eha-Alumona	14,085	17,214	31,299	36,129
15.	Nsukka	34,173	35,057	69,230	79,913
	TOTAL	**103,939**	**116,472**	**220,411**	**254,422**

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4.4 The Sampling Strategy

A two stage sampling technique was employed in the survey. First was a systematic selection of the clusters. Then, after listing the households within each of the selected clusters, a simple random sampling of the households in each cluster was included in the sample. The 15 communities that make up Nsukka LGA form 15 natural clusters from which to select. Nsukka town itself is a semi-urban town, while the rest of the 14 communities are rural communities. The systematic sampling was done with financial and time constraints in mind, hence only 6 clusters were selected from the 15. Nsukka town is centrally located in the district, while the rural areas are spread around its periphery. Even in these rural areas, they are communities that are more densely populated, and form some sort of centre within the rural areas. These were the clusters included in the sample as they are evenly spread across Nsukka LGA, and are representative of the smaller rural settlements around them. In general,

[2] These population figures were obtained from the National Population Commission.

choosing the clusters via a random process may be the best strategy. However, in this case, it is unlikely that any randomly selected clusters would give as good a representation of Nsukka LGA, especially where the number of clusters to be included in the sample is very limited.

Nsukka town was automatically included in the sample survey, as it is the only urban area in the LGA. The six clusters chosen thus were: Nsukka, Eha-Alumona, Opi, Lejja, Edem, and Obukpa. The locations of these clusters form a ring around Nsukka town and are well distributed around the LGA. In the course of collecting the data, it was observed that there was a marked difference between the living environment within the University community and the rest of the town. To that effect, we separated the data collected from the university community into another natural cluster.

For the random selection of the households to be interviewed, the ideal process would have been to obtain a list of all the households within a chosen cluster and then randomly select the households to be interviewed. However, in our case, there was no such list. The first household to be interviewed in each cluster was randomly chosen. The researcher and his primary assistant marked pieces of paper from numbers 1 through 10, and put them in a bag. If the number 4 was picked, then sampling started with the fourth house, and then continued at intervals of 10 or 8 households (depending on the population size of the cluster).

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4.5 The Survey Instrument and Data Collection Process

A household questionnaire was the instrument used for the survey. Prior to administering the survey, permission was obtained from Nsukka local government authority to carry out the survey in the district. The questionnaire is reproduced in appendix A of this study. The questionnaire is in English though it was administered in Igbo language in households where the head of the household did not understand English. It was designed in such a way that it would take a maximum of 20 minutes to administer to one household. This was done to reduce the burden on the respondent, and hence make him/her more responsive to the questions. The researcher ensured that the respondents were informed before the interview of the relatively short time it would take to complete the exercise.

The researcher and one assistant conducted a trial run of 50 interviews in Nsukka town. The trial run revealed that most people did not respond favourably to questions about their income. It was perceived that most were reluctant to divulge any information about their income, while some actually became hostile. Subsequently, the researcher substituted 'average monthly expenditure' for 'average income' in the questionnaire. Responses to questions on expenditure were better and thus deemed more reliable. The content of the questionnaire was subsequently altered in this regard.

The researcher then trained 2 graduate students and 3 undergraduate students from the Department of Economics at the University of Nigeria to assist in carrying out the survey within Nsukka town, Edem, Lejja, and Obukpa. The students were chosen because they had a good academic record and for the fact that they grew up in the locality of Nsukka. In addition, they also understood the particular dialect of the Igbo language spoken in Nsukka LGA. For Eha-Alumona and Opi communities, the researcher employed one secondary school teacher in each community who was an indigene. The research assistants were trained in a period of three days, and dispatched to well-defined locations within the sampling regions. On the whole the level of response was encouraging. In Opi and Eha-Alumona where indigenes conducted the interview, they was less resistance from the people, as they felt more secure giving out information to a familiar face. On the whole, it was quite surprising that only about 30 households refused giving information. Some of the chosen households (in the rural areas) were so happy to be interviewed that they made the assistants stay for a meal, or offered them something to drink.

The interview was always conducted with the head of the household. Where this was not possible, the most senior adult in the household was interviewed. The interviewers commenced the exercise by introducing themselves to the household head and then went ahead to explain their purpose. The Interviewers were required to carry along a copy of the letter of approval from the local government authority, and a letter of introduction from the researcher. These came in handy in situations where the household head (or representative) required some proof of intent. Where some of the household members were above the age of 18, they were interviewed individually on lifestyle issues. This was not possible in all households, so for some we relied on the information provided by the household head. The need to get information from the individuals themselves arises from the conservative nature of the average Nigerian

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society. For example, most teenagers and young adults who smoke cigarettes do so without the knowledge of their parents. So, their parents do not know that they smoke, and even if the parents do know, they may not tell interviewer that their children smoke. This is the case as smoking is generally considered to be a mark of irresponsibility.

In the field, the researcher observed that the sample size could be significantly increased with a less than proportional increase in expenditure. And so, the sample size was increased to just over 680 households. In total, 3,581 individuals were included in the sample. Subsequently, the sample to population ratio decreased to approximately 1:65 from the targeted 1:80. On the whole, the data collection process was a success, and in the researcher's opinion, the data collected are fairly reliable.

The data was first keyed into Microsoft Works Spreadsheet, and imported to Stata 6.0 for the estimation and analysis.

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CHAPTER 5
DESCRIPTIVE STATISTICS

5.1 Introduction

In the preceding chapter, we described the process of collecting the data we are going to use in this study. In this chapter, the aim is to provide, from collected data, some insight into the health status of the population in Nsukka LGA, and in the same vein, the living conditions of the people. Summary statistics on all the collected variables will also be provided. This is important as it may provide additional understanding of the determinants of health in the area. The effect of clustering (in data collection) is accounted for in all the outputs henceforth, thus the standard errors are larger and hence more conservative.

5.2 Household Size and Population Structure

A total of 683 households were included in the survey. The average household size is 5.26. The smallest households consisted of just one person, while the largest households had 16 members. The standard deviation is 2.65 and variance is 6.99. With *Skewness* and *Kurtosis* of 0.51 and 3.55 respectively, the sample is very close to being normally distributed around its mean. The sample though is slightly left-skewed, so there were more households with more than the average size. In the 683 households, 2 of the households were such that there was no household head because they consisted of a group of students living together. 126 households had a female household head, while 555 had a male household head.

The age-population structure of the data is shown below. On the basis that those between the ages of 0 – 18 are considered children, and those above 18, adults, the table above shows that there are more adults than children in our sample. Also, the dependency ratio is low, since the 'working population' is over 55%. The age-population distribution of our sample data is similar to the age-population distribution in Nigeria; this is also illustrated in the table. There are slightly more males than females in the sample. While 52% of the individuals in the sample are males, the remaining 42% are females.

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Table 5.1 Age distribution of population

Age	**Percentage (in our sample)**	**Percentage (Nigeria[3])**	**Cumulative (in our sample**	**Cumulative (Nigeria)**
0 – 4	8.04	15.2	8.04	15.2
5 – 19	35.20	39.3	43.24	54.5
20 – 64	54.05	41.3	97.29	95.8
65 +	2.71	3.8	100	99.6

Therefore, our data is a good representation of the age distribution of the Nigerian population. The number of households and individuals included in the sample for the different locations are shown below in table 5.2.

Table 5.2 Number of households and individuals per sampled location.

Location	Number of Households	Number of Individuals	Average number of household members
U.N.N.	35	207	5.9
Nsukka	179	831	4.6
Lejja	65	303	4.7
Obukpa	84	484	5.8
Edem	69	329	4.8
Opi	100	526	5.3
Eha-Alumona	150	901	6.0

As previously mentioned, the number of households sampled per location is proportional to the population of the location in relation to the population of Nsukka LGA as a whole. A look at the average number of people per household shows that there is not much of a difference from location to location. The table shows that the average household size in the locations range from 4.5 to 6 people per household.

5.3 Morbidity

The data from the sample revealed that within the past three months, 781 people out of the 3581 included in the sample reported that they had suffered from at least one type of illness or injury. This figure represents approximately 22% of the total number of people included in the sample. The diseases have been categorised into four types, namely: mild, injury, acute and chronic. Below, table 5.3 shows the top five diseases (based on number affected) that have afflicted the sick according to our categorisation. This is with the exception of 'injury'. Injuries are not diseases themselves, though they may give rise to one. A total of 49 people reported that they had sustained injuries within the three-month period.

[3] Data Source: NDHS 200

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Table 5.3 Top diseases in Nsukka L.G.A.

Mild	**Freq.**	**Acute**	**Freq.**	**Chronic**	**Freq.**
Cough	30	Malaria	293	Diabetes	13
Head ache	25	Fever	64	High blood pressure	12
Catarrh	9	Typhoid fever	40	Arthritis	8
Tooth ache	9	Cold	18	Asthma	6
Sore throat	4	Worm infection	14	Rheumatism	5
Total Mild Cases	**83**	**Total Acute Cases**	**580**	**Total Chronic Cases**	**69**

From the table, it is very clear that malaria is the most prevalent disease in the area, it accounts for 37.5% of all sick people within the sample. 64 people described having had some form of fever, but did not think they had a malaria attack. For the mild and chronic diseases, cough and diabetes top the list respectively. From the statistics presented in table 5.3, there are far more 'acute' cases than any other in the area.

5.4 Household Expenditure

The respondents were asked how much was spent (on the average) by the entire household per month. However, the use of the amount quoted by the respondent may be misleading if the number of people in the household is not taken into consideration. Of course, if the size of the household is large, then effectively, expenditure per individual will be smaller than if the size of the household were smaller. To incorporate the effect of household size on expenditure, household expenditure was divided by the number of people in the household. Therefore, what is presented is expenditure per individual in the household[4]. Below is a table showing the distribution of monthly expenditure per individual. From the sample, the average monthly expenditure per individual is ₦1, 940.50. As at the time the survey was carried out, the exchange rate for the U.S. Dollar was **₦124.5 per $1.00**. This means that the mean monthly expenditure per individual was $15.59. The minimum monthly expenditure was ₦67.00, while the maximum was ₦35, 000.00. For most of the households where the individual expenditures were below ₦ 400.00, the household

[4] Some studies make use of Equivalent scales, where number of people in the household is standardised by age. For example, adults may be assigned the value '1', and children - 0.5. This is done to make allowance for the fact that more money is spent on adults than children. We shall not make use of such scales because there is no *a priori* empirically established scale for use in Nigeria.

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usually engaged in subsistence farming in that most of their foodstuff came from their farms. This would explain in part the reason for such a low level of expenditure.

Table 5.4 Distribution of average individual monthly expenditure.

Average monthly expenditure (₦)	Frequency	Percent
0 - 1000	1372	38.31
>1000 – 2000	1063	29.68
>2000 – 3000	578	16.14
>3000 – 4000	302	8.43
>4000 – 5000	77	2.5
>5000	189	5.28

From the table it is clear that close to half of the people in the area spend less than ₦ 1,000 in a month. More than half of the people from the sample spend less than ₦ 2,000 in a month. Even by Nigerian standards, this is rather low. The national per capita income as at 1999 was $350 per annum, which translates to approximately $29 per month (NDHS, 2000). Applying the exchange rate used above, this comes to about ₦ 3,610.5 per month. However, one should not be too surprised as most of the people included in the sample are from rural areas. The mean monthly expenditure for the sub-urban areas (the University community and Nsukka town) is ₦ 2,869.55.

5.5 Education

Educational level is measured as the number of years an individual has been enrolled in formal education.

Table 5.5 Level of Education amongst the people of Nsukka L.G.A.

Years of Education		Frequency	Percent
0	(no formal education)	454	12.68
1 – 7	(primary)	1186	33.12
8 – 13	(secondary)	1129	31.53
14 - 18	(tertiary)	705	19.69
>18	(post – grad)	106	2.96
Total		**3581**	**100**

Those who have 0 years of education are considered to have no formal education. One would notice that the section marked 'primary' education comprises more than the conventional six years. The reason is that nursery school or kindergarten was included. In the area, these are considered different from primary school, and some children even spend up to two years in such institutions before moving to primary school. 169 out of the 454 illiterate people are children of ages

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between 0 and 5. About 13% of the people included in the sample are illiterate. A huge proportion of the population have completed primary education. 31% of the population are either studying at the secondary level of education or have only completed this stage of formal education. As expected, fewer people have attained tertiary education, and even fewer – postgraduate education.

5.6 Housing Conditions and Access to Clean Water

From our data, on the average, there are 2 people per sleeping room, with a maximum of 8 persons per room and a minimum of one person to seven rooms. Only 28% of the total sample use water cistern toilets, just over 50% use pit latrines, while the remaining 21% go to the bush to relieve themselves. Only about 70% of the homes in the area are electrified.

Table 5.6 Access to clean water

Source of drinking water	**Frequency**	**Percent**
Piped water	2239	62.52
Borehole water	799	22.31
Natural sources	543	15.16
Total	**3581**	**100**
Source of non-drinking water		
Piped water	1829	51.08
Borehole water	805	22.48
Natural sources	947	26.42
Total	**3581**	**100**

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The table above shows that about 15% of the population do not have access to safe drinking water. This segment of the population depends on natural sources such as streams, rainwater and other natural water bodies for drinking water. Approximately 63% of the population source their drinking water from piped water, while the remaining 22% depend on boreholes for drinking water. For non-drinking water, a higher percentage of the population (about 26%) depend on natural sources. It would seem that some of the people who source non-drinking water from natural sources (the 26%) strive to ensure that their source of drinking water is cleaner and safer. This would explain the reduction in the percentage of the population who source non-drinking water from natural water sources as compared to those who source drinking water from the same source. Also, there appears to be a reduction in the number of people who depend on piped water for purposes of drinking as

compared to non-drinking purposes. About 95% of the population living within the semi-urban area have access to clean water (i.e. either piped water or borehole water), while only about 80% of those living in the rural areas have access to clean water.

5.7 Lifestyle and Access to Healthcare

From our data, only 7% of the population admitted to being smokers, a significant proportion of these people are from one location, Eha-Alumona. Over 50% of those who admitted to being smokers are from this location. Also, only 25% of the sample admitted to regular consumption of alcoholic drinks. 'Regular consumption', referring to those who consume alcoholic drinks at least twice a week.

From our data, 40% of the sample reported that they engaged in regular exercise. However, the researcher observed that most of the people in the areas where the households engaged in subsistence farming responded in the negative. These people obviously engage in regular exercise as they spend most of their time farming. This observation was made after the survey was completed, and if our analysis is done without correcting for this, then we run the risk of obtaining misleading results. One way of correcting for this, at least in part, is to assume that those households with very low monthly expenditures are subsistence farmers, and hence do engage in regular exercise. This assumption seems to be a very reasonable one in the light of this predicament, more so since by observation not more than 25% of the households engage in subsistence farming. Further discussion on this assumption is done in the last section of this chapter.

Access to health services was measured by the time it took respondents to get to the health facility of their choice. The 'choice of health facility' referring to the type of health facility the respondent decided to go to if he/she was sick – in this case, if he/she had malaria. Three types of health care facilities were distinguished, namely: hospital or clinic, chemist and traditional healer. The data showed that 68% of the people in the sample used either the hospital or the clinic for treatment, 30% used the chemist, while 4% used traditional healers for treatment whenever they were sick (in the questionnaire, malaria was used as an example).

The table below illustrates (by location) the type of health facility the respondents went to for treatment, and the average time (in the brackets, measured in minutes) it took to get to the respective health facilities. The average travel time to health facilities were 29, 16 and 55 minutes for hospitals/clinics, chemist and

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traditional healers respectively. Those living within the university community spent the least time (17 minutes on average) to get to a hospital or clinic, while those living in Opi spent the most time (49 minutes). For those who preferred going to the chemist, the people in Obukpa spent the least time getting to the chemist (7 minutes on the average), while those living in Opi spent the most time (35 minutes on average). None of the respondents from the university community or Obukpa admitted to going to a traditional healer for treatment. The only individual in Nsukka town that went to a traditional healer spent only 3 minutes on the average to get to the traditional healer. The traditional healer is probably a neighbour. One household in Edem claimed to travel for about 3hrs to get to a traditional healer for treatment.

Table 5.7 Access to health services in Nsukka L.G.A.

	TYPE OF HEALTH FACILTY		
LOCATION	**Hospital/Clinic** Freq / time (minutes)	**Chemist** Freq / time (minutes)	**Traditional Healer**
UNN	205 (16.7)	2 (14)	0 (n/a)
Nsukka Town	624 (20.5)	206 (11.9)	1 (3)
Lejja	170 (40.0)	128 (21.7)	5 (30)
Obukpa	354 (45.2)	130 (6.9)	0 (n/a)
Edem	183 (21.7)	141 (14.5)	5 (180)
Opi	385 (49.2)	30 (35)	111 (57.6)
Eha-Alumona	517 (17.6)	362 (17.3)	22 (22.5)
TOTAL	**2438 (29.14)**	**999 (15.52)**	**144 (55.16)**

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Most people had to wait, on getting to the health facility before getting medical attention. On the average, those who went to either the hospital or clinic waited for about 30 minutes, for those who sought medical attention at chemists and traditional healers, the average waiting time was 9 minutes and 33 minutes respectively. Clearly, the time costs associated with obtaining treatment at the chemist store is much less than any other alternative. This may be the major attraction for people who source health care services from them.

Adding the two time costs gives the total time cost to the individual for sourcing health services. Therefore, on the average it would cost an hour to get health care services from a hospital or clinic, 25 minutes from the chemist and about one and a half hours from traditional healers.

5.8 Morbidity Distributions

It is interesting to see the distribution of morbidity across different parameters. The age distribution of morbidity is represented below. The values represent the percentage of people that reported that they suffered any of the different types of illnesses in relation to the total number of people within the age bracket.

Table 5.8 Age distribution of morbidity

	Percentage of age-group that was sick			
Age Group	**Mild**	**Injury**	**Acute**	**Chronic**
0 – 5	4.3%	1.1%	20.9%	0%
6 – 18	1.3%	1.2%	12.2%	0.35%
19 – 35	2.6%	1.6%	15.3%	1.5%
36 – 65	2.5%	1.2%	20.8%	4.2%
65 and above	1.9%	1.9%	12.3%	23.1%

The table reveals that children between the ages of 0 and 5 suffered the most from mild illnesses, while there appears to be an increase in the proportion of the entire population that suffered from injuries as age increases. Those of ages 0 – 5 and 35 – 65 suffered most from acute illnesses. The other age groups suffered from acute illnesses in equal proportions. There seems to be an exponential increase in the proportion of the population that suffered from chronic illnesses as age increases. On the whole 26.4% of children suffered from some illness or injury. 15.1% and 21.1% of age groups 6-18 and 19-35 respectively suffered from an illness or injury. For the age groups 36-65 and 'above 65' the percentages are 28.8% and 42.3% respectively. It would appear that people of the ages between 6 and about 35 are the healthiest in the population. Therefore, children of ages between 0-5 and the older population are the people that need the most medical attention. It is not surprising that such a relatively high proportion of those aged 65 and above suffered a chronic illness. The incidence of chronic illnesses usually comes with advanced age; hence this outcome is not contrary to expectations.

Table 5.9 below represents the proportion of people who reported sick and those who reported not being sick in the period are represented below. The proportion of the sick is almost the same in all locations (just over 20%). However, in Obukpa, those who were sick in the last three months are only 4.3% of the sample from the location. Also, the figure for Opi (17.1) is significantly lower than the rest. The location with the highest proportion of sick people is Nsukka town, with 27.7%. Note that we have

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used proportions/percentages because the sample size differed across locations. The table also shows that Nsukka Town had the most sick people.

Table 5.9 Geographic distribution of morbidity

Location	**Number who reported sick**	**Proportion of sick people**	**Proportion of the sample from location.**
UNN	50	6.4%	24.2
Nsukka Town	230	29.4%	27.7
Lejja	67	8.6%	22.1
Obukpa	61	7.8%	4.3
Edem	77	9.8%	23.4
Opi	90	11.5%	17.1
Eha-Alumona	206	26.4%	22.9
Nsukka L.G.A.	**781**	**100%**	**21.8**

More males reported being sick or injured in those three months; 408 males were sick or injured, while 373 females reported being sick or injured. The figure for males is 9.4% higher than the figure for females. The difference is not so much as to conclude that males are generally sicker than females in the area. Also, the total number of males included in the sample is approximately 9% higher than the total number of females included in the sample. Therefore, it is most probable that there is no significant difference between morbidity levels of males and females

In the next page, table 5.10 illustrates the distribution of morbidity across expenditure categories. Clearly, there are less sick people as one moves down to higher expenditure categories, but a look the last column shows that there is no such discernable trend when considering the proportion of people in the various categories that were sick. This last column is the more accurate representation of the distribution of morbidity across the expenditure categories. Contrary to expectation, the group with the highest average monthly expenditure has the highest proportion of people who reported that they had suffered an illness or injury.

Table 5.10 Distribution of morbidity across expenditure categories

Average monthly expenditure (₦)	**Frequency**	**Number of sick in period**	**Proportion of sick to group in category**
0 - 1000	1372	309	22.5
>1000 – 2000	1063	205	19.3
>2000 – 3000	578	134	23.2
>3000 – 4000	302	58	19.2
>4000 – 5000	77	20	25.9
>5000	189	55	29.1

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In terms of educational attainment, the distribution of people who admitted to having suffered a sickness is shown in table 5.11. Using individual educational attainment may not reveal the true picture of the distribution of morbidity, as most children below the age of 3 have zero years of formal education. Intuitively, their health status (and that of other young household members) may depend more on the educational attainment of older household members than theirs. Subsequently, we use the average educational level of the household members.

Usually, the average education level applied in this kind of study uses the average educational level of those who have finished formal education, or those who are beyond a certain age, say 18 or 21. This is done because compulsory schooling implies a fairly fixed relationship between the age of the younger members of the population and their educational attainment (especially in areas where there is compulsory primary education). Therefore, the educational attainment reached by the younger members of the household usually depends on their age. A close examination of the data from our survey shows that there is a very strong relationship (coefficient of correlation = 0.89) between age and educational levels of the population 18years of age and below, but there also exists an appreciable level of variability in 'educational attainment by age' within this age bracket. For example, the years of formal education for 11-year-old children ranges between 3 to 9 years (inclusive), and almost 20% of them have attained less than 5 years of formal education. Clearly, not all areas enforce compulsory schooling and/or there is high repetition rate.

We use the average years of education of the household members who are over 18 years of age. The choice of age for restriction is discussed in detail in the first section of the next chapter.

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Table 5.11 Morbidity and average household educational level

Average educational attainment (in years)	**Frequency**	**Number of sick**	**Percentage of sick to number in category**
0	128	32	25
1 – 7	769	180	23.4
8 – 13	1228	242	19.7
14 - 18	1236	276	22.3
>18	220	49	22.3

There seems to be a gradual reduction in the proportions of people who are sick as we move from the least educated group to the more educated groups. However, the

differences are not very pronounced. The group with average years of education of between 8 – 13 years have the least proportion of sick people.

5.9 Comments and Concluding Remarks

In this chapter, we have successfully presented a picture of the situation of people and in Nsukka L.G.A. It is easy to see that Nsukka L.G.A. is a relatively poor community and mostly rural. Malaria is the most prevalent disease in the area, it accounts for about 37% of all illnesses suffered by the people in the area. The observed low levels of expenditure, is obviously a reflection of the low levels of income.

Previously, in this chapter, we made mention of the fact that most of the individuals in the households that engage in subsistence farming responded in the negative to the question of whether they engage in regular exercise. To correct for this problem, we decided to adopt the assumption that the members of the households who engage in subsistence farming do engage in regular exercise. This assumption however would hold only for the members of these households that are between the ages of 12 and 65. It is expected that those within this age bracket are the active participants in farming. As previously stated, most of the households with average individual monthly expenditure of below ₦400 are subsistence farmers. Using this criterion, and the above defined age bracket, a total of 125 individuals fall into this category, out of which only 14 admitted to engaging in regular exercise. Based on our assumption, the remaining 111 individuals are now added to the proportion of the sample that engages in regular exercise. Of course, a few of the people within the described category may not be subsistence farmers, and some could be unemployed, however, given the researcher's knowledge of the area it is likely that almost all of those who fall within this category are subsistence farmers.

Statistics from data collected on Nsukka L.G.A. are similar to national figures for Nigeria. Thus our data gives a good representation of the characteristics of the people of Nigeria. In this connection, generalisation of the results of this study to the entire country can be done with an appreciable level of confidence.

The next chapter of this paper will describe the results of the models developed in the third chapter.

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CHAPTER 6

THE RESULTS

6.1 Introduction

In this chapter, we show and interpret the results of the models used to estimate health status in Nsukka L.G.A. The results presented in this chapter are from different types of models, though they all attempt to estimate health status. The reasons for the use of different model types and the development of the models have already been discussed in Chapter 3 of this study. Initially, we use all the variables specified in the Chapter 3, after which we restrict the model by removing those variables that measure government intervention. This is done to compare the results of our model with that of Wagstaff (1986). Finally, we attempt to identify the factors that influence the incidence of water-borne diseases in the area. Due to the large number of variables used, we present only a summary of the results of the models, the results of all the models are fully shown in Appendix B. The results presented here will include only the coefficients on the variables that are statistically significant at the 10% level. It would be important to familiarise the reader with the nature of some the dummy-variables used. Below, table 6.1 illustrates the two-outcome dummy variables and the values attached to each outcome.

Table 6.1 Dummy variables

Variable name	Variable	0	1
ELECTRIC	Whether the house is electrified	No	Yes
GENDER	Gender	Female	Male
SMOKER	Does individual smoke?	No	Yes
ALCOHOL	Does individual consume alcoholic drinks regularly	No	Yes
EXERCISE	Does individual engage in regular exercise	No	Yes
Urban	Place of residence	Rural	Urban

Other dummy variables used in the study have more than two outcomes, such as T_FAC, H_FAC, and source of water (drinking and non-drinking). For TOIL_FAC the outcomes are 'water cistern', 'pit latrine' and 'bush'. For H_FAC, the outcomes are 'hospital or clinic', 'chemist' and 'traditional healer'. Finally, the outcomes for sources of drinking and non-drinking water are 'piped water', 'borehole' and 'natural sources'. The software used for the estimation of the models (Stata 6.0) selects the base category for these four dummy variables.

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6.2 Selection of Variables

Remember that we had previously mentioned the possibility of the existence of multicollinearity in the model. A correlation matrix of all the independent variables was generated, and the following variables had coefficients greater than 0.5[5].

Table 6.2 Selected results of correlation matrix

Variables	Coefficient
ND_WATER and D_WATER	0.725
YRSED and AVG_EHL	0.512
AGE and AGESQ	0.953
TOIL_FAC and ELECTRIC	-0.554
URBAN and TOIL_FAC	-0.5301

It is not surprising that there exists a close linear relationship between the first two pairs of variables shown above. While the first pair depicts sources of water, the second pair comprises measures of educational levels. What is surprising though is that there appears to be no relationship between HHH_EDL (educational level of the household head) and the other measures of educational levels. We would want to be wary of the results we obtain from using HHH_EDL (i.e. its coefficients) in our model, and we never use HHH_EDL to proxy for the household's educational level. There also exists a close linear relationship between AGE and its squared form, type of toilet facility and whether the home is electrified, and lastly, the type of toilet facility and place of residence (urban or rural).

Because of the close linear relationship that exists between these pairs of variables, we drop one of each: ND_WATER, AGESQ, TOIL_FAC and YRSED. We drop ND_WATER because it measures about the same thing as D_WATER, though less important than the other, on the other hand, we drop YRSED because AVH_EDL (average household educational level) captures the effect of the educational levels of all members of the household in determining the health status of the individual. This is important where the individual is dependent on the decisions of other members of the household, e.g. infants. TOIL_FAC is dropped because it correlates with two other variables (ELECTRIC and URBAN), which hardly have any linear relationship between them. We lose less information by dropping only TOIL_FAC instead of dropping the other two variables. AGESQ is dropped because it was included to capture any non-linear relationship that may exist between age and health status.

[5] The correlation matrix is shown in Appendix B1.

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Since it is highly correlated with age, its inclusion may distort the relationship between age and 'health status'.

As previously mentioned, making use of average educational level of the household presents a problem as the educational attainment of younger members of the household depends on their age, also, the presence of young children in the household pulls down the average. To this effect, the 'average-education' variable may be represented in alternative ways to take into account of the effect of age on the educational attainment of the younger population. The alternative ways of using average years of education of the household are to restrict it to members of the household that are over a certain age, and can be argued to have completed formal education, or to use an index in adjusting the years of education of the younger population by age.

The problems with the use of these alternative measures in this study is that they presuppose the knowledge of the point from which age no longer has an effect on the educational level of the population. Given the high level of variation in age specific years of education in our data, this point cannot be easily identified. Secondly, the data being used does not specify whether the individuals were still going to school or had stopped/finished. Also, it would prove difficult in justifying the use of any index in adjusting for years of education by age over the use of any others that could generate dissimilar results.

Using the average years of education of the household without adjusting for age, however, will result in the reduction of the average educational levels of households with more young members relative to those with less of such members. Arguing in favour of this development, one might say that younger members of the household may not be as risk averse (with respect to health) in their behaviour as compared to the older members of the household, and hence their behaviour may have an impact on the health of the entire household, and that this in itself is captured by the reduction in average years of household education levels. This argument, though justifiable by intuitive reasoning, is yet to be tested (at least in the sample area used for the study). Moreover, this 'behaviour' is as a result of the age of the individual and thus should be captured by the age variable in the model and not by education. On the other hand, one could also argue that the behaviour of the children in the household is to an appreciable extent determined by the instructions of the older members of the household, and/or the parents of the children.

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To accommodate this problem, we use the average years of education for the members of the household above the age of 18 and then the 'age' variable used is constructed in such a way as it contains linear splines of the age variable. This basically means that the age variable contains a 'knot' at a specific age(s). To explain this, let us assume that age ranges between 0 and 100 years, if the age variable is constructed in splines with a knot at 50years, then the output shows two values for age. One, representing the effect of increases in age between 0 and 50 years on the dependent variable, and the other, the effect of increases in age from the ages of 50 to 100. We will apply this to our age variable with a 'knot' at the age of 18. The point (18) is not chosen arbitrarily, it is chosen because the age group 0 to 18 shows the highest correlation between age and individual years of education. To this effect (coefficient of correlation = 0.89), the impact of age on health status for those between the ages of 0 to 18 will be similar to the impact of their individual years of education on their health status.

Clearly, what this means is that first, the reduction effect of young children in the household on average years of education is minimised. Secondly, the age spline 0 –18 captures the effect of age-determined behaviour and age itself (for children within the age bracket) on health status. Coincidentally, the age 18 is usually associated with the turning point from childhood to adulthood, so if the argument that children are not as risk-averse in behaviour as adults, then this will be captured by the age spline 0 – 18. The choice of age '18' for restricting those included in calculating average years of education is based on the same reasons described above.

The basic representation of the models used is:

Health Status = f [HH_SIZE, AVMEXP, HEALTH_S, WAIT_T, AGE, HHH_ED, PPS_ROOM, GENDER, H_FAC, ELECTRIC, SMOKER, ALCOHOL, EXERCISE, WATER-SOURCE, RESIDENCE (urban/ rural), AVGEHL] ..... (6.1)

6.3 Results of Multinomial Logit Model 1: with monthly expenditure as a linear variable

The full results of the multinomial logit model are shown in Appendix B2. Table 6.3a – 6.3c summarises the results. The default comparison outcome is 'healthy', so the interpretation of the coefficients of variables for any other outcome is in terms of

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the odds of that outcome versus the outcome being 'healthy'. We start with the outcome 'mild' and proceed through to 'chronic'.

6.3.1 Outcome: 'Mild'

Table 6.3a Results for multinomial logit model 1 (Mild)

Variable name	Variable	Coefficient	Z - statistic	Significant at the 5% level
HHH_ED	Educational level of household head	0.007	3.562	Yes
HH_SIZE	Household size	-0.115	-1.688	No
AGESPLN1	Age (from 0 – 18)	-0.074	-2.165	Yes
AGESPLN2	Age (above 18)	0.022	2.044	Yes
GENDER	Gender	-0.507	-4.611	Yes
ALCOHOL	Regular consumption of alcoholic drinks	0.596	3.071	Yes
Wald chi2(2) = 1.14	Prob > chi2 = 0.5654	Pseudo R2 = 0.0511		

This first part of our result shows that a unitary increase in HHH_ED and age (for those above 18) including discrete movements (from 0 to 1) of ALCOHOL increases the chances of an individual (in Nsukka area) of having a mild illness versus being healthy. In other words, the individual is more likely to suffer a mild illness than be healthy given any of the above-described changes. Interestingly, while unitary changes in age for those above the age of 18 increases the chances that they suffer a mild illness, the reverse is the case for those below the age of 18. Based on the discussion earlier in the chapter, it is also likely that increases in education for those below the age of 18 will increase the chances that they are healthy rather than suffer a mild illness. An increase in household size increases the chances of being healthy versus suffering a mild illness. The coefficient for GENDER implies that status movement from female to male increases the chances of being healthy over the chances of suffering a mild illness. All these variables are significant at the 5% level except for HH_SIZE.

6.3.2 Outcome 'Injury'

None of the coefficients for the variables are statistically significant at the 5% or 10% level for this outcome. The outcome 'injury' may be a random outcome. It is not really an illness and is excluded from further discussion.

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6.3.3 Outcome 'Acute'

Table 6.3b Results for multinomial logit model 1 (Acute)

Variable name	Variable	Coefficient	Z - statistic	Significant at the 5% level
HHH_ED	Educational level of household head	0.003	4.648	Yes
HH_SIZE	Household size	-0.069	-1.41	No
AGESPLN2	Age (above 18)	0.0117	3.003	Yes
DUMHELT2	Dummy variable – chemist (base category–traditional medicine)	0.443	1.721	No
URBAN	Place of Residences	0.696	6.635	Yes
Wald chi2(2) = 1.14	Prob > chi2 = 0.5654	Pseudo R2 = 0.0511		

Table 6.3b above shows the results for the same model, but for the outcome 'acute'. The coefficients for HHH_ED and HH_SIZE have the same signs for outcome 'mild', and hence the same interpretations, of course with the comparison done between the outcomes of being healthy and suffering from an acute illness. Unitary increases in age (for those above 18 years) increase the chances of suffering from an acute illness over being healthy. Moving from the rural area to the urban area also increases the chances of suffering from an acute illness over being healthy. For the dummy variable DUMHELT2 (representing the sourcing of health care services from a chemist), it appears that those who choose to obtain health services from a chemist have higher chances of suffering from an acute illness as compared to being healthy than those who source health care from a traditional healer. This could also be as a result of reverse causality. The choice of health facility may not necessarily determine the incidence of an acute illness, but the choice of health facility may be as a result of being sick and other factors such as proximity of health facility and price differentials for treatment of the same illness across different health facilities.

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6.3.4 Outcome 'Chronic'

Below, table 6.3c shows the results of the last part of our model.

Table 6.3c Results for multinomial logit model 1 (Chronic)

Variable name	Variable	Coefficient	Z - statistic	Significant at the 5% level
HHH_ED	Educational level of household head	-0.029	-2.468	Yes
AGESPLN2	Age (above 18)	0.074	9.974	Yes
SMOKER	If individual is a smoker	0.524	1.886	No
PPS_ROOM	Number of people per sleeping room	-0.364	1.753	No
Wald chi2(2) = 1.14	Prob > chi2 = 0.5654	Pseudo R2 = 0.0511		

From the results, the coefficient for HHH_ED suggests that unitary increases in the level of education of the household head reduces the chances of the individual suffering form a chronic illness compared to the chance of being healthy. This has to be the case since as we observed earlier, the elderly are more prone to such diseases, and they are the same group that are the household heads. In effect, the more educated an elderly person is, the lower the chances of suffering from a chronic illness. The coefficient of age (those above 18) compliments our earlier observation that older people are more prone to chronic illnesses. Also, being a smoker increases the chances of suffering from a chronic illness over the chances of being healthy. The coefficient for PPS_ROOMS suggests that increases in the number of people per sleeping room increases the chances of an individual being healthy as compared to suffering from a chronic illness. This last result contradicts intuitive and theoretical expectations.

The last rows of Table 6.3a – 6.3c describe the goodness of fit of the model. The Wald chi^2 test evaluates the null hypothesis that all coefficients in the model, except the constant, equal zero. The probability of a chi^2 value greater than 1.14, with 2 degrees of freedom is 0.5654, so we accept the null hypothesis that all the independent variables in the model have an insignificant effect on the dependent variable – health status. The overall fitness of the model is poor. The pseudo R^2 statistic is used to compare the fit of different models for the same dependent variable, it lacks the straightforward explained-variance interpretation of true R^2 in OLS regression. Therefore, it becomes relevant only when we run additional models, with the same dependent variable[6].

In Wagstaff's model, wage was inputted into the model in its log form. We thus re-ran our model, but this time with the log of average monthly expenditure. The result of this second model is similar to that our first model (with average monthly expenditure as a linear variable). For outcome 'mild' the same variables as the previous model are significant, with the same signs except for HH_SIZE, which turned out to be insignificant at the 10% level. For outcome 'injury', DUMHELT1 (outcome: hospital/clinic – base category: traditional medicine) is positive and significant only at the 10% level. For outcomes 'acute' and 'chronic, the results are the same as our previous model. The output of the model is shown in Appendix B3.

[6] See Hamilton C. L. (1998) for detailed discussion.

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Since the results are very similar, we continue with the linear form of average monthly expenditure. Now we move on to the second set of models applied in the study – the logit models.

6.4 Results of the Logit Models; to determine health status

The logit model as we explained earlier is a binary response model. For our model, the two outcomes are 'healthy' and 'sick'. Outcome 'healthy' is '1' and outcome 'sick' is '0', so 'healthy' is taken as the 'success', while 'sick' - failure. This is an important point to note as the interpretation of the coefficients on variables depends on it. Those individuals who did not suffer any form of illness or injury (within the specified period) are categorised as 'healthy' while those who suffered any form of illness are classified as 'sick'. We run two logit models in this section: first, the model with all the variables selected for the model, as specified in equation 6.1, and then the model without variables that represent/measure government intervention (variables largely affected by individual and household choices). The idea is to run a model similar to that done by Wagstaff (1986) as previously stated, and then compare the results for the variables that the two models have in common. The variables that we consider to measure government intervention are ELECTRIC, source of health care, D_WATER, WAIT_TIM, and, HEALTH_S.

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6.4.1 Results of the logit model (1): With government intervention

In the next page are the results of the logit model with all the variables included in the multinomial logit model. The results are presented in much the same manner as the previous model.

Table 6.4a Results of the logit model (1): with government intervention

Variable name	**Variable**	**Coefficient**	**Z - statistic**	**Significant at the 5% level**
HHH_ED	Educational level of household head	-0.003	-5.224	Yes
HH_SIZE	Household size	0.061	1.688	No
AGESPLN1	Age of individual (below 18)	0.029	1.912	No
AGESPLN2	Age of individual (above 18)	-0.024	-3.847	Yes
URBAN	Place of Residences	-0.585	-5.190	Yes
Wald chi2 (2) = 1.79	Prob > chi2 = 0.8774	Pseudo R2 = 0.0335		

The coefficient for HH_SIZE suggests that increases in household size increases the chances of being healthy as compared to being sick. AGESPLN1 and AGESPLN2 are

both significant at the 10% level, however they have different signs. The results show that an increase in age for those below the age of 18 increases their chances of being healthy as compared to being sick, while the reverse is the case for those above the age of 18. The explanation for this is not far fetched. Theoretically, it is expected that as people grow older, they become more prone to suffering from illnesses as their bodies are getting weaker. On the other hand, as children get older – from infancy to adulthood -, it is expected that their bodies and immune system get stronger, and so they are less likely to be sick as their age increases. The coefficient for URBAN suggests that movement of residence from the rural to the urban area increases the chances of being sick as compared to being healthy. This may be because of the inherent comparative characteristics of most urban areas such as higher population density, lower levels of hygiene and higher levels of noise and air pollution. The results show that a unit increase in the educational level of the household head increases the chances of being sick rather than healthy. This is not in line with theoretical expectations; it is expected that increases in the educational levels of the household head would have a positive impact on the health status of the other household members.

This may be because there are only about two generations of educated people in the area. The household heads that are advanced in age are mostly either illiterate or have very few years of education, and their children's ages range from about 20 – 35 years. These children would have at least attained secondary education and some tertiary education. In this light, the years of education of the household head would not reflect the level of educational attainment in the household and hence will not capture effectively the effect of education (of the household heads) on the behaviour of other members of the household and hence their health status.

Like the previous model, the result of the Wald chi2 test implies ($Prob > chi^2 = 0.8774$) that we accept the null hypothesis that all coefficients in the model, except the constant, equal zero.

The rest of the variables and their signs are shown below in table 6.4b.

Table 6.4b Variables not significant at the 10% level, and their signs, for the Logit model (1): including government intervention.

Variable name	Variable	Signs
AVMEXP	Average monthly expenditure, per household member	+
PPS_ROOM	Number of persons per sleeping room	+
ELECTRIC	Whether the house is electrified	+

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GENDER	Gender	+
WAIT_T	Amount of time waited before attended to at health facility	+
HEALTH_S	Time it takes to get to this health facility	+
DWATDUM1	Source of drinking water: natural source (base category: borehole)	-
DWATDUM3	Source of drinking water: piped water (base category: borehole)	+
SMOKER	Whether the individual is a cigarette smoker	+
ALCOHOL	Whether the individual consumes alcohol regularly	+
EXERCISE	Whether the individual engages in regular exercise or sporting activity	-
AVGEHL	Average educational level of Household	+
DUMHELT1	Source of health care: hosp/clinic (base category: traditional medicine)	-
DUMHELT2	Source of health care: chemist (base category: traditional medicine)	-

Post-estimation analysis shows that 78.13% of the sample data was correctly classified (in terms of outcome) at the default threshold value of 0.5. None of the government-intervention variables are significant in any of these models.

6.4.2 Results of the logit model (2): Without government intervention

The result of the logit model without variables that measure government intervention is presented below.

Table 6.5a Results of the logit model (2): without government intervention

Variable name	**Variable**	**Coefficient**	**Z - statistic**	**Significant at the 5% level**
HHH_ED	Educational level of household head	-0.002	-6.647	Yes
HH_SIZE	Household size	0.064	1.831	No
AGESPLN1	Age of individual (below 18)	0.027	1.822	No
AGESPLN2	Age of individual (above 18)	-0.024	-3.822	Yes
URBAN		-0.573	-5.369	Yes
Wald chi2(2) = 120.56	Prob > chi2 = 0.0000	Pseudo R2 = 0.0302		

The same variables are significant at the 10% level as the previous output (with the same signs), although there is a very slight change in the values of the coefficients and the z-statistics. The probability of a chi^2 value greater than 120.56 with 2 degrees of freedom is less than 0.0001. This probability value is small enough to reject the null hypothesis that all the coefficients in the model, except the constant, equal zero. The overall goodness of fit of the model is very impressive.

Table 6.5b Variables not significant at the 10% level, and their signs for Logit model (2): without government intervention.

Variable name	**Variable**	**Signs**
AVMEXP	Average monthly expenditure, per household member	+
PPS_ROOM	Number of persons per sleeping room	+
GENDER	Gender	+

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SMOKER	Whether the individual is a cigarette smoker	-
ALCOHOL	Whether the individual consumes alcohol regularly	-
EXERCISE	Whether the individual engages in regular exercise or sporting activity	-
AVGEHL	Average household educational level	+

The signs are the same for these variables as in table 6.4a, except that now, the coefficients of the variable SMOKER and ALCOHOL are negative.

This model is done to compare the output with that of Wagstaff (1986). However, some of the variables used are not all the same, and some of those that measure the same phenomenon are not measured in the same way. Wagstaff's model includes variables, which measure the conditions of the work environment of each individual; this model does not. While our model measures household size, his model has three variables to represent family size according to age cohorts. Also, Wagstaff's model makes use of four variables to capture the effect of education on health status. Fig. 6.1 gives a complete description of the variables included in the Wagstaff model.

The output of Wagstaff's model is shown below in table 6.6.

Table 6.6 Result of Wagstaff's health model[7]

VARIABLES	**COEFFICIENTS**	***t* - values**	**Significant at 90% level (two-tail test)**
EDUCN	-0.049	3.47	Yes
EDUCN76	0.107	1.74	Yes
MEDICAL EDUCN	0.158	1.47	No
SPOUSE EDUCN	-0.009	1.10	No
SPOUSE MEDICAL EDUCN	-0.007	0.05	No
SEX	-0.112	1.43	No
AGE	-0.260	8.65	Yes
FAMSIZE1	0.096	1.67	Yes
FAMSIZE2	0.082	2.23	Yes
FAMSIZE3	-0.08	3.47	Yes
MARITAL STATUS	0.051	0.85	No
URBANISATION	-0.079	4.04	Yes
JOB TENURE	-0.001	0.21	No
PHYSICALLY DEMANDING	-0.041	2.64	Yes
MENTALLY DEMANDING	-0.124	8.16	Yes
HAZARDOUS SUBSTANCES	0.017	1.42	No
TEMPERATURE	-0.091	5.46	Yes
WAGE	0.004	1.87	Yes
INITIAL ASSETS	0.021	6.88	Yes
LIFE WAGE	0.001	3.76	Yes
Constant	0.052	0.21	No

[7] Data used for the model was from the 1976 Danish Welfare Survey. The data used was solely from the working age population.

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Fig. 6.1 Description on variables in the Wagstaff model

The definition of the variables used by Wagstaff are as follows:

- EDUCN no. years education (schooling plus training)
- EDUCN76 =1 if respondent received education and/or training in 1976
- MEDICAL EDUCN =1 if respondent's first or second job in health care sector
- SPOUSE EDUCN no. years education of spouse (schooling plus training)
- SPOUSE MEDICAL EDUCN =1 if spouse's first or second job in health care sector
- SEX =1 if male
- FAMSIZE1 no. family members younger than 6 years
- FAMSIZE2 no. family members aged between 6 and 15 inclusive
- FAMSIZE3 no. family members older than 15
- MARIEAL STATUS =1 if married/cohabiting
- URBANISATION score on urbanisation index ranging from 0 (respondent lives in country side) to 6 (respondents live in Copenhagen)
- JOB TENURE no. years with present employer
- PHYSICALLY DEMANDING work environment indicators
- HAZARDOUS SUBSTANCES "
- MENTALLY DEMANDING "
- TEMPERATURE "

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The variables that have some similarities between the two models (ours and Wagstaff's) are those that measure educational levels, sex, age, size of the family/household, and the economic/financial disposition of the household. The 'education' variables in the Wagstaff model have positive signs but only two are statistically significant at the 10% level. In our own model the signs are conflicting; while the coefficient on HHH_ED is significant and has a negative sign, the coefficient on AVGEHL has a positive sign, though it is not significant at the 10% level.

The coefficient on AGE for Wagstaff's model is negative and significant; this is also the case in our model for those above the age of 18. For those below the age of 18, the coefficient is positive (the data used by wagstaff contained only those of the working age population, so there are probably no observations below the age of 18). The coefficient on SEX/GENDER is significant and negative, while ours is insignificant and positive. FAMSIZE1 and FAMSIZE2 are significant with positive

signs; FAMSIZE3 is also significant, though it has a negative sign. The household size variable in our model is also significant with a positive sign. For the two models, moving from the rural areas to the urban areas has a negative effect on health status. The variables WAGE, INITIAL ASSETS, and LIFE WAGE in Wagstaff's model are all significant and have positive signs, while our proxy for income – 'average household expenditure' – though not significant at the 10% level, also has a positive sign.

In summary, the results of the two models have more similarities than differences. Both results suggest that increase in age, movement from rural to urban residence are likely to have negative impacts on health status. Increase in wages, income, assets affects the health status positively; and more educated people are likely to enjoy better health. The results of Wagstaff's model suggest that females are healthier than males; in our model we cannot make a statement about which gender group is healthier than the other, since the coefficient on GENDER is insignificant.

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6.5 Results of the Multinomial Logit Model (2): to determine the factors that influence the incidence of water-borne diseases

In this section, we present the results of the final model in this study. There are three outcomes in this model: 'healthy', 'sick from waterborne disease' and 'sick from any other type of disease'. Some sicknesses, though not the classical water borne disease like typhoid fever and cholera, will be included in this category as their incidence usually results from poor water supply and poor sanitation. A few examples are scabies, boils, sores and worm infections[8].

The comparison outcome is 'healthy'; the outcome representing those who suffered diseases that are waterborne is labelled 'sick_wat', while the label for the group that suffered any other type of disease/illness is labelled 'other'. In the sample data, only 84 individuals fall into the category 'sick_wat', which is just 11% of the total number of individuals who had suffered from some kind of illness or the other. We present only the result of outcome "sick_wat", since it is the relevant result for this part of the study. The full output can be seen in Appendix B7. Table 6.5c shows the result for outcome 'sick_wat', which denotes the outcome: 'those who suffered from waterborne diseases'.

[8] See appendix C for a list of all diseases/illnesses included in this category.

Table 6.5c Results of the multinomial logit model (2): outcome 'sick_wat'

Variable name	Variable	Coefficient	Z - statistic	Significant at the 5% level
DWATDUM1	Dummy variable – natural source (base category – borehole)	1.194	2.821	Yes
DUMHELT1	Dummy variable – hosp/clinic (base category – chemist)	0.688	3.593	Yes
ALCOHOL	Whether individual consumes alcoholic drinks regularly	-0.950	-2.170	Yes
EXERCISE	Whether individual engages in regular exercise	0.581	1.856	No
Wald chi2(2) = 5.16	Prob > chi2 = 0.2714	Pseudo R2 = 0.0410		

The results of outcome 'sick_wat' are very different from other outputs. Most of the variables that are significant were insignificant in the other models. From the above table, those who source their drinking water from natural sources such as streams, and rainwater are more likely to suffer from a water borne disease rather than be healthy as compared to those who source their drinking water from a borehole. Also from the result, those who source health care from the chemists are more likely to be healthy than suffer from a waterborne disease as compared to those who source health care from the hospital or clinic. This does not seem reasonable, as we would expect those who source healthcare from the clinics or hospitals not only get treatment for their ailments, but also receive professional advice/education on health issues. This would increases their stock of health education and subsequently encourage a more 'sickness-prevention-oriented' behaviour in the individual. May be the route of causality is the other way around. It could be that water-borne diseases are more serious diseases, and so those who suffer from them prefer to go to the hospitals /clinics for treatment, rather than to the chemist.

Surprisingly, the result suggests that those who consume alcoholic drinks regularly are more likely to be healthy than suffer from a waterborne disease than those who do not consume alcoholic drinks regularly. Those who engage in regular exercise are also more likely to suffer from a water-borne disease than those who do not. The signs of most of the coefficients that are significant for output 'sick_wat' are not at all what we expected, these results go against both theoretical and intuitive reasoning. This may be because of the relatively small proportion of the group that have suffered any form of illness that those who have suffered water-borne diseases. In this light we tested the hypothesis that the group 'other' and the group 'sick_wat' were indistinguishable. The result showed that the groups are distinguishable, and that any difference between them was also statistically significant at the 1% level.

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With Prob > chi^2 = 0.2714, we accept the null hypothesis that all coefficients in the model, except the constant, equal zero. Like most of the models, the overall goodness of fit of the model is poor.

6.6 Summary and Concluding Remarks

The goodness of fit of all the general models presented (models explaining health status in particular) is poor except for the logit model (2): without government intervention. This does not mean that we should ignore the results of the other models, however, we would give more credence to the results of the logit model (2). The variables that are statistically significant at the 10% level for the logit model (2) are significant in the other models, and are consistent in their signs. Other variables that showed up as being statistically significant in any of the other models are not consistently significant in other models. It is thus clear that these are the variables that have the most influence in determining the health status of individuals residing in Nsukka town. These variables are:

- The educational level of the household head. This variable has a negative sign, which suggests that an increase in the educational level of the household head has a negative effect on the health status of the household members.
- The size of the household. This variable has a positive sign, which suggests that an increase in the household size improves the health status of the members of the household.
- The age of the individual. The sign on this variable is positive for those between the ages of 0 and 18, and negative for those above the age of 18. This means that while increases in age has a positive effect on the health status of an individual who is below 19 years of age, the reverse is the case for those who are above the age of 18.
- The place of residence of the individual (urban or rural). The sign for this variable is negative, so those who live in urban areas are generally sicker than rural dwellers.

Hence, recommendations to the Nigerian Ministry of Health as regards the most efficient and effective means of improving the health status of the Nigerian population will be based on these factors. However, as previously noted, educational level of the household head does not correlate with any of the other 'education' variables, and so

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is not used to proxy for the educational level of the household. Also, the signs on the coefficient for HHH_ED in most of the models go contrary to theoretical expectations. From the reviewed literature, there is general consensus that education has a positive effect on health status. However, the sign for the variable for the first multinomial logit model suggests that an increase in the educational level of the household head increases the chances of being healthy as compared to suffering from a chronic illness. This can be explained by the fact that the elderly in the population are the ones who are more prone to this type of illness, and they are also the ones who are the household heads. An increase in their level of education should reduce their chances of suffering from a chronic disease.

Also, the coefficients on household size suggest that an increase in household size has a positive effect on the health status of individuals within the household. This also is also contrary to expectations. The researcher has no plausible explanation for this. The literature reviewed in this study say nothing about the relationship that may exist between household size and health status, but one would expect that increases in household size will have the effect or reducing available resources (such as money, food and sleeping rooms) per individual in the household. Since reductions in these resources are deemed to affect health negatively, it is expected that increases in household size should have a negative effect on the health status of the household members. Subsequently, the results for these two variables are ignored, and hence are not used in informing our policy recommendations.

In most international literature and empirical studies, an increase in age has a negative effect on health status. Grossman (1986) suggests that each individual is born with an initial stock of health, which declines with time. This is the general consensus regarding the relationship between age and health status. However, our results show that health status actually improves with increases in age for children below the age of 19, and then declines with increase in age for the other members of the population. This realisation is as a result of the way the age variable was structured. If the age variable was structured as a linear variable without splines, we would probably arrive at the general consensus held by most authors in the subject.

It is not surprising that urban dwellers are less healthy than rural dwellers because the urban areas in Nigeria are characterised by a higher population density, lower level of hygiene, inferior drainage, and absence of excreta disposal facilities (Bradley, et al, 1992) as already mentioned in the literature review. The study carried

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out by Wagstaff (1986) also arrived at the same conclusion though the study was carried out in a country that is much more developed.

For the results of the multinomial logit model 2 (to determine the factors that influence the incidence of water borne diseases), the result shows that provision of potable water has a positive effect on health status as regards water-borne diseases. The signs of the other variables, which are significant at the 10% level, are contrary to theoretical expectations. The provision of safe water by the government will be included as one of the factors that would inform our recommendations to the Nigerian Ministry of Health.

In the advanced stage of this study, the researcher found out that the use of a three-month recall period is too long, and may have caused recall bias (most likely the under-reporting of illnesses/injuries because the respondents could not accurately remember whether they had suffered any illness or injury within the specified period), which is a potential cause of the counter-intuitive findings listed above. There is a growing consensus that shorter recall periods (of one week to a maximum of two weeks) will produce the most reliable data on reported acute illness (McIntyre and Gilson, 2000).

In the next chapter, we review the current and future policy thrust of the Nigerian health ministry. The idea will be to compare the results of our model with these policy statements, with a view to discern whether the policy thrusts are in line with the findings of this research paper. The chapter will end with recommendations to the Ministry of Health and all its arms on the most effective and efficient path towards improving the health status of the Nigerian population.

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CHAPTER 7

REVIEW OF NIGERIAN HEALTH POLICY AND RECOMMENDATIONS

7.1 Review of the Nigerian Health policy thrust

As already mentioned, there are three tiers of health services in Nigeria. The Primary, which is closest to the people, is constitutionally the responsibility of the local government. The secondary health services, which care for patients whose problems cannot be solved at the primary level are delivered in general or district hospitals under the supervision of state governments. Tertiary health services are the most sophisticated and costly for the government and patients alike. They deal with the most difficult cases referred from the secondary health care system, treating them in teaching hospitals supervised by the Federal Ministry of Health.

Primary health care has been the main avenue via which the ministry of health has attempted to effect improvements in the health status of the people. Several policies and programmes on primary health care have been tried over the years in this regard. According to Prof. Olikoye Ransome-Kuti (former Minister of Health, Nigeria):

"*The challenge at the primary level is to establish a health care system that will touch the lives of every citizen and tackle the conditions causing the highest mortality and morbidity. The system must be organised at the grass-roots level and woven into the fabric of the community through the process of community participation. It must integrate preventive, promotive, and curative services, using technology the community will accept and can afford, and it must have an efficient and effective system of supervision and referral.*" (Ransome-Kuti, 1990)

The first attempt to put a primary health care service in place was in the 1975. The aims of the scheme were to "increase the proportion of the population receiving health care from 25 to 60 per cent, correct the imbalances in the location and distribution of health institutions and between preventive and curative medicine, provide the infrastructure for all preventive health programmes such as control of communicable diseases, family health, environmental health, nutrition and others, and establish a health care system best adapted to the local conditions and to the level of health technology." (Ransome-Kuti, 1990)

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The main policy thrust of this health policy was the provision of health care facilities, equipment and personnel. It was thought that provision of health services would make the most positive impact on the health status of the people. This was the main policy thrust of Ministry of Health until 1986, when it was realised that provision of health facilities alone did not effectively improve the health status of the people, it needed at least a functionally educated community with a reasonable standard of nutrition, a potable water supply, and good communications systems. Most of the time, the diseases being treated resulted from conditions in the community and so could have been prevented. The Nigerian Government thus realised that it was not productive to spend millions of Naira maintaining large hospitals filled with patients with preventable diseases.

Since then, the Ministry of Health has worked hand-in-hand with the relevant ministries/directorates in the provision of roads, education, potable water and better communications systems. The main policy thrust thus broadened to incorporate all these, and at the same time emphasis was placed on the training of medical/health personnel to work in the provided facilities. Specific programmes have also been initiated to combat the incidence of some diseases such as HIV/AIDS, Guinea worm etc., but discussions on these programmes are beyond the scope of this paper.

Presently, the national health policy regards primary health care as the framework to achieve improved health for the population. Primary health care services include health education; adequate nutrition; safe water and sanitation; reproductive health, including family planning; immunisation against five major infectious diseases; provision of essential drugs; and disease control. The policy document requires that a comprehensive health care system delivered through the primary health centres should include maternal and child health care, including family planning services. The current priorities in the health sector are in the area of childhood immunisation and prevention of HIV/AIDS (NDHS, 2000).

Annual redefinition and or adjustment of health programmes by the Ministry of health depend on information gathered from hospitals and clinics (private and public) across the country. Annually, each hospital/clinic in every local government area have to relay information on the number of sick people they treated in that year, and the nature of the illness these people had. The health authorities in these local government areas in turn relay the information to their respective state government authorities. Then the state authority relays the information to the federal authority. This provides

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the Federal Ministry of health with information about geographical areas and illnesses that are of priority in shaping health policies for the next year. Decisions regarding health policies and programmes are made at the federal level[9].

7.2 Policy Considerations of The Results of Estimated Models

Form the results of our models; it is clear that a few factors have significant impact in the determination of an individual's health status. We discuss each of these factors in turn. From the results of the estimated models, age is one of the factors that determine the health status of an individual. For children between the ages of 0-18 years (inclusive) increases in age has a positive impact on their health, while the reverse is the case for those older than 18 years. This means that health policy should focus more on very young children and infants, and the elderly. These are the age groups that are more prone to illnesses; therefore policies directed specifically at improving their health status would have a positive and significant impact on the general health status of the Nigerian population. Because of the close relationship between education and age for those between the ages of 0-18 years, it is likely that education also has a strong, positive influence on the health status of children within this age bracket.

It also appears that those who live in the rural areas are healthier than those who live in the urban areas. This is a signal for policy makers involved in the allocation of human and material resources across geographical areas. Surprisingly, none of the variables that measure government intervention was significant in our models. This does not mean that government interventions do not have an effect on the health status of the people. A plausible explanation for the insignificance of the variables measuring government intervention is that the infrastructure put in place by the government may be non-discriminatory (uniformly distributed) across geographic areas, so, the entire population has equal access and use of these infrastructures. In this light, there is no real variability in access and utilisation of these infrastructures; hence government interventions appear to have an insignificant effect on health status of the people. Apparently, the health status of individuals in the location is more

[9] Information on how the Federal Ministry of Health gathers information was gathered by interviewing key health officials in Nsukka L.G.A.

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dependent on their individual and collective decisions/behaviours than the health policies adopted by the government. What this means is that the government's policies to improve health status should be targeted at changing the behaviour of people, and not just targeted at provision of structural infrastructure.

From the last model (to determine the factors that influence the incidence of water-borne diseases) it is clear that the provision of potable and water by the government can help in the reduction of water-borne diseases. From our data approximately 11% of sick people suffered from a water-borne disease.

In summary, none of the factors directly affected by government policies have any significant effect on the health status of the people. Increase in age is not a matter of choice, and so does not fall into the category of household or individual choices. The other variables that have a significant effect on health status (place of residence and education for the younger members of the population) are as a result of household choices.

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7.3 Recommendations

Currently, the general policy thrust of the Nigerian health sector covers a wide range of health issues, though the areas of priority are in HIV/AIDS prevention and childhood immunisation. The general policy thrust covers the key issues that may be raised from the results of our models (though indirectly for some). However, the purpose of this study as stated earlier, is to identify those factors have the most influence on health status of the people, and subsequently point out the key issues that have to be addressed in order to have the most impact on the health status of the people. So, while these issues may be addressed by the general health policy thrust, the objective here is to show that they should be given more priority than they received in the past.

Childhood immunisation (as a health policy priority) is in line with the findings of this study. From our study children are likely to be healthier as they age from 0 to 18 years. Childhood immunisation is targeted at the younger section of this age group, who, from our results are the least healthy. Immunisation boosts the immune system of these children and leaves them less prone to specific diseases.

However, there is no specific policy in place targeted at the older members of the population. Just as the Ministry of Health collects information on the diseases suffered by infants and young children for purposes of immunisation, they should also

collect information on the diseases that older members of the population usually suffer from. Clearly, aging is a continuous process that cannot be reversed, and as people get older their bodies and immune systems get weaker. Therefore, there is no policy that the government can implement to stop aging. However, if some of the diseases that affect the older members of the population are as a result of the type of lifestyle they engaged in at earlier stages of their lives such as excessive drinking, smoking etc, then the government can influence the behaviour of younger members of the population by informing them of the effect of living such a lifestyle. Such awareness can be achieved by including these findings in the health education taught in primary and secondary schools, and through the radios and television. Of course, the course of action taken depends on the nature of the illnesses these people suffer from. From our data, there are so many diseases that old people suffer from, and none of them are particularly outstanding as the major illnesses that affect old people.

Another issue arising from this study that should be a priority area for the health sector is the living conditions in the urban areas. As previously mentioned this is because of the characteristics of the urban areas in Nigeria. The urban areas are densely populated and hence are over-populated; subsequently the housing conditions are poor. Also, there is a much higher level of noise and air pollution in the urban areas caused by the higher number of vehicles and industrial establishments. In addition, the amount of waste material generated in the urban areas is much higher, and this exacerbates the pollution problem. In this light, the Ministry of health must work hand in hand with the relevant ministries to ensure that the cars that are allowed to ply the roads are road-worthy to reduce the emission of fumes. Policies must be put in place to control the emission of toxic gases by industrial establishments. The government must be strict in terms of housing patterns within the urban areas with a view to improve on the living conditions of the people. There must be some demarcation separating residential from industrial areas, and that residential houses have adequate spacing between them. Finally, the government must renew its effort to ensure proper disposition of waste in urban areas. This recommendation is very pertinent because the Federal Ministry of Health currently focuses on the improvement of the living conditions in the rural areas, which goes contrary to the results of this study. The focus on the provision of basic infrastructure in the rural areas is understandable because most of the rural areas lack them, but based on the results of our investigation the provision of infrastructure in the rural areas should be

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done together with the improvement and the rehabilitation of the existing facilities in the urban areas.

The government must also encourage the enrolment of children for primary and secondary education. Our analysis suggests that education has a positive influence on the health status of younger members of the population[10]. The data used for this study shows that only 49% of 11year olds have completed primary education, and only 52% of 18year olds have completed secondary education. Also, health education should be a compulsory subject at all levels of primary and secondary education. This will increase the awareness of health issues amongst the young and hence cause them to behave in a more risk-averse manner. The Nigerian government has always had policies in place to encourage the enrolment of young children in schools. In 1976, the National Policy on Universal Primary Education was adopted to give every child the right to free primary education. In October 1999, Universal Basic Education (UBE) was launched, making it compulsory for every child to be educated free up to the junior secondary level in an effort to meet the nation's manpower requirement for national development. From the statistics of our data these policies appear not to have been very effective. Approximately 25% of the 12 year olds in our sample data have not received any formal education. Therefore, the government must find alternative or additional means to encourage the enrolment of children into secondary and primary schools.

Finally, the government should increase its effort in the provision of potable water to the population. Clearly this will greatly reduce the incidence of water borne diseases. The provision of potable water should be of primary concern to the health sector and must be included as a priority objective. From our data up to 15% of the sample still depend on natural sources for drinking water. The researcher has not been able to identify specifically, the government's policies as regards the provision of potable water to those who do not have them.

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7.4 Conclusion

The current priorities of the Nigerian health sector are in line with the results of the study. However, the results of our study points out that there are certain areas of

[10] We had made mention (page 52) that years of education for children below the age of 19 is highly correlated with their age, and so the impact of individual years of education on health status for this age group will be similar to the impact age on health status.

concern that the government have to include as priority health issues if it is to succeed in the effective and efficient improvement of the health status of the population. These areas are: the provision of potable water, encouragement of primary and secondary school enrolment amongst children, and the improvement of the living environment in the urban areas. It should be noted also that enrolment of children into primary education is as a result of a combination of household/individual choices, and government policies.

The fact that none of the variables representing government intervention were insignificant does not mean that the provision of basic infrastructure does not affect the health status of the population. The last model developed in the study, which tried to determine the factors, which influence the incidence of water-borne diseases showed that government intervention does in fact affect health status. Thus, it may be better to study the effect of specific policies on particular health outcomes in order to capture the effect of any policy on the health status of the people.

The researcher has an appreciable level of confidence in the data used for the study and also in the results of the analysis. However, there are certain issues that may compromise the accuracy and validity of the results of this study. First, the results of this investigation were based on data from a local government area, and not the entire country, and so one would be cautious about using them to make a generalised statement about Nigeria. Secondly, they are some other factors, which may have significant effects on health status of individuals that were not included in the study because of their nature. For example, the conditions of the work environment could not be included in the study because that would have restricted the analysis to the working age population. The study was structured to give a representation of all members of the population, irrespective of their age. Thirdly, the dependent variable (health status) was measured as a categorical variable with a finite number of outcomes. Measuring health status in another way, say, as a continuous variable may produce dissimilar results.

Nonetheless, the study does provide a systematic framework for the determination of those factors that have the most influence on the health status of the people of Nigeria. The study thus provides a basis for future inquiries on this subject, for policy information.

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APPENDIX A

The survey Instrument

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Determinants of Health in Nigeria: A Case Study of Nsukka L.G.A, Enugu State. (Survey instrument)

Name of Interviewer .....

Questionnaire number ..... Cluster number .....

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Please tick the appropriate option where required.

1. How many people live in your household? .....
2. On average, how much is the monthly expenditure of your household? .....
3. How many rooms are used for sleeping in your household? .....
4. What type of toilet facility is used in your household? | Water cistern | | Pit Latrine | | Bush |

   If other please specify | |
5. Where do you go to seek health care if any member of your household is sick? Say malaria | Hospital | | Clinic | | Chemist |

   If other please specify | |
6. How much time does it take to get to this source of health care? .....
7. When you get there, do you have to wait before you get attended to? .....

8. If yes, how much time do you usually spend waiting? .....

9. What is the main source of drinking water for your household? Piped water in residence | Public tap | Borehole

If other please specify

10. What is the main source of non-drinking water for your household? Piped water in residence | Public tap | Borehole

If other please specify

11. Do you own a telephone? .....

12. Do you own a television set? .....

13. Do you own a Radio? .....

14. Is your house of residence electrified? .....

15. How old are you? .....

16. What sex are you? .....

17. Do you smoke? .....

18. Do you consume alcoholic drinks regularly? .....

19. Do you engage regularly in any form of exercise or sporting activity? .....

20. What is the highest formal education level you have attained? .....

21. Have you been sick or injured in the last 3 months? ..... Injured

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22. If yes, what was the nature of the illness? .....

23. Please rate your current health status as either 'good' or 'bad'. .....

Now, I would like to ask you some questions about the other members of your household.

15.b	**16.b**	**17.b**	**18.b**	**19.b**	**20.b**	**21.b**	**22.b**	**23.b**
What are the ages of the other members of your household	Is the member male or female?	Does member smoke?	Does member consume alcoholic drinks regularly?	Does member engage regularly in any form of exercise or sporting activity?	What is the highest level of schooling attained by member?	Has member been sick or injured in the last 3 months?	If yes, what was the nature of the illness?	Please rate the current health status of member as either 'bad' or 'good'

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APPENDIX B

B1 Correlation Matrix of Independent Variables

	hh_size	avmexp	health_s	wait_tim	age	hhh_ed	pps_room
hh_size	1.0000						
avmexp	-0.1540	1.0000					
health_s	0.0494	-0.0010	1.0000				
wait_tim	0.0393	0.1578	0.3058	1.0000			
age	-0.1132	0.0307	-0.0491	-0.0361	1.0000		
hhh_ed	-0.0804	0.1095	-0.0222	0.0096	-0.0358	1.0000	
pps_room	0.2684	-0.1360	0.0527	0.0614	-0.1594	-0.0493	1.0000
gender	0.0074	0.0190	-0.0145	-0.0428	0.0507	0.0294	-0.0529
electric	0.0304	0.1449	-0.1902	0.0073	-0.0156	0.0637	0.0235
smoker	-0.0243	-0.0341	-0.0804	-0.1086	0.0895	0.0255	-0.1063
alcohol	-0.0396	0.0322	0.0270	-0.0431	0.2962	-0.0062	-0.1712
exercise	0.0428	0.0879	0.0277	-0.0635	-0.0997	0.0410	-0.1986
d_water	0.0389	0.1584	0.1637	0.0920	-0.0487	0.0768	0.0079
nd_water	0.0080	0.1642	0.0326	0.0586	-0.0482	0.0714	0.0340
h_fac	-0.0879	-0.1417	-0.0510	-0.2187	0.0421	0.0017	0.0133
toil_fac	-0.0318	-0.3052	0.1902	0.0287	0.0145	-0.1427	0.0651
d_water	0.0389	0.1584	0.1637	0.0920	-0.0487	0.0768	0.0079
nd_water	0.0080	0.1642	0.0326	0.0586	-0.0482	0.0714	0.0340
urban	-0.0589	0.2958	-0.2108	0.0455	-0.0507	0.1097	0.0260
agesq	-0.1006	0.0309	-0.0251	-0.0104	0.9525	-0.0370	-0.1226
avgehl	0.0242	0.2640	-0.2777	-0.0861	-0.0304	0.3035	-0.1367
yrsed	-0.0054	0.1606	-0.1794	-0.0849	0.2752	0.1282	-0.1680

	gender	electric	smoker	alcohol	exercise	d_water	nd_water
gender	1.0000						
electric	-0.0051	1.0000					
smoker	0.2325	-0.0159	1.0000				
alcohol	0.3391	-0.0906	0.4105	1.0000			
exercise	0.1382	-0.0278	0.1617	0.2213	1.0000		
d_water	-0.0025	0.0293	0.0098	-0.0110	0.0929	1.0000	
nd_water	-0.0176	0.1093	0.0018	-0.0686	-0.0058	0.7249	1.0000
h_fac	0.0148	-0.4337	0.0400	0.0832	0.0065	-0.1303	-0.1568
toil_fac	-0.0123	-0.5541	-0.0155	0.0780	-0.0612	-0.2131	-0.2776
d_water	-0.0025	0.0293	0.0098	-0.0110	0.0929	1.0000	0.7249
nd_water	-0.0176	0.1093	0.0018	-0.0686	-0.0058	0.7249	1.0000
urban	0.0067	0.3161	-0.0412	-0.1244	-0.0761	0.1216	0.2367
agesq	0.0733	-0.0189	0.0383	0.2207	-0.1636	-0.0415	-0.0435
avgehl	0.0439	0.4356	0.0821	-0.0356	0.1543	0.1124	0.1527
yrsed	0.0780	0.2336	0.1958	0.1912	0.2372	0.0474	0.0711

	h_fac	toil_fac	d_water	nd_water	urban	agesq	avgehl
h_fac	1.0000						
toil_fac	0.4823	1.0000					
d_water	-0.1303	-0.2131	1.0000				
nd_water	-0.1568	-0.2776	0.7249	1.0000			
urban	-0.1798	-0.5301	0.1216	0.2367	1.0000		
agesq	0.0279	0.0150	-0.0415	-0.0435	-0.0553	1.0000	
avgehl	-0.3352	-0.5736	0.1124	0.1527	0.4012	-0.0628	1.0000
yrsed	-0.1401	-0.3067	0.0474	0.0711	0.1913	0.0990	0.5120

	yrsed
yrsed	1.0000

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B2 Multinomial Logit Model 1 (with average monthly expenditure as a linear variable.

Multinomial regression — Number of obs = 3576
Wald chi2(2) = 1.14
Prob > chi2 = 0.5654
Log likelihood = -2405.5057 — Pseudo R2 = 0.0511

(standard errors adjusted for clustering on clustnum)

h_status	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
mild						
hh_size	-.1145451	.0678496	-1.688	0.091	-.2475278	.0184376
avmexp	-.0001428	.0000935	-1.528	0.127	-.0003261	.0000404
health_s	-.0055163	.0086329	-0.639	0.523	-.0224364	.0114039
wait_tim	-.0083906	.0061879	-1.356	0.175	-.0205188	.0037376
agespln1	-.0735419	.0339642	-2.165	0.030	-.1401105	-.0069732
agespln2	.0215007	.0105198	2.044	0.041	.0008823	.042119
hhh_ed	.00678	.0019032	3.562	0.000	.0030498	.0105101
pps_room	.1108862	.0836015	1.326	0.185	-.0529697	.274742
gender	-.5074309	.110047	-4.611	0.000	-.7231192	-.2917427
dumhelt1	.6833045	1.189492	0.574	0.566	-1.648057	3.014666
dumhelt2	.7529936	1.053505	0.715	0.475	-1.311838	2.817825
electric	.1824989	.5155953	0.354	0.723	-.8280494	1.193047
smoker	.0319259	.3283326	0.097	0.923	-.6115941	.6754459
alcohol	.5955027	.1939367	3.071	0.002	.2153938	.9756116
exercise	.1553748	.2634295	0.590	0.555	-.3609375	.6716871
dwatdum1	.0494051	.2815668	0.175	0.861	-.5024556	.6012659
dwatdum3	-.0607256	.2037126	-0.298	0.766	-.4599951	.3385438
urban	.3259598	.2874627	1.134	0.257	-.2374567	.8893763
avgehl	.0023387	.0247631	0.094	0.925	-.046196	.0508734
_cons	-2.612894	1.088119	-2.401	0.016	-4.745568	-.4802206
injury						
hh_size	-.0699345	.0747264	-0.936	0.349	-.2163956	.0765267
avmexp	-.0000331	.0000762	-0.434	0.664	-.0001825	.0001163
health_s	-.0116816	.0137457	-0.850	0.395	-.0386227	.0152595
wait_tim	-.0073563	.0066844	-1.101	0.271	-.0204574	.0057448
agespln1	-.003943	.0512327	-0.077	0.939	-.1043573	.0964713
agespln2	.0065044	.0139966	0.465	0.642	-.0209284	.0339371
hhh_ed	-.0286344	.0650274	-0.440	0.660	-.1560857	.0988169
pps_room	-.1382568	.1810576	-0.764	0.445	-.4931231	.2166096
gender	.0194069	.1834292	0.106	0.916	-.3401078	.3789215
dumhelt1	.9909159	1.234313	0.803	0.422	-1.428293	3.410124
dumhelt2	.4972207	1.01252	0.491	0.623	-1.487282	2.481724
electric	-.4198049	.3225608	-1.301	0.193	-1.052013	.2124027
smoker	.1587131	.65312	0.243	0.808	-1.121379	1.438805
alcohol	.3059128	.4678526	0.654	0.513	-.6110613	1.222887
exercise	.194076	.3774553	0.514	0.607	-.5457227	.9338748
dwatdum1	.181928	.6047424	0.301	0.764	-1.003345	1.367201
dwatdum3	.1661806	.764074	0.217	0.828	-1.331377	1.663738
urban	.2204081	.3285878	0.671	0.502	-.423612	.8644283
avgehl	.0145582	.0937628	0.155	0.877	-.1692136	.1983299
_cons	-3.642669	1.04213	-3.495	0.000	-5.685206	-1.600132
acute						
hh_size	-.0691588	.0397223	-1.741	0.082	-.147013	.0086954
avmexp	-.0000141	.00002	-0.703	0.482	-.0000533	.0000252
health_s	-.0026826	.0031072	-0.863	0.388	-.0087727	.0034074
wait_tim	.0012496	.0022954	0.544	0.586	-.0032493	.0057485
agespln1	-.0232703	.0143254	-1.624	0.104	-.0513477	.004807
agespln2	.0166536	.0055457	3.003	0.003	.0057842	.027523
hhh_ed	.0030349	.000653	4.648	0.000	.0017551	.0043147
pps_room	-.0805342	.0694536	-1.160	0.246	-.2166608	.0555924
gender	-.0314071	.1374445	-0.229	0.819	-.3007933	.2379792
dumhelt1	.4184952	.2748579	1.523	0.128	-.1202164	.9572068
dumhelt2	.4426416	.2571803	1.721	0.085	-.0614225	.9467057
electric	-.1163299	.1847623	-0.630	0.529	-.4784574	.2457976
smoker	-.1332213	.2578177	-0.517	0.605	-.6385347	.372092
alcohol	.0322946	.1312725	0.246	0.806	-.2249947	.2895839
exercise	.1096548	.1755533	0.625	0.532	-.2344234	.4537329
dwatdum1	.2821695	.2955428	0.955	0.340	-.2970838	.8614229
dwatdum3	-.0563355	.3322632	-0.170	0.865	-.7075594	.5948884

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urban	.6958822	.1048841	6.635	0.000	.4903131	.9014513
avgehl	-.0241267	.0219507	-1.099	0.272	-.0671494	.0188959
_cons	-1.092754	.2572252	-4.248	0.000	-1.596906	-.5886014
chronic						
hh_size	.0338498	.0301057	1.124	0.261	-.0251563	.0928559
avmexp	.0000139	.0000453	0.307	0.759	-.0000749	.0001027
health_s	.0051765	.003666	1.412	0.158	-.0020087	.0123616
wait_tim	.0002714	.0050423	0.054	0.957	-.0096114	.0101542
agespln1	.0904065	.0812343	1.113	0.266	-.0688098	.2496228
agespln2	.0737056	.00739	9.974	0.000	.0592215	.0881896
hhh_ed	-.0287187	.0116349	-2.468	0.014	-.0515228	-.0059147
pps_room	-.3640874	.2077207	-1.753	0.080	-.7712125	.0430377
gender	-.3336735	.2471195	-1.350	0.177	-.8180189	.1506718
dumhelt1	-.5695819	.395842	-1.439	0.150	-1.345418	.2062541
dumhelt2	-.5726216	.7279121	-0.787	0.431	-1.999303	.8540599
electric	-.3036209	.4428867	-0.686	0.493	-1.171663	.5644211
smoker	.5241287	.2779304	1.886	0.059	-.0206048	1.068862
alcohol	-.3073503	.2962681	-1.037	0.300	-.888025	.2733245
exercise	.3514088	.5029001	0.699	0.485	-.6342574	1.337075
dwatdum1	-.3451118	.5666281	-0.609	0.542	-1.455682	.7654589
dwatdum3	-.4221019	.4065509	-1.038	0.299	-1.218927	.3747232
urban	.2394867	.3134275	0.764	0.445	-.3748198	.8537932
avgehl	.0447339	.0284527	1.572	0.116	-.0110324	.1005002
_cons	-5.476262	.755645	-7.247	0.000	-6.957299	-3.995225

(Outcome h_status==healthy is the comparison group)

B3 Multinomial Logit Model 1b: With Log Form of Monthly Expenditure.

Multinomial regression — Number of obs = 3576
Wald chi2(2) = 1.40
Prob > chi2 = 0.4961
Log likelihood = -2406.375 — Pseudo R2 = 0.0508

(standard errors adjusted for clustering on clustnum)

h_status	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
mild						
hh_size	-.1051009	.0642664	-1.635	0.102	-.2310608	.0208589
lnexp	-.1267344	.1775123	-0.714	0.475	-.474652	.2211833
health_s	-.0057514	.0088303	-0.651	0.515	-.0230585	.0115557
wait_tim	-.0091316	.0065918	-1.385	0.166	-.0220514	.0037882
agespln1	-.0734133	.032896	-2.232	0.026	-.1378882	-.0089384
agespln2	.0210866	.0104132	2.025	0.043	.0006771	.041496
hhh_ed	.0068517	.0019259	3.558	0.000	.003077	.0106264
pps_room	.1192313	.082323	1.448	0.148	-.0421187	.2805814
gender	-.5043349	.110302	-4.572	0.000	-.7205229	-.2881469
dumhelt1	-.0758284	.4517099	-0.168	0.867	-.9611636	.8095068
dumhelt3	-.7661524	1.060958	-0.722	0.470	-2.845593	1.313288
electric	.1900597	.4972598	0.382	0.702	-.7845516	1.164671
smoker	.0683667	.3321606	0.206	0.837	-.5826562	.7193895
alcohol	.5751715	.1863861	3.086	0.002	.2098614	.9404817
exercise	.1427929	.268753	0.531	0.595	-.3839532	.6695391
dwatdum2	-.0257771	.2780709	-0.093	0.926	-.570786	.5192317
dwatdum3	-.1205076	.3335553	-0.361	0.718	-.774264	.5332489
urban	.2545692	.3318342	0.767	0.443	-.3958139	.9049523
avgehl	-.0013975	.025159	-0.056	0.956	-.0507082	.0479132
_cons	-1.137292	1.45505	-0.782	0.434	-3.989139	1.714554
injury						
hh_size	-.0618278	.0728336	-0.849	0.396	-.204579	.0809234
lnexp	.1233593	.2225574	0.554	0.579	-.3128452	.5595639
health_s	-.0121915	.0140717	-0.866	0.386	-.0397716	.0153885
wait_tim	-.0085582	.0076841	-1.114	0.265	-.0236188	.0065024
agespln1	-.0019228	.0488307	-0.039	0.969	-.0976292	.0937836
agespln2	.0056833	.0137435	0.414	0.679	-.0212534	.03262
hhh_ed	-.0306912	.0615934	-0.498	0.618	-.151412	.0900296
pps_room	-.1244468	.1762066	-0.706	0.480	-.4698053	.2209117

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gender	.0274342	.1841307	0.149	0.882	-.3334554	.3883239
dumhelt1	.4742676	.2600285	1.824	0.068	-.0353789	.9839142
dumhelt3	-.5900926	1.055616	-0.559	0.576	-2.659063	1.478878
electric	-.4452667	.310012	-1.436	0.151	-1.052879	.1623457
smoker	.1899685	.655066	0.290	0.772	-1.093937	1.473874
alcohol	.2812432	.4697304	0.599	0.549	-.6394114	1.201898
exercise	.1578448	.3646711	0.433	0.665	-.5568974	.872587
dwatdum2	-.183956	.5876249	-0.313	0.754	-1.33568	.9677677
dwatdum3	-.0419073	.7285677	-0.058	0.954	-1.469874	1.386059
urban	.133402	.3457796	0.386	0.700	-.5443135	.8111175
avgehl	.0103931	.0918128	0.113	0.910	-.1695568	.1903429
_cons	-3.822109	1.380006	-2.770	0.006	-6.526871	-1.117347
acute						
hh_size	-.0666029	.0379977	-1.753	0.080	-.141077	.0078711
lnexp	.0254307	.1022332	0.249	0.804	-.1749427	.2258042
health_s	-.0027189	.0031021	-0.876	0.381	-.0087989	.0033611
wait_tim	.0010526	.002167	0.486	0.627	-.0031946	.0052999
agespln1	-.0228735	.0143878	-1.590	0.112	-.051073	.0053259
agespln2	.0164534	.0054723	3.007	0.003	.0057278	.0271789
hhh_ed	.003025	.0006058	4.994	0.000	.0018377	.0042123
pps_room	-.0764648	.0722966	-1.058	0.290	-.2181635	.065234
gender	-.0299059	.1379779	-0.217	0.828	-.3003376	.2405258
dumhelt1	-.0308154	.1211175	-0.254	0.799	-.2682012	.2065705
dumhelt3	-.4688076	.2669598	-1.756	0.079	-.9920392	.054424
electric	-.1230673	.1665678	-0.739	0.460	-.4495341	.2033996
smoker	-.1230094	.2614442	-0.470	0.638	-.6354305	.3894118
alcohol	.0244852	.1323397	0.185	0.853	-.2348959	.2838662
exercise	.0991882	.1782931	0.556	0.578	-.2502598	.4486363
dwatdum2	-.2777321	.2953859	-0.940	0.347	-.8566778	.3012136
dwatdum3	-.3455859	.2730864	-1.265	0.206	-.8808254	.1896535
urban	.67408	.1069318	6.304	0.000	.4644976	.8836624
avgehl	-.0261296	.0235153	-1.111	0.266	-.0722188	.0199596
_cons	-.5540927	.8479403	-0.653	0.513	-2.216025	1.10784
chronic						
hh_size	.0353179	.0297249	1.188	0.235	-.0229419	.0935777
lnexp	.1412411	.2141796	0.659	0.510	-.2785433	.5610254
health_s	.0052706	.0037733	1.397	0.162	-.0021249	.0126661
wait_tim	-.000199	.0052341	-0.038	0.970	-.0104577	.0100596
agespln1	.0924542	.0831396	1.112	0.266	-.0704964	.2554048
agespln2	.0730065	.0076844	9.501	0.000	.0579453	.0880677
hhh_ed	-.0303272	.0109294	-2.775	0.006	-.0517484	-.0089061
pps_room	-.358583	.2026861	-1.769	0.077	-.7558404	.0386744
gender	-.3214006	.2556213	-1.257	0.209	-.8224091	.1796079
dumhelt1	-.0242761	.3983677	-0.061	0.951	-.8050625	.7565104
dumhelt3	.5045445	.7027082	0.718	0.473	-.8727382	1.881827
electric	-.317196	.43785	-0.724	0.469	-1.175366	.5409742
smoker	.5234567	.2737379	1.912	0.056	-.0130598	1.059973
alcohol	-.3183966	.3079466	-1.034	0.301	-.9219608	.2851676
exercise	.3146883	.5453691	0.577	0.564	-.7542155	1.383592
dwatdum2	.3419702	.5634353	0.607	0.544	-.7623427	1.446283
dwatdum3	-.0925474	.4484994	-0.206	0.837	-.9715901	.7864952
urban	.195879	.3347915	0.585	0.558	-.4603003	.8520583
avgehl	.0436772	.0286539	1.524	0.127	-.0124834	.0998378
_cons	-7.330486	1.874573	-3.910	0.000	-11.00458	-3.65639

(Outcome h_status==healthy is the comparison group)

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B4 Logit Model 1: with government intervention.

```
Logit estimates                                   Number of obs   =       3576
                                                  Wald chi2(5)    =       1.79
                                                  Prob > chi2     =     0.8774
Log likelihood = -1812.8557                       Pseudo R2       =     0.0335

                          (standard errors adjusted for clustering on clustnum)
------------------------------------------------------------------------------
             |               Robust
bh_statu |      Coef.   Std. Err.       z     P>|z|       [95% Conf. Interval]
-------------+----------------------------------------------------------------
 hh_size |   .0614742   .0364165      1.688   0.091      -.0099008    .1328491
  avmexp |   .0000226   .0000196      1.152   0.249      -.0000158     .000061
health_s |   .0028959   .0026824      1.080   0.280      -.0023615    .0081533
wait_tim |   .0001483   .0020252      0.073   0.942      -.0038209    .0041176
agespln1 |   .0285397   .0149288      1.912   0.056      -.0007201    .0577995
agespln2 |  -.0240437   .0062501     -3.847   0.000      -.0362937   -.0117938
  hhh_ed |  -.0028918   .0005536     -5.224   0.000      -.0039768   -.0018067
pps_room |   .0798669   .0779883      1.024   0.306      -.0729874    .2327212
  gender |   .0866292   .1056572      0.820   0.412      -.1204552    .2937135
dumhelt1 |  -.2828521   .2044719     -1.383   0.167      -.6836096    .1179055
dumhelt2 |  -.2884144    .199879     -1.443   0.149      -.6801701    .1033413
electric |   .1122501   .1748139      0.642   0.521      -.2303788     .454879
  smoker |   .0035419   .2138997      0.017   0.987      -.4156938    .4227776
 alcohol |  -.0528879   .1253242     -0.422   0.673      -.2985189    .1927431
exercise |  -.1351561   .1958071     -0.690   0.490       -.518931    .2486187
dwatdum1 |  -.2057802   .2681048     -0.768   0.443       -.731256    .3196957
dwatdum3 |   .0709908   .3080435      0.230   0.818      -.5327633     .674745
   urban |  -.5852164   .1127673     -5.190   0.000      -.8062362   -.3641966
  avgehl |   .0183314   .0186152      0.985   0.325      -.0181537    .0548165
   _cons |   .6634165   .2496424      2.657   0.008       .1741264    1.152707
------------------------------------------------------------------------------
```

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B5

Logistic model for bh_statu

```
             -------- True --------
Classified |         D             ~D          Total
-----------+--------------------------+-----------
     +     |      2789            773  |        3562
     -     |        10              8  |          18
-----------+--------------------------+-----------
   Total   |      2799            781  |        3580

Classified + if predicted Pr(D) >= .5
True D defined as bh_statu ~= 0
--------------------------------------------------
Sensitivity                     Pr( +| D)   99.64%
Specificity                     Pr( -|~D)    1.02%
Positive predictive value       Pr( D| +)   78.30%
Negative predictive value       Pr(~D| -)   44.44%
--------------------------------------------------
False + rate for true ~D        Pr( +|~D)   98.98%
False - rate for true D         Pr( -| D)    0.36%
False + rate for classified +   Pr(~D| +)   21.70%
False - rate for classified -   Pr( D| -)   55.56%
--------------------------------------------------
Correctly classified                        78.13%
--------------------------------------------------
```

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B6 Logit Model (2): Without government Intervention.

```
Logit estimates                                   Number of obs   =       3576
                                                  Wald chi2(5)    =     120.56
                                                  Prob > chi2     =     0.0000
Log likelihood = -1819.0215                       Pseudo R2       =     0.0302

                          (standard errors adjusted for clustering on clustnum)
------------------------------------------------------------------------------
             |               Robust
bh_statu |      Coef.   Std. Err.       z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     hh_size |   .0644964   .0352194     1.831   0.067    -.0045323    .1335251
       avmexp |    .000032    .000021     1.528   0.126    -9.05e-06    .0000731
    agespln1 |   .0256431   .0140772     1.822   0.069    -.0019477    .0532338
    agespln2 |  -.0237645   .0062174    -3.822   0.000    -.0359505   -.0115786
      hhh_ed |  -.0022003    .000331    -6.647   0.000    -.0028491   -.0015515
    pps_room |   .0798726   .0714952     1.117   0.264    -.0602554    .2200005
      gender |   .0740186    .105128     0.704   0.481    -.1320285    .2800657
      smoker |  -.0179038   .1969954    -0.091   0.928    -.4040077        .3682
     alcohol |  -.0371118   .1276022    -0.291   0.771    -.2872074    .2129838
    exercise |   -.085962   .2156009    -0.399   0.690     -.508532     .336608
       urban |  -.5730822   .1067459    -5.369   0.000    -.7823004   -.3638641
      avgehl |   .0200573   .0134481     1.491   0.136    -.0063005    .0464151
       _cons |   .5104507   .2519459     2.026   0.043     .0166458    1.004256
------------------------------------------------------------------------------
```

B7 Multinomial Logit Model (2): to determine the factors that influence the incidence of water-borne diseases

```
Multinomial regression                            Number of obs   =       3576
                                                  Wald chi2(4)    =       5.16
                                                  Prob > chi2     =     0.2714
Log likelihood = -2056.4628                       Pseudo R2       =     0.0410

                          (standard errors adjusted for clustering on clustnum)
------------------------------------------------------------------------------
             |               Robust
w_health |      Coef.   Std. Err.       z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
other        |
     hh_size |  -.0614862   .0337207    -1.823   0.068    -.1275777    .0046052
       avmexp |  -.0000255   .0000217    -1.171   0.242    -.0000681    .0000172
    health_s |  -.0032491   .0027155    -1.196   0.232    -.0085715    .0020732
    wait_tim |   .0001205   .0019742     0.061   0.951    -.0037488    .0039898
      hhh_ed |   .0031362   .0005617     5.583   0.000     .0020353    .0042371
    pps_room |  -.0651911   .0802277    -0.813   0.416    -.2224345    .0920522
      gender |  -.1140019   .0877939    -1.299   0.194    -.2860747    .0580709
    electric |  -.0854756   .1616503    -0.529   0.597    -.4023045    .2313533
      smoker |  -.0563477   .2412958    -0.234   0.815    -.5292788    .4165834
     alcohol |   .1643418   .1492862     1.101   0.271    -.1282539    .4569375
    exercise |   .0834847   .2078441     0.402   0.688    -.3238823    .4908517
    dumhelt1 |   .2311313   .2193517     1.054   0.292    -.1987902    .6610527
    dumhelt2 |   .3073524   .2191988     1.402   0.161    -.1222694    .7369742
       urban |   .6638779   .1287395     5.157   0.000     .4115532    .9162026
    dwatdum1 |   .0657508   .2670004     0.246   0.805    -.4575603     .589062
    dwatdum3 |  -.0937145   .3023138    -0.310   0.757    -.6862387    .4988097
    agespln1 |  -.0371632   .0137398    -2.705   0.007    -.0640927   -.0102338
    agespln2 |   .0259861    .006351     4.092   0.000     .0135383    .0384339
      avgehl |  -.0171823   .0176844    -0.972   0.331    -.0518431    .0174785
       _cons |  -.6873702   .2375676    -2.893   0.004    -1.152994   -.2217462
-------------+----------------------------------------------------------------
sick_wat     |
     hh_size |   -.067292   .0671313    -1.002   0.316     -.198867    .0642829
       avmexp |   6.36e-06    .000034     0.187   0.852    -.0000603     .000073
    health_s |    .000344   .0047369     0.073   0.942    -.0089401    .0096282
    wait_tim |  -.003552   .0034709    -1.023   0.306    -.0103547    .0032508
      hhh_ed |  -.0011241   .0035913    -0.313   0.754    -.0081629    .0059148
    pps_room |  -.1925835   .1408992    -1.367   0.172    -.4687409    .0835738
      gender |   .1544894   .3388217     0.456   0.648     -.509589    .8185678
    electric |    -.32593   .2656994    -1.227   0.220    -.8466914    .1948313
      smoker |   .5420353    .447641     1.211   0.226    -.3353249    1.419395
```

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```
 alcohol |  -.9503726   .4379363    -2.170   0.030    -1.808712   -.0920332
exercise |   .5806819   .3127879     1.856   0.063    -.0323712    1.193735
dumhelt1 |   .6876368   .1914011     3.593   0.000     .3124974    1.062776
dumhelt2 |   .1179088   .3202763     0.368   0.713    -.5098211    .7456388
   urban |    -.18907   .1839369    -1.028   0.304    -.5495796    .1714396
dwatdum1 |   1.193647   .4230934     2.821   0.005     .3643991    2.022895
dwatdum3 |   .1917472    .398657     0.481   0.631    -.5896061    .9731005
agespln1 |    .049645   .0440901     1.126   0.260      -.03677     .13606
agespln2 |   .0097649   .0125183     0.780   0.435    -.0147706    .0343003
  avgeh1 |  -.0272319   .0507629    -0.536   0.592    -.1267254    .0722615
   _cons |  -3.985503   .6945297    -5.738   0.000    -5.346756   -2.624249
------------------------------------------------------------------------------
(Outcome w_health==healthy is the comparison group)

.
```

B8

```
. test  [sick_wat = other]

 ( 1) - [other]hh_size + [sick_wat]hh_size = 0.0
 ( 2) - [other]avmexp + [sick_wat]avmexp = 0.0
 ( 3) - [other]health_s + [sick_wat]health_s = 0.0
 ( 4) - [other]wait_tim + [sick_wat]wait_tim = 0.0
 ( 5) - [other]hhh_ed + [sick_wat]hhh_ed = 0.0
 ( 6) - [other]pps_room + [sick_wat]pps_room = 0.0
 ( 7) - [other]gender + [sick_wat]gender = 0.0
 ( 8) - [other]electric + [sick_wat]electric = 0.0
 ( 9) - [other]smoker + [sick_wat]smoker = 0.0
 (10) - [other]alcohol + [sick_wat]alcohol = 0.0
 (11) - [other]exercise + [sick_wat]exercise = 0.0
 (12) - [other]dumhelt1 + [sick_wat]dumhelt1 = 0.0
 (13) - [other]dumhelt2 + [sick_wat]dumhelt2 = 0.0
 (14) - [other]urban + [sick_wat]urban = 0.0
 (15) - [other]dwatdum1 + [sick_wat]dwatdum1 = 0.0
 (16) - [other]dwatdum3 + [sick_wat]dwatdum3 = 0.0
 (17) - [other]agespln1 + [sick_wat]agespln1 = 0.0
 (18) - [other]agespln2 + [sick_wat]agespln2 = 0.0
 (19) - [other]avgeh1 + [sick_wat]avgeh1 = 0.0
       Constraint 1 dropped
       Constraint 2 dropped
       Constraint 3 dropped
       Constraint 4 dropped
       Constraint 5 dropped
       Constraint 6 dropped
       Constraint 8 dropped
       Constraint 11 dropped
       Constraint 14 dropped
       Constraint 16 dropped
       Constraint 17 dropped
       Constraint 18 dropped
       Constraint 19 dropped

           chi2(  6) =  404.86
         Prob > chi2 =    0.0000
```

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APPENDIX C

C1 List of Illnesses suffered by the People of Nsukka L.G.A.

Mild	Acute	Chronic
Catarrh	Malaria	Problem with central nervous system
Headache	Aches and Pains	Arthritis
Boil	Typhoid fever	Hypertension
Toothache	Stomach pains/infection	Sickle cell
Cough	Worm infection	Rheumatism
Scabies	Flu/cold	Heart pains
Sore Throat	Bruises (due to allergy)	Diabetes
	Migraine	Stroke
	Pneumonia	Anaemia
	Fever	Brain Tumour
	Hernia	Kidney problem
	Vomiting	Impotency
	Diarrhoea	Insomnia
	Ulcer	Spleen problem
	Chicken pox	Asthma
	High blood pressure	Hepatitis
	Eye problem	
	Pile	
	Food poisoning	
	Sleeplessness	
	Chest pains	
	Convulsion	
	Appendicitis	
	Hookworm infection	
	Meningitis	
	Abscess	
	Measles	
	Cholera	
	Rashes	
	Tonsillitis	
	Haemorrhoid	
	Dyspepsia	
	Dysentery	
	Fibroid	

C2 Diseases Included as Water-Borne Diseases

Boil, Scabies, Typhoid fever, Worm Infection, Diarrhoea, Food poisoning, Cholera, Dysentery and Hepatitis A.

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REFERENCES

African Development Indicators, 1998/99. World Bank.

Berhman J. R. (1993), Health and Economics: theory, evidence and policy, in: World Health Organisation, *Macroeconomic Environment*, Geneva: World Health Organisation.

Blaxter, M. (1989) A comparison of measures of inequality in morbidity, in *Health Inequalities in European Countries* (ed. A. J. Fox), Gower, Aldershot.

Blaxter M (1990) Health and Lifestyles, London, Routeledge.

Bradley, David John, and others. (1992). *A Review of Environmental Health Impacts in Developing Country Cities*. Urban Management Program, Paper 6. World Bank, Washington, D.C.

Braveman P., *Monitoring Equity in Health: A Policy-oriented approach in Low and Middle Income countries*, 1998.

Brinkman, Uwe, and Brinkman, A. (1991). "Malaria and Health in Africa: The present situation and Epidemiological Trends". Tropical Medicine and Parasitology 42(3)204-13.

British Medical Association (1987) Deprivation and Health, London, BMA Board of Science and Education.

Carr-Hill, R. (1987) The inequalities in Health debate: A critical review of the issues. *J. Soc. Policy*, **16**, 4, 509-42

Cumper G. E. (1980) Resource Requirement for Achieving Health for all by the year 2000. Paper presented to seminar on Costs and Financing Patterns of Primary Health Care. World Health Organisation, Geneva.

Davey Smith G., Bartley M., and Blane D. (1990) " The Black Report on socio-economic inequalities in health ten years on", *British Medical Journal*, **301**, 373-375.

Ehrenreich B. and English D. (1976) *Complaints and Disorders: The sexual politics of Sickness*, London, Writers and Readers Publishing Cooperative.

Esrey,S. A., J. B. Potash, L. Roberts, and C. Schiff. (1991). "Effects of Improved Water Supply and Sanitation (Excreta Disposal) on Ascaris, Diarrhoea, Dracunculosis, Hookworm, Schistosomiasis and Trachoma." *Bulletin of the World Health Organisation* 69(5):602-21.

Fox, A. J. (ed.) (1989) Health Inequalities in European Countries, Gower, Aldershot.

Gilson L, McIntyre D (2000). Experiences from South Africa: dealing with a poor health legacy of apartheid. In: Whitehead M, Evans T, Diderichsen F. and Bhuiya A.

University of Cape Town

(eds). *Challenging Inequalities in Health*: From ethics to action. New York: Oxford University Press.

Goldblatt, P. (1990) *Longitudinal Study: Mortality and Social Organisation* 1971-81 England and Wales, OPCS Series LS No 8. London, HMSO.

Grossman, M. (1972) On the concept of health capital and the demand for health, *Journal of Political Economy*, 80, pp. 223-255.

Hamilton C. L. (1998) Statistics with Stata 5. Duxbury press, London.

Illsley R. and Svensseon P. –G. (eds) (1990) Social inequalities in health. *Soc. Sci. Med.* 31, 223-240.

Kunst, A. E., Mackenbach, J. P., *Measuring Socio-economic Inequalities in He*alth. A discussion paper for WHO/EURO, EUR/ICP/RPD 416, 1994.

Long J. S., (1997) Regression Models for Categorical and Limited Dependent Variables. Thousand Oaks: Sage Publishers, California.

Lozano R, Zurita B, Franco F, Ramirez T, Torres J. L., Hernandez P. (2000). Health Inequalities in Mexico: A country level analysis 1990-1996. In: Whitehead M, Evans T, Diderichsen F. and Bhuiya A. (eds). *Challenging Inequalities in Health*: From ethics to action. New York: Oxford University Press.

Marmot G. Michael, Kogevinas Manolis, and Mary Ann Eliston. "Social Class and Epidemiology" In: Health Promotion Research. Edited by Bernhard Badura and Ilona Kickbusch. WHO Regional Publications, Europe Series; No 37, Copenhagen, 1991.

Mielk A. and Rosario Giraldez M. (eds) (1993) Inequalities in Health and Healthcare. Review of selected publications from 18 Western European Countries. Waxmann, Munster/New York.

Naidoo J. and Wills J. (1994) Health Promotion: Foundations for Practice. Baillere Tindall, London.

Netherlands Central Bureau of Statistics (1988) *Netherlands Health Interview survey 1981-1985*. SDU, The Hague

Nigerian Demographic and Health Survey (NDHS) 1999. National Population Commission. Abuja, Nigeria. December, 2000.

Pearce T. and Falola T. (1994) Child Health in Nigeria, Aldershot: Avebury.

Phillimore P., Beattie A., and Townsend P. (1994) "Widening inequality of health in northern England", *British Medical Journal*, **308**, 1125-1128.

Power, C., Manor, O., Fox, J. (1991) Health and Class: The Early Years. Chapman and Hall, London.

University of Cape Town

Ransome-Kuti, O. (1990) Achieving Health for all by the Year 2000; In: Midway Reports of Country Experiences. Edited by E. Tarimo and A. Creese. Division of Strengthening of Health Services, WHO. Geneva, Switzerland.

"Social Indicators of Development." Baltimore and London: The John Hopkins University Press, various years.

Townsend P. and Davidson N. (1982) Inequalities in Health: the Black Report, London, Penguin.

Townsend P., Phillimore P., and Beattie A. (1988) *Health and Deprivation: Inequalities and the North*, London, Routledge.

UNICEF (1992). *Africa's Children, Africa's Future*. New York.

Verhasselt Y., Pyle G. Introduction (To Studies on Health Inequalities in Developing Countries) Social Science and Medicine 361 (10) 1239-1241, 1993.

Wagstaff, A. (1986) The demand for health: theory and applications. *Journal of Epidemiology and Community Health*, 40, 1-11.

Wagstaff A. (1986) The Demand for Health: Some New Empirical Evidence. Journal of Health Economics 5 (1986) 195-233. Elsevier Science Publishers B. V. North-Holland.

Whitehead M. (1988) The Health Divide, London, Health Education Council.

Whitehead M. (1989) The health divide. In Inequalities in Health, eds P. Townsend, N. Davidson and M. Whitehead. Penguin Books, London.

Whitehead M. (1990) *The Concepts and Principles of Equity and Health.* World Health Organisation, Copenhagen.

Wilkinson R. G. (ed.) (1986) Class and Health: Research and Longitudinal Data, London, Tavistock.

WHO (1991). "The Relationship of HIV/AIDS and Tuberculosis in the African Region." Plenary presentation during the WHO/GPA/NACP manager's meeting. Saly Mbour, Senegal.

WHO, *Equity in Health and Healthcare*: a WHO/SIDA Initiative, WHO/ARA/96.1

World Bank (1994) Better Health In Africa: Experience and Lessons Learned. The International Bank for Reconstruction and Development/The World Bank.

"World Development Report: Investing in Health." New York: Oxford University Press, June 1993.

World Health Organisation (1990) *Targets for Health for All.* WHO Regional Office for Europe, Copenhagen.

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