University of Alberta

Social Class Differences and Malaria in Ghana

by

Kwame Annor Boadu

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A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

Demography

Department of Sociology

Edmonton, Alberta

Fall 2002

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P. O. Box 1458
Mamprobi - Accra
GHANA

Date: June 24, 2002

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled *Social Class Differences and Malaria in Ghana* submitted by Kwame Annor Boadu in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Demography.

Frank Trovato
Dr. F. Trovato
Co-Supervisor

Susan A. McDaniel
Dr. S. McDaniel
Co-Supervisor

L. Laing
Dr. L. Laing

Walter Kipp
Dr. W. Kipp

Dr. A. Kaler

B. KuateDefo
Dr. B. Kuate Defo
University of Montreal

Date: June 24, 2002

Dedicated to Abena, Ama and Adwoa

Abstract

This study posits that disease patterns in Ghana are conditioned by the whole complex of sociodemographic factors consisting of demographic, economic, social, cultural, political and environmental. These factors are manifested in differential opportunities that generate social inequalities and delineate the population into different social groups. As a result, the socio-economic circumstances of each group determine their health conditions. On the strength of above argument, this study examines the relationship between social class differences and the prevalence of malaria in Ghana. Data utilized is obtained from the 1997 Core Welfare Indicators Questionnaire (CWIQ) Survey, a study conducted by the Ghana Statistical Service in collaboration with the World Bank. In all, 14,514 household heads were successfully interviewed, out of which 9,162 were rural household heads and 5,352 urban household heads.

The research method employed involves the construction of a composite index of social class from six indicators namely, education, dwelling ownership, heads of cattle, modern household items, main source of cooking fuel and type of toilet facility. Some of these factors not only affect exposure to the risk of malaria, but they also are indicators of social class or socioeconomic status. Social class, therefore, represents the main predictor variable in the investigation, and is examined together with marital status and personal hygiene. The prevalence rate of malaria is the dependent variable while sex, age and ecological zone are employed as controls. The focus on malaria stems from the pervasive influence of the disease as the leading cause of morbidity and mortality in Ghana, and its linkage to socioeconomic and environmental conditions.

Bivariate analysis is first performed to establish the correlation among the selected indicators. Thereafter, the principal component analysis method was employed to determine the proportion of variance. The generated factor loadings in the component matrix are used as weights representing the proportional contribution of each indicator to the index. The cumulative frequency rule is then applied to obtain three identifiable groups in the sample population; lower class, middle class and upper class. Finally, multivariate logistic regression is executed to examine the influence of social class on malaria, while controlling for all other variables. The results indicate that social class has no direct influence on the prevalence of malaria in Ghana but rather, its effect is mediated by marital status. This outcome suggests that regardless of class position, marital status represents a powerful influence in the transmission of malaria in Ghana.

AKNOWLEDGEMENTS

This dissertation would not have been possible without the untiring support and guidance of my co-supervisors, Dr. Frank Trovato and Dr. Susan McDaniel who pushed me to the edge reminding me every time that they expected nothing short of "an excellent piece of work" from me. I owe them a debt of gratitude for the wealth of knowledge that I gained from them as a result. Also, the invaluable comments of Dr. Lory Laing and Dr. P. Krishnan were exceptionally helpful in the production of this work and I am deeply appreciative of that. I also acknowledge the critical comments of Dr. Russell Wilkins (Statistics Canada) and the expert direction and assistance provided to me by Professor Kwodwo Asenso-Okyere (University of Ghana). Their inputs not only enhanced my understanding of the problem that I was investigating, but sharpened the focus of my inquiry. I remain very grateful to them. Last but not least, I am deeply grateful to the many nice people in the Department of Sociology who helped me in diverse ways throughout my program of studies right from the beginning of my Master's to the end of my Ph.D. You are such a wonderful group of people.

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CHAPTER ONE

INTRODUCTION

Background and Statement of the Problem

Social class is a powerful determinant of a multitude of factors that affect health status: access to resources, such as medical care and adequate housing; the nature of the physical and urban environment; and individual resources, such as income and education, that lead to differential opportunities. It can also be argued that social class is the primary determinant of exposure to adverse factors; however, the mechanisms by which class might influence health conditions varies across different cultures and populations as a whole. Therefore, this study intends to investigate the relationship between social class differences and the prevalence of malaria in Ghana. The thesis focuses on malaria because it is the leading cause of morbidity and mortality in Ghana. In addition, the fact that the transmission mode of the disease is linked to socioeconomic and environmental conditions. On this basis, the central hypothesis examined is this: people belonging to the upper class are less likely to have malaria than people belonging to the lower class.

As Hertzman et al (1994) point out, human populations display marked diversity in their patterns of health and disease. The diversity, according to these authors, is not simply a consequence of the trivial observation that "every individual is different" because individual variations can be cancelled out by aggregation, but there exist significant differences between entire populations, or among subgroups of the same population. And these differences in health - life expectancy, for example, or functional capacity, injury rates, or prevalence of particular illnesses - can be correlated with other distinguishing characteristics of those populations or subgroups.

Of particular interest is that there are ways of partitioning populations that consistently define subgroups differing greatly and systematically in their average health status, and mortality in general. The authors note, for instance, that large gradients in life expectancy by income level, educational attainment, social class, ethnic background, place of residence, etc have been repeatedly discovered in populations during the twentieth century. The association between lower social class status and adverse physical and mental health (Hollingshead and Redlich, 1958; Dohrenwend and Dohrenwend, 1969) has been reported in the United States (Haan et al., 1987; Williams, 1990; King and Williams, 1992), in Great Britain (Marmot et al., 1991 1987, 1984; Marmot and Theorell, 1988; Car-Hill, 1989) and in Scandinavia (Vagero and Lundberg, 1989; Vagero, 1991). Inversely, higher socioeconomic status is consistently associated with longer life. But there obviously are many characteristics that when used as a basis for partitioning a population also yield groups differing markedly in their aggregate health status. These yield aggregate measures of health status between or among population groups that appear to be consistently associated with some defining characteristics of those groups.

For example, it is noted that socioeconomic factors, broadly defined, have a major effect not only on the relative health status of groups within a population, but on the health status of "the same" population at different points in time. This is not to say that medical care is ineffective, if available. Rather, it demonstrates the extraordinarily powerful effects, from a long-term perspective, of factors external to the health care system. For populations over time, as for population groups at a point in time, these "other factors" do not reflect simply the presence or absence of poverty and deprivation. They point to the profound linkage between health status and the social environment, including the levels and distribution of prosperity in a society, as well as other sociodemographic factors.

Unfortunately, not much information is available by way of developing country studies that would match exactly those that have been conducted in developed countries. However, there are studies that have covered whole regions and groups of countries configured along the lines of economic development (Bourgeois-Pichat, 1983; Chidambaran et al., 1985) to much of the entire world (Preston, 1975), including some developing countries. In the course of such analyses, a wide variety of morbidity patterns and mortality measures has been found to be associated with many demographic, economic and social variables as already noted. Prominent among these have been measures of the size, growth rate, distribution, and structural composition of income (DaVanzo et al., 1985; Dyson, 1984; Tekce and Shorter, 1984; Flegg, 1983); measures of the level and changes in the level of educational attainment (Hobcraft et al., 1984; Ware, 1984); and measures in the level of health and health care expenditures (Pendleton and Yang, 1985). Other variables that have been studied include occupation of the labour force and urban-rural residence (Arriaga and Hobbs, 1982; Clifford and Brannon, 1985; Millard, 1985) and fertility levels/birth order, which are especially pertinent to infant and childhood, as well as maternal mortality (Hobcraft et al., 1983; Benoit et al., 1984a, b; Cleland, 1985; Gille, 1985).

In a careful investigation of this question, the United Nations (1982) concluded that for the 24 developing countries that could supply reasonably reliable mortality information in the 1950s, 1960s and 1970s, the average gain in life expectancy was .57 years per calendar year between the 1950s and 1960s, and .49 years per calendar year between the 1960s and 1970s. The study found that the average pace of change declined from .61 years per year to .43 between the two decades. It was also reported that the relatively small decline in the rate of mortality advance was essentially confined to Latin American countries and some of the decline there was attributed to several countries having reached high levels of life expectancy where rates of advance are normally slow. According to the 2001 Wold Population Data Sheet (PRB, 2001), the average life expectancy of less developed countries has reached sixty-four years.

With regard to disease patterns, the global burden of disease study (GBD) reveals that over fifty million people died in 1990, more than half (55%) of them from non-communicable diseases (Murray and Lopez, 1996). The study finds that for several regions of the developing world, more people already die from non-communicable diseases than from infectious and parasitic diseases and malnutrition. This is particularly evident in China and Latin America and the Caribbean, where the ratio of chronic to infectious disease deaths is about 4.5 and 2, respectively. The study notes further that it is only in India and sub-Saharan Africa that infectious and parasitic diseases still dominate, accounting for an estimated fifty-one percent and sixty-five percent of deaths. Specifically, the study notes that worldwide, ischaemic heart disease is the leading cause of death, claiming an estimated 6.3 million lives in 1990, more than half of them in the developing world. Stroke is the second leading cause, claiming about 4.4 million victims

Table 1.1: Sociodemographic Indicators, Ghana, 1969-1999

Year	Crude Birth Rate	Crude Death Rate	Rate of Natural Increase (%)	Infant Mortality Rate	Total Fertility Rate	Life Expectancy at birth			Percent Urban	GNP (US$)
						Total	Male	Female		
1999	39	10	2.9	66	5.4	59	57	61	37	
1998	40	12	2.9	66	5.5	56	54	58	35	
1997	40	12	2.9	66	5.5	56	54	58	36	390
1996	42	12	3.0	66	5.5	56	54	58	36	360
1995	42	12	3.0	81	5.5	56	54	58	36	390
1994	42	12	3.0	81	6.0	56	54	58	34	430
1993	43	12	3.1	86	6.2	55	53	57	32	430
1992	44	13	3.2	86	6.4	54	52	56	32	450
1991	44	13	3.2	86	6.3	55	53	57	32	400
1990	44	13	3.1	86	6.3	55	53	57	32	390
1989	44	13	3.1	90	6.4	53	51	55	32	380
1988	42	11	3.1	72	5.8	58	56	60	31	400
1987	42	14	2.8	94	5.8	54	52	56	31	390
1986	47	13	3.4	90	6.5	54	52	56	31	390
1985	47	15	3.2	107	6.5	52	50	54	40	390
1984	48	16	3.2	102	6.7	50	48	52	36	-
1983	48	16	3.2	102	6.7	50	48	52	36	320
1982	48	17	3.1	103	6.7	48	46	50	36	360
1981	48	17	3.1	115	6.7	48	46	50	31	402
1980	48	17	3.1	115	6.7	48	46	50	36	420
1979	48	17	3.1	115	-	49	47	51	31	400
1978	49	20	2.9	115	-	49	47	51	31	390
1977	47	20	2.7	156	-	48	46	50	31	380
1976	49	22	2.7	156	-	44	42	46	29	580

Table 1.1: Sociodemographic Indicators, Ghana, 1969-1999 contd.

Year	Crude Birth Rate	Crude Death Rate	Rate of Natural Increase (%)	Infant Mortality Rate	Total Fertility Rate	Life Expectancy at birth			Percent Urban	GNP (US$)
						Total	Male	Female		
1975	48.8	22	2.7	156	-	44	42	46	-	460
1974	-	-	-	-	-		-	-	-	350
1973	47	18	2.9	156	-	46	44	48	-	-
1972	47	18	2.9	122	-	-	-	-	18	300
1971	48	18	3.0	156	-	-	-	-	-	310
1970	47	20	2.9	156	-	-	-	-	-	-
1969	47	20	2.5	156	-	-	-	-	-	190

Source: World Population Data Sheet, 1969-1999. Population Reference Bureau, Inc. Washington, DC, USA.

each year, two-thirds in developing countries, and circulatory diseases as a whole are estimated to have caused about 14.3 million deaths, compared with 6 million from cancer, and 5 million from injuries (intentional and unintentional).

In the particular case of Ghana, the crude death rate (CDR) in the late 1960s was estimated at between 19 and 20 per thousand population. Specifically, in 1969 and 1970, the CDR was 20 per thousand population, declining to 18 between 1971 and 1973, only to rise again to 22 in 1975 and 1976, and declining thereafter to 20 in 1977 and 1978 (see Table 1.1). After these years, the CDR declined significantly from 17 per thousand for the period from 1979 to 1982 to as low as 11 in 1988, only to rise to 13 between 1989 and 1992, and 12 for the period 1993 to 1998, and finally to a low of 10 in 1999. Infant mortality rate (IMR) stood at 156 per thousand live births in 1969, remaining fairly stable at that level before declining to 115 in 1978 and the subsequent three years. There was a further decline thereafter, stabilizing at a low of 66 from 1996 to 1999. Life expectancy increased gradually during the period, reaching 59 years in 1999 from a low of 44 years in 1975.

It is also reported that infectious and parasitic diseases and systemic disorders accounted for 66.8 percent and 61.4 percent of the certified deaths in Ghana in 1967 and 1969 respectively. In both years, the third group of major killers consisted of prenatal disorders and pregnancy complications, followed by nutritional and metabolic disorders, claiming 13.2 percent and 6.4 percent of the deaths, respectively, in 1967 and 8.0 percent and 10.2 percent in 1969. Among the infectious and parasitic diseases, the major killers were enteric fever and shigella (25%), followed by malaria (23%) and infective hepatitis pertussis. Broncho-pneumonia, bronchitis and gastro-enteritis were the most deadly of the systemic diseases (Corsa and Oakley, 1971).

Also, it is reported that 70 percent of deaths occurring to children aged under 5 years are due to infectious and parasitic diseases, which are usually aggravated by malnutrition. It is noted that although these children make up 20 percent of the Ghanaian population, they contribute at least 50 percent of all recorded deaths. The Ministry of Health in Ghana also observes that apart from communicable diseases, deaths due to prematurity and diseases of the newly born are also common. The major causes of death among women of child-bearing age are related to complications of pregnancy and childbirth.

Morbidity data for the most recent decade between 1989 and 1998 are consistent with the trends reported above. Table 1.2 shows that for the general population, infectious and parasitic diseases still remain the major killer, with malaria dominating

Table 1.2

MORBIDITY TREND (%) IN GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

	YEAR									
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	44.12	38.53	40.53	39.90	41.26	36.74	41.20	42.06	42.68	40.62
Upper Respiratory Infections	8.07	6.76	6.66	7.44	8.11	7.55	8.56	8.08	7.79	7.78
Diseases of the skin	4.26	4.58	4.62	4.55	5.06	n/a	6.31	5.73	5.04	4.91
Diarrhoeal diseases	6.79	6.66	8.38	5.37	5.08	4.34	4.86	4.36	4.40	4.50
Accidents	3.20	4.98	5.12	4.78	4.69	3.94	4.51	4.49	4.28	3.63
Pregnancy related complications	3.02	4.66	3.31	3.20	2.85	2.12	2.59	2.55	2.66	3.06
Intestinal worms	3.15	2.97	2.93	2.97	2.92	2.61	2.58	2.52	2.30	2.46
Gynaecological disorders	1.84	3.15	2.64	2.60	2.27	1.70	1.81	2.09	1.95	1.88
Diseases of the eye	1.48	2.44	2.17	2.00	2.48	2.09	1.76	1.96	2.06	2.30
Hypertensive diseases	1.65	1.62	1.89	2.06	2.03	1.63	1.66	1.62	1.68	1.99
Rheumatic diseases	1.84	1.62	1.62	1.67	1.63	1.54	1.32	1.53	1.46	1.63
Anaemia	n/a	1.41	1.53	1.44	1.35	1.23	1.26	1.25	1.41	1.62
Diseases of oral cavity	0.75	1.39	1.24	1.28	1.45	1.08	1.58	1.36	1.46	1.12
Measles	n/a	1.08	n/a	1.16	0.87	0.75	0.94	0.64	0.72	0.50
Diseases of the ear	0.90	1.04	1.15	1.15	1.06	0.93	1.10	1.36	1.08	0.95
Other diseases	18.94	17.11	16.21	18.41	16.91	31.75	17.96	18.40	19.03	21.05
Total # of all cases	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

the top fifteen causes of out-patient consultation for the entire period; in fact, accounting for an average of 41% for all cases. Upper respiratory infections and diarrhoeal diseases are second and third respectively, from 1989 to 1994, except in 1991 with each accounting for less than 10% of all cases. From 1995 to 1998, diseases of the skin displaced diarrhoeal diseases as the third biggest cause of out-patient consultation. Whereas the dominance of malaria was maintained at the regional level, upper respiratory infections, diseases of the skin, and diarrhoeal diseases accounted for the second, third, or fourth biggest cause of out-patient consultation at different times in each region within the period (see Appendix A1-10). It is not possible, however, to discern the prevalence and incidence rates from this information since first reported cases are not disaggregated from repeat cases. Though each of these still accounted for relatively small proportions of total cases in any one particular year, the disparities underscore the regional differentials in morbidity patterns across the country.

General mortality rates showed that the life expectancy at birth in the late 1960s was estimated at 47 years, 48.3 for females and 45.6 for males (Gaisie, 1974:16). Table 1.1 shows that life expectancy in 1973 was 46 years, 44 years for men and 48 years for women, however, in 1975 and 1976 this figure declined to 44 years, registering 42 years for men and 46 years for women. Subsequent years showed some fluctuations in life expectancy but generally gradual improvements from 48 years in 1977 to 50 years in 1983 and 1984 and 58 years in 1988. The 1971 Supplementary Enquiry data reveal evidence of regional variations, ranging from between 60 and 65 years in the national capital district to about 36 years in some regions. The urban-rural differential is also significant, with life expectancy in the urban centres exceeding that of rural areas by between 12 and 13 years. Sex differential is also evident, revealing a higher life expectancy for females, the difference ranging between 3 and 4 years. These estimates of life expectancy indicated a steady decline in mortality from the period since the early 1940s.

Several studies suggest that mortality and morbidity differentials within a population are reflective of inequalities in health status between and among different subgroups of the population (e.g., Vagero and Lundberg, 1989; Marmot et al., 1984). Studies that have attempted an investigation of this problem have employed different measurement criteria of health status. In studies of developed countries of this problem, life expectancy seem to be the most widely used indicator. In the case of developing country studies, on the other hand, two common measures that have been used are the nutritional status of children and correspondingly, the body mass index (BMI) of adults. However, the former, involving mainly anthropometric methods is the most frequently used indicator in studies on Ghana.

Asenso-Okyere et al (1997) suggest in their study that "the interconnections between the health and nutrition of a household is better understood by considering children in the early stages of their life." The reason, according to the authors, is that the nutrition and health status of a child may be linked to the poverty level of the household. Reutlinger and Selowsky (1978) also point out in their study that the nutritional status of an infant is the most important policy-induced determinant of the individual's physical condition. A study by Ewusi (1978) on the nutritional status of children used anthropometric measurements based on changes in the upper arm circumference, as is the study by Orraca-Tetteh and Watson (1977).

Still more studies have used nutritional status of children and the same anthropometric methods to examine health status: the nation-wide nutrition survey conducted jointly by the Nutrition Department of the Ghana Ministry of Health and UNICEF in 1986 (World Bank, 1989); the 1988 Demographic and Health Survey (1989) of Ghana report on the levels of malnutrition among 1,841 children between the ages of three and thirty-six months; the study by Alderman (1990) based on the first round of the Ghana Living Standards Survey (GLSS 1) data; and the data collected by the Catholic Relief Services (1987) of Ghana on the nutritional levels of children reporting to maternal child health centres.

When the anthropometric measurement using the nutritional status of children is extended to adults, this has mainly been related to adult body mass index (BMI), defined as a person's weight in kilograms divided by the square height in metres. It must be noted, for the sake of emphasis, that BMI provides direct nutritional information. The generally accepted normal range for adult BMI is from 18.5 - 25 (WHO, 1995), and for affluent countries, the mean adult BMI is generally in the range 23 - 27 (Rotimi et al, 1995; Bailey and Ferro-Luzzi, 1995 Simmons et al, 1996). Studies have revealed that in developing countries, the mean BMI of adults is generally lower than in high-income countries, and a considerable proportion of the population may have a BMI below the normal range (FAO, 1994; Alemu and Lindtjorn, 1995).

But one can argue that while nutritional status and body mass index may reflect the health status or general well-being of children and adults respectively, these measurements tend to ignore the important role that the social system as a whole plays in their manifestation. Whilst pointing out the complex relationships between health and nutrition, these studies fail to account for the fact that nutritional status in general is a direct consequence of socio-economic status or social class and vice versa; and for that matter, the nutritional status of a child is invariably associated with the social class of their parents or, to put it more generally, the social class of the head of the household.

Asenso-Okyere et al acknowledge this fact in their study by asserting that the nutrition and health status of a child may be linked to the poverty level of the household, in which sense it may be inferred that the household here is represented by the head, or a reflection of the social and economic circumstances of same. The authors explain further that "the relative importance of the various factors that determine health and nutrition is affected by local conditions with respect to climate, food availability and accessibility, water and sanitation facilities, etc (p.61)." Here too, it is not difficult to see here how all of these conditions may represent a direct consequence or reflection of socio-economic status or vice versa of an individual, and in the case of a child, the socio-economic status of the household or the household head.

In addition to the direct nutritional interpretation of BMI-data, a number of studies in developing countries have also reported a positive correlation between adult BMI and simple socio-economic indicators such as incomes or expenditures (Alderman and Garcia, 1993; Ghana Statistical Service, 1994; Sichieri et al, 1994; Kennedy and Garcia, 1994; INCLEN, 1994; Cornu et al, 1995). Low levels of BMI have been shown to be associated with impaired physiological functions, such as poor pregnancy outcome (FAO, 1994), while susceptibility to illness may be increased (Garcia and Kennedy, 1994). At the other end of the scale, overweight (BMI between 25 and 30) and obesity (BMI >30) are known to be associated with an increased risk of chronic disorders such as diabetes, mellitus, hypertension, coronary heart disease, and certain types of cancer (WHO, 1990, 1995). At the same time, it is noted that in affluent countries, and increasingly in high income strata in developing countries, high prevalence rates of overweight and obesity are a major public health problem (INCLEN, 1994). Once again, socio-economic status and/or social class are seen as influential factors in BMI as well.

The foregoing review notwithstanding, there is very little or no evidence of a particular study on Ghana (either methodological, or conceptual, or both) that involves an integrated analysis and a substantive explanation of health status differentials based on social class as envisaged in this study. In fact, Banguero (1984) observes that the epidemiological, biological and curative aspects of malaria have been well analyzed from the theoretical and methodological points of view (Yetukiel, 1965; Molineaux and Granicia, 1980). However, the social and economic aspects of the problem have received very little attention among researchers and, therefore, development and testing of theoretical and methodological approaches are lacking.

Banguero notes further that the works of Barlow (1967) and Conly (1975) were oriented towards the identification of the economic effects of malaria eradication rather than to the analysis of the role played by the social and economic factors of the disease. This study is therefore an attempt to fill the void. And considered against the backdrop of the economic transformation and/or reform that have taken place in Ghana, especially in the last two decades, the epidemiologic transition theory would provide a useful theoretical and historical perspective for the study. The reason being that this theory explains the complex change in patterns of health and disease and the interactions between these patterns and their demographic, economic and sociologic determinants and consequences (Omran, 1971).

Objectives of the Study

The broad objective of this study is therefore two-fold: (1) to situate Ghana in terms of its stage of socioeconomic and epidemiologic developments; and (2) within this context, investigate how social class differences influence the prevalence of malaria. The first objective would be achieved through a descriptive analysis of aggregate level social and/or development indicators. The second objective would be accomplished by constructing a social class index based on some selected socioeconomic characteristics of the Ghanaian society. The index would be employed as a predictor variable in a logistic regression analysis with the prevalence rate of malaria as the dependent variable. Based on the results obtained, the study would offer suggestions for the direction of future research, as well as discuss policy implications in respect of population health programs in Ghana.

Organization of the Thesis

This thesis is organized into eight chapters. Chapter One, the introduction, discusses the background to the study and states the problem to be investigated. Some sociodemographic indicators and morbidity data are also discussed. Chapter Two presents a general overview of development trends in Ghana, looking at modernization, development and social change. The broad policy of structural adjustment is examined as contextual background leading to a discussion of socioeconomic development in Ghana. Several economic data are presented to provide further insights. Theoretical Orientation is the title of Chapter Three. The opening section of this chapter concerns itself with the theory of epidemiologic transition, followed by a discussion of the conceptual framework of the study. Under the framework, the concept of health and health status is explained, and the factors affecting health are also discussed. The factors covered include socioeconomic, psychological, physical and cultural. Other factors discussed are personal health practices, medical/health care, genetics and social support. Two models depicting the relationship between these factors, on the one hand, and health status on the other are presented, and a statement of the hypotheses concludes the chapter.

Chapter Four is captioned Description of Data, and looks at the data source, selection of variables, and quality and limitations of the data. Chapter Five examines the sociodemographic profile of rural-urban Ghana. This chapter begins with a general overview of the geography and population of Ghana, and continues with a description of various macro economic activities. As well, regional/rural-urban disparities, gender inequity and poverty are discussed. An examination of the supply, accessibility and availability of certain basic services in Ghana is undertaken in this chapter, and concludes with a discussion of the results of cross-tabulations.

Chapter Six outlines the various steps involved in the construction of the composite index of social class. These are discussed under the sub-titles of statistical criteria, selection of indicators, measurement of indicators and evaluating the strength of the indicators. Obtaining the composite index scores of social class, calculation of stratum boundaries, index of dissimilarity and validation of the index follow in that order. Chapter Seven opens with a brief overview of malaria. This is followed by a description of some contingency tables involving the predictor variables and the dependent variable. The elaboration model, measurement of variables, the logistic regression procedure and descriptive statistics all are next discussed in that order in this chapter. This is followed by a discussion of the results of the logistic regression analysis. Chapter Eight provides a summary of the results of the study and their implications, and puts forward some policy suggestions based on same.

CHAPTER TWO

A GENERAL OVERVIEW OF DEVELOPMENT TRENDS IN GHANA

Modernization/Development and Social Change

It is useful to gain some insight of the processes of modernization and/or development and social change as pertains to the particular circumstances of developing countries, and their influence on the various segments of the population. This would enable the study have a better perspective of development trends in Ghana and their impact on health and health status. It is

worthy to note that most of the discussion on the development process is circumscribed by the modernization and dependency paradigms and each of these admit of a multiplicity of theories. For the newly emancipated Third World Countries in the fifties and sixties, the modernization paradigm was a powerful attraction. One of its principal architects, Talcott Parsons, formulated that certain values, attitudes and norms - pattern variables - were associated with the traditional society (particularistic, diffuse, and ascriptive oriented). In a modern society, the corresponding values were their opposites (universalistic, specificity-and-achievement oriented). This linear evolutionary scheme influenced scholars in the allied social sciences as well (Rostow, 1960; Eisenstadt, 1966, 1970; etc).

Implicit in the modernization paradigm are two important assumptions. First, that a set of countries had already accomplished the task of development and had become modern. Their problems thenceforward could only be post-modern relating to an era of "beyond high mass consumption." The countries outside this set (of the Third World) had to go through the process of development. Second, that the former set of countries represented models of social structures, technologies and lifestyles on which the latter group of countries could fashion their development. The history of modernization, it was contended, had provided evidence of "the process of change towards those types of social, economic and political systems that have developed in Western Europe and North America from the seventeenth to the nineteenth centuries" (Eisenstadt, 1966).

It was within this paradigm that Rostow presented his noncommunist manifesto of the "stages of economic growth." Rostow asserted in this theory that all societies in their economic dimensions could be found within one of the five categories, "the traditional society, the preconditions for take-off, the take-off, the drive to maturity, and the age of high mass consumption" (Rostow, 1960). He notes that the take-off stage was the great watershed in the life of the modern societies in which the rate of growth of the economy became self-sustaining. It has been established that British economic history provided the major data base for the construction of the unilinear evolutionary model of the stages of growth.

On the other hand, the dependency paradigm has posed a fundamental challenge seeking to juxtapose theories of development with theories of underdevelopment. The Latin American sociologists and economists came out with the starting thesis that underdevelopment in the Third World was a necessary condition for the sustained prosperity of the modern capitalist countries (see, e.g., Baran, 1957; Frank, 1967; Dos Santos, 1969). Hence, the "metropolitan centres" of the world capitalist system systematically exploited their "satellite peripheries." The structural mechanisms by which the unequal exploitative relationships was maintained involved the utilization of the elite ruling class in the developing countries comprising landlords, entrepreneurs, merchants, salaried public official, trade union leaders, who wittingly or unwittingly served or were dominated by the centre, were rewarded or were dependent on, special interest and power groups such as multinational corporations (MNCs), national bilateral agencies, multilateral donor organizations. These authors argued that developing countries were not necessarily "backward" or "undeveloped" but essentially made to remain "underdeveloped" by the metropolises.

This extreme view has been subject to some modifications. Evidence suggests that growth of aggregate income in some of the peripheral Latin American countries has indeed taken place, but then growth patterns have been conditioned by the dictates and requirements of the dominant centres. Thus, these countries were experiencing an externally induced "dependent development" (Amin, 1974; Cardoso, 1979). Frank (1967), in support of this assertion emphasizes the point that dependency as a conditioning factor alters the internal functioning and articulation of the elements of the "dependent social formation" such that the dominance of the "centre" is maintained or even enhanced (Roxborough, 1979).

At a different level of abstraction, outside the dependency paradigm, a critique of the development process takes the form of "incorrect" or "inappropriate" policies which are attributed to expert advisers from the developed countries and the "expert" takers of such advice in the (host) developing countries - "leading university intellectuals, trade unionists, future high level government economists and other civil servants who get their training in developed country institutions where they are unwittingly served an unhealthy dose of alien concepts and models camouflaged behind a smokescreen of excessive sophistication and esoteric irrelevance" (Todaro, 1984).

It would seem from the foregoing that the broad sociodemographic and structural corollaries of modernization as they develop in the major institutional spheres are well known. Perhaps the best over-all summary of the sociodemographic indices of modernization has been coined by Karl Deutsch (1962) in the term *social mobilization*. Deutsch has defined it as "the process in which major clusters of old social, economic and psychological commitments are eroded and broken and people become available for new patterns of socialization and behaviour." He has indicated that some of its main indices are exposure to aspects of modern life through demonstrations of machinery, buildings, consumers' goods, response to mass media, change of residence, urbanization, change from agricultural occupations, literacy, growth of per capita income, and so forth.

Deutsch observes that these varied processes of differentiation and social mobilization have developed side by side with basic structural changes in all major institutional phases of social life of modern or modernistic societies. He notes that in the economic sphere proper, these developments have been characterized by growing specialization of economic activities and occupational roles, by the development of units of production oriented to the market, and by the growth of the scope and complexity of the major markets - the markets for goods, labour and money. In the sphere of social organization, the most important single "external" manifestation of these changes has been the process of urbanization, the growing conglomeration of continuously growing parts of the population in urban centres in which the more specialized types of economic, professional, and civic activities and enterprises became concentrated and expanded continuously.

According to him, the process of urbanization has usually been very closely related to the breakdown of at least some of the more traditional ascriptive criteria of status - whether tribal, estate, or regional - and to the development of somewhat more flexible and variegated social strata; the upsurge of social mobility through economic, occupational and educational channels; and the development of a great variety of forms of social organization ranging from various functionally specific economic enterprises to various civic and voluntary associations, professional groups, and so forth. Deutsch observes that the educational channels themselves have changed from agencies oriented mainly toward the education of an elite and agencies of "sponsored" mobility to agencies concerned with the "spread" of education, with cultural mobilization of wider strata, and with problems of social mobility in general and occupational mobility in particular.

In the political sphere, Deutsch notes that modernization is characterized, first, by the development of a highly differentiated political structure in terms of specific political roles and institutions, of the centralization of the polity, and of development of specific political goals and orientations. In the cultural sphere, the process of modernization has been characterized by a growing differentiation between the major aspects of the major cultural and value systems (i.e., religion, philosophy, ideology), by growing secularization, by the weakening of traditional cultural elites, by the spread of literacy and secular education, and by the emergence of new secular intelligentsia and various professional groups.

Deutsch draws attention to the fact that the very nature of the process of modernization, with its growing social differentiation and mobilization, creates in all the institutional spheres of the society many problems. Among such problems are those of agrarian reform, labour relations and organization, and control of different types of markets (for goods, labour and credit) in the economics field; problems of the development and integration of the national community and identity and of specifying its relation to different parts of its historical tradition in the political spheres; problems of relations among the educational system, social and occupational mobility, and the extent of autonomy of professional organization in the broader social field.

Similarly, the major structural characteristics of modernization have been identified as the development of a high extent of differentiation: the development of free resources which are not committed to any fixed, ascriptive (kinship, territorial, etc.) groups; the development of specialized and diversified types of social organization; the development of wide nontraditional, "national," or even supernational group identifications; and the concomitant development, in all major institutional spheres of specialized roles and of special wider regulative and allocative mechanisms and organizations, such as market mechanisms in economic life, voting and party activities in politics, and diverse bureaucratic organizations and mechanisms in most institutional spheres (Eisenstadt, 1973).

Different strata - depending on their placement in the social structure (e.g., on their occupational and status position), their relative strength with regard to other strata, their own traditions, orientations and predispositions to modernization, and their internal cohesion - tend to develop specific attitudes and types of social organization in response to these problems. In some cases, the encounter between the preexisting institutions, the modernizing tendencies of the various groups and strata, and the policies of the elites may give rise to relatively stagnant structures or to various blockages and eruptions. As a result, institutional systems may develop which are "transitional" in the sense that they do not develop fully some of the over-all characteristics of modern systems, although they may very well continue to exist for a very long period of time. There may also develop at more "advanced" levels of modernization, cases of vicious circles of underdevelopment and cleavages or breakdowns of modern structures. Change, therefore, should be seen as an inherent part of any development or modernization process.

Any change that needs to be administered and accomplished with growth has some implicit positive anguish. Development, in its ultimate, being a concept of proportionateness, interdependence, collectivity and individuation implies controlled inputs and workable constraints, in the absence of which development itself may develop deficiencies, retardations and even decay (Nordhaus and Tobin, 1972). As Todaro (1984) asserts, "development, in its essence, must represent the entire gamut of change by which an entire social system, tuned to the diverse basic needs and desires of individuals and social groups within that system, moves away from a condition of life widely perceived as unsatisfactory and toward a situation or condition of life regarded materially and spiritually better."

In this sense, modernization implies not only the development of various indices of social mobilization and of growing structural differentiation, but also the development of a social, economic, or political system which not only generates continuous change, but unlike many other types of social or political systems, is also capable of absorbing changes beyond its own initial institutional premises. Although the propensity to generate changes and also to some extent to absorb them is built into the institutional structure of modern social systems, the capacity to deal with such changes effectively varies greatly among modern societies. Eisenstadt notes that the history of modern societies is replete with cases of unsuccessful adaptation or lack of adaptation of existing structures to new types of problems, and of the inability of major institutions to incorporate even in a partial way, the various changes and movements of protest inherent in the process of modernization. In such cases, the capacity for continuous growth and for continuous sustenance of such growth may be blocked or impaired.

To the extent that such blockages and eruptions are not merely transitory, their structural outcomes may cause the disintegration of a given social, political, or economic system or the successful restriction of the new demands and organizations to a level (sometimes the former level, sometimes a somewhat new level) with which the existing institutions are capable of dealing. Thus, these blockages often create conditions of uneasy stagnation in society. But as Eisenstadt (1973) points out, the new civilization and tradition which started to develop in Europe in the nineteenth century spread through the world, creating a worldwide international political, economic, and cultural system or systems. The forces of these systems, spreading from their centers - first in Europe and America, then in Russia and Japan - have continuously impinged on most of the world's societies and civilizations, calling forth from within them a great variety of responses through which the different types of post-traditional, modern, sociopolitical and cultural orders have been emerging.

Although many of the problems which these societies faced were not dissimilar from those relating to the development of European modernity, the setting differed greatly from that of the development of modern sociopolitical orders in Europe. By and large, modernity was an indigenous development in Western Europe, whereas its spread to Central and Eastern Europe and beyond to Asia, Africa, and, to some extent, also Latin America was rather the result of external forces impinging on traditional societies and civilization.

Eisenstadt notes that this impingement took several forms. First, it undermined the traditional bases of economic, political and social organization, making various new demands on these elites and opening up new possibilities to their members. Second, the forces of Western modernity impinged on the world beyond the West by creating a new international order within which differences in strength in modern (economic or political) terms became the major determinant of relative international standing. Third, the forces of modernity created in traditional societies a vogue or demand for a growing participation of citizens in the center, a demand most clearly manifest in the tendency to establish universal citizenship and suffrage and some semblance of a 'participant' political or social order.

The above discussion would seem to suggest that the consequences of the processes of modernization and/or development in developing countries as manifested in the distortion of traditional social structures and institutions, as well as disparities in population subgroups have been sufficiently demonstrated. However, one cannot fail to observe that the idea of development as a process of comprehensive and deliberate change was a culmination of the process which began with the dominant ideology of economic growth. The latter drew strength from the belief that what mattered most for the welfare of people in economically backward countries was increase in production as reflected in GNP and per capita income. Upon the first decade of development (i.e., up to 1970), GNP growth was considered a natural indicator of development.

There were at least two major assumptions about this growth strategy: the first was that a certain amount of inequality was necessary to produce the amount of saving and investment which were important preconditions for economic growth. It was postulated that if a country was able to attain a rate of growth of 6 to 8 percent, it could reach the take-off stage. For this, a net investable saving of 18-21 percent was necessary (Harrod-Domar model). If this was not possible through domestic savings, the balance required could be met through foreign aid or investments from multinational corporations. Any foreign involvement would naturally mean that the investor will look forward to an area of investment which would get him maximum profit; the second assumption was that the GNP growth will automatically "trickle down" to the lower income groups. Both these assumptions proved fallacious and the theory that the development path will proceed from initial inequality to greater equality proved unfounded (Lebenstein-Galenson model).

The consequence of such a policy for many developing countries was that the limited capital available indigenously, coupled with foreign investments introduced a typically modern industrial sector which went on extending in the form of modern enclaves without creating the necessary linkages within the domestic economy. As a result, these countries could not develop any capacity to absorb increases of population or the requirements of their entire economies. This created a "dualism" within the economies with enclaves of prosperity amidst the masses of rural poor, exacerbating inequalities. The "trickle"never reached "down" the bottom. This strategy of development" created more problems than it could resolve for the society as a whole (Singer, 1979). Evidence of the effects of these strategies are represented in the implementation of the structural adjustment policy of the International Monetary Fund and the World Bank.

The Policy of Structural Adjustment

According to Engberg-Pedersen and associates (1996:3), structural adjustment policy consists of reforms which encourage a shift in economic policies from an interventionist stance, which permits and sometimes encourages state intervention in the economy, towards a neo-liberal position which aims to minimize it, allowing the market to allocate resources wherever possible. That the various programs under the policy are executed largely on the initiative of the IMF, the World Bank, and bilateral donors with a view to establishing market-based economies in developing countries attest to above definition.

In fact, according to the World Bank (1995a), the aim of structural adjustment loans (SALs) and sectoral adjustment loans (SACALs) is to support programs of policy and institutional change necessary to modify the structure of an economy so that it can maintain both its growth rate and the viability of its balance of payments. In line with this, the Bank makes clear the objectives implicit in its definition of structural adjustment lending which are viz; stabilizing the macroeconomic environment; promoting economic growth and alleviating poverty; promoting openness of the economy; improving transparency in the incentive system; improving efficiency in resource allocation; improving scope for private sector development; and strengthening institutions and capacity for policy analysis. These policies, put in simple terms, involve currency devaluation, deregulation of prices and wages, reduction of public spending on social programs and state bureaucracies, removal of food and other subsidies on basic necessities, trade liberalization, privatization of parastatal enterprises, and the expansion of the export sector; the latter - in the case of agriculture - often at the expense of food production.

And as a result of deteriorating economic conditions over long periods of time, well over half of the countries in sub-Saharan Africa, as well as other developing countries of Africa, Latin America and Asia embarked on economic reforms. But as Engberg-Pedersen et al. (1996) point out, only a few countries have returned to even the low growth path of the 1960s and 1970s. Instead, according to them, there has been a general reduction in per capita growth. As well, there is even little evidence of stabilization in the main pre-adjustment economic imbalances. The authors report that there is fairly strong evidence that the adjustment period has everywhere seen further deterioration in the position of the worst-off groups, amongst whom are women and children who are disproportionately represented.

Engberg-Pedersen and associates observe that contemporary literature points to three important emerging issues. First, rural areas have witnessed increasing differentiation as a result of adjustment-induced changes in agricultural pricing and marketing. This, according to them, has improved conditions for some agricultural producers but has reduced the income opportunities of others. Second, contrary to conventional wisdom, the rural-urban gap may have increased during the course of adjustment, to the disadvantage of rural areas. This is due *inter alia* to the immediate effects in urban areas of increased inflows of aid and imported consumer goods, problems related to agricultural liberalization, and lower than expected levels of public sector retrenchment. Finally, although African governments and international agencies emphasize the difficult plight of the poorest population groups, the experience with targeted assistance to particularly weak and vulnerable groups is so far largely negative.

Ghai (1992) reports that the implementation of structural adjustment policy and developments in the world economy over the past decade or so have had wide-ranging impacts on poverty, income and wealth distribution within and across countries. These policies, according to the author, have contributed indirectly to a range of other social problems including for example, a significant redistribution of income and wealth from the poor to the rich both national and internationally. The World Bank (1995b) notes in its study of 33 countries (adjustors and nonadjustors) that high levels of income inequality persist and that changes in income inequality varied substantially across countries and regions. The Bank observes that the increase in inequality is most prominent in the African countries.

Ghai (1992) notes also that although comprehensive and reliable data on poverty and income distribution are scarce or non-existent for most developing countries, the available evidence points to the fact that in Latin America, the incidence of poverty increased and income distribution worsened in the 1980s. Also, Foxley (1981), examining the impact of monetarist stabilization programs introduced in four Latin American countries shows that in all cases, real wages fell, while unemployment and income inequality rose in two.

A study by Altimir (1984) has also established that prevailing programs have a deflationary content reducing the incomes of the poor, as well as incomes of most other members of society. These effects are sometimes compounded by deterioration in income distribution. The author concludes that overall, prevailing adjustment programs tend to increase aggregate poverty, or, in other words, the number of people and of children - living below the poverty line. However, he points out that this does not mean that every program has had an adverse effect on poverty levels. Rather, on average, this tendency prevails particularly when demand restraint policies predominate. Altimir notes that besides the overall effect on poverty that an adjustment package tends to have, some of its specific components have a direct and unambiguous impact on particular socioeconomic groups, at least in the short term.

Engberg-Pedersen and associates (1996) note also that there has been much concern about the trends in women's health and educational statuses under crisis and adjustment. The authors argue that from the outset, structural adjustment programs have been gender-blind, mainly disadvantaging women. They note that even with the attempts of the last few years to address issues of social and economic inequality, women have only been targeted as part of wider groups (the poor, the rural poor, etc.). They argue that in ignoring the gendered nature of the agricultural division of labour and rural household income distribution, adjustment policies have severely overestimated the possibility of increasing peasant cash-crop production via producer price increases.

According to them, most of the labour that must reallocate from "non-tradeables" is female, but this labour is not allocated through the market. It therefore appears to be locked into the sub-sector where it already has typically low earnings. In other words, the authors note that women are concentrated in activities that according to adjustment policy need to decline, but their mobility to do so is severely constrained. It has further been argued that adjustment is, in fact, likely actually to increase especially female labour immobility in important respects through the intensification of women's domestic care duties as public service provisions are rationalized or withdrawn.

The authors note further that the other side of the adjustment objective of promoting export-crop production has been a systematic withdrawal of the subsidies and services to food-crop production characteristic of most African countries in the 1970s and early 1980s. They point out that this is the area of agriculture in which women have traditionally been concentrated, but as producers, they always benefited less than men from subsidies and services. Therefore, the latter's withdrawal may still disadvantage women most.

The World Bank concedes that the adverse effects of adjustment have generally been more pronounced for the urban than for the rural population. According to the Bank, the adverse effects on the rural population have usually been offset by the positive income effects of adjustment so that, on balance, the rural population benefited from the macroeconomic adjustment even in the short run. Within the urban population on the other hand, the Bank notes that there is no clear-cut evidence suggesting that the poor have suffered disproportionately more. According to the Bank, it appears rather that the direct negative impact of macroeconomic reforms has been felt more strongly by the middle classes because they usually participate more in the formal sectors, which have often contracted during adjustment, and consume subsidized public goods and services.

The Bank reveals that rural populations, most of whom are poor in the countries studied, have benefited more when adjustment has led to increases in tradeable crop incomes or agricultural incomes in general, and relatively less when the gains were concentrated on exportable crops. This is because the poor usually participate less in exportable crop production than in the rest of the agricultural sector. Consequently, although the poor may have benefited indirectly from the expansion of export crops through increased demand for their services, income inequality in rural areas appears to have increased in some of these countries, although the absolute incomes of most groups have increased. One important observation is that the rural-urban gap is very significant in regard to access to safe water, education and health services.

To counter the negative evidence, several economists both within and outside the IMF have produced a series of empirical studies documenting the fact that during the 1960s and 1970s, in broad terms, program countries recorded significant reductions in their external deficits while exhibiting only marginal changes in their growth rates of real GDP and consumption - changes that were not significantly different from those experienced by non-oil developing countries in general. Thus, considering the group of program countries in the aggregate, the costs associated with the external adjustment effort appear to have been less severe than has sometimes been suggested (Donovan, 1982, p. 197).

But as Cornia and associates (1987) argue, due to the great variety of country circumstances and adjustment packages, it is difficult to arrive at any general <u>ex ante</u> conclusion about the distributive impact of adjustment policies, although it is clear that effectively implemented policies are unlikely to be distributionally neutral and can cause severe deteriorations for given population groups. According to them, different adjustment policies differently affect major socio-economic categories, i.e., wage earners (in both urban and rural areas); self-employed; small and subsistence farmers; rentiers and capitalists; and destitute.

Wage restraint policies, for instance, according to the authors, cause some hardship to those engaged in the formal sector, but it is not necessarily true that these are the most disadvantaged group and that therefore income inequality will increase. They contend that this might be the case in countries where the share of modern-sector wages in GDP is high, but not where modern-sector wage earners are an economic elite. They note that in very poor, highly rural countries, in particular, a major distributive preoccupation should be the improvement of rural-urban terms of trade and not the relative income distribution within the modern sector (Johnson and Salop, 1980).

In Sahn's (1994) view, although structural adjustment programs have not been sufficient to relieve poverty or produce rapid growth, "there is no evidence that they have harmed the poor either." According to Sahn, evidence shows that the poor have benefited in countries with fully adopted adjustment programs which, according to him, are necessary preconditions to restoring economic growth and stability in Africa. He concludes that "Africa remains in crisis. However, without policy reform, the well-being of the poor would be worse." But based on overall performance, some experts still are of the view that structural adjustment policy is inappropriate, ineffective and inequitable and have had deleterious consequences on the poor since such reform initiatives have resulted in falling wages, higher unemployment, higher prices for staple goods and fewer services (Cornell Chronicle, 1994).

Moon and Dixon (1993) argue that external reliance is destructive of basic needs. They point out that foreign sources of capital, especially if introduced in the form of foreign direct investment by multinational corporations, exacerbates sectoral and class inequalities, aggravate unemployment, distort the social and political system, and bias state policy against the poor (Biersteker, 1978; Evans, 1979; Bornschier and Chase-Dunn, 1985). The authors argue that while benefiting local elites and some western interests in the short term, this approach has widened social inequalities.

The divergent viewpoints expressed above are not unexpected. The reason being that populations living within the confines of what is usually designated a "society," of a macrosocietal order, are not usually organized in one "system," but rather in several different ways and on several levels. Furthermore, these different levels of organization of societal activities may be carried by different parts of the populations and through different mechanisms and structures; the movements of the "same" or of closely related populations through such different systems may vary to some degree independently of each other; these aspects of social order differ greatly and evince different patterns of organization, continuity, and change; and they may change within the "same" society to different degrees and in different ways, and would not respond to the same situation in like manner. Therefore, the effects of structural adjustment are bound to vary across countries, and even in the same population at different time points. This is characteristic of the experience of Ghana as other developing countries.

Socioeconomic Development in Ghana

At the time of independence in 1957, conditions were favourable for Ghana to achieve rapid socio-economic development. Indeed, in the first two decades following independence, Ghana's economy experienced rapid economic growth. Ghana was the world's largest producer of cocoa, with the highest per capita income of all countries in sub-Saharan Africa (Novak, et al., 1996). GNP per capita in US dollars more than doubled from US$190 in 1969 to a high of US$400 in 1979 (see Table 1). However, as a result of unsustainable economic policies and over-dependence on one crop (cocoa) for most of the country's foreign exchange earnings, the economy begun to experience serious crisis from the mid-1970s onward. According to Eboe Hutchful (1996), total exports declined sharply with cocoa exports falling from 397,300 metric tonnes in 1975 to 160,000 metric tonnes in 1981. Ghana's share of total world production dropped correspondingly from 24.4 percent in 1974-75 to 15.4 percent in 1980-81.

As a matter of fact, between 1975 and 1983, the national economy declined on the average by about 10% per year. National income per capita declined by a margin of 27% between 1975 and 1982. Similarly, gross domestic product per capita declined by a total of 19.7 percent in 1970-80 (about 2.2 percent per annum) and by 21.2 percent between 1980 and 1983 (or 7.7 percent annually). During the same period, the Ghanaian domestic economy witnessed similar contraction in industry and agriculture. The local manufacturing index plummeted from 100 in 1977 to 63.3 in 1981 whilst average capacity utilization fell from 40.4% in 1978 to only 21% in 1982 (see Table 2.1). This combination of fiscal deficits and falling domestic and export production led to inflation and falling living standards. Inflation rose to 116.3 percent in 1977, declined gradually to 54 percent in 1979 and 1980 before peaking at 123 percent in 1983 (Eboe Hutchful, 1996).

These conditions prompted the government to initiate an economic recovery program in 1983. The macro-economic framework of the program, commonly referred to as structural adjustment program (SAP) was determined jointly with the World Bank and the International Monetary Fund. In the first ten years of the program, the economy recorded remarkable progress, with almost all macro-economic indicators showing strong positive response or growth. The gross domestic product (GDP) increased by an average of about 5% *per annum* between 1983 and 1992 and the rate of inflation fell from 123% in 1983 to 10% in 1992. GNP per capita reached a high of US$450 in 1992. However, the stable and favourable macro-economic environment of the 1983-1992 period could not be sustained, thus leading to a general downturn in the economy from the beginning of 1993. The GNP per capita declined to US$430 in 1993 and 1994, and further to US$390 in 1997. Energy generated (electricity), which was increasing steadily in the years prior to 1992, registered a sharp decline in 1993 and 1994 (Table 2.2).

Against the backdrop of these economic developments, one observes that there has not been any significant shift in the fundamental structure of the economy since independence. Table 2.2 shows that between 1960 and 1984, there was no significant shift in economic activity; agricultural activity, forestry, hunting and fishing still remained the predominant economic activity, employing 61 percent of the economically active population in 1984 as against 58 percent twenty-four years earlier. Correspondingly, percentage contribution in terms of GDP between 1975 and 1998 indicates agricultural activity as the major contributor, followed by the industry and services sectors in that order as seen in Table 2.1.

Table 2.2 shows that the economically active population engaged in mining and quarrying declined from 1.8% in 1960 to 0.5% in 1984, whilst manufacturing recorded a slight increase from 8.6% in 1960 to 10.9% in 1984. Construction and electricity, gas and water both recorded slight declines, whilst wholesale and retail trade gained 1%

Table 2.1: Selected Economic Indicators, 1975-1998

Gross National Product (GNP) at 1975 prices (million cedis)								
	1975	1976	1977	1978	1979	1980	1981	1982
	5,241	5,046	5,185	5,633	5,489	5,453	5,302	4,935
Per Capita National Income at 1975 prices (cedis)								
	537	504	504	504	479	465	435	391
Gross Domestic Product (GDP) by kind of economic activity and percentage distribution in purchasers' value at constant 1975 prices (million cedis)								
agriculture	2518.2 (52.4%)	2476.7 (53.1%)	2362.6 (50.6%)	2788.9 (55.7%)	2955.2 (60.4%)	2933.0 (59.5%)	2881.2 (53.9%)	2723.9 (54.8%)
industry	1108.6 (23.1%)	1079.9 (23.2%)	1127.7 (24.2%)	1039.7 (20.8%)	820.9 (16.8%)	838.4 (17.0%)	751.8 (14.1%)	624.3 (12.6%)
services	1179.5 (24.5%)	1104.5 (23.7%)	1178.5 (25.2%)	1176.8 (23.5%)	1119.2 (22.9%)	1154.0 (23.4%)	1823.7 (34.1%)	1757.7 (35.3%)
Electricity - energy generated (millions of kwh)								
	-	-	-	3,770	4,680	5,310	5,380	4,973
Manufacturing Industries - Estimated Rate of Capacity Utilization (%)								
	-	-	-	40.4	33.1	25.5	24.9	21.0

Selected Economic Indicators, 1975-1998 (contd.)

Gross National Product (GNP) at 1975 prices (million cedis)								
	1983	1984	1985	1986	1987	1988	1989	1990
	4,717	5,103	5,345	5,601	5,866	6,206	6,545	6,724
Per Capita National Income at 1975 prices (cedis)								
	363	391	397	407	412	426	439	437
Gross Domestic Product (GDP) by kind of economic activity and percentage distribution in purchasers' value at constant 1975 prices (million cedis)								
agriculture	2533.6 (53.5%)	2,779.7 (53.9%)	2,797.7 (51.6%)	2,890.2 (50.7%)	2,891.4 (48.4%)	2,994.7 (47.4%)	3,121.9 (47.1%)	3,058.9 (44.6%)
industry	535.4 (11.3%)	599.3 (11.5%)	704.8 (13.0%)	758.1 (13.3%)	844.1 (14.1%)	906.5 (14.4%)	930.3 (14.0%)	994.8 (14.5%)
services	1797.8 (38.0%)	1,917.0 (37.3%)	2,061.2 (38.0%)	2,195.1 (38.5%)	2,401.0 (40.2%)	2,589.1 (41.0%)	2,761.9 (41.6%)	2,980.8 (43.5%)
Electricity - energy generated (millions of kwh)								
	2,571	1,815	2,996	4,405	4,676	4,808	5,231	5,801
Manufacturing Industries - Estimated Rate of Capacity Utilization (%)								
	30.0	18.0	25.0	25.0	35.0	40.0	40.6	39.8

Selected Economic Indicators, 1975-1998 (contd.)

Gross National Product (GNP) at 1975 prices (million/billion* cedis)								
	1991	1992	1993	1994	1995	1996	1997	1998
	7,079	7,359	7,739	8,034	4076.1*	4264.0*	4445.3*	-
Per Capita National Income at 1975/1993* prices (cedis)								
	449	453	462	468	217,907*	221,871*	224,426*	-
Gross Domestic Product (GDP) by kind of economic activity and percentage distribution in purchasers' value at constant 1975 (million cedis)/1993 (billion cedis)*prices								
agriculture	3,235.1 (47.2%)	3,195.2 (42.6%)	3,269.3 (41.6%)	3,358.2 (42.7%)	1,511.2* (36.3%)	1,590.1* (36.5%)	1,658.4* (36.6%)	1746.4* (36.8%)
industry	1,031.6 (14.9%)	1,096.0 (14.6%)	1,154.9 (14.7%)	1,187.3 (15.1%)	961.1* (24.9%)	994.5* (24.9%)	1,035.3* (25.4%)	1182.3* (24.9%)
services	3,135.1 (45.7%)	3,391.4 (45.2%)	3,634.1 (46.2%)	3,816.9 (48.5%)	1,065.8* (28.1%)	1,118.6* (28.0%)	1,170.8* (28.7%)	1377.7* (29.1%)
Electricity - energy generated (millions of kwh)								
	6,109	6,602	6,261	6,077	6,133	6,627	-	-
Manufacturing Industries - Estimated Rate of Capacity Utilization (%)								
	40.5	44.5	45.7	-	-	-	-	-

Source: Compiled from Quarterly Digest of Statistics, 1982-1998, Ghana Statistical Service, Accra - Ghana.

Table 2.2: Economically Active Population by Industry, Ghana, 1960 and 1984

Year	Total population	Population 15-64	Total economically active population	Agric., forestry, hunting & fishing	Mining & Quarrying	Manufacturing	Construction	Electricity, gas & water	Wholesale & retail trade	Transport, storage & communication	Financing, insurance & business services	Community, social & personal services	Activities not adequately defined
1960	6,726,815	3,516,832	2,724,850	1,578,880 (58.0%)	48,430 (1.8%)	235,240 (8.6%)	89,370 (3.3%)	14,110 (0.5%)	371,500 (13.6%)	68,420 (2.5%)	155,090 (5.7%)	-	163,810 (6.0%)
1984	12,296,081	6,267,606	5,422,480	3,310,967 (61.1%)	26,828 (0.5%)	588,418 (10.9%)	64,686 (1.2%)	15,437 (0.3%)	792,147 (14.6%)	122,806 (2.3%)	27,475 (0.5%)	473,716 (8.7%)	-

Source: Extracted from United Nations Demographic Yearbooks 1964, 1988 and 1992.

Table 2.3: Value Added in Agriculture and Industry, Ghana, 1980-97

Millions of US dollars, constant 1987 prices												Ave. annual percentage growth		
	1980	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1975-84	1985-89	1990-97
Agric.	2,626	2,660	2,773	2,717	2,873	2,838	2,904	2,983	3,109	3,234	3,305	0.2	2.3	2.4
Indus.	877	888	912	975	1,011	1,074	1,132	1,163	1,202	1,252	1,312	-7.5	9.1	4.5

Source: African Development Indicators, 1998/99, tables 2-2 & 2-3. The World Bank, Washington, D.C.

during the period. Transport, storage and communications remained relatively unchanged, however, financing, insurance and business services recorded the most significant decline from 5.7% in 1960 to 0.5% in 1984.

The dominance of agriculture as the major economic activity of the population continued into the 1990s as revealed in Table 2.3. Value added in terms of millions of US dollars at constant 1987 prices was significantly higher in agriculture than in industry for all years from 1980 to the late 1990s. However, average annual percentage growth for the period 1975 to 1984 was 0.2 in agriculture compared to -7.5 in industry. For the 1985-1989 period, it was 2.3 and 9.1 respectively, whilst from 1990 to 1999, the average annual percentage growth was 2.4 for agriculture and 4.5 for industry. Much detailed description of the various economic activities engaged in and their performance would be presented later. For now, it would be interesting to compare some development indicators with the economic figures just discussed.

The human development index (HDI) saw some slight improvement in overall standard of living for Ghana, rising from .310 in 1990 to .544 in 1997. Literacy rate also improved significantly, from a low of 27 percent in 1960 to a high of 66 percent in 1997. As well, the proportion of women in the labour force increased from 42 percent in 1970 to 51 percent in 1997, while maternal mortality dropped from 1,070 per 100,000 live births in 1980 to 740 for the period 1990-96. It is also reported that the population without access to safe water declined from a high of 65 percent in 1970 to a relatively low of 35 percent for the period 1990-97. The population without access to health services remained relatively high at 40 percent for the period 1985-90 and 1990-95, whilst the population without access to sanitation also remained high at 45 percent in

1970, and as recently as the period 1990-97 (World Development Report, 1998/99; Human Development Reports, 1982-1999).

While some evidence would tend to suggest that economic and social development over the last five decades in Ghana has had a positive impact on health and health services (ISSER, 1994; Lavy and Quigley, 1993), the effect on the health status of the population in general remain debatable. This is explained by the fact that as in Ghana and elsewhere in the world, health forms an integral part of development. But development in general in developing countries such as Ghana, as noted earlier is part of a wider problem which cannot be divorced from the global restructuring of capital, and the strategies of development promoted by the Bretton Woods agencies namely, the World Bank and the International Monetary Fund in the 1980s and early 1990s.

The Institute for Statistical, Social and Economic Research (ISSER) reports that the difficult economic situation created by structural adjustment has led to a rapid decline in health services in Ghana as a whole, with the rural areas being hit the severest (ISSER, 1994). According to the Institute, the lack of basic health facilities for the population, particularly in the rural areas has resulted in a very high mortality rate in the country. The Institute notes that out-patient attendances at Ministry of Health institutions fell from 10-11 million in 1973 to about 3.7 million in 1992, mainly as a result of declining standards in quality of service, including shortages of drugs.

The problem, according to the Institute, is compounded by the introduction of the fee system in respect of medical services provided by the Ministry of Health. It is revealed, as for example, that there are many cases where people just refused to visit a health facility simply because they could not afford the cost of the service to be provided. The Institute concludes that, total coverage and hence access to health services remain low, or simply do not reach, or are inaccessible to a large proportion of the population in need.

Lavy and Quigley (1993:10) also note that medical care in Ghana at any level has become a serious burden particularly for lower income as well as better-off households. They point out that regardless of the choice of treatment regime, the cost of medicine is a very large fraction of total costs, about 60 percent at all intensities of treatment (access costs are also very high, transportation accounting for 8 to 13 percent of total costs). As these authors observe in their survey of low-income Ghanaian households, while "in absolute terms the expenditures on medical care are quite small ... these are very poor households. On average, one consultation costs 877 cedis or only about US$3. But average per capita income is only 71,000 cedis a year. Therefore, one medical consultation in a four week period consumes roughly 15 percent of monthly income." With this kind of burden, the authors note it is hardly surprising that utilization of government medical facilities has fallen under the period of adjustment.

Still, other studies reveal that serious nutritional problems remain in Ghana, especially among children and women. These are illustrated by data from the national nutrition survey conducted by UNICEF in 1986 and reports from the Ministry of Health (ISSER, 1994). The UNICEF survey showed that 58.5 percent of pre-school children suffered from acute or chronic undernutrition, that is, were underweight (weight-for-age). This was twice the level reported in the first nutritional survey in 1961. Also, 51.5 percent were stunted (height-for-age); 40.3 percent were wasted (weight-for-height); and 8 percent were clinically classified as suffering from marasmus and kwashiorkor (that is, were severely malnourished). Also, the Ministry of Health found 70.1 percent of pregnant women who attended antenatal clinics to be anaemic by World Health Organization (WHO) standards. The Ministry observes that the high prevalence of malnutrition in Ghanaian women from all regions reveals a nationwide problem of malnutrition in this segment of the population.

In summary, while the evidence is presumably good enough to show convincingly that there has been some improvement in socioeconomic development, it is not possible to be precise about the magnitude of change, especially in regard to health and social conditions. The pace of decline in socioeconomic conditions is, however, presumed to have slowed down in the 1960s. Also, in the opinion of many experts, developing countries cannot for long continue to make progress in reducing mortality through the intensification and extension of health technology unless great advances are made in other spheres of modernization and economic development. Thus, future trends of mortality in developing countries may depend more than in the recent past on economic and social developments (Gaisie, 1981).

But the evidence clearly suggests that Ghana has remained a predominantly agriculture-based economy since independence to the present period. The manufacturing and services sector whose expansion represents a shift from pre-industrial to an industrial-based economy or modernization, and its concomitant shift in disease patterns has remained relatively stagnant or underdeveloped. This scenario leads to a discussion of the epidemiologic transition theory that would provide the theoretical context that would situate Ghana in its present stage of epidemiologic transition.

CHAPTER THREE

THEORETICAL ORIENTATION

The Theory of Epidemiologic Transition

Omran (1971) posits in the theory of epidemiologic transition that "many countries have experienced a significant change or transition from high to low mortality accompanying either social development ... or a combination of medical development and early social change ... when antibiotics, insecticides, sanitation and other medical technology were introduced after World War II." He also identifies the commonality of the shifts in the kinds of diseases and causes of mortality that are prevalent at specific time-points in the development of a country or society. Following from this, he posits that an epidemiologic transition has parallelled the demographic and technologic transitions in the now developed countries of the world and is still underway in developing countries. Omran distinguishes three major successive stages of mortality transition: (1) the age of pestilence and famine when mortality is high and fluctuating, thus precluding sustained population growth; (2) the age of receding pandemics when mortality declines progressively, and the rate of decline accelerates as epidemic peaks become less frequent or disappear; (3) the age of degenerative and man-made diseases when mortality continues to decline and eventually approaches stability at a relatively low level.

The first component of the epidemiologic transition as identified by Omran represents the shifts in recorded cause-of-death patterns. Trends in causes of death are observed most frequently as a ratio of the relative contributions of each cause of death to deaths from all causes, or more simply as changes in the relative rankings of the ten leading causes of death. Rapid changes in cause-of-death patterns imply that a major transition in the general health status of the population has taken place.

During this first stage, death rates fluctuate at very high levels in response to epidemics (i.e., infectious and parasitic diseases) that periodically ravaged the population. The major killers during this era included influenza, pneumonia, diarrhea, smallpox, tuberculosis, and other related diseases. Infants and children were preyed upon the most by the major killers of this era, although women of reproductive ages also faced an unusually high risk because of the complications associated with pregnancy and delivery.

The second component involves the age and sex groups of the population that are affected by mortality transitions. The importance of following changes in patterns of death among different age and sex groups is that one may determine, first, whether some subgroups of the population are benefiting more or less than others from changes in the population's general health status, and second, it provides more detailed information on the relative risk of death by cause for population subgroups. This stage, the Age of Receding Pandemics was noted as a transitional phase. It was characterized most by rapid improvements in sanitation and standards of living, with medical and public health measures contributing significantly (McKinlay and McKinlay, 1977; Chen and Wagner, 1978).

With health and social conditions improving, those who have previously succumbed to infectious and parasitic diseases survive through their early years into middle and older ages where they face the elevated risk of dying from chronic degenerative diseases. Since degenerative diseases and infectious and parasitic diseases tend to kill at opposite ends of the age structure, the transformation in causes of death during this era resulted in a redistribution of death from the young to the old. The most favourable effects on survival were, therefore, concentrated among infants, children and women of childbearing ages, which resulted in increased prospects for surviving to, and through adulthood.

The third component of epidemiologic change is the effects of transitions in causes of death on survival; which group benefits the most from mortality transitions in terms of gains in life expectancy. The importance of this component is that it identifies the benefactors of declining mortality not just in terms of changes in the risk of dying, but in terms of the number of years of life gained. Also, by observing relative changes in longevity for different age and sex groups as a function of mortality change across the age structure, it is possible to pinpoint where the largest gains in longevity are concentrated.

This stage, the Age of Degenerative and Man-made Diseases, has been described basically as a plateau phase in the epidemiologic history where we again reach a level considerably lower than that of the first stage. In this stage, the pace of the declines in mortality rates throughout the age structure slows as the theoretical limits to mortality declines are approached. The major causes of death for the population are established as chronic degenerative diseases, such as heart disease, cancer, and stroke, which tend to kill at ages near what was believed to be the end of the life span.

Olshansky and Ault (1986) argue that the distinct trends in mortality since the mid-1960s qualify as a fourth stage of the epidemiologic transition. According to them, the general characteristics of the fourth stage include: rapidly declining death rates that are concentrated mostly in advanced ages and which occur at nearly the same pace for males and females; (2) the age pattern of mortality by cause remains largely the same as in the third stage, but the age distribution of deaths for degenerative causes are shifted progressively toward older ages; and

(3) relatively rapid improvements in survival are concentrated among the population in advanced ages.

Thus, in this stage the major degenerative causes of death that prevailed during the third stage of the transition remain with us as the major killers, but the risk of dying from these diseases is redistributed to older ages. This unexpected shift in the age pattern of mortality for degenerative causes for the population in advanced ages is what is so unique about the fourth stage and is its major distinguishing characteristic from the third stage of the transition. Since this stage is characterized most by a substitution of the ages at which the major determinants of death prevailing at the time tend to kill, it is referred to as the Age of Delayed Degenerative Diseases. This means that while it is likely that degenerative diseases will remain with us as the major causes of death, the risk of dying from these diseases during this stage in our transition is thought to be progressively redistributed from younger to older ages.

But as Rogers and Hackenberg (1987) observe, the epidemiologic transition theory concentrates on two major types of death – infectious, and chronic and degenerative – but masks interactions. Based on their study of disease patterns in the United States, they note, for instance, that the present stage of science, technology, and affluence provides the occasion for the interaction between infectious and chronic diseases. Similarly, some terminal cancer patients die of pneumonia, influenza, or septicemia. Such examples, according to them, highlight the interplay of infectious and chronic diseases. Also, the theory postulates that infectious diseases will decline, but will not be eradicated. But in the United States, infectious diseases, including tuberculosis, influenza, cholera, and diphtheria represented 53 percent of all deaths in 1900, but only 6 percent in 1970 (Omran, 1977). As well, many infectious diseases, including smallpox have been eliminated.

Furthermore, the theory posits that with time, chronic and degenerative diseases increase in importance. Between 1900 and 1970, the percentage of deaths due to heart disease and cancer jumped from 12 to 56 percent. The theory, however, cannot easily account for decreases in mortality rates for such chronic degenerative diseases as stroke and ischemic heart disease (see Crimmons, 1981; Manton and Soldo, 1985; Rosenwaike, 1985). These studies reveal that many of these declines have been realized through medical factors and lifestyle changes including, reduced cigarette smoking, increased physical activity, and reduced intake of saturated fats.

It is also observed that several causes of death, including violent deaths, have changed significantly over time, but are not considered separately under the theory. Broudy and May (1983), in their study of Navajo Indians, found that behavior-related mortality, especially violent death, was a leading cause of mortality. They therefore added the category "social pathology," to include accidents, alcoholism, suicide, homicide, and cirrhosis of the liver. According to the theory, the Navajos had entered the last stage of the transition. However, the proportion of mortality due to degenerative diseases was rising slowly while mortality due to social pathologies was rising rapidly.

Rogers and Hackenberg also observe that many deaths in the United States are now due to social pathologies. They therefore saw the need to include categories that capture violent and accidental deaths, and deaths due to behavioral causes, in the epidemiologic transition theory. The authors note that disease pattern shifts before the twentieth century in the United States were more closely associated with improved nutrition, rising standards of living, and changes in the nature of some diseases, than with medical progress. In the twentieth century, according to them, the United States progressed through the transition in response to medical progress and public health programs (Omran, 1982, 1983; Preston, 1977).

Another observation is that although the major causes of death are still due to degenerative and man-made diseases, death is becoming increasingly influenced by individual behaviors and new lifestyles, influences not concretely addressed in the present theory. The theory attributes declining mortality to improving life-styles; however, cancer mortality has increased because of such detrimental life-styles as cigarette smoking. Rogers and Hackenberg are therefore of the view that for future mortality reductions, there is the need to couple medical technology, public health measures, and individual life-style changes. They note that public health measures have become increasingly important, especially insofar as they can beneficially alter individual behaviors. Another feature of the fourth stage of the epidemiologic transition not addressed is the narrowing of the sex gap in life expectancy at age zero, after a prolonged pattern of widening differences in favour of women (Trovato and Lalu, 1996).

Based on above evidence, the authors suggest the United States has entered a new stage which extends the epidemiologic transition theory. They refer to this stage as the hybristic stage which, according to them, began in the 1970s. They define hybris as excessive self-confidence, a belief that one cannot suffer, and that one is invincible. Morbidity and mortality in the hybristic stage are affected by man-made diseases and increasing modernization as well as individual behaviors and potentially destructive life-styles. They note that Acquired Immunodefficiency Syndrome (AIDS), which is directly related to a person's behavior and life-style, exemplifies causes of death in the hybristic stage.

It is reported that since the AIDS epidemic began, more than sixty million people have been infected with the virus (UNAIDS/WHO, 2001). The report observes that HIV/AIDS is now the leading cause of death in sub-Saharan Africa, and the fourth-biggest killer world-wide. At the end of 2001, an estimated forty million people globally were living with HIV, with 2.3 million killed in Africa. In addition, it is noted that the estimated 3.4 million new HIV infections in sub-Saharan Africa in the past year mean that 28.1 million Africans now live with the virus. And in many parts of the developing world, the majority of new infections occur in young adults aged 15-24, with young women especially vulnerable. Most of them do not know they carry the virus, and many millions more know nothing or too little about HIV to protect themselves against it.

With particular reference to Ghana, the Ministry of Health (1999) reports that two transmission mechanisms account for most new HIV infections: heterosexual contact and mother-to-child (MTC) transmission. The Ministry observes that even though the probability of transmitting HIV during intercourse can be quite low, one factor that increases the risk of infection is the presence in either partner during unprotected sex of a sexually transmitted disease (STD), such as syphilis or gonorrhea. A second contributing factor is the large number of sexual partners. The Ministry also reports that many children are infected through mother-to-child transmission, during pregnancy, at the time of birth, or through breastmilk. According to the Ministry, about 30-40 percent of infants born to infected mothers will themselves be infected, whilst the other 60-70 percent will not become infected, but are at the risk of becoming orphans.

Official statistics indicate that the number of AIDS cases reported was 29,550 as at the end of 1998. The most affected age groups were 30-40 for males and 25-35 for females (Table 3.1). The Ministry notes that this figure is far below the actual number of people who have contracted the disease since most AIDS cases are not reported. However, based on a projection model used by the Ministry, it is estimated that the total number in Ghana was more than 114,000 by the end of 1998.

Considered against the totality of the evidence presented so far - the fact that Ghana still remains a predominantly agricultural-based economy but with some signs of emerging industrialization, coupled with the fact that malaria also remains the number one killer, though accompanied by significantly low mortality, as well as evidence of some positive development indicators - the argument can be made that Ghana has passed the first stage of the epidemiologic transition, and is in the early part of the second stage; the Age of Receding Pandemics. This theoretical background makes possible the development of a conceptual framework that would serve as basis for the analyses.

Table 3.1: Incidence of Reported Aids Cases (Cumulative) in Ghana by Age and Sex, 1986-1998

Age Group	Male		Female		Total	
	No. of cases	%	No. of Cases	%	No. of Cases	%
0 - 4	154	1.4	163	0.9	317	1.1
5 - 9	29	0.3	22	0.1	51	0.2
10 - 14	20	0.2	42	0.2	62	0.2
15 - 19	77	0.7	526	2.8	603	2.0
20 - 24	535	5.0	2878	15.3	3413	11.6
25 - 29	1798	16.8	4449	23.6	6247	21.1
30 - 34	2490	23.3	3849	20.4	6339	21.5
35 - 39	2296	21.5	2782	14.8	5078	17.2
40 - 44	1324	12.4	1621	8.6	2945	10.0
45 - 49	980	9.2	1042	5.5	2022	6.8
50 - 54	469	4.4	691	3.7	1160	3.9
55 - 59	221	2.1	307	1.6	528	1.8
60+	226	2.1	329	1.7	555	1.9
Not Stated	81	0.8	145	0.8	226	0.8
Total	10700	100.0	18846	100.0	29546	100.0

Source: Ministry of Health, Accra, Ghana. National AIDS/STD Control Programme. 1999. HIV/AIDS in Ghana. Background, Projections, Impacts, Interventions.

Conceptual Framework

The multicausal approach of epidemiology has made it possible to describe the distribution and course of diseases in the population. According to the epidemiological concept, health-disease is a process depending on the balance between man, various external pathogenic factors and the physical, biological and social environment. Therefore, the conceptual framework guiding this study involves two levels of analyses; macro- and micro-level analyses. This is premised on the fact that the level of social development and/or modernization and the accompanying mortality trends and disease patterns are indicative of the stage of epidemiologic transition. This, in turn, is determined at the macro level by such aggregate development and/or social indicators as birth rates, mortality rates, life expectancy, gross domestic product, income per capita, level of literacy, and many more as has already been established. It follows from above that the macro-level analysis, which is mainly descriptive has been extensively covered in the preceding chapters.

However, to achieve optimum targeted outcomes in policy implementation, it is important that indicators or measures are investigated at the individual and/or subgroup level. This is where the usefulness of micro-level analysis, which forms the primary focus of this study comes in handy. Indeed, micro-level analysis has the advantage not only of enhancing our understanding of the aggregate level indicators, but more importantly, it permits a more detailed insight of the problem under investigation. This part of the analysis would examine the health status of the population as reflected in the prevalence of malaria. This would be in relation to selected sociodemographic characteristics such as age, sex, place of residence, marital status, socioeconomic status, among others. The theoretical relevance of these variables is discussed in the sections below.

Concept of Health and Health Status

Formal definition of health has gone through several revisions in the literature which reflect the increasing sophistication in understanding of the determinants of health. The World Health Organization (1975) defined health as a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity. With time, this definition was judged inadequate as attention got focussed on health promotion activities and population health. As a result, the health promotion definition views health as "... a resource for everyday life, not the objective of living" (The Ottawa Charter on Health Promotion, 1986). Similarly, Jake Epp (1986) defined health as " a resource which gives people the ability to manage and even to change their surroundings."

Evans and Stoddart (1994) observe in the above definitions an expression of a general perception that there is much more to health than simply a collection of negatives - a state of not suffering from any designated undesirable condition. They note that common usage suggests a continuum of meanings; at one end of the continuum is well-being in the broadest sense, the all-encompassing definition of the World Health Organisation, and at the other end is the simple absence of negative biological circumstances - disease, pain, disability or death.

These authors observe that the concept of health, as traditionally defined from the patient's perspective is the absence of illness or injury, of distressing symptoms or impaired capacity. On the other hand, disease, as a medical construct or concept, will usually have a significant bearing on illness, and thus on health, but is not the same thing. Illness, in turn, has a very important (negative) influence on well-being, but not the only one. The authors note that the functional capacity of the individual will be influenced but not wholly determined by the perception of illness, and that capacity too will be an aspect, but not the totality, of well-being.

Therefore, health status can only be adequately investigated in relation to the whole social-structural context, and it becomes necessary to pull together all the applicable elements of proven conceptual models in order to have a broader perspective. These factors would then be synthesized into a simple multi-dimensional framework applicable to Ghana taking into consideration unaccounted for aspects and the unique social structure of the population. The elements in question are generally discussed under the broad heading of factors affecting health.

Factors Affecting Health

Socioeconomic Factors:

Despite general improvements in health status, broad-based social and economic change, and advances in health care technology and the delivery of medical services, socioeconomic status (SES) remains a powerful predictor of health throughout the industrialized world and in poorer developing countries (Marmot et al., 1987; Williams, 1990). The elements that make up the social and economic environment include, among others, employment, social status, social support networks, education and other social factors in the work place.

Also, studies have established that the link between health status and socioeconomic status is strong (Syme, 1994), not only within the community, but also in the work place (Frank and Mustard, 1994; Wilkinson, 1994; Renaud, 1995). Rank in the social hierarchy appears to have important implications for health behaviour, with those higher up feeling more control over life and unhealthy habits (Renaud, 1995). The significant association between unemployment and illness (Jin et al., 1995) presents a strong argument that the provision of gainful employment opportunities acts to safeguard the health of individuals.

Psychological Factors:

Internal or psychological dynamics that influence coping style, host response and resilience seem to account for differences between individuals who share similar socio-environmental conditions. Stress is a complex multidimensional process, and while there has been an abundance of research on the stress process, the definition of stress is still debated in the literature. A negative perception of stress (or a negative meaning attached to a stressor) is referred to as distress. There have been several cross-sectional studies of how psychological states influence perceived health, generally finding that distress is associated with poorer perceived health, even after controlling for other measures of health status (e.g., Krause, 1987; Levkoff et al., 1987).

While psychological distress has been associated with poorer perceived health, Farmer and Ferraro (1997) question whether the effect of distress is long-term, and if poor perceived health in turn leads to more distress. Life stress may lead to health decline, and health problems often become sources of distress. Louria (1992) points to numerous definitions used to explore stress including external events, depression, and even specific physiological or biochemical changes associated with "stressful" situations. However, what has become clear is that stress does not necessarily cause a decrement in quality of life. Life changes and experiences that appear stressful do not necessarily lead to negative outcomes (House, 1994).

House argued that an individual's perception of the situation mediates the relationship between social conditions and outcomes. He notes that there are few objective social conditions that are inherently stressful. Instead, the meanings that individuals attach to the condition are what determines if it is a source of stress (Mead, 1934; Stryker, 1980). Wheaton (1990) showed convincingly that many life transitions do not precipitate distress. Rather, it is the context and meaning of the transition that are key to explaining the outcomes of life events.

When distress is experienced, it is clear from previous research that it negatively affects perceived health. The greater the stress a person experiences, the more likely that physical illness will occur (Brody, 1989). When several negative events occur in the same general time period, they have a cumulative effect (Seta, Seta, and Wang, 1991); that is, as the total number of stressful experiences increases, the probability of illness increases (Cohen, Tyrrell, and Smith, 1993). In one of the first studies on the subject, Maddox (1962) found that depression, a poor adjustment to the environment, and pre-occupation with health are related to poor perceived health. Tessler and Mechanic (1978) examined four data sets and found a significant correlation between distress and perceived health. Krause (1987) used the life stress perspective to study racial differences in perceived health status and found that different types of life stress, life events or chronic life strains influence perceived health.

Physical Factors:

Within the health determinants framework, social and physical environments feature prominently as important factors contributing to health status (Keating and Mustard, 1993; Syme, 1994). Having addressed social environment in the context of the economy, it is important to look at the physical environment. Basically, physical environment refers to existing conditions at one's place of residence and work. Interpreted more broadly, this may include the potentially harmful effects of exposure to physical, chemical and biological agents at home, at work and anywhere else. The safety, quality, and sustainability of the physical environment has profound implications for health. Nutrition, water, air and housing must be clean for optimal health. Environmental degradation resulting in the toxification or depletion of country foods has led to dramatic dietary and economic changes as well as poor health. Also, there is increasing evidence that the social structure of workplaces and the level of job discretion strongly influence workers' risks of heart disease and overall mortality rates (Marmot and Theorell, 1988).

With respect to malaria transmission, Jamison et al (1993) observe that vector density and survival, human-vector contact and duration of parasite development in the vector are dependent on availability of surface water and climate, which in turn also influences the distribution of rural populations and their agricultural activities. It is therefore possible to identify major differences in the epidemiology of malaria associated with main types of ecological areas, which would provide a first characterization of the epidemiological pattern.

It is also reported that even before the mechanism of malaria transmission had been elucidated, Hirsch (1883) had long recognized that protection against the disease was related to low temperatures and high altitudes. He noticed that epidemics in the highlands were always located in a valley with a small declivity or a basin-like depression in plateau. Hills and mountains have therefore been recognized as natural shelter against the heat and diseases of the lowlands for at least several centuries. Studies suggest that the current upper limit for malaria in the African highlands is difficult to define precisely and is likely to rise but it is reported that in many countries, this boundary is thought to occur around 2000 meters, noting that that areas higher than 1500 meters have little or no malaria.

Cultural Factors:

Culture has traditionally been defined as a socially acquired "way of life" transmitted from one generation to another (Murdock, 1965). Cultural influences on health and medical care involve such basic aspects of human behaviour and belief systems as religious practices, language, folk medicine, diet, dress, norms, values, and help-seeking behaviour. These cultural practices in turn have an impact on perceptions of symptoms, definitions of illness, delivery of health services, disease prevention, health promotion, medical practice, and patient adherence (Snow, 1978; Jackson, 1981).

Studies of the consequences of culture change for the health of a population have shown that these consequences vary with different categories of people, and suggest that the significance and stressful potential of the new situation differ accordingly (Coren, 1995). Culture change is not restricted to objective transformations affecting concrete conditions of life; it also involves deep cognitive changes at the level of values and self-perceptions, and therefore underlie health status differentials in populations.

Dressler's (1982, 1985) studies of culture change are more directly informed by a socio-structural perspective. Thus, he assumes that the transformation of culture has an impact on the social structure of relationships and involves social differentiation; its impact would be manifested by differential access to material goods and to sources and symbols of prestige which play an important role in the framing of social identity. Dressler considers "lifestyle" an important marker of the place an individual occupies within a class and/or society. "lifestyle stress" would result from the conjunction between low economic status and a high material lifestyle, which is hypothesized to undermine social identity. According to Dressler, culture change is not pathogenic in itself. Adaptation to modern life is problematic only when individuals lack access to the economic resources necessary to sustain their aspirations to a modern lifestyle.

Over the last decade, medical anthropologists and cultural psychiatrists committed to an interpretive frame have explored the social origins of disease and the ways that macrosocial forces translate into local structures of power and interact with cultural features and bodily processes in the production, expression, and management of disease (Kleinman, 1981, 1986). In a study of neurasthenia in China, Kleinman found that local systems of explanation and traditional values helped to shape the meaning, experience, and manifestations of the disorder. Specifically, the general disruption brought about by the Cultural Revolution constitutes an overarching frame of meaning, encompassing discrete events in individuals' lives and in part, determining both the occurrence and the significance of these events. Relying on a combination of epidemiological data and intensive interviews with patients, their families and healthcare providers, Kleinman illustrates how macrosocial forces are reflected in micro-depressogenic systems, and how they can lead to demoralization, distress, and despair.

Personal Health Practices:

The health of individuals is strongly linked to one's coping skills and to the choices one makes about health behaviours. Being able to communicate with others, to cope with stress, and having a sense of control over one's life circumstances are all important in helping resist disease (see for example, Turner and Roszell, 1994; Kessler, Turner and House, 1988; Mirowsky and Ross, 1990; Rosenfield, 1989). Also, the choices individuals make about smoking, alcohol consumption, drug use, physical exercises, sexual behaviour, diet, personal hygiene, etc have a major impact on one's health and well-being.

Medical/Health Care:

Health services promote, protect, maintain, and restore good health and are an important determinant of health. Differences in health status may result from systematic differences in care-seeking behaviour, in access to health services, or in availability to other resources or characteristics that influence the effectiveness of health care. Also included here would be differential survival rates for a given disease when effective therapy has been provided.

Genetics:

The genetic endowment of the individual, biological differences in sex, and the way in which the human body develops and ages are fundamental determinants of health status. The onset of genetic disease may occur at any time in the life cycle, and results from a complex interaction between the genetic endowment (genotype) of the individual and the environment. Some diseases are the direct consequence of genes that do not permit normal function in any environment. In others, a genetic predisposition is only expressed under certain environmental conditions. Genetics can be crucial to well-being for single-gene diseases, inherited vulnerabilities, and propensities. Baird (1994:134) observes that "genes set the limits of our possible responses, not only to physical and biological environments, but also to our psychological and social environments." Evans and Stoddart (1994:51-52) observe that inherited vulnerabilities and propensities may be even more important for populations than single-disease genetic predispositions.

The protection of populations against diseases by their genetic makeup is termed balanced polymorphism. And Breman (2001) observes that human populations exposed to malaria infection may vary from in their susceptibility to infection and severity of illness. He notes that sickle cell and other traits that alter red blood cells structure limit parasite multiplication, and since the heterozygous trait is more prevalent in African populations, it may protect against malaria, particularly cerebral malaria. He explains further that the presence of the Duffy blood factor on the surface of red blood cells is required for the *Plasmodium vivax* to enter the red blood cells and because over ninety percent of sub-Saharan Africans lack the Duffy factor, *Plasmodium vivax* is essentially absent from most of this area.

Social Support:

Social support usually refers to the functions performed for the individual by significant others,such as spouse, family members, friends, and co-workers. Significant others can provide instrumental, informational, and/or emotional assistance (House and Kahn, 1985; House, 1981). These various supportive functions usually are highly correlated and often form a single underlying factor summarized as perceived or received social support. This form of support has been linked to a diverse array of positive outcomes, including stress reduction (Haines and Hurbert, 1992; House, Umberson and Landis, 1988), decreased likelihood of everything from cancer and cardiological problems to infections (Adams and Blieszner, 1995; Evans and Stoddart, 1994; Syme, 1994), decreased mortality and suicide (Cornell, 1992; Pescosolido, 1990), career mobility (Ibarra, 1992), church membership (Bainbridge, 1990), and life satisfaction (Stevens, 1992). The healing support of friends and family is not a new insight. However, it is also observed that too many people in one's social network can be as daunting and stressful as social isolation (McDaniel, 1995, 1993). In fact, a number of researchers are of the view that social support is a multifactorial construct that may have differing consequences (Funch and Mettlin, 1982; House, 1981).

The mechanisms linking social ties to mortality can be grouped into four general categories: (1) individual attributes including personality characteristics, coping strategies and psychological impairment - all of which may influence reactions to stress, how one deals with health concerns, the appraisal of stressful events, and the availability of social ties (see, e.g., Lieberman, 1982; Wortman, 1984); (2) behavioral mechanisms by which social ties facilitate compliance with medical regimens or motivation to engage in harmful behaviors (e.g., Caplan, Harrison, Wellons and French, 1980); (3) physiological or biochemical mechanisms, such as neuroendocrine responses to the presence of others (e.g., Berkman and Syme, 1979; Broadhead, Kaplan, James, Wagner, Schoenbach, Grimson, Heydon, Tibblin and Gehlbach, 1983); and (4) buffering or prevention of situational factors such as chronic strain, life events, or environmental stressors (e.g., Lieberman, 1982; Thoits, 1982, Wortman, 1984).

Studies of social relationships and mortality reveal that family relationships are particularly instrumental in protecting individual health. Umberson (1987) posits that family ties involve elements of meaning and obligation which contribute to social control; that social control is a mechanism by which social relationships affect health behaviors; and that health behaviors affect health outcomes. He observes that numerous possible pathways exist, both physiological and social-psychological, by which social relationships may affect health outcomes. One pathway is through health behaviours; involvement in social relationships may affect health behaviours that influence mortality. A study by Berkman and Breslow (1983) found that social networks and healthful behaviors have an additive effect on change in physical health, as well as on mortality. These findings suggest that part of the impact of social ties on subsequent mortality may occur indirectly through its effect on health behaviors.

Among the relationships examined, marital relationship is one of the most consistent categories of social contact in predicting mortality. Age-adjusted mortality rates are consistently higher for the unmarried than for the married (Lillard and Waite, 1995; Trovato, 1992; Trovato and Lauris, 1989; Blazer, 1982; House, Robbins and Metzner, 1982). Several authors of social relationship and mortality studies suggest that mortality differences among marital status (Berkman and Syme, 1979; Gove, 1973; House et al., 1982; Hughes and Gove, 1981; Syme, 1974) and parenting status (Kobrin and Hendershot, 1977) groups exist partly because the unmarried and nonparents are more likely than the married and parents to engage in behaviors that contribute to premature mortality.

Durkheim (1951), and later Syme (1974) and Gove (1973) have argued that the married have lower mortality rates than other marital status groups partly because marriage provides a healthy social environment for its participants. This environment may be due to an enhanced "sense of meaning and importance," which inhibits self-destructive acts (Gove, 1973), or may exist because married individuals are more likely than others to have someone who regulates their behavior in an adaptive way (Hughes and Gove, 1981). There is evidence that married individuals and parents experience significantly lower levels of meaninglessness than do their unmarried and childless counterparts, supporting the former explanation (Umberson and Gove, 1986). Gove's (1973) study lends support to the hypothesis that marriage serves to regulate health behaviors. He argued that the state of being married is related to (1) psychological well-being, the lack of which contributes to certain causes of death (e.g., accidents, homicide, suicide); (2) activities leading to death (e.g., smoking, drinking); and (3) the willingness and ability to undergo treatment for certain diseases (e.g., tuberculosis). For all of these causes of mortality, the married had substantially lower rates of mortality than the unmarried.

Similarly, a study of mortality differentials in Canada by marital status found that the married generally display the lowest odds of death, thus providing support for a marriage protection effect (Trovato, 1992). Also, trends in total and cause-specific mortality by marital status in the Netherlands between the period 1950-1990 reveal that married men had the lowest rate of mortality followed by widowed and never-married men, while divorced men had the highest risks (Joung, 1996). In a related study of the effect of divorce on child survival in a rural area of Bangladesh (Bhuiya and Chowdhury, 1997), it was revealed that chances of survival were always lower for children of divorced mothers than for those of non-divorced mothers.

The point needs be made that all of the factors discussed here are interrelated and their combined effect, directly or indirectly influence health status and disease patterns. Any variation in one factor is likely to influence others. As well, the order of causal determination may differ from one social context to another. At the same time, however, the extent or magnitude of the contribution of each one factor is also acknowledged.

For the purpose of this study, however, it is posited that health status in Ghana is conditioned by a complexity of sociodemographic factors. These factors consist of demographic (e.g., mortality, fertility, age structure), economic (e.g., industry, market systems, labour force participation), social (e.g., class structure, family structure, family formation), cultural (e.g., religion, norms, values, beliefs, customs), political (e.g., kinship systems, legislation, structure of government), environmental (e.g., place of residence, pollution), as well as other internal and external factors.

This proposition is represented in two conceptual frameworks (Figures 3.1 & 3.2) that depict the relationship between social class differences and the health status of Ghanaians. It must be pointed out that given the data constraints and time limitation, it would not be possible to statistically test all the variables mentioned in the foregoing discussion. Therefore, the variables represented in the final model are selected solely for the particular objective of this study. Figure 1 combines both the macro and micro levels

Figure 3.1: CONCEPTUAL FRAMEWORK FOR THE ANALYSIS OF SOCIAL CLASS DIFFERENCES AND MALARIA IN GHANA

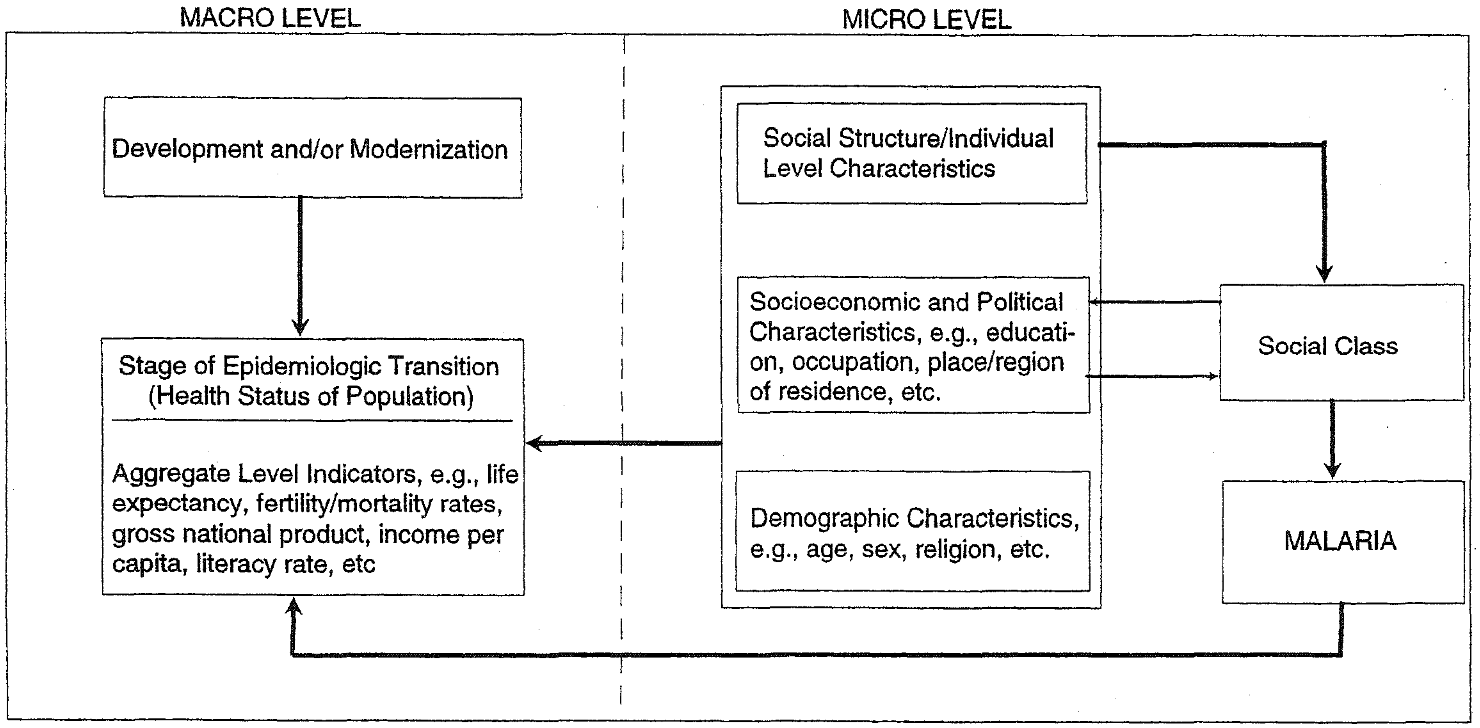
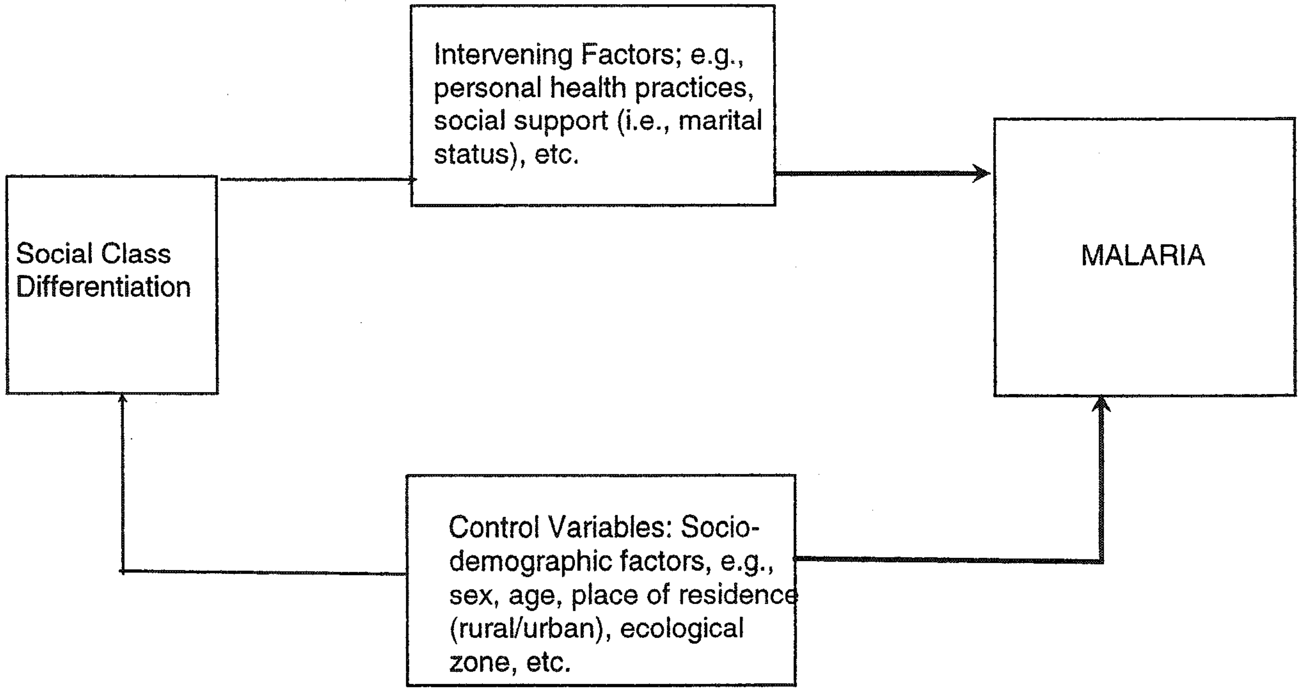


Figure 3.2: ANALYTIC FRAMEWORK FOR THE ANALYSIS OF SOCIAL CLASS DIFFERENCES AND MALARIA IN GHANA



of conceptualization, the former representing aggregate level variables as a stage of epidemiologic transition, and the latter, the effects of social class on health status. Given the particular role of the intervening variables that would be tested in this study, these relationships are further illustrated separately in Figure 3.2.

Figure 3.1 depicts that the level of development and/or modernization is an important exogenous factor at the macro level that determines the overall health status of the population, represented in the combined measure of aggregate level indicators such as life expectancy, fertility and mortality rates, income per capita, etc and several others. These measures collectively serve as indicator of the stage of epidemiologic transition. At the micro level, modernization and the development process involve economic restructuring that engenders deep socioeconomic differentiation in society, as has been amply demonstrated by countries adopting structural adjustment policy. As a result of differential opportunities, subgroups within the population become more "distant" economically and socially. This differentiation acts as intervening factors on two fronts; the demographic (age and sex) and the socioeconomic and political (e.g., education, occupation, place of residence, etc), both of which result in the creation of social classes which system, in turn, impacts health status. It must be noted that under the second condition, the opposite also holds true; socioeconomic and political factors could also influence social class.

The model represented in Figure 3.2 posits that social class influences health status through marital status and personal health practices. It is hypothesized that people of higher social class would usually be a married male and highly educated with a university degree and is less likely to suffer from malaria. This is because by virtue of their education, they are better informed and would normally lead healthy lifestyles, even though this may not hold true at all times. Additionally, the mere fact that they are married is enough to make such people lead "responsible" lifestyles even though this may not always hold true. As well, their high level of education would qualify them for highly prestigious jobs with equally high incomes, and these jobs would typically be located in the urban centres where the basic necessities of life are readily available. These may include modern health facilities as well as good social amenities that they could easily afford. They would most likely be living in big and spacious houses in the affluent parts of the city in a clean environment. In addition, they would also be owning the houses in which they live, or it must have been provided by their employers as part of the conditions of engagement, usually reserved for senior level management and professional positions. A combination of all of these factors would generally result in very high self-esteem and with that, a very healthy lifestyle that would most likely result in little or no exposure to the most common infectious disease in Ghana.

The common perception is that higher social class status is a product mainly of higher education, and perhaps, urban residence. Whilst this may be true to some extent, especially in regard to the former, other factors (e.g., dwelling ownership, number of separate rooms, heads of cattle, land ownership, etc.) when considered in combination with education would yield quite a sizeable proportion of people of higher class status in rural areas as would be shown later on in this study. Ironically, and as with most developing countries like Ghana, this group constitutes only a small proportion when it comes to considering the entire population. As such, the relatively higher life expectancy, low mortality rates, etc. experienced by this group have little influence on aggregate level health indicators of the country.

At the opposite end of the social spectrum are people of lower social class of which two groups can be identified. In the urban centres, they are those with the least education or no education at all who would normally be unemployed or, at best, engaged in the formal sector as manual labourers in the construction and manufacturing industries, and in the informal sector as traders and other service occupations. As well, it is not uncommon to find a large proportion of this group engaged in fishing activities in the urban areas of the coastal regions. Then there is a second group with some minimum level of education and engaged in the formal sector as low level clerical and support staff. In the rural areas, on the other hand, the greater proportion of this group of people is unemployed, or engaged in small-scale economic activities usually suited to their particular climate and region of residence, specifically, food and cash crop farming in the forest and savannah regions and fishing in the coastal regions. Majority of these people would most likely be unmarried and equally divided between the sexes, though its possible females would outnumber males by a slim margin.

Quite unlike the upper class, the greater proportion of people of lower class would typically live in over-crowded family compounds for free, and quite a significant number would be homeless or living in make-shift structures. In the urban areas, such family compounds are usually located in the oldest parts of the city where sanitary conditions are very poor. The same may apply to rural areas except that the family compounds may not necessarily be located in the oldest part of the township but evenly spread out. Generally, this group of people may be described as deprived because they lack most or all of the basic necessities of life that are so easily available to those in the upper class and as a result, are likely to experience high rates of malaria infection. Since people of lower class constitute more than half of the population, their social conditions significantly impact aggregate level social and health measures, such as life expectancy and mortality rates, as well as national disease patterns.

Sandwiched between these two polar classes is the middle class. This will typically be people who had secondary or some other tertiary education but not university education, even though this is not impossible. The occupations mostly dominated by people in the middle class are teaching and middle-level supervisory and administrative positions. Those in the informal sector may be engaged in medium-scale commercial activities such as trading. Within this class of people, there exist a wide range of educational levels with those with the highest education occupying the topmost spot and enjoying some advantage over those with relatively less education, regardless of place of residence. These relative differentials determine what basic social services the individual would be able to afford, which invariably translates into differential rates of infection.

A greater proportion of people of middle class status is married but cannot afford to own their homes and therefore, would usually rent houses at prices they perceive to be reasonable to them. Such houses may not be very big, compared to that of the upper class, but would typically contain sufficient number of rooms for a confortable living arrangement. In terms of proportions, both sexes may be equally represented in this class. Overall, it is expected that people of middle class would generally experience some incidence of malaria infection depending on how close or how far their conditions approximate that of the upper or lower class.

Given the particular objective of this study, three social classes will be identified - upper class, middle class and lower class. This will be accomplished by constructing a composite index based on a set of socioeconomic factors whose meaning and significance are derived from the sociocultural context of Ghana. Even though the precise meaning of the concept of social class *vis-a-vis* the different sociological perspectives and their applicability to Ghana is beyond the scope of this study, some brief explanation is warranted here.

The Concept of Social Class

There is no simple definition of class or socioeconomic status. The former is defined relationally, referring to groups of people who share a similar position such as the relationship to means of production, whiles the latter refers to the position of individuals, families, households, or other aggregates on one or more dimensions of stratification. These dimensions include income, education, prestige, power, wealth, or other aspects of standing that members of society deem salient (Bollen et al., 2001). These definitions give expressions to social and economic characteristics that are believed to be important, but the rationale or meaning is not always made clear. This notwithstanding, it is possible to discern two broad approaches.

The first approach sees class or socioeconomic status (SES) as essentially a unitary concept. From this perspective, a fundamental dimension underlies class or SES, and it is this dimension that is the primary driving force of some class analyses. This concept of class is closely associated with the thesis of Marx (1894[1978]). The work of

Wright (1997) is the most thorough contemporary attempt to measure class positions empirically from a Marxist perspective, and these measures enable the examination of the effects of class on micro-level outcomes such as health and fertility. A unitary measure of class not associated with relationship to the means of production is that of Warner (1949), who developed a measure by summing ratings on occupation, source of income, dwelling type and neighbourhood and then assigned scores to "classes." Another measure of social class, the British Registrar General's scale, has been the measure of class status most widely used in studies of health and mortality in the United Kingdom (see, for example, Marmot et al., 1991). A comparable scale for the United States is the Edwards Social-Economic Grouping of Occupations (Liberatos et al., 1988). Shared among these approaches is the idea of class being distinguished by categories rather than by continuums.

The second viewpoint focuses on the components of class or SES and treats them as having distinct effects. This conceptualization disputes the unidimensionality of class or SES by highlighting the separate dimensions of stratification. It predicts that different dimensions can have different consequences. It is noted, however, that having a unidimensional concept of class does not deny the possibility of including other components of inequality in the analysis. In fact, many scholars who use class in their analyses do no assert the primacy of class in determining all social phenomena (Wright, 1996).

Bollen et al (2001) observe that there has been limited exploration of general SES indexes for developing countries. They proceeded to cite the few studies around to support their claim. Employing Warner's measure as a model to develop a scale for

Bangladesh, Karim (1990) used characteristics of the dwelling, educational attainment of household members, occupation of household head, possession of a number of household items, membership in a co-operative, self-perception of class, amount of land owned and food self-sufficiency. From these variables, he constructed a scale based on all the variables whose correlations with the SES variables were statistically significant. Cortinovis et al (1993) also used multiple correspondence analyses to develop a SES index for a nutrition and health survey for Uganda. The index was constructed from a host of variables representing housing quality, literacy, cultural factors, demographic conditions and economic conditions. In an exploration of the consequences of maternal education for fertility and child survival in Mexico, Levine et al (1991) employed an index of SES that includes husband's education, husband's occupational status, basic household services and appliances owned.

Hypothesis

Following from above arguments, the major hypothesis to be tested in this study is that health status is a function of social class. Under this hypothesis, it is predicted that people belonging to the upper class are less likely to have malaria than those belonging to the lower class. This hypothesis would be tested controlling for rural and urban populations, among others, as shown in the model. This differentiation is necessary because in addition to being an intervening variable, the underlying dimensions of social stratification are not the same for rural and urban populations. Above all, what defines the unitary measure of class in this study is intrinsic cultural relevance. As well, it must be mentioned that for the purpose of this study, social class and SES would be used interchangeably in the discussions.

CHAPTER FOUR

DESCRIPTION OF DATA

Data Source

The study utilizes data from the 1997 Core Welfare Indicators Questionnaire (CWIQ) survey conducted by the Ghana Statistical Service in collaboration with the World Bank. The study was designed to provide simple and reliable statistical indicators on a timely basis for monitoring poverty and the effects of various development policies, programs and projects on living standards in Ghana. For most users, such indicators are needed not only at the national level, but also at disaggregated levels for various population sub-groups. It has been suggested that the traditional impact indicators, such as those obtained from the Ghana Living Standards Survey (GLSS) for measuring changes in welfare status (e.g., percentage of the population below the poverty line, income and expenditure data, etc.) are both expensive and time-consuming to collect. Again, to ensure optimal reliability of the data as well as cost-effectiveness, it is essential to select as large a sample as is feasible. It was for these reasons that the Ghana Statistical Service, with technical assistance from the World Bank conducted this survey. This data set is considered more suitable for this study than the more popular demographic and health survey (DHS) because it includes a measure of poverty quintile that disaggregates the population into sub-groups much similar to the exercise anticipated here. As well, it contains a specific measure of malaria, the intended outcome variable to be employed in this study but not included as part of any DHS data set.

The fieldwork for the CWIQ survey was carried out between September 1997 and November 1997 with the following objectives in mind: to furnish policy makers, planners and program managers with a set of simple indicators for monitoring poverty and the effects of development policies, programs and projects on living standards in the country; to provide reliable data on timely basis for monitoring changes in the welfare status of various subgroups of the population; to ensure rapid data capture, processing, tabulation and analysis; to ensure optimal precision by the use of as large a sample as is feasible; and finally, to eliminate data entry problems through "scanning" using the Optical Mark Recognition (OMR) technology.

The survey is based on a two-stage, stratified, nationally representative sample of households. The National Sampling Frame of Enumeration Areas (EA's) with population and household information formed the basis of the sample design for the survey. The frame was first stratified into three ecological zones, namely coastal, forest and savannah, and then into rural and urban EAs. Additionally, the EAs were stratified into the ten administrative regions in the country. At the first stage of sampling, 588 EAs were selected with probabilities proportional to the number of households (PPS-Method). Households within the selected EAs were subsequently listed and a systematic sample of 25 households per EA was selected at the second stage. The survey was designed to yield a total sample of 14,700 households nationwide. This large sample size was made possible by the OMR technology which permits rapid data capture and on-line editing. It is important to note that this is not a self-weighting sample design. It was therefore necessary to compute weights or "Raising Factors" for the estimation of parameters based on the probabilities of selection. For details on the computation of weights, see Appendix B.

To ensure an efficient and effective fieldwork, training was organized for field staff based on a supervisor's manual. The training involved systematic and comprehensive explanations of the contents of the questionnaire using an interviewer's manual specifically prepared to guide them. The training afforded participants the opportunity to familiarise themselves with the sampling methodology, the selected sampling areas, the EA maps and field operation techniques. Some officers and assistants were also trained in the use of scanners to capture the field returns and the use of CWIQ application for data processing. These officers were taken through the process of data scanning, editing and validating, whilst the assistants were trained in the preparation and scanning of the questionnaire from the field.

The CWIQ used a household-based questionnaire which consisted of four double-sided forms with pre-coded multiple choice questions. Information solicited from households were on the following modules: background characteristics of household members; education; health; employment; household assests; household amenities; poverty predictors; and child anthropometry. In all, 14,514 household heads were successfully interviewed, of which 9,162 were rural household heads and 5,352 urban household heads.

An average household size of 4.1 was obtained for the country, with rural households registering a higher average household size (4.3) than urban households (3.8). In terms of regional distribution, rural Northern Region recorded the highest average household size of 5.7, followed by the Upper East and Upper West regions with an average of 5.1 each. The lowest average household size (3.5) was recorded in the urban areas of Ashanti and Brong-Ahafo regions. The proportion of the population fifteen years and under is 41.8 percent. At the regional level, urban Greater Accra has the lowest dependency ratio of 1.6 while rural Northern region has the highest dependency ratio of 2.1.

About two-thirds (64.8%) of households in the country are headed by males while a third (35.2%) are headed by females. The survey shows that 40.3 percent of household heads are males in monogamous marriages. Polygamous male-headed households in the rural areas (12.2%) are almost double that in the urban areas (6.2%). On the other hand, single male, married female, and widowed/divorced female household heads are a more prominent feature in the urban areas than in the rural areas. Majority of household heads (72.2%) are self-employed (own-account workers) with 15.4% being regular or casual employees. The proportion of household heads that are unemployed is 2.4 percent. Majority of household heads (57.2%) in the country are engaged in the primary sector; agriculture, forestry or fishing. This phenomenon, however, is mainly a feature in the rural areas where about three-quarters (74.7%) of household heads are engaged in that sector. The largest proportion of household heads in the urban areas is found in the service industry (28.9%), followed by retail trade (28.7%).

The survey results show that 46.9 percent of households in the country are literate. The level of literacy among males (56.6%) is however higher than that of females (28.9%). Literacy among female household heads in the urban areas (40.7%) is about twice the level in rural areas (22%). An examination of the highest educational level completed by the heads of households reveals that majority (30.4%) completed Junior Secondary school level or its equivalent.

Selection of Variables, Quality and Limitations of the Data

Selection of Variables

The selection of variables to be used in an investigation of this nature and magnitude requires an in-depth knowledge of the population under study and for that matter, the data at hand. This is because the variables to be used should be able to predict the problem under investigation with a fair degree of accuracy. But as with most studies involving secondary data, a closer examination of the survey questions reveal that several of them in their original form are not suitable for the particular purposes of this study. Nonetheless, there are a few others that when considered within the sociocultural context of Ghana are good enough for analysis even though they too are not entirely free of measurement problems. Perfect examples of such questions would include education, industry of employment, dwelling ownership, number of separate rooms, type of toilet facility, material of walls of house, modern household items owned, main source of cooking fuel, main source of drinking water, acres of land owned, heads of cattle owned, marital status and how many times in the past week the household prepared a meal with meat. As already intimated, the reference to these variables is based purely on theoretical importance, substantive reasoning and above all, availability of data, in addition to the overall objectives of this study. And it is important to mention here that only household heads are included in the analysis and as a result, the minimum age of respondents is fifteen years. These variables would then be evaluated and a final selection made on the basis of how reliable the variable in question is perceived to have measured its intended target or subject of interest with less ambiguity and a reasonable level of accuracy. This leads to a discussion of the quality and limitations of the data.

Quality and Limitations of the Data

The measurement of malaria, the dependent variable represents a serious problem since it is not confirmed by laboratory procedures. Self-reporting of an event or a problem is very subjective and represents a major limitation in any study that such a variable is employed in the analysis. In most traditional societies with low levels of education as obtains in Ghana, the presence or absence of malaria is more culturally determined and may be at variance with a clinical diagnosis. Given that malaria is the most common disease, symptoms of other illnesses, especially fever are reported as malaria resulting in over-reporting in some cases and under-reporting in the case of other diseases. No wonder then that the response is "fever/malaria." Worse still, it is not possible to determine from the question whether what is being measured here is the incidence or prevalence rate.

With respect to the other variables, it is interesting to note that even though a major objective of the survey was to collect information relating to poverty and standard of living, there is no direct question on income which is considered a standard indicator either in itself, or as part of a number of questions seeking information of this nature. A question that comes near to answering income such as "who contributes most to the household income" is vague and cannot be a substitute for actual income under any circumstances. While there is no doubt that income variables are a first and important indicator of socioeconomic status, they do have their limitations as identified by House (1991). However, these limitations do not warrant that income variables are discounted in their entirety in view of their importance in predicting other variables. Similarly, the question on industry of employment is also problematic in itself as well as for the particular purpose of this study. Without additional information, it is difficult to understand the basis of the categorizations arrived at. However, the intended purpose in this study is to use it as a proxy to establish the relative prestige of the various occupations, even though this is also not without difficulty.

As for example, attempting a classification based on the common notion that occupations in finance, insurance, real estate, etc. are lucrative and prestigious while those in the agricultural, forestry, and fishing sectors are low-paying jobs and of little or no prestige would not be entirely accurate without any hard evidence. In the same vein, the mere fact that a respondent is employed in the financial or insurance sector does not imply automatically that they are wealthy and therefore of higher class status, neither is the respondent employed in the agricultural sector a farm labourer of lower class status. But in a predominantly agricultural economy such as Ghana, which invariably defines the sociocultural environment, this perception is more often the reality.

In Ghana, and most probably every part of the world, education is one of the most important indicators of socioeconomic status, though in varying degrees. Whereas it may require a university degree to secure a job that would ultimately enable an urban resident earn higher socioeconomic status and gain social acceptance and recognition as belonging to the upper class, the same cannot be said of the rural resident where land holdings and heads of cattle are valuable symbols of wealth and prestige. Put differently, it is possible that a rural resident would have the least basic education or none at all, but own large acres of land and quite a significant number of cattle and as such, would occupy a very high place in society than the university graduate. Similarly, in the urban centre, the university graduate is held in high esteem than the uneducated person with large land holdings and several heads of cattle.

The measurement of dwelling ownership also has some inherent problems; the particular location of the house, the material of the walls of the house, and the number of separate rooms are all aspects that add to the problem. Most or all dwellings in urban centres are built of cement or sandcrete which, in addition to the high cost of land, makes them very expensive. As a result, dwelling ownership in an urban centre is a very important indicator of class status depending on size, and which part of the city or urban centre the house is located. However, the problem lies in not differentiating between ownership of a one-room mud house and a luxurious five-bed-room house, wherever these may be located. The same would apply to government-owned and other non-owner occupier houses of top government functionaries and chief executives of both private and public corporations and/or organizations. It is logical to assume that people occupying big houses comprising multiple rooms would most likely be of higher class status than people occupying houses that comprise a single room.

At the other extreme, typically in the oldest parts of the urban area or city would be located mud or mud brick houses and other make-shift structures constructed of aluminium sheet, wood or cardboard. These mud houses or make-shift structures would be big or small depending on the number of people living in them, and these people would most likely to found at the bottom of the social ladder. In addition to the aforementioned problems, the question on number of separate rooms does not lend itself to unambiguous interpretation; there is no additional information to indicate whether the dwelling is a family compound house of several rooms occupied for free by several family members or a single owner-occupier house occupied by only one family.

Another problem becomes even more apparent with regard to material of walls of the house. In some particular regions of Ghana, most notably in the Northern regions, the dwellings are predominantly mud or mud brick houses, reflecting the tradition and culture of the people. Thus, the traditional rulers who own most of the land and large heads of cattle, as well as the ordinary citizenry all live in mud or mud brick houses, the difference being only in design, size and the number of rooms. Customarily, the traditional ruler's house would typically be a big house comprising several rooms with unique designs depicting their authority and high status. And these houses are not confined to the rural areas only, but could be found in the urban centres as well. Therefore, occupants or owners of cement houses in these regions may not necessarily be regarded in high esteem compared to those living in mud houses. Given this complexity, material of walls of dwelling presents a conflicting dilemma represented in identical description but portraying different meanings in cultural space.

Another problem is in respect of marital status. Marriage as an institution is one important indicator of social class in Ghana. Normally, marriage would be regarded as a sign of responsibility and respect to the extent that one would not be eligible to occupy certain positions as the family head or traditional ruler if they are not married. In fact, there is a negative social stigma associated with individuals who choose to remain single when they have reached or exceeded the age of marriage, or are divorced, regardless of their economic situation. Since such people would often be regarded as "irresponsible," remaining single may be an unavoidable choice for only the less privileged in society in

Ghana. Added to this is the fact that some religions and cultures permit polygamous relationships, and the problem arises in trying to differentiate between the two. Besides Islamic religion which preaches and practices polygamy, such marriage is also practised, albeit on a low scale across all cultures by the wealthy in society and especially, traditional rulers and chiefs. So in the case of Muslims who may choose to marry more than one woman regardless of their economic status, polygamous marriages are also contracted by people of higher class, of which chiefs are a part.

The above problems notwithstanding, some variables are fairly consistent in their description, meaning as well as usage and may not be as problematic. These would include education, main source of cooking fuel, main source of drinking water, type of toilet facility used, modern household items owned, acres of land owned, heads of cattle owned, and how many times a meal with meat was prepared by the household in the past week. It is in light of above that cultural relevance becomes such an important defining factor in this study, both substantively and theoretically.

To provide adequate substance to this quest, it is pertinent to ensure, as intimated elsewhere, that the variables selected are perceived as deriving their meaning of what social class represents from the sociocultural context of Ghanaian society. Such discussion would be better informed by a broader perspective of the sociodemographic profile of the population as obtained in the data being used for this study. This is accomplished mainly through simple cross-tabulations computed according to rural-urban residence, but preceded by a general overview of the geography and population of the country. The distributions have the added advantage of enabling the study ascertain the completeness or otherwise of the variables on hand. Some variables were recoded to suit the particular purpose of this study.

CHAPTER FIVE

SOCIODEMOGRAPHIC DIFFERENCES IN RURAL-URBAN GHANA

A General Overview of the Geography and Population of Ghana

Ghana is located on the west coast of Africa along the Atlantic ocean, with a land mass of 238,533 square kilometres. The country is divided into ten administrative regions as shown in the map (Figure 5.1). These are Greater Accra, Western, Central, Volta, Eastern, Ashanti, Brong-Ahafo, Northern, Upper East and Upper West regions. The national capital of Ghana is Accra, located in the Greater Accra region. The provisional results of the 2000 Population and Housing Census reveals the total head count of the population as 18,412,247 persons, comprising 9,025,019 males and 9,387,228 females. The most populated region is Ashanti, with a population of 3,187,601 (17.3%), followed by Greater Accra with a population of 2,909,643 (15.8%), while the Upper West and Upper East regions are the least populated with populations of 573,860 (3.1%) and 917,251 (5.0%) respectively. The remaining distributions are as follows: Western, 1,842,878 (10.0%); Central, 1,580,047 (8.6%); Volta, 1,612,299 (8.8%); Eastern, 2,108,852 (11.4%); Brong-Ahafo, 1,824,822 (9.9%); and Northern, 1,854,994 (10.1%). Even though overall the female total population is slightly higher (51.0%) than the total male population (49.0%), this varies by region. Two regions, Western and Brong-Ahafo have a slightly higher male population than female.

The ten regions are further classified into three ecological zones: the coastal zone comprising Greater Accra, Western, Central and Volta; the forest zone made up of Ashanti, Eastern and Brong-Ahafo; and the savannah zone formed by Northern, Upper

Figure 5.1: ADMINISTRATIVE MAP OF GHANA

East and Upper West. The coastal zone, as the name implies borders the Atlantic Ocean which makes fishing the major economic activity. More than two-thirds of the population in this zone is engaged in fishing activities, not excluding children who accompany the adults. The forest zone is the bread basket of the entire country with very fertile land as well as rich mineral deposits. Farming is the major agricultural activity undertaken in this region, providing the bulk of the country's most important export crop, cocoa as well as other forest products. Mineral exploration activities in this ecological zone include gold, diamond, bauxite and manganese. The savannah zone, also referred to collectively as the Northern region has soil and ecological conditions that are suitable for the cultivation of cereals and grains as well as livestock farming.

Ghana is endowed geographically with a nation-wide distribution of settlements of varying sizes. According to the 1986 Census, there are over 47,800 towns and villages, with the majority of the population in small-sized settlements or communities. It is reported that about one-third of the population is scattered over 40,000 settlements with populations of fewer than 500 persons, a little over one-third live in about 7,000 settlements with populations ranging between 500 and 5,000 persons, while the remaining one-third are in the 189 statistically classified urban settlements with populations of 5,000 or more. The Census observes an imbalance in the distribution of human settlements between the north and south, with high population density and pressure on resources in the south and low population density and relative underdevelopment in the north, culminating in a dual national space economy.

The past patterns of spatially unbalanced investment that has resulted in this spatial inequality is further reflected in the so-called "golden triangle" comprising the three regional centres of Accra-Tema (Greater Accra Region), Sekondi-Takoradi (Western Region) and Kumasi (Ashanti Region). These areas continue to enjoy the highest levels of economic and social services whilst the northernmost parts of the country are the most deprived. This development is also manifested in the distribution of industrial employment. In 1962, the "golden triangle" had 71 percent of all persons engaged in industry whilst the northern regions of the country (with larger land surface area) had a mere 11 percent. The industrial census of 1987 had 87.7 percent of all industrial establishments located in this region and 6.3 percent in the northern regions. Greater Accra and Ashanti regions accounted for 61 percent of all registered businesses, with Greater Accra alone having 31.8 percent and the Upper West region recording only 0.6 percent.

The urbanization process is dominated by the four major cities - Accra-Tema (Greater Accra region), Kumasi (Ashanti region), Sekondi-Takoradi (Western Region), and Tamale (Northern region) which increased their share of total population from 12.1 percent in 1960 to 15.7 percent in 1976 and further to 16.3 percent in 1984. These four urban centres have a disproportionate share of total urban population; 45.6 percent (1960), 49.2 percent (1976), and 49.8 percent (1984).

Macro Economic Activities

Ghana's economy continues to be dominated by the agriculture sector, which includes fishing and forestry. Crop production is undertaken by small-holders, operating on subsistence basis. These farmers concentrate mainly on food crops in the form of grains, starch staples, oilseeds, sugarcane, and fruit and vegetables. The contribution of large-scale commercial farming is very negligible. There is a predominance of women in agriculture and rural non-farm activities, and earnings from cocoa are an important source of cash income for farmers in the Ashanti, Brong-Ahafo and Western regions, with increasing dependence of households on women's earnings. Cattle rearing also is an important source of protein food and of income to farmers especially in the northern regions of the country. Harvesting, selling and processing fish is the main source of income for rural communities in the coastal zones. On the whole, the agriculture sector contributes over 40 percent of total gross domestic product (GDP) and is the main source of income for about 60 percent of the population. However, the performance of this sector has not been adequate to ensure good nutrition and food security. The agriculture sector's share of gross domestic product (GDP) declined from 44.9 percent in 1990 to 41.0 percent in 1995.

Within the industrial sector, the manufacturing sub-sector which accounts for well over 50 percent of the industrial sector output has not been encouraging, recording an average growth rate of only 2.4 percent over the period 1991 to 1995 and accounting for 8.2 percent of GDP, according to 1995 figures. Construction and mining and quarrying contributed 3.0 and 1.5 percent to GDP respectively. The services sector (comprising finance, insurance and real estate, transport, storage and communications) has experienced consistently higher growth rate than the other two major sectors, averaging 6.1 percent per annum during the period, with its share of GDP reaching 46.9 percent in 1995, compared with 43.5 percent in 1991. The trade (wholesale and retail), restaurants and hotels sub-sectors are the largest of the services sub-sectors. This sub-sector recorded an average growth rate of 7.8 percent over the period, due in part to the increase in tourism, whilst activities in the finance sub-sector has been declining.

In general, the structure of Ghana's economy is characterized by a large informal sector and a small but growing formal sector. The majority of Ghanaian manufacturers, producers of food and services are engaged in micro and small-scale enterprises in the informal sector, operating with little capital output and at low levels of technology. At present, the greater proportion of the economically active population in Ghana is self-employed. In addition to small-holder farmers and fishermen, a considerable number of people earn their living in the informal sector as artisans and traders. According to a 1997 study by the Ghana Statistical Service (GSS, 1997), 13 percent of the population sampled was employed by government or private firms, whilst 69 percent was self-employed, and 18 percent had no regular jobs.

Regional/Rural-Urban Disparities, Gender Inequity, and Poverty

There are pronounced disparities in the conditions of rural and urban populations, which are a direct reflection of the economic activities and their related performances described above. In terms of income distribution, the share of urban dwellers in total expenditure was estimated by the Ghana Living Standards Survey 3 (GLSS-3, 1987) at 41 percent, whereas the share of rural dwellers, who comprise 68 percent of the population was only 59 percent. With regard to source of income, 42 percent of household income in Accra, the national capital is derived from paid employment. The corresponding proportion for the other urban centres is 24 percent, whilst it is 9 percent for the rural areas. In the rural coastal and forest areas on the other hand, paid employment provides 11 percent and 12 percent respectively of household incomes, whiles it is 4 percent for the Upper East region and 7 percent for the Upper West region. There is also significant differences in expenditure patterns; average expenditure per person in urban areas was nearly 40 percent higher than in rural areas. Similar disparities were also reflected in access to social services. It is observed, for example, that even though enrolment ratios were only about one and a quarter times higher in the capital city than in the rural savannah, average expenditure on education per pupil in the capital city was four times higher.

According to the same study, about 31 percent of the Ghanaian population could be defined as poor in 1991/1992, slightly improving to 28.0 percent in 1998/99. It is noted that since two-thirds of the population live in rural areas, rural dwellers account for 75 percent of total poverty in the country. Specifically, a Ghana Statistical Service study (GSS, 1995) revealed that about 34 percent of the rural population of Ghana live in poverty, whilst the proportion for the urban population is 28 percent. Furthermore, it is observed that the incidence of poverty is marked by regional variations, with the northern part of the country exhibiting significantly high degree of poverty compared with the southern part. As well, it is noted that poverty is highest among food crop farmers and lowest among households where the principal income earner is engaged in formal sector employment, either in the public or private sector. The study reveals that the incidence of morbidity, infant and child mortality, malnutrition, food insecurity, illiteracy and underemployment is highest among the poor. Thus, it concludes poverty translates into a state of vulnerability, and observes at the same time that Ghanaian women are generally worse off than their male counterparts, especially in the rural areas.

The study notes that traditional beliefs regarding the benefits of education for women have resulted in their receiving little or no attention thereby disadvantaging them further by limiting their prospects for betterment. In addition, traditional customs and laws continue to work against gender equality, especially in the rural areas. Consequently, women are largely discriminated against and remain deprived in their efforts to improve their social status, conditions and circumstances. Little wonder female unemployment is about 50 percent higher than male unemployment, while about 49.8 percent of females have never attended school, with only 3 percent attaining secondary or higher education compared with 29.1 percent and 9 percent respectively for males.

Adult literacy rate is estimated at 60 percent of the adult population (15 years and above), but varies considerably between men and women, the respective rates being 64 and 42 percent. Primary and secondary school enrolment rates amount to 77 percent and 38 percent respectively of the population in the relevant age groups. Again, school enrolment rates are higher for males than for females and the discrepancy widens as one progresses through the educational ladder; registering a male-to-female ratio of 55:45 in primary school, and 67:33 in senior secondary school. A small minority, comprising less than 2 percent of the population in the relevant age groups continue on to tertiary education in teacher training, nursing training and technical colleges as well as universities.

The underlying cause of the relatively high levels of poverty in rural areas, in the view of the study is lack of jobs. This manifests itself not in high rates of unemployment but in the small proportion of workers in paid employment and the large numbers of self-employed people operating under conditions of what could be described as under-employment in the informal sector. The major economic problem in rural areas according to the study, is low labour productivity arising out of high labour under-employment, which results in low levels of remuneration, particularly in agriculture-related jobs. Moreover, the high rates of unemployment in urban centres are a reflection of the lack of opportunities for paid employment in rural areas. Coupled with poor social and economic amenities in the rural areas, these negative factors encourage young people in the villages to migrate to the towns and cities in the hope of improving their living standards. The above conditions are not unrelated to the supply, accessibility and availability of basic services in both rural and urban areas.

Supply, Accessibility and Availability of Basic Services

The housing problem in Ghana is a very acute one, especially in urban centres. Investment in housing represents a significant part of the disposable income of private households. It is a principal asset to be owned as well as a source of rental income. Therefore, low-to-middle income families (constituting more than 60% of the population) face very serious housing problems. High and rising prices of land increasingly make it less affordable to these income groups, who face the added problem of having no access to the limited available credit facilities. The housing finance market in Ghana is at a developmental stage and as a result, the rate of housing supply is barely adequate. Low and middle income groups are not able to meet the security requirements of the traditional housing finance institutions and therefore, have no opportunity to participate in employer-funded housing schemes. As well, existing housing finance institutions would not make available suitable loan portfolios for this income group because of the risks involved.

Infrastructure in public housing in urban centres has deteriorated due to lack of maintenance and repair whilst in the rural areas on the other hand, over half of the dwellings have become run down over time. In addition to above constraints, a large variety of building materials is imported into Ghana for use in the building industry. These include cement clinker, lime, galvanized iron and asbestos roofing sheets, sanitary wares and fittings, and a lot others. There is therefore an over-dependence on imported building materials thereby pushing the cost of housing well beyond the means of the average Ghanaian, and a preserve of few wealthy individuals and families. Also, it is common knowledge that whereas there is no absolute shortage of land, there exist supply bottlenecks in the delivery of affordable serviced land in appropriate locations. The government lacks the necessary resources to acquire lands for public housing projects, especially in the urban areas, thus compounding the problem for the middle and low income groups.

The energy sector of Ghana is predominantly wood-fuel based. Firewood and charcoal consumption account for about 69 percent of total energy consumption, whereas electricity and petroleum products account for 10 and 21 percent respectively. Per capita energy consumption is estimated at 300 kilograms of oil equivalent (koe). Studies indicate that electricity consumption has been growing at the rate of 14 percent per year since 1991.

Safe water sources are not available to many Ghanaian communities, most especially the rural areas. While about 93 percent of urban dwellers are estimated to have access to safe water, only 39 percent of the rural population have similar access (Government of Ghana, 1997). Overall, only about 56 percent of the population have access to reliable supply of safe water. Although considerably better than rural water supply, urban water supply also has problems, especially in slum and other high population density areas where water supply infrastructure is over-stretched. Inadequate water supply, coupled with unhygienic practices in these areas contribute to the prevalence of water-borne diseases such as cholera in urban slums. On the other hand, most rural communities rely on ponds and streams as their main source of water supply and therefore, are at risk of exposure to guinea-worm, bilharzia and other water-borne diseases. Poor access to water in both rural and urban areas not only increases the risk of morbidity and mortality, but also exacerbates drudgery of women and children, especially in poor households since it is they who are assigned responsibility for water collection. The foregoing provides a general context that would facilitate an informed discussion of the results of the cross-tabulations in the next section.

Discussion of Results of Cross-tabulation

Table 5.1 shows the distribution of respondents by sex and place of residence. Of the total 9,162 rural household heads, 68.2 percent is male compared with 31.8 percent female. Likewise, 61.4 percent of urban household heads is male while 38.6 percent is female. It is important to note here that these proportions are not a true reflection of the general population which has a slightly higher proportion of females than males as was revealed earlier on. The second table (Table 5.2) provides information on highest grade of education and place of residence. For respondents who completed post-secondary, 1.2 percent lived in the rural area whilst 4.1 percent lived in an urban area. At the other end, 90.7 percent of respondents with no education or the least education lived in the rural area as against 75.9 percent that lived in an urban area. This is consistent with information elsewhere that a greater proportion of these people may be unemployed or underemployed, and/or engaged in occupations that would require no formal education such as in the farming or fishing industry. The proportion of respondents with secondary

Table 5.1: Distribution of Respondents by Sex and Place of Residence

Sex	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Male	6248	68.2	3287	61.4
Female	2914	31.8	2065	38.6
Total	9162	100.0	5352	100.0

Table 5.2: Distribution of Respondents by Highest Grade of Education Completed and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Post-Secondary	108	1.2	222	4.1
Sec./Voc./Comm/ Teacher Training/ Nursing Training	747	8.2	1066	19.9
No School/Pre-Primary/Primary/ Middle Sch./JSS	8307	90.7	4064	75.9
Total	9162	100.0	5352	100.0

Table 5.3: Distribution of Respondents by Industry of Employment and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Finance, Insurance, Real Estate & Wholesale trade	22	0 .3	117	19.5
Constr., Manuf., Minerals, Trans., Comm., Utilities, & Service Indus.	2239	26.7	3430	77.8
Agriculture, Forestry and Fishing Industry	6112	73.0	859	19.5
Total	8373	100.0	4406	100.0

Table 5.4: Distribution of Respondents by Dwelling Ownership and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Owns Dwelling	4622	50.5	1049	19.6
Rents Dwelling	897	9.8	1983	37.1
Rent-free Dwelling	3643	39.7	2320	43.3
Total	9162	100.0	5352	100.0

or other tertiary education is greater in the urban area (19.9%) than in the rural area (8.2%) because there are many teaching opportunities and other middle-level administrative jobs in the services sector in the urban area than in the rural area.

The distribution of respondents by industry of occupation (Table 5.3) shows 73 percent of rural respondents as against 19.5 percent of urban respondents are engaged in the agriculture, forestry and fishing industry, and 0.3 percent as against 19.5 percent respectively in the finance, insurance, real estate and wholesale trade sectors. This is because most post-secondary graduates work in the public sector in government organizations and other high-paying jobs in the financial and real estate sectors which are located mostly in urban areas, whilst those with less education are engaged in agricultural activities, the most dominant occupation in the rural areas. Similarly, there are more construction and manufacturing activities in the urban area than in the rural area, employing 77.8 percent and 26.7 percent respectively.

The distributions in Tables 5.4 and 5.5 are consistent with above observations. Table 5.4 shows that the proportion of respondents who own dwellings in rural areas is greater (50.5%) than the proportion in urban areas (19.6%) because most dwellings in rural areas are the simple types built of less expensive materials (e.g., mud/mud bricks) as against the more expensive the rural area (39.7%). A possible explanation is that many people would prefer to live in family houses for free, whilst a few others would live in make-shift structures or remain homeless, situations that are not uncommon in most urban areas. For the same reasons, urban dwellings that contain four or more separate rooms are half fewer (7.8%) than rural dwellings urban houses that would normally be built of cement. As a result, rented dwelling in the urban area is greater (37.1%) than in

Table 5.5: Distribution of Respondents by Number of Separate Rooms and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
4 or more	1415	15.4	415	7.8
2 or 3	3518	38.4	1921	35.9
1 or none	4229	46.2	3016	56.3
Total	9162	100.0	5352	100.0

Table 5.6: Distribution of Respondents by Material of Walls of House and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Cement/sandcrete	2181	23.8	3827	71.6
Mud/mud bricks	6909	75.4	1370	25.6
Aluminium sheet, Cardboard, Wood	72	0 .8	155	2.8
Total	9162	100.0	5352	100.0

the rural areas (9.8%) because most people cannot afford to own their house. Ironically, rent-free dwellings are slightly greater (43.3%) in the urban area than in (15.4%), whilst the proportion of dwellings with only one separate room or none at all is greater in the urban area (56.3%) than in the rural area (46.1%), according to Table 5.5.

As already mentioned, the proportion of houses built of cement is greater (71.6%) in the urban area than in the rural area (23.8%), whilst the reverse is true in the case of mud houses, 25.6 percent and 75.4 percent respectively (Table 5.6). This goes to show that mud houses are more of a prominent feature in rural areas than in urban areas. That the proportion of aluminium and wood structures in the urban area is greater (2.8%) than in the rural area (0.8) confirms the existence of many make-shift structures in urban areas alluded to earlier.

The distributions of respondents by type of toilet facility (Table 5.7) used and modern household items owned (Table 5.8) are also consistent with earlier findings. A predominantly large proportion (82%) of rural residents have no access to any modern means of toilet facility, unlike in the urban area where the proportion is lesser (43%). Conversely, 17 percent of urban residents use the flush toilet (WC) as opposed to only one percent in the rural area. Similarly, university and secondary school graduates living and working in urban areas have a better chance of owning a car or truck (2.5%) or modern electronic gadgets (44.7%) than their rural counterparts (0.7% and 11.9%, respectively). Correspondingly, the proportion that cannot afford any of these items is greater (87.4%) in the rural area than in the urban area (52.8%).

Table 5.7: Distribution of Respondents by Type of Toilet Facility and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Flush toilet (water closet [WC])	102	1.1	882	16.5
KVIP*/pan or bucket latrine	1511	16.5	2196	41.0
None (bush), cov-Red/uncovered pit Latrine, other	7549	82.4	2274	42.5
Total	9162	100.0	5352	100.0

* Kumasi Ventilated Improved Pit Latrine

Table 5.8: Distribution of Respondents by Modern Household Items Owned and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Car or Truck	64	0.7	134	2.5
Fridge, TV, Video, Stereo, Stove	1087	11.9	2393	44.7
None	8011	87.4	2825	52.8
Total	9162	100.0	5352	100.0

Table 5.9: Distribution of Respondents by Main Source of Cooking Fuel and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Gas and Electricity	52	0.6	526	9.8
Charcoal and Kerosene	862	9.4	3487	65.2
Firewood	8248	90.0	1339	25.0
Total	9162	100.0	5352	100.0

Table 5.10: Distribution of Respondents by Main Source of Drinking Water and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Piped into dwelling	98	1.1	16	0.3
Public tap/ borehole	4249	46.4	450	8.4
Well	3289	35.9	540	10.1
River, lake, pond	1120	12.2	1999	37.4
Other	406	4.4	2347	43.8
Total	9162	100.0	5352	100.0

The same reasons would account for why a greater proportion of 9.8 percent of urban residents would use gas and electricity as their main source of cooking fuel as against 0.6 percent of rural residents, or why 65.2 percent of urban residents would use charcoal or kerosene as against 9.4 percent of rural residents as seen in Table 5.9. However, the greater proportion (90%) of rural residents would use firewood as their main source of cooking fuel because it may be the cheapest and best alternative, compared with their urban counterparts (25%).

The distribution of respondents by main source of drinking water (Table 5.10) shows a rather unusual situation where rural respondents who have their main source of water piped into the dwelling is greater than in the urban area, 1.1 percent and 0.3 percent respectively, while a similar observation is made regarding public tap or borehole, 46.4 percent for rural as against 8.4 percent for urban. This information is inconsistent with the general sociodemographic profile of the population of Ghana presented earlier. Though the rural proportion in the latter case cannot be challenged in view of the proliferation of several water projects undertaken by both local and international governmental and non-governmental organizations over the last decade, the urban proportion seems a little bit on the low side. It is equally strange that a greater proportion (37.4%) of urban household heads would have as their main source of drinking water, river, lake, or pond as against 12.2 percent of rural household heads. These inconsistencies may be the direct result of reporting problems or the nature of the sample in general. However, that 35.9 percent of rural households as against 10.1 percent of urban households report the well as their main source of drinking water may be a true reflection of the situation. The highest proportion of 43.8 percent of urban households

Table 5.11: Distribution of Respondents by Acres of Land Owned and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
100 acres or more	1241	13.5	217	4.1
Less than 100 acres	3113	34.0	870	16.3
None	4808	52.5	4265	79.7
Total	9162	100.0	5352	100.0

Table 5.12: Distribution of Respondents by Heads of Cattle Owned and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
10 or more	158	1.7	34	0.6
Less than 10	408	4.5	36	0.7
None	8596	93.8	5282	98.7
Total	9162	100.0	5352	100.0

who have "other" as their main source of water may represent households that rely on the services of water tankers, a common practice in most urban centres.

The distribution according to acres of land owned and place of residence as evident in Table 5.11 is consistent with the traditional system in Ghana. With the exception of some few families, chiefs and traditional rulers are the major custodians of lands in Ghana, which would have been inherited or acquired through conquests. In general, therefore, very few people own land in Ghana with the greater proportion of these lands usually located in the rural areas, or on the fringes of urban centres. That explains why 13.5 percent of rural respondents as against 4.1 percent of urban respondents own more than hundred acres of land, with a corresponding proportion of 34.0 percent and 16.3 percent owning less than hundred acres. Almost 80 percent of urban residents as against 53 percent of rural residents do not own any land at all.

The same can be said of cattle, which is a predominantly rural "asset" (1.7%), even though some few cattle owners (0.6%) can be found in the peripheries of urban areas as observed in Table 5.12. However, the proportion of people who do not own any cattle is quite significant, both in the rural area (94%) and the urban area (99%), an indication perhaps, of the high cost involved in either owning and/or rearing livestock in Ghana.

Generally, marriage, legal or common law is virtually a universal phenomenon in Ghanaian society. That explains why the proportion married in both rural (69.0%) and urban (60.4%) is quite high (see Table 5.13). In fact, the social prestige of an adult in traditional Ghanaian society is enhanced by their marital status since the institution of marriage conveys a sign of moral and social responsibility regardless of economic status.

Table 5.13: Distribution of Respondents by Marital Status and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
Not Married	2837	31.0	2120	39.6
Married	6325	69.0	3232	60.4
Total	9162	100.0	5352	100.0

Table 5.14: Distribution of Respondents by number of times in past week that Meal with meat was prepared in household and Place of Residence

Indicator	Rural		Urban	
	No. of Cases	Percent	No. of Cases	Percent
7 times or more	125	1.4	199	3.7
3 to 6 times	730	8.0	743	13.9
2 times	620	6.8	663	12.4
Once	721	7.9	673	12.6
Nil	6966	76.0	3074	57.4
Total	9162	100.0	5352	100.0

In most ethnic groups, one would not qualify for the head of family or chief if they are not married. And adults who are single are presumed to be irresponsible and may not be invited to participate in certain traditional and social functions. The proportion unmarried in the urban area is greater (39.6%) than in the rural area (31.0%). One possible reason that may account for this difference is that most young people usually move into urban areas in search of jobs and would usually marry only after they are well established economically.

As has been previously noted, poverty is predominantly a rural phenomenon, even though it is not entirely confined to these areas. However, it may well be the case that the relative proportion of the population that go hungry in urban centres is greater than in the rural area. This is because cost of living is relatively higher in the urban area than in the rural area. In addition, rural residents do not have the sophisticated tastes of urban dwellers and would usually be content with any small amount of cheap meat from the market. That explains why in Table 5.14, the proportion of urban households that is not able to prepare a meal with meat is consistently greater than in rural households all throughout from one to seven times or more. However, and as is consistent with the overall trend described earlier, the proportion of households that cannot afford to prepare any meal with meat at all is greater in the rural area (76%) than in the urban area (57%). The foregoing discussion leads into the construction of the social class index that represents an important component of this study.

CHAPTER SIX

CONSTRUCTION OF THE COMPOSITE INDEX OF SOCIAL CLASS

In arriving at a set of variables for the construction of an index of social class, it is important to acknowledge the difficult and complicated nature of the task. In one such attempt, Gwatkin et al (2000) constructed a socio-economic index for Ghana using the asset approach. The asset information was gathered through the DHS household questionnaire that includes questions concerning the household's ownership of a number of consumer items ranging from a fan to a television and car; dwelling characteristics such as flooring material; type of drinking water source and toilet facilities used; and other characteristics that are related to wealth. At the end of the exercise, the authors admitted that creating an index that includes all asset variables limits the types of analysis that can be performed.

In particular, they noted that the use of a unified index does not permit a disaggregated analysis to examine which particular asset variables in the index are more or less important in their association with health, nutrition and population-related status or service use, a question which according to them, could have important policy implications. However, the task in this study is rendered simpler by the fact that not many of the variables targeted would pass the scrutiny of the most basic statistical test given the measurement and classification problems discussed earlier. This notwithstanding, excluding a variable should be based purely on statistical evaluation, particularly in predicting a substantial amount of the explained variance.

Statistical Criteria

A composite index is created to measure some particular construct. To come up with a good index, Babbie (1989) offers a couple of useful criteria that should be met and steps to be followed. The first statistical criterion that must be satisfied in selecting items for an index, according to the author, is face validity (or logical validity). To measure social class, for example, each of the items should appear *on its face* to indicate, or define some aspect of class status. In this respect, one must consider items of economic value (e.g., dwelling, land, cattle, etc) and social prestige (e.g., education, occupation, etc) as perceived within the context of the population under study.

The methodological literature on conceptualization and measurement also stresses the need for unidimensionality in index construction: a composite measure should represent only one dimension, that is, social class. As well, an important consideration should be the amount of variance accounted for the items. If an item is intended to indicate a particular attribute, it is pertinent that the proportion of respondents identified as such is a close reflection of what pertains in reality otherwise, that item would not be very useful in the index. One possible way of achieving variance is to select items on which responses distribute respondents about equally in terms of the variable.

The second step in index construction is to examine the bivariate and multivariate relationships among the items being considered for the index. If each of the items is indeed valid on its face, then they should be related to one another empirically. Additionally, whiles bivariate relationships would determine the relative strengths of relationships among the several pairs of items, multivariate analysis would indicate how much variance each indicator contributes to the index. It must be added, however, that even though the primary objective for evaluating these relationships is the strength of the relationships, the use of this criterion is rather subtle.

It is important to be wary of items that are not related to one another empirically because it is unlikely that they measure the same variable if they are unrelated. As such, a particular item that is not related to several other items probably should be dropped from consideration. At the same time, however, a very strong relationship between two items presents a difficult problem. This is because the primary purpose of index construction is to develop a method of classifying subjects in terms of some variable, as stated previously. Therefore, an index of social class such as would be constructed in this study should aggregate people into different class categories (i.e., upper class, middle class and lower class). These gradations are provided by the combination of responses given to the several items included in the index. Thus, the respondent who appeared as upper class on all items would be considered very upper class overall. For an index to provide meaningful gradations in this sense, each item must add something to the evaluation of each respondent. In view of this, it does not make sense, statistically, to include in an index two items that would seem to be perfectly related to one another. If this were to happen, the other would add nothing to the evaluation of respondents.

At the same time, while it often makes sense to expect indicators of the same construct to be positively related to one another, this is not always the case; indicators should be related to one another if they are essentially “effects” of a construct. For example, to measure social class, a question would seek to know the highest grade of education completed and/or whether respondent owns some modern household items. A respondent of higher social class would typically be highly educated as well as possess some modern household items such as television, refrigerator, or car. On the other hand, a person of lower social class would have none of these. Since each indicator depends on, or "reflects" social class, it is expected that they will be positively correlated.

More generally, indicators that depend on the same variable would be associated with one another if they are valid measures. But this is not the case when the indicators are the "cause" rather than the "effect" of a variable. In this situation, the indicators may correlate positively, negatively, or not at all. As an example, social class in Ghana may be determined by level of education, acres of land owned and heads of cattle owned, but these indicators need not necessarily be positively correlated. Level of education, for instance, may be inversely related to heads of cattle owned, in the same way as it may be negatively related to acres of land owned. While it may not be statistically feasible to meet or satisfy all of above conditionalities and requirements given data limitations, it is not impossible to achieve some reasonable level of efficiency. Towards this end, in addition to simple bivariate analysis, principal component analysis represents a robust analytical tool that would also be invoked. As well, this procedure provides the formula for obtaining the score of each indicator that would be used in constructing the composite index of social class.

Selection of Indicators of Social Class

On the basis of above discussion, six variables are selected for the index construction in this study: highest grade of education completed; main source of cooking fuel; type of toilet facility; modern household items; dwelling ownership; and heads of cattle owned. These variables are selected on the strength of earlier arguments and the fact that their underlying clusters or dimensions subsume a larger number of intercorrelated variables. Arguably, one such indicator is education which inherently can determine several other variables, amongst them, occupation. For this reason, the original intention to use industry of employment as a proxy for occupational prestige was discarded in view of the ambiguity in the categorizations noted.

As a matter of fact, occupation can be regarded as among the most useful variables to be included in the construction of an index of social class. Some authors (e.g., Centers, 1950 and Mayer, 1955) suggest it is the best single index to be employed in large-scale statistical inquiries. This notwithstanding, occupational categorizations without additional information are not very useful both with respect to the number of groups they distinguish as well as the criteria on which they were based. It is for this reason that Wrong (1980) proposed a combination of occupation and income as a better objective measure of class status rather than occupation alone. Unfortunately, and as already reported, there is no income variable in the current data.

But given the data on hand, the indicator "dwelling type" as employed by Warner in his study may be substituted in this study by any one of, or a combination of three variables, namely, "type of material of walls of house," "number of separate rooms," or "dwelling ownership." Despite the measurement problems inherent in dwelling ownership, this variable was considered the most preferable because it subsumes the other two dwelling-related variables (material of walls of house and number of separate rooms) and, perhaps, even land ownership in Ghana.

The choice of heads of cattle is based purely on substantive reasoning because it is without question one important item of wealth and prestige in Ghana, most especially in the rural area. The exclusion of land is based on the simple reason that between land and cattle, the latter is more commonly owned. Also, modern household items, main source of cooking fuel, and type of toilet facility are perceived more as symbols of prestige and class status in the context of Ghanaian society than mere basic necessities as in Western countries hence their inclusion. It must be mentioned here that some of the variables not included as part of the composite index could very well be used in validating the index constructed.

Measurement of Indicators

Generally, indicators used in the construction of an index must be measured on an interval scale. However, it would be noticed that the indicators selected are measured in different scales. Education and heads of cattle are both measured as continuous variables and hence have interval scales of measurement. Main source of cooking fuel, dwelling ownership and type of toilet facility are nominal variables comprised of different categories. These were transformed into ordinal variables and treated as interval level scales, a practice neither uncommon nor indefensible (see Cliff, 1993). The different categories were re-classified and arranged in order of importance from the least to the most. The requirement of having interval level measurement in index construction can be relaxed in the case of ordinal variables on the assumption that there exists equal interval between the ordered categories.

Modern household items is measured as a dichotomy of six items (i.e., refrigerator, television, video deck, stereo system, modern stove and car or truck). This indicator too was transformed and ordered in such a manner as would represent an index. This was accomplished simply by recoding and designating car or truck as the highest order item, possession of any of the other modern household items the second highest, and non-possession of any item at all the lowest in the order, thus making it a continuous variable.

Evaluating the Strength of Indicators

Bivariate Analysis of Indicators

Table 6.1 presents the zero-order correlation coefficients for the relationship among the indicators according to rural and urban. Overall, the associations are not very strong, ranging from very weak or insignificant to moderately strong. The urban sample exhibits relatively stronger and significant associations overall than the rural sample. The strongest association is found in the urban sample where main source of cooking fuel registers a significantly positive association (.412) with modern household items. In the rural sample on the other hand, the association is of moderate strength (.292) and significant. This is followed by a moderately strong positive and significant association between main source of cooking fuel and toilet facility with magnitudes .366 and .307 in the urban and rural samples respectively. In the latter case, this represents the strongest correlation overall in the rural sample.

Education registers the third significant and moderately strong .342 positive association with main source of cooking fuel in the urban sample, whilst it is a modest .236 in the rural sample. In the urban sample, the next significant and moderately strong positive association of .305 is between education and modern household items, as against .271 in the rural sample. Other significant and positive associations are found between toilet facility and modern household items, posting .278 in the urban sample and .187 in

Table 6.1: Correlation Matrices of Indicators

Rural (N=9162)

Variables	Education	Cooking fuel	Toilet facility	Household items	Dwelling ownership	Heads of cattle
Education	1.000	.236**	.151**	.271**	-.050**	-.051**
Main source of cooking fuel		1.000	.307**	.292**	-.084**	-.064**
Type of toilet Facility			1.000	.187**	-.096**	-.087**
Modern household items				1.000	-.011	-.014
Dwelling ownership					1.000	.151**
Heads of Cattle						1.000

Urban (N=5352)

Variables	Education	Cooking fuel	Toilet facility	Household items	Dwelling ownership	Heads of cattle
Education	1.000	.342**	.264**	.305**	-.003	-.010
Main source of cooking fuel		1.000	.366**	.412**	-.040**	-.033
Type of toilet Facility			1.000	.278**	-.016	.002
Modern household items				1.000	.114**	.035
Dwelling ownership					1.000	.097**
Heads of cattle						1.000

** significant at $p \leq .01$

the rural sample, whilst education also registers a positive association with toilet facility with magnitudes of .264 for urban and .151 for rural.

All of above associations are as predicted and consistent with the reality of Ghanaian society. For example, the ownership and/or use of any modern household item is dependent on electricity and gas as represented in main source of cooking fuel. These facilities, in turn, go hand in hand with modern toilet facility. Then overall, those likely and able to afford these facilities or items are mostly the highly educated, and this group of people would usually be located in urban centres hence the relatively stronger associations found in the urban sample. As well, it is reasonable to anticipate that most homeowners would be able to afford these modern household items as depicted by the moderately positive association (.114) in the urban sample. The opposite is the case in the rural sample where the association is negative, albeit a weak and non-significant one (-.011). The reason for this result could be traced to the ambiguity in respect of dwelling ownership alluded to earlier. The same reason would account for the negative association between dwelling ownership on the one hand, and education, main source of cooking fuel, and type of toilet facility on the other. The suspicion is that if dwelling ownership had been properly defined and measured, it would have been positively associated with the last three variables.

The positively significant but weak association between heads of cattle and dwelling ownership is consistent with what has been mentioned elsewhere that people who own cattle are among the wealthy in Ghanaian society. The fact that most cattle owners would most likely be located in the rural area explains the relatively stronger association (.151) in the rural sample compared to the urban sample (.097). Likewise, the negative association between heads of cattle on the one hand, and education, main source of cooking fuel, type of toilet facility and modern household items on the other are not out of order. Cattle owners would most likely not be highly educated, in addition to the fact that basic social amenities are lacking in most rural areas where they are located. But those who are resident in urban areas may have access to, and could afford some of these facilities as depicted in the positive but non-significant association.

It must be noted in above discussion that the particular foci of the individual questions are less important than their intrinsic cultural relevance as a measure of social class in Ghana, coupled with the ability to predict a substantial amount of explained variance. At the same time, however, it is commonly assumed that the inclusion of an indicator with a negative correlation tends to weaken the predictive power of the index. As such, it is common practice for indicators that generate negative correlation to be removed from the analysis. However, the decision to remove or not remove remains with the researcher. If the objective is to obtain a parsimonious index, the removal of an indicator with a negative correlation would be the logical thing to do.

On the other hand, if the objective is to obtain an index that is meaningful and relevant within the cultural context of the population under study, statistical parsimony would be of lesser concern. And especially where few indicators are appropriately measured as in this study, sociocultural relevance is to be preferred over parsimony. Additionally, in this study, the reliability of the index would further be tested externally by how closely the three groups of social class obtained match the proportions based on the poverty quintile index in the original study for which the data was collected. An external test, all things being equal, provides a relatively unbiased and stronger validation than an internal test. Moreover, the poverty quintile is analogous to the social class index since both are derived from socio-economic variables. Index of Dissimilarity provides a simple method of undertaking such a comparison.

Principal Component Analysis

The method of principal components provides a useful representation of the correlational structure of a set of variables (Fox, 1984). If for example, we assume vectors of standardized regressors $z_1, z_2, \ldots, z_k$, the principal components $w_1, w_2, \ldots, w_p$ provide an orthogonal basis for the regressor subspace. The first principal component, w_1, is oriented so as to account for maximum collective variation in the z_j; the second principal component, w_2, is orthogonal to w_1 and, under the restriction of orthogonality, is oriented to account for maximum remaining variation in the zj; w_3 is orthogonal to both w1 and w_2; and so on. There are therefore as many principal components as there are linearly independent regressors; that is, p = rank (Z_x).

The principal components of the k standardized regressors Z_x are a new set of k variables derived from Z_x by a linear transformation: $W = Z_xA$, where A is the (k x k) transformation matrix. The columns of A are ordered by their corresponding eigenvalues: The first column corresponds with the largest eigenvalue, and the last column to the smallest. The eigenvalue L_j associated with the j^{th} component represents the variance attributable to that component. If there are perfect collinearities in Z_x, then some eigenvalues will be zero, and there will be fewer than k principal components. Near collinearities are associated with small eigenvalues and corresponding short principal components. Consistent with common practice, only eigenvalues that exceed unity are considered significant.

The above procedure was employed in evaluating a selected combination of indicators, with two emerging as the best possible combination out of which one would finally end up as the index. The first combination comprising four indicators (education, main source of cooking fuel, type of toilet facility, modern household items) provided the greater explained variance of 37.37 percent and 44.67 percent for the rural and urban samples respectively, after only one component extraction (see Table 6.2.1). However, a cursory inspection of the indicators in this combination would suggest a subtle urban bias. The second combination that includes dwelling ownership and heads of cattle (Table 6.2.2) is therefore expected to counter any such effects. It will be recalled that in addition to their importance as status symbols, these are two indicators that favour a disproportionately large number of rural respondents (refer to Tables 5.4 and 5.12) and thus, would ensure some balance in distribution.

In the second combination (education, main source of cooking fuel, type of toilet facility, modern household items, dwelling ownership, heads of cattle), two components are extracted. Table 6.2.2 shows that the first extracted component produces an explained variance of 25.17 percent and 29.93 percent for rural and urban respectively, whilst the corresponding percentages for the second extracted component are 18.60 and 18.01. The combined factors account for 43.77 and 47.94 percent respectively. The second combination is therefore preferred, which choice would further be affirmed statistically by the index of dissimilarity.

Table 6.2.1: Total Variance Explained, First Combination

Component	Rural			Urban		
	Initial Eigenvalues			Initial Eigenvalues		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	1.495	37.374	37.374	1.787	44.670	44.670
2	.999	24.982	62.356	.909	22.727	67.397
3	.783	19.567	81.923	.699	17.482	84.879
4	.723	18.077	100.000	.605	15.121	100.000

Table 6.2.2: Total Variance Explained, Second Combination

Component	Rural			Urban		
	Initial Eigenvalues			Initial Eigenvalues		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	1.510	25.165	25.165	1.796	29.926	29.926
2	1.116	18.602	43.767	1.081	18.009	47.935
3	.969	16.143	59.910	.947	15.775	63.710
4	.917	15.279	75.188	.907	15.116	78.826
5	.776	12.930	88.118	.686	11.435	90.262
6	.713	11.882	100.000	.584	9.738	100.000

Obtaining the Composite Index Scores of Social Class

The component analysis procedure also provides the study with a formula for obtaining the composite index scores of social class. It is manifestly clear at this stage that each one of the six indicators selected does not make the same contribution to the index, both in substance and space. It is therefore imperative that this is factored into the computation so that the specific magnitude of individual contributions are accounted for. This is accomplished by using the generated factor loadings as weights, the reason being that these loadings are assumed to indicate the correlation between the hypothesized factor (social class) and the indicators. For the purpose of this study, the factor loadings appearing in the first component (unrotated) matrix are used because it generates the highest maximum collective variance. This is presented in Tables 6.3.1 and 6.3.2.

For the first combination (Table 6.3.1), modern household items has the highest positive factor loading in rural while main source of cooking fuel loads highest in urban. Education and modern household items are the next highest loadings in rural and urban respectively, followed by main source of cooking fuel in rural and education in urban. Type of toilet facility registers the lowest positive loading in rural while in urban, it posts a negative loading. The magnitudes of the loadings would seem to suggest that social class as reflected by this combination of indicators is determined largely by socioeconomic status rather than by either economic property or social prestige singularly and soley.

In the case of the second combination (6.3.2), two components are extracted and the clustering of variables remains largely similar to that obtained in the only extraction made in the first combination, and modern household items emerges unique across the

Table 6.3.1: Factor Loadings in Component Matrix of First Combination

Indicators	Component	
	Rural	Urban
Highest education completed	.704	.704
Main source of cooking fuel	.668	.763
Type of toilet facility	.141	-.438
Modern household items	.730	.719

Table 6.3.2: Factor Loadings in Component Matrix of Second Combination

Indicators	Rural		Urban	
	Components			
	1	2	1	2
Highest education completed	.696	-.079	.695	.197
Main source of cooking fuel	.665	-.113	.754	.174
Type of toilet facility	.179	.644	-.441	.078
Modern household items	.710	-.187	.727	-.121
Dwelling Ownership	.212	.627	-.108	.751
Heads of cattle	-.029	-.503	.099	-.654

two factor structures. The same cannot be said of the second component extraction, however. In looking at the rural sub-sample, type of toilet facility and dwelling ownership produce the highest positive factor loadings, with the former slightly higher. The rest of the indicators post negative factor loadings. In the case of urban, on the other hand, dwelling ownership stands out as the most dominant, registering the highest positive loading. Heads of cattle posts a very high negative loading, while the remaining indicators all register very low positive factor loadings. The second principal factor in the solution points in the direction of economic property.

The next step in the process of constructing the index is to apply the factor loadings to expected ideal type characteristics (Table 6.4.1) envisaged for the three groups postulated; upper, middle and lower class. Respondents falling in the upper class are expected to have completed post-secondary education and living in their own dwelling. As well, it is expected that their main source of cooking fuel would be electricity or gas and their toilet facility, water closet. It is also expected that they will own a car or truck in addition to ten or more heads of cattle. People belonging to the middle class status are expected to have completed some senior secondary, vocational or commercial education, teacher or nursing training and living in rented dwellings. Unlike people of first class status, the main source of cooking fuel used by this group is expected to be charcoal and kerosene. Their toilet facility is also expected to be the KVIP or pan latrine. Lastly, it is expected that this group of people would possess some modern household items such as a fridge, television, video deck, stereo system, or modern stove, in addition to owning less than ten heads of cattle.

Table 6.4.1: Expected Ideal Type Characteristics of Social Class in Ghana

Indicators	Social Class		
	Upper	Middle	Lower
Highest grade of education comp.	Post Secondary	Senior Sec., Vocational, Commercial, Teacher and Nursing Training	No School, Pre-Primary, Primary, Middle and Junior Sec. School
Main source of cooking fuel	Electricity or Gas	Kerosene or Charcoal	Firewood
Type of toilet Facility	Flush toilet (WC)	Pan/Bucket, KVIP	None (bush), covered/uncovered pit Latrine, other.
Modern household items owned	Car or truck	Fridge, television, video deck, stereo system and electric/gas stove	Owns none
Dwelling Ownership	Owns dwelling	Rents dwelling	Rent-free
Heads of cattle	10 or more	Less than 10	None

For respondents in lower class, it is expected that they would have completed some pre-primary, primary, middle or junior secondary school, or not had any education at all. Also, it is expected that they will have free accommodation. People of lower class are expected to use firewood as their main source of cooking fuel, as well as use the pit latrine as their toilet facility. Lastly, they are not expected to own any modern household item or heads of cattle. Based on above, the proportions of three social groups envisaged are obtained as in Table 6.4.2. The assumed weights are then multiplied by the score obtained by a respondent on each one of the indicators, and the sum of the weighted product is taken to represent the total index score of social class. Thus, the index score is

Table 6.4.2: Distribution Based on Ideal Type Characteristics of Social Class in Ghana

Indicator	Rural				Urban			
	Social Class							
	Lower	Middle	Upper	Total	Lower	Middle	Upper	Total
Highest grade of education	8307 (90.7%)	747 (8.2%)	108 (1.2%)	9162 (100%)	4064 (75.9%)	1066 (19.9%)	222 (4.1%)	5352 (100%)
Main source of cooking fuel	8267 (90.2%)	843 (9.2%)	52 (0.6%)	9162 (100%)	1359 (25.4%)	3467 (64.8%	526 (9.8%)	5352 (100%)
Type of toilet facility	7549 (82.4%)	1511 (16.5%)	102 (1.1%)	9162 (100%)	2274 (42.5%)	2196 (41.0%)	882 (16.5%)	5352 (100%)
Modern house-hold items	8011 (87.4%)	1087 (11.9%)	64 (0.7%)	9162 (100%)	2825 (52.8%)	2393 (44.7%	134 (2.5%)	5352 (100%)
Dwelling Ownership	3643 (39.8%)	897 (9.8%)	4622 (50.4%)	9162 (100%)	2320 (43.3%)	1983 (37.1%)	1049 (19.6%)	5352 (100%)
Heads of cattle owned	8596 (93.8%)	408 (4.5%)	158 (1.7%)	9162 (100%)	5282 (98.7%)	36 (0.7%)	34 (0.6%)	5352 (100%)

obtained by combining the raw variables with weights that are proportional to their component loadings (Kim and Mueller, 1978), that is, the proportion of their contribution to the index. This can be expressed as follows:

$$\mathrm{TISSC} = \Sigma R_i W_i$$

where TISSC = total index score of social class

R_i = score by each indicator

W_i = weight of indicator

The frequency distribution of above computation is presented in Appendices 2 and 3 for the first and second combinations respectively. Respondents can then be classified into groups depending on how they placed on the index scale. However, an important last step is a proven method for delineating the cut-off points for the three groups envisaged. This can be accomplished by using the Cumulative $\sqrt{}$f(y) Rule.

Calculation of Stratum Boundaries using the Cum $\sqrt{}$f(y) Rule

For a single item or variable 'y,' the best way to determine boundaries between strata is by using the frequency distribution of 'y' itself. The next best is presumably the frequency distribution of some other quantity highly correlated with 'y.' Given the number of strata, the equations for determining the best stratum boundaries was worked out by Dalenius (1957). Unfortunately, the equations involved were ill adapted to practical computation. This led to a much improved method by Delanius and Hodges (1959). This method is based on the premise that the frequency of 'y' (i.e., f[y]) should be approximately constant (rectangular) within a given stratum. Hence given f(y), the rule is to form the cumulative of $\sqrt{}$f(y) and choose the value of f(y) in a stratum so that they create equal intervals on the cum$\sqrt{}$f(y) scale. It would be observed in Appendices C and D that the distribution is skewed, with the mode at the lower end.

In Appendix C of the cum$\sqrt{}$f(y) column of the rural population for the first combination, $48.55 = \sqrt{2357}$; $51.55 = \sqrt{2357} + \sqrt{9}$; $60.44 = \sqrt{2357} + \sqrt{9} + \sqrt{79}, \ldots$; $549.35 = \sqrt{2357} + \sqrt{9} + \sqrt{79} \ldots + \sqrt{1}$. Since three strata are required and the total cum$\sqrt{}$f(y) is 549.35, this figure is divided by three to obtain three division points; 48.55, 191.65 and 363.80. The nearest available interval points on the scale are as follows:

Stratum (rural) for First Combination

	(1)	(2)	(3)
Boundaries	2.24 - 2.95	2.97 - 4.04	4.06 - 8.14
Intervals on cum√f(y)	48.55 - 191.65	203.44 - 363.80	370.05 - 549.35

Likewise in the urban population for the first combination, 2.45 = √6; 20.94 = √6 + √342; 21.94 = √6 + √342 + √1; ... ; 675.78 = √6 + √342 + √1 ... + √1. With a total cum√f (y) of 675.78, the three division points are 2.45, 222.59 and 452.01 and the nearest available interval points on the scale are as follows:

Stratum (urban) for First Combination

	(1)	(2)	(3)
Boundaries	-0.88 - 1.591	1.64 - 3.06	3.07 - 7.62
Intervals on cum√f(y)	2.45 - 222.59	235.85 - 452.09	454.09 - 675.78

Applying the same formula to the cum√f (y) of the second combination in Appendix D, the following results are obtained:

Stratum (rural) for Second Combination

	(1)	(2)	(3)
Boundaries	-22.21 - 3.24	3.25 - 4.26	4.26 - 8.85
Intervals on cum√f(y)	1.00 - 356.75	357.75 - 709.93	713.67 – 1064.49

Stratum (urban) for Second Combination

	(1)	(2)	(3)
Boundaries	-1.24 - 1.32	1.32 - 2.72	2.74 – 25.40
Intervals on cum√f(y)	2.00 - 368.64	369.64 - 737.96	739.38 - 1105.65

The three delineating interval points form the boundaries of the three social classes that would be investigated. Although the mathematics behind the rule is crude, the rule has worked well in both theoretical and actual distributions (Cochran, 1967). The distribution of the classes is presented in Table 6.5 below. The Table shows the first combination has 69.1% and 46.9% of rural and urban residents respectively who are of lower class status. The proportion for middle class is 24.6% and 35.2% respectively. The upper class has the lowest proportions of 6.3% in rural and 17.9% in urban. The

Table 6.5: Distribution Based On Derived Index Scores of Social Class

Social Class	First Combination				Second Combination			
	Rural		Urban		Rural		Urban	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Lower Class	6332	69.1%	2510	46.9%	4578	50.0%	2588	48.4%
Middle Class	2254	24.6%	1885	35.2%	3613	39.4%	1807	33.8%
Upper Class	576	6.3%	957	17.9%	971	10.6%	957	17.9%
Total	9162	100.0%	5352	100.0%	9162	100.0%	5352	100.0%

corresponding rural-urban proportions for the second combination are 50.0% and 48.4%, 39.4% and 33.8%, and 10.6% and 17.9% respectively for lower, middle and upper classes. Overall, both distributions would seem to be consistent with the reality of Ghanaian society especially with respect to the urban proportions, however, the proportions obtained using the second combination best approximates those obtained in the original study (see Table 6.6.1), and this is affirmed by the index of dissimilarity.

Index of Dissimilarity

Dissimilarity Index is the sum of the absolute differences between the proportional distributions of two populations. It ranges from zero (complete similarity) to unity (dissimilarity) between the distribution of the two populations (Duncan and Duncan, 1955). To allow for comparison with the three groups of social class, the five proportions in Table 6.6.1 are condensed into three (Table 6.6.2) based on mere observation.

Table 6.6.1: Distribution based on Poverty Quintile in CWIQ Survey

Rural					
Poor					Non-poor
1	2	3	4	5	Total
1,868	1847	1770	1893	1784	9162
20.39%	20.16%	19.32%	20.66%	19.47%	100.00%
Urban					
1026	1068	1081	1086	1091	5353
19.17%	19.96%	20.20%	20.29%	20.38%	100.00%

Source: Core Welfare Indicators Questionnaire (CWIQ) Survey, 1997, Summary Table 2A, p.10.

Table 6.6.2: Distribution by Poverty Quintile (condensed)

Rural			
Poor		Non-poor	Total
1	2	3	
3715	3663	1784	9162
40.55%	39.98%	19.47%	100.00%
Urban			
2094	2167	1091	5352
39.13%	40.49%	20.38%	100.00%

Source: Derived from CWIQ Survey, 1997, Summary Table 2A, p.10.

Table 6.7.1: Computation of Dissimilarity Index (Combination One)

Rural				
Category/Proportion				
Description	1	2	3	Dissimilarity Index
Quintile	40.55	39.98	19.47	Sum of diff./2
Social Class	60.10	24.60	6.30	= 57.1/2
Difference	28.55	15.38	13.17	= 0.29
Urban				
Quintile	39.13	40.49	20.38	= 15.54/2
Social Class	46.90	35.20	17.90	= 0.08
Difference	7.77	5.29	2.48	

Table 6.7.2: Computation of Dissimilarity Index (Combination Two)

Rural				
Category/Proportion				
Description	1	2	3	Dissimilarity Index
Quintile	40.55	39.98	19.47	Sum of diff./2
Social Class	50.00	39.40	10.60	= 18.9/2
Difference	9.45	0.58	8.87	= 0.09
Urban				
Quintile	39.13	40.49	20.38	= 18.44/2
Social Class	48.40	33.80	17.90	= 0.09
Difference	9.27	6.69	2.48	

Tables 6.7.1. and 6.7.2 indicate that both combinations exhibit close similarity to the quintile distribution even though the magnitude of dissimilarity index of rural segment in Combination One is seen to be clearly out of order. Combination Two, which shows remarkable consistency in magnitude in both rural and urban dissimilarity indices is therefore selected as the social class index to be employed in the analysis. It is worthy to note that given the possibility of slippages across boundaries as a result of collapsing the original quintile distribution, a dissimilarity index of 0.09 is significantly high and attests positively to the validity of the index constructed.

Index Validation

In the basic logic of validation, it is assumed that the composite index provides a measure of some variable; that is, the successive scores on the index arrange cases in a rank order in terms of that variable. As for example, an index of social class rank-orders people in terms of their relative prestige and/or socioeconomic status. If the index succeeds in doing this, it follows that persons who fall within, say, the upper class should appear relatively upper class in all other indicators of upper class as already noted. As such, if each of the preceding steps is carried out carefully, the likelihood of the index actually measuring the variable is enhanced. To demonstrate success, however, there must be validation of the index through two methods: internal validation and external validation.

Internal validation, otherwise called *item analysis* examines the extent to which the composite index is related to (or predicts responses to) the items in the index itself. This is executed simply by creating tables in which the index is the independent variable and the item is the dependent variable. If the index has been carefully constructed through the examination of bivariate and multivariate relationships among the items, this exercise should confirm the validity of that index, with each individual item correlating with the index scores as predicted. This method also provides a convenient test of the independent contribution of each of the items to the index. Tables 6.8.1-6 present indicators of the item analysis.

The proof of this method hinges on internal consistency; that is, the total proportions should correspond with those obtained based on the derived index scores of social class. And the general observation is that the proportions do, indeed, correspond.

In Table 6.8.1, the upper class contains the highest proportion of respondents with post-secondary education while the highest proportion of respondents with the least education are in the lower class. Similar observation is made with regard to main source of cooking fuel (Table 6.8.2), type of toilet facility (Table 6.8.3) and modern household items (Table 6.8.4). The same cannot be said of dwelling ownership (Table 6.8.5), however, and it is not hard to attribute the inconsistency to sampling design or the measurement problem mentioned elsewhere in this study. In the case of heads of cattle (Table 6.8.6), it is difficult to deduce a reasonable explanation for the proportions in rural since the proportions in urban seem to conform to expectation. But one cannot rule out response error since it is possible herdsmen might have responded as owners, just as more than one family member might also have responded to the ownership of the same heads of cattle belonging to the family.

Table 6.8.1: Highest Grade of Education Completed

Social Class	Rural				Urban			
	No school, pre-primary, primary, middle, JSS*	Sec./Voc./ Comm./Teacher/Nursing Training	Post-Secondary	Total	No school, pre-primary, primary., middle, JSS*	Sec./Voc./ Comm./Teacher/Nursing Training	Post-Secdary	Total
Lower	4547 (99.3%)	31 (0.7%)	-	4578 (100%)	2431 (93.9%)	153 (5.9%)	4 (0.2%)	2588 (100%)
Middle	3311 (91.6%)	296 (8.2%)	6 (0.2%)	3613 (100%)	1347 (74.5%)	420 (23.2%)	40 (2.2%)	1807 (100%)
Upper	449 (46.2%)	420 (43.3%)	102 (10.5%)	971 (100%)	286 (29.9%)	493 (51.5%)	178 (18.6%)	957 (100%)
Total	8307 (90.7%)	747 (8.2%)	108 (1.2%)	9162 (100%)	4064 (75.9%)	1066 (19.9%)	222 (4.1%)	5352 (100%)

* JSS = junior secondary school

Table 6.8.2: Main Source of Cooking Fuel

Social Class	Rural				Urban			
	Firewood	Charcoal/ Kerosene	Gas/Ele-ctricity	Total	Firewood	Charcoal/ Kerosene	Gas/elec-tricity	Total
Lower	4550 (99.4%)	28 (0.6%)	-	4578 (100%)	1016 (39.3%)	1572 (60.7%)	-	2588 (100%)
Middle	3241 (89.7%)	372 (10.3%)	-	3613 (100%)	302 (16.7%)	1479 (81.8%)	26 (1.4%)	1807 (100%)
Upper	476 (49.0%)	443 (45.6%)	52 (5.4%)	971 (100%)	41 (4.3%)	416 (43.5%)	500 (52.2%)	957 (100%)
Total	8267 (90.2%)	843 (9.2%)	52 (0.6%)	9162 (100%)	1359 (25.4%)	3467 (64.8%)	526 (9.8%)	5352 (100%)

Table 6.8.3: Type of Toilet Facility

Social Class	Rural				Urban			
	Uncovered/ covered pit latrine/none	Pan/bucket or KVIP	Flush toilet (WC)	Total	Uncovered/ covered pit latrine/none	Pan/bucket or KVIP	Flush toilet (WC)	Total
Lower	4528 (98.9%)	41 (0.9%)	9 (0.2%)	4578 (100%)	1141 (44.1%)	1442 (55.7%)	5 (0.2%)	2588 (100%)
Middle	2486 (68.8%)	1097 (30.4%)	30 (0.8%)	3613 (100%)	924 (51.1%)	551 (30.5%)	332 (18.4%)	1807 (100%)
Upper	535 (55.1%)	373 (38.4%)	63 (6.5%)	971 (100%)	209 (21.8%)	203 (21.2%)	545 (56.9%)	957 (100%)
Total	7549 (82.4%)	1511 (16.5%)	102 (1.1%)	9162 (100%)	2274 (42.5%)	2196 (41.0%)	882 (16.5%)	5352 (100%)

Table 6.8.4: Modern Household Items Owned

Social Class	Rural				Urban			
	None	Fridge, tv., Stereo, etc	Car or truck	Total	None	Fridge, tv., Stereo, etc	Car or truck	Total
Lower	4488 (98.0%)	88 (1.9%)	2 (0.0%)	4578 (100%)	2020 (78.1%)	557 (21.5%)	11 (0.4%)	2588 (100%)
Middle	3209 (88.8%)	400 (11.1%)	4 (0.4%)	3613 (100%)	733 (40.6%)	1046 (57.9%)	28 (1.5%)	1807 (100%)
Upper	314 (32.3%)	599 (61.7%)	58 (6.0%)	971 (100%)	72 (7.5%)	790 (82.5%)	95 (9.9%)	957 (100%)
Total	8011 (87.4%)	1087 (11.9%)	64 (0.7%)	9162 (100%)	2825 (52.8%)	2393 (44.7%)	134 (2.5%)	5352 (100%)

Table 6.8.5: Dwelling Ownership

Social Class	Rural				Urban			
	Rent-free	Rents dwelling	Owns dwelling	Total	Rent-free	Rents dwelling	Owns dwelling	Total
Lower	783 (17.1%)	198 (4.3%)	3597 (78.6%)	4578 (100%)	1311 (50.7%)	750 (29.0%)	527 (20.4%)	2588 (100%)
Middle	2310 (63.9%)	456 (12.6%)	847 (23.4%)	3613 (100%)	689 (38.1%)	777 (43.0%)	341 (18.9%)	1807 (100%)
Upper	550 (56.6%)	243 (25.0%)	178 (18.3%)	971 (100%)	320 (33.4%)	456 (47.6%)	181 (18.9%)	957 (100%)
Total	3643 (39.8%)	897 (9.8%)	4622 (50.4%)	9162 (100%)	2320 (43.3%)	1983 (37.1%)	1049 (19.6%)	5352 (100%)

Table 6.8.6: Heads of Cattle Owned

Social Class	Rural				Urban			
	None	Less than 10	10 or more	Total	None	Less than 10	10 or more	Total
Lower	4056 (88.6%)	375 (8.2%)	147 (3.2%)	6104 (100%)	2580 (99.7%)	7 (0.3%)	1 (0.0%)	2588 (100%)
Middle	3581 (99.1%)	23 (0.6%)	9 (0.2%)	2262 (100%)	1779 (98.5%)	20 (1.1%)	8 (0.4%)	1807 (100%)
Upper	959 (98.8%)	10 (1.0%)	2 (0.2%)	796 (100%)	923 (96.4%)	9 (0.9%)	25 (2.6%)	957 (100%)
Total	8596 (93.8%)	408 (4.5%)	158 (1.7%)	9162 (100%)	5282 (98.7%)	36 (0.7%)	34 (0.6%)	5352 (100%)

In the context of external validation, if the index adequately measures a given variable, it should successfully predict other indicators of that variable not included in the index. Respondents ranked as upper class on an index should appear upper class in their responses to other items in the study. Indeed, the ranking of groups of respondents on the index should predict the ranking of those groups in answering other questions related to social class. With regard to cultural relevance, some items that qualify to be used for such validation are marital status, number of separate rooms and how many times in the past week a meal with meat was prepared in the household. The results are presented below in Tables 6.8.7-9.

All three external items confirm the validity of the index. The proportion of respondents married is highest in the upper class, and the proportion not married is also lowest in this class as well (Table 6.8.7). Just as in the previous case, some inconsistency is apparent in number of separate rooms (Table 6.8.8) but it is more pronounced in the rural segment. In the urban segment, the highest proportion of those with one or no room is found in the lower class, followed by the middle and upper classes in that order.

Table 6.8.7: Marital Status

Social Class	Rural			Urban		
	Married	Not Married	Total	Married	Not Married	Total
Lower	3243 (70.8%)	1335 (29.2%)	4578 (100.0%)	1420 (54.9%)	1168 (45.1%)	2588 (100.0%)
Middle	2339 (64.7%)	1274 (35.3%)	3613 (100.0%)	1132 (62.6%)	675 (37.4%)	1807 (100.0%)
Upper	743 (76.5%)	228 (23.5%)	971 (100.0%)	680 (71.1%)	277 (28.9%)	957 (100.0%)
Total	6325 (69.0%)	2837 (31.0%)	9162 (100.0%)	3232 (60.4%)	2120 (39.6%)	5352 (100.0%)

Table 6.8.8: Number of Separate Rooms

Social Class	Rural				Urban			
	1 or None	2 or 3	4 or more	Total	1 or None	2 or 3	4 or more	Total
Lower	1478 (32.3%)	2119 (46.3%)	981 (21.4%)	4578 (100%)	1642 (63.4%)	799 (30.9%)	147 (5.7%)	2588 (100%)
Middle	2237 (61.9%)	1051 (29.1%)	325 (9.0%)	3613 (100%)	1018 (56.3%)	659 (36.5%)	130 (7.2%)	1807 (100%)
Upper	514 (52.9%)	348 (35.8%)	109 (11.2%)	971 (100%)	356 (37.2%)	463 (48.4%)	138 (14.4%)	957 (100%)
Total	4229 (46.2%)	3518 (38.4%)	1415 (15.4%)	9162 (100%)	3016 (56.4%)	1921 (35.9%)	415 (7.8%)	5352 (100%)

Table 6.8.9: Number of times meal with meat prepared in past week

Social Class	Rural						Urban					
	0	1	2	3-6	7+	Total	0	1	2	3-6	7+	Total
Lower	3663 (80%)	295 (6%)	272 (6%)	311 (7%)	37 (1%)	4578 (100%)	1728 (67%)	268 (10%)	245 (10%)	275 (11%)	72 (3%)	2588 (100%)
Middle	2704 (75%)	313 (9%)	242 (7%)	296 (8%)	58 (2%)	3613 (100%)	937 (52%)	256 (14%)	263 (15%)	278 (15%)	73 (4%)	1807 (100%)
Upper	599 (62%)	113 (12%)	107 (11%)	123 (13%)	30 (3%)	971 (100%)	409 (43%)	149 (16%)	155 (16%)	190 (20%)	54 (6%)	957 (100%)
Total	6966 (76%)	721 (8%)	620 (7%)	730 (8%)	125 (1%)	9162 (100%)	3074 (57%)	673 (13%)	663 (12%)	743 (14%)	199 (4%)	5352 (100%)

Correspondingly, the upper class has the highest proportion of respondents with four or more rooms, while the middle class has the second highest proportion and the lower class the lowest proportion. As in the previous case, the problem with the rural segment may be due to sampling design or response errors.

The above notwithstanding, it is important to note that overall, the rank order of responses (proportions) among the three groups corresponds with the rank order obtained by the index itself. At the same time, each item provides a different description of social class overall. For example, the validating item, "dwelling ownership" suggests that a significant proportion of rural respondents owns a dwelling. If this were the only indicator of social class, it might be concluded that majority of rural residents are of higher class status. However, respondents falling into upper class on the index are more likely to own a dwelling, while those who own a dwelling but are lacking in other attributes (indicators) associated with upper class status would fall into middle or lower class. And the proportions giving this answer correspond to the scores assigned on the index.

CHAPTER SEVEN

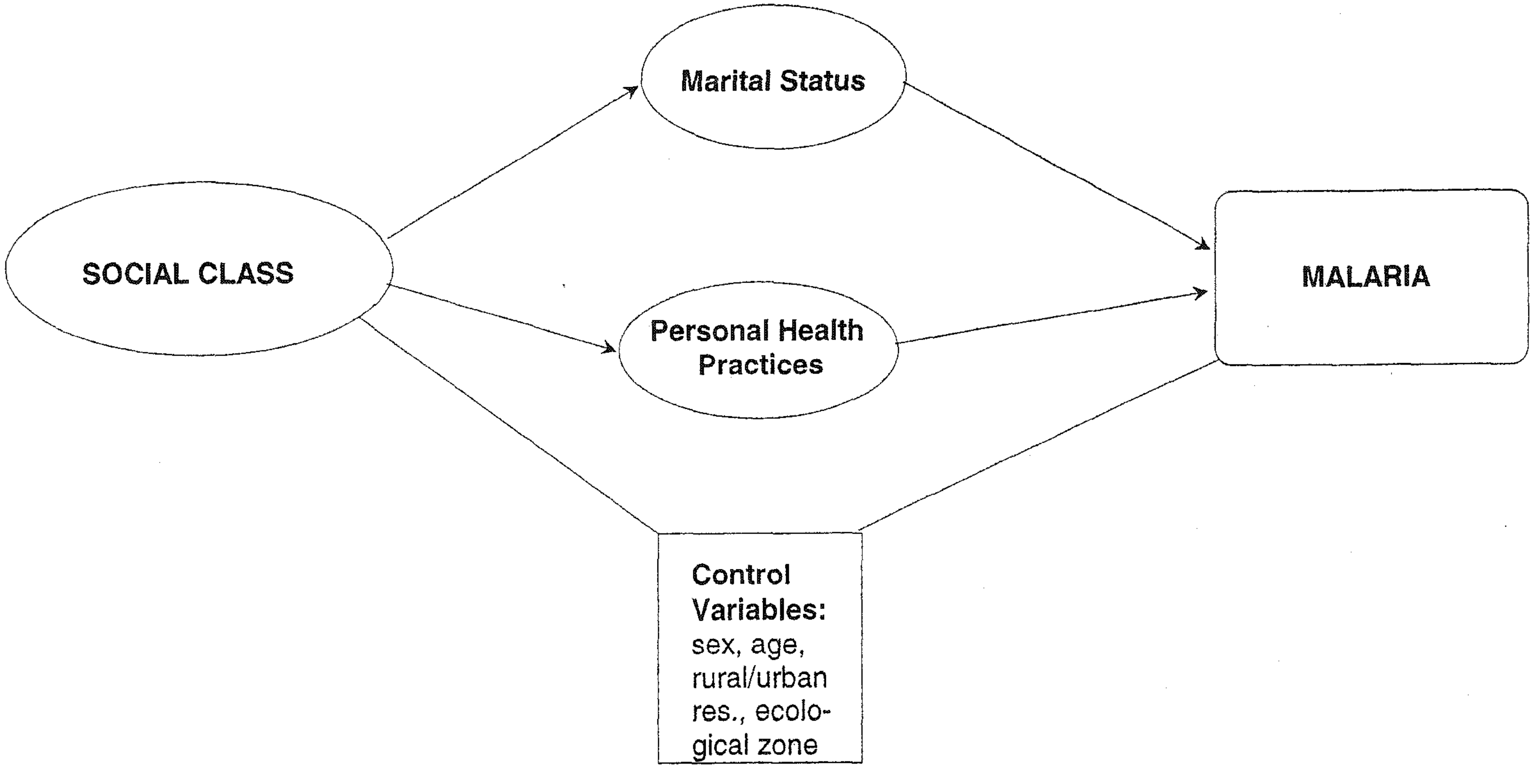
MULTIVARIATE ANALYSES

The Regression Model

Figure 7.1 is the schematic representation of the final operational model that is employed in the logistic regression analyses. The model depicts the effect of social class differences on the prevalence of malaria. Basically, it is posited that the prevalence of malaria is a function of social class mediated by marital status and personal health practices. The relationship between social class and malaria is premised on the observation that "widespread poverty … contribute directly to the high death toll from infectious and parasitic diseases (Olshansky, 1997)." Alnwick (2000) notes that malaria afflicts primarily the poor, who tend to live in dwellings that offer little or no protection against mosquitoes (p.1377). Hence the incidence of poverty could here be seen as a culmination of the different dimensions that constitute the socioeconomic environment and facilitate the creation of subgroups within the population.

In fact, Banguero's (1984) study in Colombia revealed wage income to be significantly correlated with the incidence of malaria. But Gallup and Sachs (2001) observe that the high levels of malaria in poor countries are not mainly a consequence of poverty. As well, the positive influence of marriage as a social support mechanism in health status has been amply demonstrated in several studies (see for example, Mastekaasa, 1992; Lee et al., 1991 and Glenn and Weaver, 1988). Concerning personal health practices, Olshansky notes that "the majority of existing infectious and parasitic diseases that now affect humans can be prevented through … personal hygiene (p.5)."

Figure 7.1: OPERATIONAL MODEL FOR SOCIAL CLASS DIFFERENCES AND MALARIA IN GHANA



Hence there is no doubt regarding the role of personal health practices or personal hygiene in the transmission of malaria.

Control variables introduced into the analysis are sex, age, place of residence and ecological zone. There is a general belief that rate of malaria infection in males and non-pregnant females is similar (Laserson et al, 1999; Brabin and Brabin, 1992; El Samani, 1987). Other studies report that the prevalence rate is higher in females than males (e.g., Giha et al., 2000; Ejov et al., 1999; Bawden et al., 1995). There is also sufficient evidence that suggests the incidence of malaria varies with age, the risk being highest in children and the elderly (Giha et al., 2000; Bawden et al., 1995; Lienhardt et al., 1990; Jones et al., 1991). All of above studies point in the direction that there obviously are differences in health status between males and females as well among different age groups. Lastly, other studies also show the influence of environmental factors in the transmission of malaria, especially with respect to rural-urban residence and ecological conditions (see e.g., Koram et al, 1995; Afari, et al., 1994).

Given the theoretical importance of IPDs to this study, and the fact that they are a major health problem in Ghana as illustrated earlier, a brief overview of the disease would shed some light on how and why malaria was selected for this study.

A Brief Description and Overview of Malaria

Briefly, malaria is caused by a protozoan parasite (plasmodium). The four most commonly found parasites causing malaria in humans are the *plasmodium falciparum* (considered the most dangerous), *plasmodium vivax, plasmodium malariae* and *plasmodium ovale*. The malaria parasite is injected into the human host by a vector, the *Anopheles* mosquito. Therefore, malaria transmission refers to anopheline mosquitoes actively transmitting malarial infections in human populations at particular locations (Carter et. al., 2000). The intensity of transmission is related to the frequency with which a person at a given location may be exposed to the bite of an anopheline mosquito infected with malaria sporozoites, and thus to the possibility of becoming infected with malaria parasites.

Malaria is governed by a large number of environmental factors, which affect its distribution, seasonality and transmission intensity (Snow et al, 1999). Although there is a great diversity of anopheles species in Africa, members of the *Anopheles gambiae* complex are the principal vectors of malaria throughout most of the continent (Lindsay et al, 1998). The authors report that most malaria epidemics in Africa are due to Plasmodium falciparum, the most lethal and dominant species found on the continent.

Carter et al (2000) note that malaria is non-randomly distributed across a landscape in patches and the association of malaria transmission with specific locations is attributable to the presence of breeding sites of the anopheline vectors. The habitats that support breeding by the vectors of human malaria are extremely diverse and in general are highly species specific. Their only feature in common, according to the authors, is the presence of fresh water or sometimes, brackish water. Recorded sources of malaria vectors include marshlands and other areas of poor drainage, surface water retained by dams and other means, pools in drying rivers, and water accumulated in bromeliad plants. Each type of habitat in each region is associated with a particular species of anopheline vectors. For example, the *Anopheles gambiae* complex characteristically breeds in small, often temporary, collections of water close to human habitations such as those formed by wheel tracks, domestic containers and cattle wallows.

According to Lindsay et al, altitude is one of the oldest defences against malaria as earlier mentioned. The authors note that as altitude increases, temperature declines and both the development and survival of the mosquito vector and parasite are critically dependent on the ambient temperature. Additionally, as the temperature drops, so does the risk of infection, and there is a typical threshold below which transmission ceases. However, one factor worthy of note is that the altitude limit of transmission in an area may be due to a lack of breeding sites, rather than unfavourable climatic conditions. Rainfall patterns also influence malaria transmission. It is on record that the catastrophic malaria epidemic in Ethiopia in 1958 was associated with unusually high rainfall over an extended period as well as with elevated temperatures and relative humidity (Fontaine, 1961). Also, it is known that the 1940 outbreak in Nairobi, Kenya, resulted from heavy rains (Roberts, 1949).

Once malaria is introduced into an area, it tends to become a growing problem largely as a consequence of agroforestry development as suggested by Garnham (1948) and Matson (1957). The principal reason for the link between such developments and malaria is related to the ecology of the *Anopheles gambiae* complex, which is intimately related to human activity. Land clearance for road construction and transportation, development of new townships and housing communities, and large scale irrigation and dams are some of the major activities that create favourable conditions for the *Anopheles gambiae* to breed. As well, human migration also plays a significant role in malaria transmission. Another factor frequently mentioned is that the decline in basic health services as a result of war, civil conflicts and declining resources, compounded by growing resistance to anti-malaria drugs, most notably to chloroquine contribute to the transmission of the disease.

Ahmed (1989) observes that malaria is endemic throughout Ghana. He notes further, in his study that the distribution of malaria in Ghana follows distinct ecological zones and climatic conditions, especially the seasonal rainfall pattern. In the middle forest zone of Ghana where rainfall is high most of the year, the study reveals that malaria transmission is intense throughout the year, whereas in the coastal zone where there is low rainfall accompanied by a relatively long period of dry weather, transmission is lower. However, the infection rates in this zone during the rainy season approach the level experienced in the middle forest zone. On the other hand, the northern savannah zone which has a longer period of dry climate has lower infection rates throughout the year except in the rainy season. It has been established that the normally humid climate of the forest zone and the attendant heavy and double rainfall pattern, coupled with the farming practices employed create more breeding sites and favourable conditions for malaria transmission, hence the forest ecological zone reports the highest rate of malaria infection in Ghana.

Ahmed reports further in his study that records of out-patient attendances in some rural health centres in Ghana indicate that between 1981 and 1987, 97.9 percent of the malaria parasites identified were *Plasmodium falciparum*. He also notes that during the same period, the malaria parasite rate was highest in children below ten years. In Tanzania, the *Plasmodium falciparum* was the predominant parasite species that accounted for 98.3 percent of malaria infections in children aged one year and less

(Matola, et al., 1987). Studies in Sudan have also shown that 91 percent of malaria cases are due to *Plasmodium falciparum* (Omer, 1978a) and the disease is seasonal with a peak occurring during the wet season of July to September (Omer, 1978b).

Olshansky et al (1997) note in their study of infectious diseases that many scientists and public health workers expected that death rates from IPDs would "wane as countries developed economically and as international health campaigns reached greater proportions of the world's population (p.2)". But the sociodemographic (Table 1.1) and economic indicators (Tables 2.1-3) on Ghana, coupled with the incidence in IPDs notably, malaria (Tables 1.2-12) would tend to suggest otherwise. This view is corroborated by the revelation that IPDs are the leading causes of death worldwide, killing more than 17 million people in 1995 – accounting for more than one-fourth of all deaths (Sharma, 1995). It is observed also that IPDs exact their heaviest toll in developing countries, where about 79 percent of all deaths occur, with a disproportionately high share in the poorest countries.

According to Olshansky et al, IPDs are most likely to claim the lives of the very young or very old, or of adults whose health have been compromised by malnutrition or another infectious or degenerative disease. In addition, the authors write that the age structure of a population also influences the death toll from IPDs, noting that the populations of developing regions are very young – 44 percent of Africans were under age 15 in 1997, for example. This explains why IPDs are responsible for more than half of the deaths in sub-Saharan Africa, which has the youngest age structure of all the major world regions. Specifically, according to the authors, an estimated one million children die of malaria annually in Africa, and millions fall prey to diarrheal diseases, tuberculosis, measles, hepatitis, tetanus, cholera and other IPDs. In Ghana, malaria is estimated to cause eight percent of all certified deaths, and ranks as the commonest cause of death in children under age five (Ahmed, 1989). As well, children in low-income countries are especially vulnerable to death from IPDs because they often are malnourished and have not had a chance to develop immunity against most infections.

Lindsay and Martens (1998) also note that malaria is responsible for high morbidity and mortality among both children and adults. As well, Alnwick (2000) observes that malaria is a major factor in Africa's high rate of infant and maternal mortality, of low birth weight, of school absenteeism, and of low productivity in farming and other work. The general observation that poverty, or more broadly economic conditions are a contributory factor to malaria transmission would tend to underscore the theoretical importance of the present study, as well as justify the inclusion of the variables selected for the study.

The following model predictions for the expected probability of malaria will therefore be examined:

(1) malaria = f (social class + sex + age + urban/rural residence + ecological zone)

(2) malaria = f (social class + marital status + personal health practices + sex + age + urban/rural residence + ecological zone)

(3) marital status = f (social class + sex + age + urban/rural residence + ecological zone)

(4) personal health practices = f (social class + sex + age + urban/rural residence + ecological zone)

(5) malaria = f (social class + marital status + social class*marital status + sex + age + urban/rural residence + ecological zone)

(6) malaria = f (social class + personal health + social class*personal health practices + sex + age + urban/rural residence + ecological zone)

Equation 1 examines the direct effect of social class on malaria, controlling for sex, age, place of residence and ecological zone, while Equation 2 examines the impact of the two intervening variables on malaria and personal health practices. Equations 3 and 4 measure variations in marital status and personal health practices respectively, on the basis of social class. Finally, Equations 5 and 6 attempt an examination of possible interaction effects between social class and marital status, and social class and personal health practices, respectively on the prevalence of malaria. The veracity of the above relationships is examined through simple cross-classifications in Tables 7.1 to 7.6. The relationships described above are further confirmed through elaboration model technique (Babbie, 1989) in Tables 7.7 through to 7.10. In the ensuing discussions, emphasis is placed on the proportion of respondents that have malaria.

Cross-Classification of Model Variables

Overall, malaria prevalence is higher in the urban area (12.3%) than in the rural area (11.2%). Even though malaria does not occur in well-established, densely populated urban areas, Jamison et al (1993) note that many tropical cities are surrounded by rapidly growing slums, which are basically a high concentration of shelters in what is still primarily a rural environment. It is observed in Table 7.1 that the proportion of females with malaria is higher compared to the proportion for males in both the rural and urban areas. Table 7.2 shows that the oldest age-group has the highest proportion of

Table 7.1: Distribution of Malaria Status by Sex and Place of Residence

Disease Status	Rural			Urban		
	Male	Female	Total	Male	Female	Total
No Malaria	5643 (90.3%)	2490 (85.5%)	8133 (88.8%)	2959 (90.0%)	1734 (84.0%)	4693 (87.7%)
Have Malaria	606 (9.7%)	423 (14.5%)	1029 (11.2%)	328 (10.0%)	331 (16.0%)	659 (12.3%)
Total	6249 (100.0%)	2913 (100.0%)	9162 (100.0%)	3287 (100.0%)	2065 (100.0%)	5352 (100.0%)

Table 7.2: Distribution of Malaria Status by Age and Place of Residence

Disease Status	Rural				Urban			
	15-44	45-64	65+	Total	15-44	45-64	65+	Total
No Malaria	4055 (88.8%)	2814 (89.5%)	1264 (87.2%)	8133 (88.8%)	2581 (87.8%)	1517 (87.8%)	595 (87.1%)	4693 (87.7%)
Have Malaria	512 (11.2%)	331 (10.5%)	186 (12.8%)	1029 (11.2%)	360 (12.2%)	211 (12.2%)	88 (12.9%)	659 (12.3%)
Total	4567 (100.0%)	3145 (100.0%)	1450 (100.0%)	9162 (100.0%)	2941 (100.0%)	1728 (100.0%)	683 (100.0%)	5352 (100.0%)

7.3: Distribution of Malaria Status by Ecological Zone and Place of Residence

Disease Status	Rural				Urban			
	Savannah Zone	Forest Zone	Coastal Zone	Total	Savannah Zone	Forest Zone	Coastal Zone	Total
No Malaria	1314 (92.9%)	3548 (87.5%)	3271 (88.5%)	8133 (88.8%)	270 (86.3%)	1711 (85.6%)	2712 (89.2%)	4693 (87.7%)
Have Malaria	101 (7.1%)	505 (12.5%)	423 (11.5%)	1029 (11.2%)	43 (13.7%)	288 (14.4%)	328 (10.8%)	659 (12.3%)
Total	1415 (100%)	4053 (100%)	3694 (100%)	9162 (100%)	313 (100%)	1999 (100%)	3040 (100%)	5352 (100%)

Table 7.4: Distribution of Malaria Status by Marital Status and Place of Residence

Disease Status	Rural			Urban		
	Not Married	Married	Total	Not Married	Married	Total
No Malaria	2403 (84.7%)	5730 (90.6%)	8133 (88.8%)	1791 (84.5%)	2902 (89.8%)	4693 (87.7%)
Have Malaria	434 (15.3%)	595 (9.4%)	1029 (11.2%)	329 (15.5%)	330 (10.2%)	659 (12.3%)
Total	2837 (100.0%)	6325 (100.0%)	9162 (100.0%)	2120 (100.0%)	3232 (100.0%)	5352 (100.0%)

respondents with malaria in both rural and urban. While the middle aged-group has the lowest proportion of malaria cases in the rural area, the youngest age group has the second highest proportion in the rural area. The two remaining age-groups register the same proportion of malaria cases. In Table 7.3, the Forest zone records the highest proportion of malaria cases in both rural and urban areas. The Coastal zone has the second highest proportion of malaria cases in the rural area while the Savannah zone registers the second highest proportion in the urban area. The Savannah zone registers the lowest proportion of malaria cases in the rural area while the Coastal zone registers the lowest proportion in the urban area.

The married have less malaria than the unmarried as observed in Table 7.4. The disparity is slightly greater in the rural area than in the urban area. Table 7.5 shows the distribution of respondents who observe personal hygiene by malaria status. As would be expected, the proportion of malaria cases among respondents who observe no personal hygiene in both rural and urban is higher than the proportion that practices personal hygiene. The distributions in Table 7.6 indicate that while in the rural area the highest proportion of respondents with malaria is found in the upper class, by contrast in the urban area it is the lower class as would be expected. The middle class has the second highest proportion of malaria cases in both rural and urban areas. The pattern observed in the urban area is consistent with the stated hypotheses of this study, unlike what is observed in the rural area.

Table 7.5: Distribution of Malaria Status by Personal Health Practices and Place of Residence

Disease Status	Rural			Urban		
	No personal hygiene	Personal hygiene	Total	No personal hygiene	Personal hygiene	Total
No Malaria	7430 (88.7%)	703 (89.3%)	8133 (88.8%)	3094 (86.8%)	1599 (89.5%)	4693 (87.7%)
Have Malaria	945 (11.3%)	84 (10.7%)	1029 (11.2%)	471 (13.2%)	188 (10.5%)	659 (12.3%)
Total	8375 (100.0%)	787 (100.0%)	9162 (100.0%)	3565 (100.0%)	1787 (100.0%)	5352 (100.0%)

Table 7.6: Distribution of Malaria Status by Social Class and Place of Residence

Disease Status	Rural				Urban			
	Lower Class	Middle Class	Upper Class	Total	Lower Class	Middle Class	Upper Class	Total
No Malaria	4087 (89.3%)	3192 (88.3%)	854 (88.8%)	8133 (88.8%)	2236 (86.4%)	1595 (88.3%)	862 (90.1%)	4693 (87.7%)
Have Malaria	491 (10.7%)	421 (11.7%)	117 (12.0%)	1029 (11.2%)	352 (13.6%)	212 (11.7%)	95 (9.9%)	659 (12.3%)
Total	4578 (100.0%)	3613 (100.0%)	971 (100.0%)	9162 (100.0%)	2588 (100.0%)	1807 (100.0%)	957 (100.0%)	5352 (100.0%)

The Elaboration Model

The elaboration model helps in confirming and understanding "the relationship between two variables through the simultaneous introduction of additional variables (Babbie, 1989, p. 416)." This is accomplished by first dividing the sample into subsets on the basis of a control or test variable. In the present study, the test variable introduced is social class, and the sample is divided into three subsets of lower, middle and upper class. The relationship between the original two variables used (e.g., sex and malaria, ecological zone and malaria, marital status and malaria, personal health practices and malaria) is then recomputed separately for each of the subsamples to obtain the partial relationships. The partial relationships are then compared with the relationship observed in the original sample. The results of this exercise are presented in Tables 7.7 to 7.10 using the four classifications cited above. These results would be compared with the distributions in Tables 7.1, 7.3, 7.4 and 7.5 respectively.

It would be observed in Table 7.7 that in both rural and urban areas, the proportions of females that have malaria is higher than males across all social groups. This is consistent with the distribution in Table 7.1, confirming the fact that the incidence of malaria is greater among females than among males regardless of class position. Table 7.8 follows similar pattern. The Forest zone registers the highest proportion of malaria overall in both rural and urban areas irrespective of social class. The Savannah zone registers the second highest proportion in the urban area, followed by the Coastal zone. Interestingly, both of these outcomes are consistent with the distributions observed in Table 7.3, unlike the rural area whose proportions are not definitive enough. Table 7.9 also shows that across all social groups in both rural and

Table 7.7: Incidence of Malaria by Social Class, Sex and Rural-Urban Residence

Disease Status	Rural						Urban					
	Male			Female			Male			Female		
	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class
Have no Malaria	3019 (91%)	1961 (90%)	663 (89%)	1068 (85%)	1231 (86%)	191 (84%)	1212 (89%)	1070 (91%)	677 (92%)	1024 (84%)	525 (84%)	185 (85%)
Have Malaria	307 (9%)	219 (10%)	80 (11%)	184 (15%)	202 (14%)	37 (16%)	154 (11%)	112 (9%)	62 (8%)	198 (16%)	100 (16%)	33 (15%)
Total	3326 (100%)	2180 (100%)	743 (100%)	1252 (100%)	1433 (100%)	228 (100%)	1366 (100%)	1182 (100%)	739 (100%)	1222 (100%)	625 (100%)	218 (100%)

Table 7.8: Incidence of Malaria by Social Class, Ecological Zone and Rural-Urban Residence

Disease Status	Rural									Urban		
	Savannah Zone			Forest Zone			Coastal Zone			Savannah		
	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class
No Malaria	1212 (93%)	61 (88%)	41 (85%)	1294 (87%)	1835 (88%)	419 (87%)	1581 (88%)	1296 (89%)	394 89%)	113 (88%)	118 (85%)	39 (87%)
Have Malaria	86 (7%)	8 (12%)	7 (15%)	187 (13%)	255 (12%)	63 (13%)	218 (12%)	158 (11%)	47 (11%)	16 (12%)	21 (15%)	6 (13%)
Total	1298 (100%)	69 (100%)	48 (100%)	1481 (100%)	2090 (100%)	482 (100%)	1799 (100%)	1454 (100%)	441 (100%)	129 (100%)	139 (100%)	45 (100%)

Disease Status	Urban (contd.)					
	Forest			Coastal		
	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class
No Malaria	1011 (84%)	514 (86%)	186 (87%)	1112 (88%)	963 (90%)	637 (91%)
Have Malaria	179 (16%)	82 (14%)	27 (13%)	157 (12%)	109 (10%)	62 (9%)
Total	1197 (100%)	596 (100%)	213 (100%)	1269 (100%)	1072 (100%)	699 (100%)

Table 7.9: Incidence of Malaria by Social Class, Marital Status and Rural-Urban Residence

Disease Status	Rural						Urban					
	Not Married			Married			Not Married			Married		
	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class
Have no Malaria	1129 (85%)	1029 (86%)	182 (80%)	2958 (91%)	2100 (90%)	672 (90%)	977 (84%)	574 (85%)	240 (87%)	1259 (89%)	1021 (90%)	622 (91%)
Have Malaria	206 (15%)	182 (14%)	46 (20%)	285 (9%)	239 (10%)	71 (10%)	191 (14%)	101 (15%)	37 (13%)	161 (11%)	111 (10%)	58 (9%)
Total	1335 (100%)	1274 (100%)	228 (100%)	3243 (100%)	2339 (100%)	743 (100%)	1168 (100%)	675 (100%)	277 (100%)	1420 (100%)	1132 (100%)	680 (100%)

Table 7.10: Incidence of Malaria by Social Class, Personal Health Practices and Rural-Urban Residence

Disease Status	Rural						Urban					
	Observes personal hygiene			Observes no personal hygiene			Observes personal hygiene			Observes no personal hygiene		
	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class
Have no Malaria	2153 (91%)	958 (88%)	71 (87%)	1934 (88%)	2234 (89%)	783 (88%)	485 (86%)	195 (88%)	24 (92%)	1751 (86%)	1400 (88%)	838 (90%)
Have Malaria	217 (9%)	133 (12%)	11 (13%)	274 (12%)	288 (11%)	106 (12%)	78 (14%)	27 (12%)	2 (8%)	274 (14%)	185 (12%)	93 (10%)
Total	2370 (100%)	1091 (100%)	82 (100%)	2208 (100%)	2522 (100%)	889 (100%)	563 (100%)	222 (100%)	26 (100%)	2025 (100%)	1585 (100%)	931 (100%)

urban areas, the proportion of married people that have malaria is less than the proportion among the unmarried, an outcome that follows exactly the distribution pattern observed in Table 7.4. This result would also imply that irrespective of social class position, the single or unmarried will have more malaria than the married. Similarly, Table 7.10 mirrors the distributions observed in Table 7.5, though with some minor deviations.

It is important to recognize that none of the distributions observed in the variables employed here denied the prediction of the original relationships between sex and malaria, ecological zone and malaria, marital status and malaria, and personal health practices and malaria. Additionally, the nature of the empirical relationships among them were confirmed through the introduction of a third variable. As Kendall (1989) notes, "the elaboration paradigm permits the investigator to rule out certain possibilities and gain support for others."

Logistic Regression Analysis

Measurement of Variables

Dependent Variable

The dependent variable, fever/malaria was extracted from the general question in the survey: What sort of sickness/injury did you suffer from in the past four weeks? Respondents who responded as having suffered from fever/malaria were coded as "1" while respondents who stated otherwise were coded as "0." Due to the lack of precision in the question, the proportion of respondents who have fever/malaria would be taken as representing a measure of prevalence for the purposes of this study. And in line with the stated objective of this study, emphasis would be placed on malaria.

Predictor Variables:

The main predictor variable is social class, with marital status and personal health practices acting as intervening variables. Social class is comprised of three categories namely, lower, middle and upper class with upper class representing the reference category. Marital status, as mentioned elsewhere is used in this study as a proxy for social support and measured as a dichotomous variable comprising "not married" and "married." Since overcrowding is a risk factor in malaria transmission, it would have been ideal to look at monogamous and polygamous marriages separately in order to establish whether the large number of people usually associated with most polygamous households in Ghana would make a difference. However, a cross-tab analysis revealed that there was no significant difference in malaria prevalence between the two groups to warrant such partitioning (see Appendix E). "Personal health practices" or personal hygiene is a combination of three hygiene-related items: use of toilet paper rolls, toothbrush/toothpaste and package soap. This is measured as a dichotomous variable of respondents who do not observe personal hygiene against those who do.

Control Variables:

The control variables introduced are sex, age, place of residence and ecological zone. Sex is represented as male and female. Age is comprised of three sub-groups namely, 15-44, 45-64 and 65 years or more. Age 65 or more represents the reference category. These classifications are intended to test for possible sex or age-specific effects. Place of residence is analyzed as rural and urban as control for rural- or urban-specific differences, where urban is defined as a locality with at least 5,000 people (Ghana Statistical Service, 1995). The data set was partitioned into two subsets according to rural and urban prior to executing the logistic regression analysis. Ecological zone is also comprised of three sub-groupings namely, Savannah (Northern, Upper East and Upper West regions), Forest (Ashanti, Eastern and Brong-Ahafo regions) and Coastal (Greater Accra, Western, Central and Volta regions) with Coastal as the reference category.

The logistic analysis is executed using the indicator-variable coding scheme. As would be noted from above discussion, three variables are binary coded whiles the other three are categorical. But in using the logistic procedure, all variables are entered as a series of "dummies" with the highest coded item of a variable designated as the reference category. To be precise, "female," "married" and "observe personal hygiene" are the respective reference categories for the binary variables in the logistic equations. For the variables, age, ecological zone and social class, their respective reference categories are; age 65+, coastal zone and upper class. Thus, age groups 15-44 and 45-64 would each be examined separately in relation to age-group 65 years and over. Similarly, savannah zone would be examined in relation to the coastal zone, while the forest zone would also be analyzed in relation to the coastal zone. Likewise, lower class and middle class would each be analyzed separately using upper class as reference.

The motivation to use the logistic regression stems from the fact that the response variable is dichotomous. Formally, we can explain this application of logistic regression as follows: suppose that the precise degree of malaria experienced by an individual is a latent continuous variable denoted by Y^*, then Y^* can be thought of as representing the propensity for the event to occur. Hence the observed "Y" is a reflection of the latent variable Y^*. To be more specific, if the presence of malaria is represented by 1, then people report having malaria whenever Y*>0. That is, Y = 1 if Y*>0, and Y = otherwise. Under this assumption, logistic regression is the appropriate mathematical model.

Another compelling motivation is that the use of linear function in modeling a binary dependent variable is problematic because it can lead to predicted probabilities outside the range of 0 to 1. This problem arises because in a linear regression with E(Y) = π as the dependent variable, the right hand side of the equation,

$\pi = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$

is not restricted to fall between 0 and 1, whereas the left-hand side, π, is. The mathematical advantage of the logit formulation is evident in the ability to express the probability that Y=1 as a closed-form expression:

$$P(Y = 1) = \pi = \frac{\exp(\alpha + \Sigma \beta_k X_k)}{1 + \exp(\alpha + \Sigma \beta_k X_k)}.$$

Since the exponential function (exp) always results in a number between 0 and infinity, it is evident that the right-hand side of the equation (i.e., the predicted probability of Y=1) above is always bounded between 0 and 1. In fact, the logistic function is S-shaped (sigmoid curve) that is approximately linear in the middle, but curved at either end as "X" approaches either very small or very large values, whiles the linear function needs to "bend" a little at the ends in order to remain within the 0, 1 bounds. The pseudo-isolation condition (Bollen, 1989) requiring the error term to be uncorrelated with the predictors, is also violated when a binary dependent variable is modeled with OLS regression (see Hanushek and Jackson, 1977; McKelvey and Zavoina, 1975). In summary, it has been shown that the linear function is a natural choice for an interval response; but the logistic function is a natural choice for modeling a probability, as is required in this study.

Descriptive Statistics

A discussion of the logistic regression results is preceded by a presentation of some descriptive statistics in Table 7.11. In analysing these statistics, it must be noted that the mean is the proportion of those in the sample whose response or characteristic is originally coded as 1. Therefore, the results indicate a female proportion of 32 (i.e., .32) percent in the rural sample and 39 (i.e., .39) percent in the urban sample, with a standard deviation of .466 and .487 respectively. The mean age for the age-group 15-44 in the rural area indicates a proportion of 50 (i.e., .499) percent while it is 34 (i.e., .343) percent for the age group 45-64. The standard deviations are .500 and .475 respectively. The corresponding proportions for the age groups in the urban area are 55 (i.e., .550) percent and 32 (i.e., .323) percent respectively, with standard deviations of .498 and .468.

With respect to ecological zone, the rural area indicates a proportion of 15 (i.e., .154) percent for savannah zone and 44 (i.e., .442) percent for the forest zone. The standard deviations are .361 and .497 respectively. For the urban area, the savannah zone has a proportion of 6 (i.e.,.058) percent with a standard deviation of .235, while the forest zone has a proportion of 37 (i.e., .375) percent with a standard deviation of .484. Marital status registers 69 (i.e., .69) percent married in the rural sample with a standard deviation of .462 as against 60 (i.e., .60) percent married with a standard deviation of .489 in the urban sample.

Also, it is revealed that the proportion of the rural sample that observes personal

Table 7.11: Descriptive Statistics

Variable	Rural		Urban	
	Mean	Std. Deviation	Mean	Std. Deviation
Sex	.318	.466	.386	.487
15-44	.499	.500	.550	.498
45-64	.343	.475	.323	.468
Savannah	.154	.361	.058	.235
Forest	.442	.497	.374	.484
Marital Status	.690	.462	.604	.489
Personal Health	.613	.487	.849	.359
Lower Class	.500	.500	.484	.500
Middle Class	.394	.489	.338	.473
Malaria	.112	.316	.123	.329

hygiene is 61 (i.e., .61) percent with a standard deviation of .487, compared to 85 percent and a standard deviation of .359 for the urban sample. In the case of social class, the Table shows the proportion of lower class in the rural area to be 50 (i.e., .500) percent with a standard deviation of .500, while the middle class has a proportion of 39 (i.e., .394) percent with a standard deviation of .489. The corresponding proportions for the urban area are 48 (i.e., .484) percent for lower class with a standard deviation of .500 and 34 (i.e., .338) percent for the middle class with a standard deviation of .473. Lastly, the Table shows a proportion of 11 (i.e., .11) percent rural respondents with malaria

Table 7.12: Gross Effects of Predictor and Control Variables on Malaria by Rural-Urban Residence in Ghana, 1997

	Rural			**Urban**		
Variable	B	Significance	Exp(B)	B	Significance	Exp(B)
1. *Social Class*						
Lower class	-.055	.629	.947	.158	.212	1.172
Middle class	-.127	.259	.881	.082	.535	1.085
(Upper class)	-	-	-	-	-	-
2. *Marital Status*						
Not Married	.426	.000	1.530	.319	.001	1.376
(Married)	-	-	-	-	-	-
3. *Personal Health Index*						
No hygiene	.113	.353	1.120	.166	.081	1.180
(Hygiene)	-	-	-	-	-	-
4. *Sex*						
Male	-.252	.001	.778	-.391	.000	.676
(Female)	-	-	-	-	-	-
5. *Age*						
15-44	-.044	.642	.957	.073	.575	1.075
45-64	-.130	.188	.878	.056	.685	1.057
(65+)	-	-	-	-	-	-
6. *Ecological Zone*						
Savannah	-.467	.000	.627	.270	.128	1.310
Forest	.096	.177	1.101	.294	.001	1.342
(Coastal)	-	-	-	-	-	-

compared to 12 (i.e., .12) percent of urban respondents. The accompanying standard deviations are .316 and .329 respectively.

Gross effect of predictors measures the association of each variable with the dependent variable without controls. As observed in Table 7.12, marital status is the only significant predictor of malaria in both rural and urban areas. For the control variables on the other hand, sex is significant in both rural and urban areas, but whiles the savannah zone is significant in the rural area, it is the forest zone that is significant in the urban area.

Discussion of Results

The Exp(B_k) is the estimated odds ratio for those who are a unit apart on X_k, net of other predictors in the model. For the coefficients of binary predictors, a unit difference in X_k is the difference between membership in category X_k and membership in the omitted category. In this case, Exp(B_k) is the odds ratio for those in the membership category versus those in the omitted category. The log of the odds of "Y" can be any number between minus and plus infinity and can therefore be modeled as an addictive function of the predictors through a log transformation on the probability π. The logistic regression model then becomes:

$$\log\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$$

where π = prob(malaria)

α = constant

X_1= sex

β_1= coefficient for sex

X_2= age

β_2= coefficient of age, etc

The fit of a specified logistic regression model to the data is represented by the *model chi-square* value. The test statistic is the –2Log(L) – [-2Log(L1)], where L0 is the likelihood function for the model containing only an intercept (i.e., a baseline model of equiprobability), and L1 is the likelihood function for the hypothesized model (i.e., the fitted model) evaluated by Maximum Likelihood. The likelihood function gives the joint probability of observing the current sample values for "Y" given the parameters in the model. The degrees of freedom for the test is the same as the number of predictors (excluding the intercept) in a specified equation.

The result presented in Table 7.13 represents the equation that examines the direct influence of social class on the prevalence of malaria. The model chi-square for the equation is 69.531 and 57.426 for rural and urban respectively. With seven degrees of freedom, both are highly significant at $p<.001$. The results indicate that the odds of having malaria in the rural area are about .95 and .88 times less for the lower class and middle class respectively as they are for the upper class. This suggests that each of these groups has a better health status than the upper class. The reverse is the case in the urban area where the odds of having malaria is about 1.17 times for the lower class and about 1.09 times for the middle class respectively as they are for the upper class.

One reason that may account for the seemingly anomalous outcome in the rural area is that people of upper class who would usually be highly educated and more knowledgeable about malaria may be reporting more and seeking medical assistance than the less educated people who would normally be of lower class. Interestingly, these

Table 7.13: Logistic Regression: Direct Effect of Social Class on Malaria by Rural-Urban Residence, Ghana, 1997.

	Rural			Urban		
Indicators	B	Significance	Exp(B)	B	Significance	Exp(B)
Male	-.400	.000	.671	-.516	.000	.597
(Female)	-	-	-	-	-	-
15-44	-.081	.391	.922	.022	.863	1.022
45-64	-.168	.089	.846	.003	.981	1.003
(65+)	-	-	-	-	-	-
Savannah Zone	-.436	.000	.647	.327	.063	1.386
Forest Zone	.078	.271	1.081	.283	.001	1.327
(Coastal Zone)	-	-	-	-	-	-
Lower Class	-.055	.629	.947	.158	.212	1.172
Middle Class	-.127	.259	.881	.082	.535	1.085
(Upper Class)	-	-	-	-	-	-
Constant	-1.617	.000	.198	-1.925	.000	.146
Model Chi-square	69.531					57.426
df	7					7
significance	.000					.000

results are in conformity with the distributions obtained in the cross-classification analysis. This means the outcome is consistent with the data, even though it is not statistically significant. And the non-significance is indication that social class does not influence malaria prevalence in either rural or urban Ghana.

This outcome is consistent with various studies that have sought to investigate the effect of socioeconomic or social class factors on the prevalence of malaria. Koram et al (1995) investigated the possible importance of socioeconomic variables on the severity of malaria in Gambian children and found out that socioeconomic and behavioural factors are not major determinants of severe malaria in African children. Similarly, Luckner et al (1998) found that socioeconomic factors are not major determinants of severe malarial anaemia in children in Gabon. But in the republic of Congo, low socioeconomic standard was significantly associated with severe disease in a cross-sectional study comparing 84 children with cerebral malaria and 600 controls (Carme et al., 1994).

Also, socioeconomic and environmental factors such as poor housing, crowding, lack of knowledge of the causes of malaria, and educational level have been shown to predispose populations to malaria in parts of Asia and Latin America (Banguero, 1984; Battraporn et al., 1986). As well, in a cross-sectional study of the association between nutritional, environmental and socio-demographic factors and malaria occurrence among children under 5 years in a Sudanese rural community, El Samani et al (1987) found an inverse relationship between ownership of refrigerator, which is an indicator of socioeconomic status and the incidence of malaria. The attack rate of malaria was significantly lower among children in households with a refrigerator (20%) than those without (33%). The study revealed further that children from homes with two rooms or less had a significantly higher occurrence of malaria (31%) than children from homes with three or more rooms (23%).

The results in Table 7.14 explain to what extent the prevalence of malaria is mediated by marital status and personal health practices. The study first examines whether the addition of these variables makes a significant contribution to the prediction of malaria. This is represented by the difference in model chi-squares between the first and second regression equations (rural=99.757-69.531; urban=70.352-57.426) which are 30.226 and 12.926 respectively for rural and urban. With nine degrees of freedom, the result is highly significant ($p<.001$) suggesting that at least one of the intervening terms is important.

The coefficients reveal that the significance of the set of intervening variables is due primarily to the strong impact of marital status. In the rural area, being married reduces the odds of having malaria by a factor of 1.53 while in the urban area, it reduces the odds by a factor of 1.37. Put differently, the odds of having malaria are about 1.53 times as large for the unmarried as they are for the married in the rural area. For the urban area, the corresponding odds are 1.37 times greater for the unmarried. This finding affirms the protection hypothesis of marriage as contributing positively to better health status as several studies have demonstrated.

Furthermore, it is observed that the odds of having malaria in rural and urban areas respectively, are 1.13 and 1.14 times as large for those who do not observe any personal hygiene as they are for those who do. This outcome is consistent with what would be obtained in any modern society or population anywhere in the World where

Table 7.14: Logistic Regression: Inclusion of Intervening Variables to Equation in Table 7.13.

	Rural			Urban		
Indicators	B	Significance	Exp(B)	B	Significance	Exp(B)
Male	-.204	.010	.815	-.388	.000	.678
(Female)	-	-	-	-	-	-
15-44	.003	.977	1.003	.086	.512	1.089
45-64	-.102	.308	.903	.057	.681	1.058
(65+)	-	-	-	-	-	-
Savannah Zone	-.432	.000	.649	.296	.097	1.344
Forest Zone	.084	.237	1.088	.282	.002	1.325
(Coastal Zone)	-	-	-	-	-	-
Not Married	.426	.000	1.531	.311	.001	1.365
(Married)	-	-	-	-	-	-
No personal health	.118	.351	1.125	.132	.193	1.141
(Personal health)	-	-	-	-	-	-
Lower Class	-.095	.420	.909	.079	.557	1.083
Middle Class	-.168	.148	.845	.031	.817	1.032
(Upper Class)	-	-	-	-	-	-
Constant	-2.034	.000	.131	-2.218	.000	.109
Model Chi-square	99.757			70.352		
df	9			9		
significance	.000			.000		

normal hygienic practices are observed. As well, all of above results are consistent with the distributions obtained by the cross-classification analysis. But whereas marital status is statistically significant, personal hygiene is non-significant. This is consistent with the gross effect estimated in Table 7.12. It can therefore be inferred that between the two intervening variables, it is only marital status that mediates the influence of social class on malaria prevalence.

Turning to the control variables, the results of the first equation (Table 7.13) indicate that the odds of having malaria are about .67 and .60 times less respectively in rural and urban areas for males than they are for females. A similar outcome is obtained for the second equation (Table 7.14) with even greater odds. This finding is statistically significant, underscoring the sex-specificity of malaria infection. By inference, males enjoy better health than females. There is no definitive explanation for this difference, however, possible reasons would include; (1) increased risk of exposure to vector mosquitoes because of differential behaviour, (2) medical care being sought more often or earlier by females; and (3) the presence of higher parasite loads in females as reported by Brabin and Brabin (1992) which under stress of the disproportionate burden of domestic chores and other related activities result in clinical illness.

Concerning age, it is observed that the odds of having malaria for the age group 15-44 are about .92 times less in the rural area and 1.02 times more in the urban area as they are for the age-group 65 and over. A possible reason for this finding is that the younger age group is engaged in more economic activities, such as agriculture which leads to greater exposure than the relatively older age group. For the age-group 45-64 on the other hand, a similar outcome is observed where the odds are .85 times less in the rural area but 1.00 times more in the urban area as they are for the 65 or more age-group. As intimated elsewhere, the difference here may be attributable to reporting, even though there are no hard facts to support this view. A reasonable conjecture would be that in rural areas where health facilities are lacking compared to the urban areas, most people would resort to self-treatment rather than report to a health facility hence the higher reportage in the urban area. The direction of effects is similar even with the introduction of the intervening variables in the second equation (Table 7.14), the only difference being the 15-44 age-group in the rural area. These findings are also not statistically significant. Not unexpectedly, differing outcomes have been found in studies that examine sex-age variation in the prevalence of malaria. In fact, explanations advanced differ for any one particular outcome.

For example, in an investigation of the epidemiology of uncomplicated falciparum malaria in an area of unstable and seasonal transmission in eastern Sudan, Giha et al (2000) found that malaria risk was significantly lower in individuals aged 20-88 years than in the 5-19 age-group. The study reports that distribution of risk among the age-groups varied between the groups analyzed. The incidence of malaria was lower in males than in females in the first year of the study and reversed two years later. Also, Aramburu et al (1999) in an overview of the malaria epidemic in the Peruvian Amazon reported that age-specific attack rates were highest in adults, particularly males and suggested that occupation might be an important risk factor, even though they found no associations between malaria incidence and specific occupations.

In the particular case of Ghana, a study of a peri-urban area near Accra by Landgraf et al (1994) examined 1048 schoolchildren between the ages of 5 and 17 in order to determine the prevalence of malaria. When standardized for age, the study discovered that the overall parasite rates were 53.7 percent in females and 57.4 percent in males even though the difference was not statistically significant. The same study revealed that the mean parasitaemia at the age of six and seven years was higher in girls than in boys.

In another study, Laserson et al (1999) surveyed malaria infection and disease among 1,311 Yanomami in three communities in the Venezuelan Amazon and found that the rate of infection in males did not differ from that of females. The study also revealed that in areas where transmission was most intense, children under five years of age experienced the highest rate of infection and disease, while adults infrequently were affected. Yet still, in a study by Bawden et al (1995), it was revealed that among displaced Haitians in temporary camps at the US Naval Base in Guantanamo Bay, the incidence of clinical malaria for females under 16 years of age was 491 per 10,000 compared to 278 per 10,000 for males of the same age. The reasons Bawden assigned for this outcome were consistent with Brabin and Brabin's (1992) hypotheses.

Finally, Fungladda et al (1987) examined sociodemographic and behavioural factors associated with hospital malaria patients in Kanchanaburi, Thailand and found that malaria cases were predominantly male, under age 30 and single. They reported significant association for knowledge of transmission, use of mosquito nets and residing or working in forested areas two weeks prior to the illness with malaria occurrence. In fact, Mendis et al (2001) argue in their study that for occupational reasons, the risk of malaria can be expected to be several times greater in men than in women, except during pregnancy.

With regard to the impact of climatic and ecological conditions, Kleinschmidt et al (2001) observed in their study that even small differences in climate can have very marked effects on the intensity of malaria transmission. In fact, the results in Table 7.13, much like the one in Table 7.14 both lend credence to this finding. It would be observed that in the rural area, the odds of having malaria are less in the savannah zone as they are for the coastal zone. The reverse is the case in the forest zone where the odds are greater. In the urban area on the other hand, the odds of having malaria are about 1.3 times greater for both the savannah and forest zones as they are for the coastal zone.

These results are substantiated by Ahmed (1989) who established in his study that the distribution of the prevalence of malaria transmission Ghana follows distinct ecological zones and climatic conditions most especially, the seasonal rainfall pattern. Ahmed's study revealed that the normally humid climate of the forest zone and the attendant heavy and double rainfall pattern, coupled with the farming practices employed create more breeding sites and favourable conditions for malaria transmission. It is therefore not surprising that the forest zone reports the highest rate of malaria infection throughout the year. On the other hand, Ahmed observes that malaria transmission is lower in the coastal zone where there is low rainfall accompanied by a relatively long period of dry weather. And for the northern savannah zone which has a longer period of dry weather, the study notes that infection rates are lower throughout the year except in the rainy season.

Variations in Marital Status and Personal Hygiene

This study attempted further to examine variations in marital status and personal health practices each separately in relation to social class on the strength of the results obtained in the first two regression analyses. The results in Table 7.15 suggest that the odds of being married in both rural and urban areas are less for people of lower class and middle class than they are for people of upper class. Specifically, the odds of being married in the rural area are .88 and .80 less for people belonging to the lower and middle class respectively, as they are for people of upper class status. Similarly, the odds are .73 and .82 less respectively for the lower and middle class than they are for those belonging to the upper class in the urban area.

In the rural area, the outcome is not significant for the lower class but moderately significant for the middle class. In the urban area, it is highly significant for the lower class while it is moderately significant for the middle class. Two possible factors may be responsible for this outcome: the universality of marriage as an institution in Ghana and economic resource. In the rural area with a predominantly mode of subsistence economy, mainly agriculture, cost of living is low and it takes relatively less resources to get married than in the urban area. As a result, class status would be less of a factor in the decision to marry for someone of lower class status in the rural area than it is for someone in the urban area as the results indicate. For someone of middle class status who would probably have had some secondary education, other factors such as their readiness to engage in a relationship given their financial situation might form part of the decision-making process and where it is found to be unfavourable, they might decide against committing themselves to a permanent relationship.

The results in Table 7.16 also follow the pattern witnessed in Table 7.15. People belonging to the lower and middle class are less likely to observe personal hygiene as

Table 7.15: Logistic Regression of Marital Status as Dependent Variable by Rural-Urban Residence, Ghana, 1997

	Rural			Urban		
Indicators	B	Significance	Exp(B)	B	Significance	Exp(B)
Male	2.183	.000	8.876	1.860	.000	6.426
(Female)	-	-	-	-	-	-
15-44	.883	.000	2.418	.582	.000	1.790
45-64	.772	.000	2.164	.709	.000	2.032
(65+)	-	-	-	-	-	-
Savannah Zone	.137	.118	1.146	.102	.459	1.107
Forest Zone	.088	.121	1.092	.233	.001	1.262
(Coastal Zone)	-	-	-	-	-	-
Lower Class	-.133	.163	.876	-.318	.001	.728
Middle Class	-.219	.020	.803	-.197	.038	.821
(Upper Class)	-	-	-	-	-	-
Constant	-1.120	.000	.326	-1.072	.000	.342
Model Chi-Square	2227.801			1084.393		
df	7			7		
significance	.000			.000		

Table 7.16: Logistic Regression of Personal Health Practices as Dependent Variable by Rural-Urban Residence, Ghana, 1997.

	Rural			Urban		
Indicators	B	Significance	Exp(B)	B	Significance	Exp(B)
Male	-.138	.105	.872	-.088	.198	.916
(Female)	-	-	-	-	-	-
15-44	.602	.000	1.825	.693	.000	2.001
45-64	.394	.008	1.483	.371	.001	1.450
(65+)	-	-	-	-	-	-
Savannah Zone	-1.083	.000	.338	-1.674	.000	.187
Forest Zone	-.190	.019	.827	-.704	.000	.495
(Coastal Zone)	-	-	-	-	-	-
Lower Class	-2.371	.000	.093	-2.200	.000	.111
Middle Class	-1.560	.000	.210	-1.303	.000	.272
(Upper Class)	-	-	-	-	-	-
Constant	-1.027	.000	.358	.596	.000	1.815
Model Chi-Square	684.211			1040.508		
df	7			7		
significance	.000			.000		

those belonging to the upper class. In the rural area, the odds of observing personal hygiene are .09 times less for the lower class as they are for the upper class. For the middle class, the odds are .21 times less for the middle class as they are for the upper class. In the urban area, the odds are .11 and .27 times less for the lower class and middle class respectively, as they are for the upper class. Here, education and income would seem to be the factors influencing the observed trend. Someone belonging to the lower or middle class would most likely be less educated compared to someone of upper class status. Such a person would probably not appreciate the importance of observing personal hygiene as would a person of upper class status. Coupled with this is the fact that less education is commonly associated with low income and as such, even if a person belonging to any of the two social groups could afford basic hygiene items, it is likely these would not be considered an immediate priority in the face of competing demands and limited income.

But the reason why the middle class is less likely to observe personal hygiene than the lower class may be explained by differences in perception and reporting as mentioned earlier. While someone of middle class would appreciate the benefits of personal hygiene and report the lack of it because they might have practiced it before, someone of lower class, who, in the first place might not have observed any personal hygiene before would probably not perceive the difference between observance and non-observance and would likely not report any. It may even be the case that their perception of personal hygiene does not form part of the hygiene items that have been included in the measurement of this variable.

Table 7.17: Logistic Regression of Malaria (test of interaction effect between Social Class and Marital Status), Rural-Urban Residence, Ghana, 1997.

	Rural			Urban		
Indicators	B	Significance	Exp(B)	B	Significance	Exp(B)
Male	-.198	.013	.820	-.385	.000	.681
(Female)	-	-	-	-	-	-
15-44	-.009	.922	.991	.067	.605	1.070
45-64	-.110	.271	.896	.049	.723	1.050
(65+)	-	-	-	-	-	-
Savannah Zone	-.421	.001	.656	.333	.059	1.395
Forest Zone	.087	.223	1.091	.299	.001	1.348
(Coastal Zone)	-	-	-	-	-	-
Non-married	.791	.000	2.206	.372	.103	1.450
(Married)	-	-	-	-	-	-
Lower Class	-.284	.125	.753	.088	.654	1.092
Middle Class	-.458	.013	.632	.049	.813	1.051
(Upper Class)	-	-	-	-	-	-
LCxNM*	.323	.160	1.382	.090	.722	1.094
MCxNM**	.495	.033	1.641	.030	.911	1.031
Constant	-2.070	.000	.126	-2.192	.000	.112
Model Chi-square	103.614			68.819		
df	10			10		
significance	.000			.000		

*LC = lower class; NM = non-married; **MC = middle class

Table 7.18: Logistic Regression of Malaria (test of interaction effect between social class and personal health practices) by Rural-Urban Residence, Ghana, 1997

	Rural			Urban		
Indicators	B	Significance	Exp(B)	B	Significance	Exp(B)
Male	-.407	.000	.666	-.521	.000	.594
(Female)	-	-	-	-	-	-
15-44	-.075	.426	.928	.035	.785	1.036
45-64	-.166	.093	.847	.009	.947	1.009
(65+)	-	-	-	-	-	-
Savannah Zone	-.440	.000	.644	.273	.125	1.314
Forest Zone	.077	.281	1.080	.259	.004	1.296
(Coastal Zone)	-	-	-	-	-	-
No personal health	.427	.060	1.533	.149	.516	1.161
Personal health	-	-	-	-	-	-
Lower Class	-.169	.186	.844	.055	.782	1.057
Middle Class	-.260	.043	.771	.099	.629	1.104
(Upper Class)	-	-	-	-	-	-
LCxPH*	.193	.590	1.213	.200	.465	1.221
MCxPH**	.520	.072	1.681	-.198	.480	.821
Constant	-1.919	.000	.147	-1.972	.000	.139
Model Chi-square		74.276			62.620	
df		10			10	
sig.		.000			.000	

*LC = lower class; PH = personal health; MC = middle class

Interaction Effects

In Tables 7.17 and 7.18, the study explores the interaction between marital status and social class on the one hand, and personal health practices and social class on the other, and their respective effects on malaria prevalence. Using Equation 1 as an example, if marital status is designated X_1 and the moderator variable (interaction term) X_2, with $W_1, W_2, \ldots W_k$ as the other predictors in the model, these would be represented in the logistic regression equation as:

$$\log\left(\frac{\pi}{1-\pi}\right) = \alpha + \sum \lambda_k W_k + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 X_2$$

$$= \alpha + \sum \lambda_k W_k + \beta_2 X_2 + (\beta_1 + \beta_3 X_2) X_1 .$$

The partial slope of the impact of X_1 on the log odds would therefore be $\beta_1 + \beta_3 X_2$ implying that the impact of X_1 depends on the level of X_2 and the multiplicative impact of X_1 on the odds is correspondingly, exp $(\beta_1 + \beta_3 X_2)$. This can also be interpreted as the odds ratio for those who are a unit apart on X_1, controlling for other predictors. This odds ratio changes across levels of X_2, however.

Following from above equation, the odds of being unmarried and belonging to lower class or middle class are represented by the following exponential functions using the respective coefficients from Table 7.17 and the assigned coding of the particular variable.

(1) rural/lower class: exp(.791 + .323*1) = 3.047

(2) rural/middle class: exp(.791 + .495*0) = 0.791

(3) urban/lower class: exp(.372 + .090*1) = 1.587

(4) urban/middle class: exp(.372 + .030*0) = 0.372

Similarly, the odds of not observing personal hygiene and belonging to lower or middle class are obtained using the coefficients in Table 7.18 and the assigned coding of the particular variable as follows:

(5) rural/lower class: $\exp(.427 + .193*1) = 1.859$

(6) rural/middle class: $\exp(.427 + .520*0) = 0.427$

(7) urban/lower class: $\exp(.149 + .200*1) = 1.418$

(8) urban/middle class: $\exp(.149 - .198*0) = 0.149$

For people of lower class status (equation #1) in the rural area, the odds of having malaria are about three times as great for the unmarried as they are for the married. For the rural middle class (equation #2) on the other hand, the odds of having malaria are about 0.79 times as great for the unmarried as they are for the married. In the urban area, the odds are about twice as large for the unmarried as they are for the married in the lower class (equation 3) but for the middle class, the odds are 0.37 times as great for the unmarried as they are for the married (equation 4).

With respect to personal hygiene, on the other hand, it would be observed that for people of rural lower (equation #5) and middle class (equation #6), the odds of having malaria are about two and 0.43 times respectively as large for those who do not observe personal hygiene as they are for those who do. In the urban area on the other hand, the odds of having malaria for people of lower class (equation # 7) who do not observe personal hygiene are about one and a half times more than they are for those who do, while for people of middle class (equation 8) status, the odds are 0.15 times less for those who do not observe personal hygiene as they are for those who do.

Table 7.19: Effects of Each Individual Variable on Probability of Malaria

Variable	Rural			Urban		
	Logit	e^{Bx}	Predicted Change	Logit	e^{Bx}	Predicted Change
Sex	-.204	.815	.458	-.388	.678	.509
15-44	.003	1.003	-.389	.086	1.089	-.389
45-64	-.102	.903	-.372	.057	1.058	-.385
Savannah	-.432	.649	-.318	.296	1.344	-.415
Forest	.084	1.088	-.401	.282	1.325	-.414
Not Married	.426	1.531	-.443	.311	1.365	-.417
Observes no personal hygiene	.118	1.125	-.405	.132	1.141	-.395
Lower Class	-.095	.909	-.374	.079	1.083	-.388
Middle Class	-.168	.845	-.362	.031	1.032	-.382

Effects of Individual Variables on Probability of Malaria

Table 7.19 employs the sample means computed in Table 7.11 to calculate the change in probability of malaria resulting from a unit change in an independent variable, x as follows:

$$\Delta P = P(D=1| L_1) - P(D=1| L_0)$$

$$= \exp (L_1) / [1 + \exp (L_1)] - \exp (L_0) / [1 + \exp (L_0)]$$

where L_0 is the logit before the unit change x_j, and $L_1 = L_0 + \beta_j$ is the logit after the unit change in x_j.

As would be observed in the Table, all the changes are substantial, with the most significant change associated with marital status, among the predictor variables. The results indicate that a change in marital status from non-married to married status reduces the expected probability of malaria by .443 in the rural area and by .417 in the urban area as evaluated at the sample mean. This outcome is consistent with earlier analyses and further affirms the positive contribution of marriage to healthy living.

With respect to personal hygiene, the effect of a change from non-observance to observance is associated with a much greater reduction in the expected probability of malaria in the rural area (-.405) than in the urban area (-.395). Since the prevalence of malaria would most likely be higher in the rural area given the poor hygienic conditions compared to the urban area, it is reasonable to assume that a change in personal hygiene for the better would elicit a larger proportional change in expected probability of malaria in the rural area than in the urban area. In the case of social class, a change from lower class status to upper class is associated with a -.374 and -.388 change respectively in expected probability of malaria in rural and urban. The corresponding changes in the middle class are -.362 for the rural area and -.382 for the urban area. These findings indicate a decrease in expected probability of malaria associated with each change. That the reductions in the lower class are greater than in the middle class confirm earlier trend and are consistent with the reality on the ground since the risk of malaria would normally be higher in the lower class than in the middle class.

For the control variables, it would be seen that a change from male to female is associated with a positive .458 change in expected probability of malaria in the rural area and a positive .509 change in expected probability of malaria in the urban area. Both of these outcomes are positive and indicate an increase in the expected probability of malaria associated with the changes as determined at the sample mean. These outcomes are also consistent with the logit findings discussed earlier. In the case of age, a change from either age-group15-44 to 65 and over, or 45-64 to 65 and over are both associated with a decrease in expected probability of malaria in both rural and urban areas. The proportional change in the age group 15-44 is slightly higher than in the 45-64 age-group, thus confirming earlier observation that younger adults are more vulnerable to malaria infection than the elderly.

As regards ecological zone, it is observed in Table 7.19 that for the rural area, a change from forest to coastal zone results in quite a substantial decrease (-.401) in the expected probability of malaria than a change from savannah to coastal (-.318). For the urban area, on the other hand, the proportional changes in expected probability are similar and even greater than in the rural area. Specifically, the changes are -.414 for the forest zone and -.415 for the savannah zone. It would be recalled that the similarity observed in the urban area here was also seen in the logit results. More significantly, the outcome of the rural area confirms the position of the forest ecological zone as the most malaria prone area in Ghana as intimated earlier.

Predicted Probability of Malaria by Social Class, Marital Status and Personal Hygiene

Predicted probability of malaria by social class, marital status and personal hygiene are shown in Table 20. This is computed as:

$$\Pr(y = 1 | x) = \frac{e^{\alpha + \Sigma\beta(x)}}{1 + e^{\alpha + \Sigma\beta(x)}}$$

where x is any given characteristic (e.g., marital status). Overall, the findings show that the predicted probability of malaria varies significantly with marital status, as well as for marital status in combination with personal hygiene. Given what is already known about the role of marital status on the incidence of malaria in this study, this outcome is not unexpected. For the rural area, the predicted probability of malaria for a person who is married and of lower class status is .101, while it is .095 for a person belonging to the middle class and .110 for someone who is of upper class status. For the unmarried on the other hand, the corresponding probabilities are .147, .138 and .159. It is obvious from above that the observed difference is as a result of marital status; that is, being married or not married and not social class per se.

A similar trend is observed in the urban area, but unlike in the rural area, the predicted probability of malaria for a person of lower social class standing is the greatest of the three social groups, for both the married (.120) and the unmarried (.158). The above findings are consistent with what has been observed throughout the study; that is,

Table 7.20: Predicted Probability of Malaria by Social Class, Change in Marital Status and Personal Hygiene

Variable	Rural			Urban		
	Lower Class	Middle Class	Upper Class	Lower Class	Middle Class	Upper Class
Married	.101	.095	.110	.120	.115	.112
Not Married	.147	.138	.159	.158	.151	.147
Married/observes personal hygiene	.095	.088	.103	.109	.104	.102
Not married/observes personal hygiene	.138	.130	.089	.143	.137	.133
Married/does not observe personal hygiene	.105	.098	.114	.122	.115	.114
Not married/does not observe personal hygiene	.153	.143	.165	.160	.151	.150

in the rural area, people of lower class are less likely to have malaria than people of upper class, while the reverse holds true for the urban area, but these differences are hardly significant. The most revealing finding is that the probability of malaria infection is greater for the unmarried of any social class position than for the married in both the rural and urban area, thus confirming earlier findings.

With the introduction of personal hygiene, the predicted probability of malaria for someone of upper class status in the rural area who is married and observes personal hygiene still remains the highest (.103), followed by the lower class (.095), and then the middle class (.088). For the urban area, on the other hand, the upper class registers the lowest probability of malaria (.102), as against the highest probability posted by the lower class (.109). A major difference, however, is observed with regard to the unmarried person who observes personal hygiene. According to the findings, such a person who happens to belong to the upper class has the lowest predicted probability of malaria in both the rural (.089) and urban area (.133), unlike with previous findings where someone belonging to the upper class in the rural area had the highest risk of malaria. Here too, it is not difficult to see that the key factor is marital status rather than social class. The reversal in outcome with respect to the rural area may be attributed, perhaps, to the powerful effect of observing personal hygiene. In this instance, the critical role that income plays in class stratification cannot be discounted since even in the rural area, belonging to the upper class and being able to observe personal hygiene makes a huge difference.

But for the married who do not observe any personal hygiene, the original pattern is revisited. The upper class has the highest predicted probability of malaria in the rural area (.114), while in the urban area it has the lowest predicted probability (.114). This time around, the middle class has the lowest predicted probability of malaria in the rural area (.098), while the lower class posts the highest predicted probability in the urban area (.122). A similar observation is made regarding someone not married and at the same time not observing any personal hygiene. As would normally be expected, the results indicate that overall, this group of people have the highest predicted probability of malaria of any social group regardless of place of residence. But once again, the effect of social class seems inconsequential.

In summary, it can be argued that most of the findings support the predictions specified in the operational model, thus confirming the study hypothesis. Though not significant, it is shown that people belonging to the upper class are less likely to have malaria compared to people of lower class status. This prediction is supported by findings in the urban area but not in the rural area. These conflicting findings do not detract from the overall fit to the operational model of the study since the expected directionality was achieved in all other analyses in the rural sub-sample. In fact, there is insufficient information that would lead the study to conclude that the finding in the rural area is unrealistic, but it is not hard to tell that systematic, but differential underestimation may be responsible. Most importantly, the mediating influence of marital status on the effect of social class on the prevalence of malaria is without question. This outcome affirms the protection hypothesis of marriage, unlike in the case of personal health practices.

CHAPTER EIGHT

SUMMARY, CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

Major Findings and Discussion

This study set out to examine the stage of epidemiologic transition in Ghana and with that as a basis, investigate the influence of social class on the prevalence of malaria in the population. As the literature has demonstrated, the powerful influence of social class on health status is widely recognized and has been extensively investigated in Western societies. The often-cited Whitehall study of British civil servants (Marmot et al., 1991, 1978) cannot escape mention in this regard. Other studies in this field include Baker and Illsley (1990), Fox (1989), Fox et al. (1985), Cleland and Rodriquez (1988) and Goldblatt (1989).

With regard to developing countries, most studies involving class or socioeconomic status (SES) have focused mainly on child health. Some notable examples are Caldwell's (1979) study of mortality decline in Nigeria, the analysis of household survey data from 17 developing coutries by Bicego and Boerma (1993), and Desai and Alva's (1998) analysis of household-level survey data of 22 developing countries. Other studies are the analysis of famine mortality in Bangladesh (Razzaque et al., 1990) and the study of infant mortality in Sri Lanka (Waxler et al., 1985) and Egypt (Casterline et al., 1989). What is missing in these studies is a concise and directed effort aimed at investigating the effect of social class on the prevalence of malaria in the general population.

As a matter of fact, beside studies on child health there is no shortage of information on the generally poor health conditions of the populations of developing countries. But quite often these studies have been conducted mainly on the basis of aggregate measures. It is worthy to note that these approaches mask the crucial problem of differences in disease prevalence rates among sub-groups of the population as has been amply demonstrated in studies of Western societies. But in attempting a similar study of a sub-Saharan country such as Ghana, one is confronted with the conceptual definition of social class as pertains to a largely traditional African society. Prior to the introduction of Western cultures in this region of the world, the traditional and cultural practices of most of these societies engendered strict social stratification. In fact, this hierarchical system permeated all aspects of their social and economic lives. The social institutions, belief systems, social norms and values of these societies conferred class statuses and/or social prestige on individuals irrespective of educational background and/or occupation. These positions aptly fit the description of ascribed statuses rather than achieved status, and the practice still forms part of their cultures today.

With the advent of modernity and/or industrialization in these societies, class status gained a much broader definition. This became necessary as other social and economic factors that were seen as contributing to the creation of distinct sub-groups in Western societies were introduced into these societies. Three such factors that have gained universal acceptance are education, occupation and income, which gave currency to the concept of socioeconomic status. Thus, the existence of sub-groups or different classes of people within populations has long been recognized. This social transformation was paralleled by the transition in disease and mortality patterns across Western societies. Studies established that the level of development attained by a particular society determined what stage of the epidemiologic transition it had reached.

As a result, the linkage between development and health has never been in doubt. Within populations, these developments manifested in differential health outcomes for different segments of society. This explains why the modern or Western concept of social class is income- or economy-based and is measured by achieved rather than ascribed status. This notion is evident in almost all Western society studies across most social science disciplines as demonstrated in the literature. Unfortunately, the economic transformation of developing countries has not proceeded in the same manner as those of Western industrialized societies. At the present time in history, the economies of developing countries are driven by economic reform programs under the auspices of the International Monetary Fund (IMF) and the World Bank. These programs, as would be expected, have transformed the social structures of most developing countries and resulted in differential health outcomes along social classes as occurred in Western societies.

It must be pointed out that the component dimensions of achieved status as seen in Western societies fail to embrace most, if not all of the underlying constituents of ascribed status as exist in traditional sub-Saharan societies. It is therefore imperative that in undertaking a study involving social class in Ghana, the two concepts be integrated in order to capture all of the underlying dimensions of social class as seen within the context of these societies. And this can be accomplished objectively in the selection of the indicators to be used for the construction of the index of social class. An investigation of social class differences in health status as undertaken in this study is an attempt in that direction.

This said, the descriptive analysis carried out at the beginning of the study would seem to suggest that Ghana is at the early part of the second stage of the epidemiologic transition considering that malaria still represents the largest proportion of morbidity cases in the population. Even though evidence points to declines in mortality and general improvements in life expectancy over the years, the levels are not sufficient enough to meet the anticipated conditions of a more advanced stage of the epidemiologic transition.

The second part of the study examining differentials in the prevalence of malaria by social class involved logistic regression analysis using data from the Core Welfare Indicators Questionnaire (CWIQ) Survey. This study was carried out in 1997 by the Ghana Statistical Service in collaboration with the World Bank. The total sample population employed is made up of 14,514 household heads, 9162 of them representing rural households and 5352 of them, urban households. Males formed 66 percent of the sample while females made up the remaining 34 percent. Of the rural sub-sample, 68 percent is males and 32 percent females. For the urban sub-sample on the other hand, 61 percent is males and 39 percent females.

A cross-tabulation analysis using selected variables aggregated according to rural-urban residence was done. The purpose was to gain a broad knowledge of the socioeconomic characteristics of the population under study. Variables included in the analysis were education, industry of employment, dwelling ownership, number of separate rooms, material of walls of house, type of toilet facility, modern household items, main source of cooking fuel, main source of drinking water, acres of land owned and heads of cattle owned. These factors were seen as attributes of class status within the sociocultural context of Ghanaian society. Employing component analysis, and based on a set of determined criteria, a social class index was constructed combining six of the variables namely, education, dwelling ownership, heads of cattle, modern household items, main source of cooking fuel and type of toilet facility. The advantage gained by using component analysis is that it incorporates as many as possible the competing factors that go into defining the socioeconomic environment.

Three social groups, namely lower class, middle class and upper class were delineated for both rural and urban areas. For the rural area, 50 percent of the population was classified as lower class, 39 percent as middle class, and 11 percent as upper class. The corresponding proportions for the urban area were 48 percent lower class, 34 percent middle class, and 18 percent upper class. These proportions were seen as fairly representative of Ghanaian society. Certain analytical procedures were invoked to validate the social class index both internally and externally. Thereafter, multivariate logistic regression was used to determine the effect of social class on malaria, controlling for all other predictors.

Malaria was employed as the dependent variable with marital status and personal hygiene introduced as the only intervening variables. The control variables were sex, age and ecological zone. The choice of malaria was due to its pervasive influence as the leading cause of morbidity and mortality in developing countries and its linkage to socioeconomic and environmental conditions, a relationship that has been extensively investigated (e.g., Luckner et al., 1998; Banguero, 1984). While some studies are of the view that widespread poverty contributes to the high mortality from infectious and parasitic diseases (Alnwick, 2000; Olshansky, 1997), others argue that the high levels of malaria in poor countries are not due to poverty. What stands out clearly, however, is that no study investigating the incidence of malaria has attempted to aggregate the different socioeconomic factors and conditions into a composite index as done in this study.

The study hypothesis as depicted in the operational model posited that malaria prevalence is a function of social class, with marital status and personal health practices acting as intervening factors. Specifically, the study predicted that people belonging to the upper class would have less malaria than people belonging to the lower class. It was also predicted that the incidence of malaria for the group of people belonging to the middle class would be the intermediate of the lower and upper social groups. Under this broad prediction, other sub-predictions were examined with the view to confirming or providing support for the study hypothesis. The first sub-prediction sought to examine the direct effect of social class on malaria. The second examined the effect of social class on malaria with the inclusion of the two intervening variables; marital status and personal health practices. The third prediction posited that marital status was a function of social class, while the fourth examined personal health status as a function of social class. Furthermore, it was hypothesized that social class and marital status would both exert a common influence on malaria so this sub-prediction was examined as an interaction effect. Similarly, the interaction effect between social class and personal health practices on malaria was also examined as a sub-prediction.

Prior to executing the logistic regressions, the logical consistency between the predictor variables and the social groups identified was examined using the elaboration model technique developed by Babbie (1989). The test revealed that in both rural and urban areas, the unmarried was more likely to have malaria than the married across all social groups. When personal health practices was tested using the same statistical procedure, not all the outcomes conformed to expectations across the three social groups in rural and urban areas. In a related exercise involving sex and ecological zone, females and forest ecological zone showed a consistently high proportion of malaria across all social groups in both rural and urban areas. Finally, the mean and standard deviations as well as the gross effects of all the variables were also computed. The latter method confirmed marital status as the most significant predictor variable.

The findings of the logistic regression failed to support any direct influence of social class on malaria as predicted. In other words, the study found that social class has no direct effect on malaria prevalence. This result is consistent with several studies that have examined the socioeconomic consequences of malaria in developing countries. On the other hand, the study revealed that in the urban area, people belonging to the upper class were less likely to have malaria than people belonging to the middle class or lower class. As well, people belonging to the middle class were also less likely to have malaria than people of lower class status. Quite strangely, the findings revealed that in the rural area, people of upper class status were the most likely to have malaria, followed by people belonging to the middle class. Ironically, none of above findings was significant.

The underlying cause of this intriguing finding may be traced to a number of factors, the first of which is the composite index used in stratifying the population. It may be that some of the indicators included, either singularly or jointly did not capture sufficiently the characteristics of the intended social group. Second, it is also possible that the method used in delineating the social groups was not good enough to provide a near approximation of the membership of each social class. It would be recalled that even after allowing for the measurement problems inherent in the indicators, and the unexpected directionality in some of the results, the internal and external validity of the index constructed were established. In addition, further statistical tests all indicated a very high degree of consistency between the index on the one hand, and the other variables. In light of above, not much can be pointed in the direction of data or coding problems.

In any case, as the problem would seem to be limited to the rural area, one can speculate that there were differences in response for rural and urban respondents as a result of different perceptions of the symptoms of malaria versus other diseases, and differing access to healthcare and medical diagnoses of the condition, if present. A related question would then be whether a set of different indicators should have been used or different cut-off points should have been applied to the rural and urban areas. As one would readily observe, both suggestions evoke methodological issues concerning validity and bias which in turn, lead to problems of comparability of findings. Even in the present study, if the outcome variable was not clearly defined and meaningful as noted elsewhere, it calls into serious question the validity of comparisons across the sub-groups. A closer examination of the social class index and the role played by education and income in social stratification may attest to this assertion.

As would be noted, people belonging to the upper class in the rural area did not score as high on the education factor as their urban counterparts. This, in effect, means that their membership of the upper class is due largely to higher scores on factors that were disproportionately skewed in favour of rural areas (e.g., dwelling ownership and heads of cattle). It is obvious that these two factors translate into income which invariably provides people of upper class status with the means to seek medical attention when they are sick compared to other disadvantaged social groups who may not be in a position to afford the cost of healthcare and therefore resort to self-treatment. It is also possible that even if healthcare services are not available in the rural area, someone belonging to the upper class could obtain such service from the nearby urban centre but still report as a rural resident.

Coupled with above reasoning, the social status of people belonging to the upper class in the rural area also increases their awareness of malaria even if they are not the average educated elite as would be found in the urban area. If it turns out that the rural upper class is also the educated type, their level of awareness is enhanced even the more. So whichever way one looks at it, income and increased awareness result in higher reportage among people belonging to the upper class in the rural area than it would occur in the other social groups with relatively less income or education. The same cannot be said of the urban area where healthcare services are readily available and relatively cheaper and hence can be accessed by all class of people. Hence the finding in the urban area can be seen as demonstrating what would normally be expected of class effect more clearly than in the case of the rural area.

The variable that exhibits the most consistency in outcome throughout the study is marital status. The findings reveal that marital status does indeed mediate the influence of social class on malaria. In fact, its influence cuts across both rural and urban areas. Even where marital status interacts with social class, the dominance of the former on the outcome is strikingly obvious. As mentioned elsewhere, there are several ways in which marital status could possibly mediate the influence of social class on malaria transmission through the “protection” and “health selection” hypotheses. Married people are less likely to live risky lifestyles such as staying out late in the night when mosquitoes are very active. On top of that, married people live in better housing, eat better and take better care of themselves (Trovato and Lauris, 1989). Also, a spouse is likely to make sure that prompt medical attention is received when illness occurs. It is also argued that people who get married may be more robust physically or emotionally than those who remain single. Lastly, the variable personal health practices does not display the same consistency as marital status, even though it comes out strongly in the rural area as mediating the influence of malaria.

Conceptual and Methodological Implications

The conceptual approach in this study follows along the lines of most health research that seek to explain differentials in health status on the basis of social class. This theoretical framework – social determinants of health and their pathways – has been used extensively to investigate the impact on health of social factors such as race, social class, education, sex, marital status, employment and the quality of jobs in mostly Western societies. Differing outcomes have been documented but the perspective offered in this study is uniquely relevant to traditional societies of developing countries and provides a sound basis for the evaluation of health research and policies in these countries.

In fact, this study represents the first in-depth investigation of the prevalence of malaria in Ghana on the basis of social class at the rural and urban levels. The different forms of analytical procedures employed in the study may have been used variously in health research in Ghana, but what sets this study apart is the detailed and systematic execution that provides context and meaning to the different aspects of the problem under investigation and enhance our understanding. This notwithstanding, the issue arises as to the appropriateness of using an index based on a single indicator or multiple indicators. Either way, should the index be applied across all geographical boundaries, or different scales or levels should be applied differently?

With respect to multiple indicators, should the indicators selected for the index of a particular geographical area be similarly applied to another geographical area, considering the suggestion that each component is capable of exerting different effects? In Weber's (1946) classic essay, "Class, Status, and Party," he argues that class (economic position), status (prestige), and party (political power) represent interrelated yet distinct dimensions of stratification. He notes that while economic position can affect prestige and power, prestige and power can influence both one another and economic position. Durking et al (1994) also find that various socioeconomic components operate differently in different contexts in their study of rural and urban Bangladesh and Pakistan.

Researchers have also expressed concern about the use of aggregate information as a proxy variable for SES or social class at the community level. A number of studies have suggested that urban households are better off than rural households, for example, and used this as an explanation for their findings why malaria transmission is greater in rural than urban households. An important question is whether urban residence is merely a proxy for individual-level differences in status, or if it also captures an effect of community characteristics. In other words, will the consistently observed rural/urban differential in malaria cases be eliminated with adequate controls for household SES?

The evidence concerning this question has been mixed. In a study of child mortality in Brazil, Sastry (1997) finds that specific community infrastructure factors play important roles in child mortality above and beyond the effect of household SES. In addition, Desai and Alva (1998) used a fixed-effects model to control for unobserved community-level factors and find that this greatly diminishes the effect of maternal education on child health. A number of studies have also emphasized that the effects of individual-level SES indicators varied by the socioeconomic context of the community. In a recent study based on data from Ecuadorean Amazon, Labao and Brown (1998) show that the effect of individual SES factors on fertility is greatly moderated by the existing development context and class structure.

Limitations of the Study

One major problem that confronts this study concerns the measurement of the dependent variable malaria, which represents a crucial part of the investigation. A simple "yes" response to a question that seeks to know whether the respondent suffered from fever/malaria in the past four weeks is not sufficient to define clearly whether it is the incidence (new cases) of malaria or the prevalence (existing cases) rate, and how the presence or absence of the disease was determined. As would be noted, malaria is a chronic disease which has acute phases, latent periods and relapses. As such, it would be very difficult to obtain any meaningful information from self-reported recall of suffering from fever/malaria "in the past four weeks." Added to this is the possible cases of fever that have been reported as malaria.

A second limitation that can readily be identified with the study is that the construction of the social class index was influenced by data availability. As a result, the index may not have succeeded in incorporating all the dimensions that contribute to social stratification in Ghana. For example, Duncan's (1961) socioeconomic index (SEI) is based on the average educational attainment and income in an occupation. As well, Hollingshead's Two Factor Index of Social Position combines education and occupation (Hollingshead and Redlich, 1958). While there is no income variable in the data set used in this study, the occupation variable could not be used because of problems with measurement. But occupation is considered a particularly useful proxy for income (see e.g., Friedman, 1957; Houthaker, 1957; Mayer, 1963; Hauser and Warren, 1997) so that in the absence of the latter, the former would have been very useful.

Also, it is observed that the six indicators used in the construction of the composite index are not completely free of measurement problems and that also poses a problem of validity. Furthermore, even though the observed proportion of each social group was tested and validated, it could still be that the procedure used in obtaining the stratum boundaries may have mis-classified people who were close to the margins. If any at all, the effect of such mis-classification is not expected to have a dramatic influence on the final outcome since it is common to all the social groups. One possible means to overcome this problem is to employ the social class index as an ordinal measure, and not categorized as three groups.

Another factor that imposes some limitation on the study relates to the sample employed in the analysis. In generalizing the outcome of this study to the entire population, one needs to exercise some caution in view of the fact that if potential observations from some population of interest are excluded from a sample on a nonrandom basis, one risks introducing into the analysis sample selection bias (Berk, 1983). In Ghanaian society, all household heads would normally be adults. As noted in this study, the number of respondents in the sample under age twenty is very low with the lowest age being 15 years. Also, other members of the households are excluded. In light of above, the sample cannot be considered representative of the Ghanaian population. It is therefore difficult to anticipate whether the biased regression estimates overstate or understate the true causal effects. However, it can be said that the estimated causal effect of respondents below age15 years on malaria will be substantially smaller than the causal effect in the population, and the exclusion of this group of people attenuates the causal effect in this instance. As well, the problems caused by nonrandom exclusion of certain observations jeopardizes internal validity because effects of the exogenous variable and the disturbance term are confounded, and causal effects are attributed to effects that are really a product of random perturbations.

Policy Implications

The above limitations notwithstanding, the outcome of the study provides further insights into the social and economic aspects of malaria. Overall, the findings suggest that in order to improve upon the general health status of the Ghanaian population, the scourge of malaria will have to be eliminated or at least contained. One cannot underestimate the fact that the direct economic costs of malaria are enormous and weigh particularly heavily on poor countries with few resources (Samba, 2000). These are reflected in healthcare costs, lost workdays and schooldays by patients and family members, as well as other indirect costs. In fact, research has shown a close correlation at the country level between the rate of economic development and the burden of malaria, even after adjusting for potential confounding factors. Particularly devastating to development is the long-duration effects manifested in learning and behavioural disorders and decreased capacity to work. Since healthcare facilities cannot be improved overnight, preventive measures would seem to be the most logical and cost-effective option. These measures could be in the form of educational programs involving the mass media to create awareness in the population of the dangers of malaria and how people could protect themselves from the disease through simple personal hygiene. This campaign should be at all levels and the study of basic hygiene as a core subject should be accorded prominence in elementary school curricula.

The geographical differences in infection, morbidity and transmission between the seasons also demand selective approaches in combating the disease in order to maximize available resources. Programs should specifically target the worst infected areas and the poor who are the most vulnerable. As observed earlier, the transmission pattern of malaria is not the same for the rural and urban areas. The savannah region of the rural area has lower odds of malaria than the urban area, whereas the forest region posts the greatest odds of malaria in both rural and urban areas. The old system where health personnel paid visits to households to educate people on hygienic practices and healthy living may have to be reintroduced by the health authorities. Such one-on-one visits, though demanding a lot of human resources can be very effective in especially rural communities that have limited access to the mass media. Government might also consider subsidizing the cost of anti-malaria drugs for the poor, free provision of mosquito impregnated bednets, and the mass spraying of mosquito-infested areas. Malaria control policies should also recognize the role of home treatment and drug shops in the management of malaria and incorporate them into existing control strategies. The study also showed that the best "natural" protection against malaria is marriage. The government cannot legislate compulsory marriage, but at least it can create a favourable economic environment that would encourage more people to marry to improve the general health status of the population.

Finally, to decrease and stop the transmission of malaria also requires extensive research. There is an urgent need for malaria vaccines, newer drugs, and better vector control methods as well as the ability to improve current technologies and use them more efficiently. To better confront and solve the considerable malaria and research challenges, an increased number of well-trained and active scientists and institutions are required. In this direction, the objective of the Multilateral Initiative on Malaria (MIM) "to strengthen and sustain through collaborative research and training, the capability of malaria endemic countries in Africa to carry out research required to develop and improve tools for malaria control (Davies, 1999)" is laudable.

Directions for Future Research

As already noted, the limitations imposed on the study with regard to data availability also inform the directions for future research. Even though the original conceptual framework depicted several potential relationships that could have been examined, the final operational model was handicapped because of the non-inclusion of certain crucial variables or incomplete information on others. This was particularly so with regard to intervening variables where only two were included for analysis. Perhaps the explanatory power of the model could have been enhanced with the inclusion of variables like income and occupation.

In a related issue, one observes in the cross-sectional data presented in Table 1.2 that the level of malaria prevalence in the population is on average, forty percent for the ten-year period between 1989 and 1998, while the data set used in this study indicates a level of a little over ten percent. This discrepancy is too large to be ignored. Two factors may account for this problem. The first appears to be the result of the method by which the information on malaria was obtained. As already mentioned, self-reporting of a disease such as malaria is highly subjective and unreliable, and optimum accuracy could be guaranteed only if the prognosis is confirmed by laboratory procedure. Second, given the seasonal nature of malaria in Ghana, the question of time is very paramount since the rate of transmission is highest in the wet rainfall season than in the dry season. Given that the information in the data set used in this study was collected between September and November 1997, it is not surprising that the prevalence rate is very low since this is a period of very dry weather in Ghana. Any future study would therefore have to factor in the time element.

A closely related issue is that in a predominantly agricultural society such as Ghana, arriving at an objective measure of social class should involve some variables related to means of production and power. Even though the study attempted to address this problem by emphasizing cultural relevance in the selection of indicators, it does not seem much was accomplished due to data constraints. It is not infrequent to see social science arguments discuss the working class, upper class, etc as class positions that determine individual behaviour, but the focus has mainly been on the components of SES. Future research should strive to include specific questions that would provide information on the relation of the individual or the household to the means of production so that these measures could be used in the construction of a class index. As well, the "density of social networks" is an important indicator of social influence and status which cannot be underestimated in the measure of social class in the context of any traditional African society. A comparison of such measures to the more typical SES measures could reveal whether class has justifiably been ignored in previous works. If SES has performance superior to class, then it will raise serious questions about the meaningfulness of sociological arguments suggesting an impact of class membership on individual behaviour. Alternatively, if class has greater explanatory power than SES, there will be the need to re-evaluate the effects that have typically been attributed to SES.

Another area of comparison deserving attention in future research relates to single or multiple-component measures of social class. Is the single indicator a superior measure than the multiple-component measure, or is the latter made up of subparts that have distinct influences. It has been suggested that some of the divergences in the findings on socioeconomic variables in the field of health research could reflect the failure to adequately account for unobservable factors such as family background. Even if SES is best thought of as a collection of components, this does not address the standing of class as a unidimensional or multi-dimensional concept.

The issues raised here represent a major challenge to researchers that will hopefully lead to more development and testing of other theoretical and methodological approaches in the investigation of social class and health status. This will impact positively population health policy for Ghana and other developing countries for the betterment of the well-being of their populations.

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Appendix A

Table A.1

MORBIDITY TREND (%) IN THE GREATER ACCRA REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

					YEAR					
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	41.03	32.03	39.18	35.92	37.86	40.71	39.64	39.76	42.52	37.87
Upper Respiratory Infections	9.99	7.01	7.70	8.51	8.77	11.57	10.12	10.06	9.96	9.16
Diseases of the skin	4.39	3.82	4.45	4.65	5.69	n/a	7.97	7.33	6.27	5.96
Diarrhoeal diseases	5.89	4.79	14.05	4.45	4.48	5.22	4.33	3.99	4.00	3.94
Accidents	0.35	6.90	6.63	5.90	7.25	5.74	4.56	4.99	4.24	4.14
Pregnancy related complications	3.40	10.53	4.44	4.21	4.64	3.95	3.46	2.58	2.83	2.99
Intestinal worms	1.86	1.49	1.55	1.53	1.39	1.67	1.30	1.44	1.18	1.76
Gynaecological disorders	1.60	6.98	3.89	4.01	4.26	2.09	1.57	2.50	1.97	1.85
Diseases of the eye	1.64	4.33	3.51	2.96	4.30	3.00	2.35	2.38	1.91	2.45
Hypertensive diseases	2.36	1.95	2.69	2.92	2.69	2.90	2.40	2.31	2.52	3.92
Rheumatic diseases	2.41	1.32	1.40	1.28	1.37	1.46	1.30	1.67	1.65	1.85
Anaemia	n/a	0.90	1.12	0.82	0.77	0.93	0.92	1.02	1.18	1.47
Diseases of oral cavity	1.53	2.91	2.24	2.90	3.00	2.50	2.24	1.66	2.51	2.83
Measles	n/a	0.61	n/a	0.59	0.62	0.56	0.60	0.39	0.72	0.35
Diseases of the ear	0.97	0.97	1.08	1.21	1.05	1.11	0.91	0.95	0.99	1.17
Other diseases	22.58	13.45	6.10	18.14	11.86	16.61	16.33	16.99	15.53	18.29
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.2

MORBIDITY TREND (%) IN THE WESTERN REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

	YEAR									
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	41.33	34.84	38.76	39.97	37.73	39.73	38.75	44.43	43.43	42.28
Upper Respiratory Infections	8.11	6.83	7.39	7.74	7.10	7.21	7.00	6.98	7.09	6.90
Diseases of the skin	5.10	4.62	5.41	5.10	4.81	n/a	5.92	5.60	4.23	4.22
Diarrhoeal diseases	6.66	6.73	6.50	3.88	4.76	4.27	3.96	4.14	3.74	4.35
Accidents	4.82	5.45	4.72	4.86	4.35	3.92	5.15	4.10	4.41	3.26
Pregnancy related complications	2.29	3.29	3.01	3.60	4.95	4.13	2.63	3.16	2.65	3.37
Intestinal worms	3.55	4.63	4.43	4.14	4.19	3.98	3.39	3.43	3.11	3.56
Gynaecological disorders	1.77	2.24	2.15	2.47	2.26	1.85	1.87	1.51	1.79	1.76
Diseases of the eye	3.02	3.22	3.13	2.70	2.96	3.01	2.11	2.71	2.35	2.70
Hypertensive diseases	2.36	2.41	1.57	1.54	1.81	1.48	1.47	1.60	1.62	1.56
Rheumatic diseases	1.88	1.90	2.26	2.05	1.61	1.65	2.02	1.31	1.73	1.86
Anaemia	n/a	1.65	1.50	1.32	1.33	1.68	1.55	1.50	1.86	1.79
Diseases of oral cavity	0.50	1.43	1.19	1.73	1.67	1.99	1.99	1.31	1.52	1.42
Measles	n/a	1.67	n/a	1.48	0.59	1.00	0.89	0.49	0.58	0.33
Diseases of the ear	1.67	2.13	2.08	1.45	1.33	1.44	1.22	1.33	1.22	1.16
Other diseases	16.94	16.95	15.91	15.95	18.56	22.66	20.08	16.40	18.67	19.49
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.3

MORBIDITY TREND (%) IN THE ASHANTI REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

	YEAR									
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	49.72	41.44	43.69	42.39	45.72	43.71	43.80	44.30	46.23	42.59
Upper Respiratory Infections	8.82	7.59	7.81	9.12	9.53	9.33	9.53	8.81	8.32	8.58
Diseases of the skin	2.78	3.79	3.87	4.04	4.38	n/a	5.04	5.30	4.55	4.58
Diarrhoeal diseases	6.10	6.41	7.07	6.48	6.00	6.36	6.09	4.79	5.02	5.41
Accidents	3.88	4.45	5.17	4.55	3.22	4.08	4.28	4.66	4.42	3.53
Pregnancy related complications	1.97	2.04	1.73	1.78	1.27	1.10	1.22	1.50	1.89	2.58
Intestinal worms	2.23	1.99	2.22	1.89	2.28	2.18	2.15	1.92	1.55	2.18
Gynaecological disorders	2.40	2.18	2.46	2.16	1.35	1.34	1.48	2.07	1.56	1.38
Diseases of the eye	0.74	1.19	1.29	1.35	2.23	2.49	1.43	1.86	2.67	2.31
Hypertensive diseases	1.35	1.42	1.56	1.79	1.59	1.36	1.19	1.36	1.09	1.84
Rheumatic diseases	0.92	1.50	1.33	1.52	1.19	1.10	1.01	1.17	0.82	1.70
Anaemia	n/a	1.10	1.29	1.09	1.02	1.16	0.87	0.93	1.28	1.98
Diseases of oral cavity	0.48	1.40	1.78	1.51	1.94	1.05	2.78	2.54	2.54	0.34
Measles	n/a	1.38	n/a	1.85	0.70	0.95	1.08	0.52	0.44	0.54
Diseases of the ear	0.58	0.98	1.43	1.39	1.13	1.06	1.45	1.66	1.60	0.67
Other diseases	18.03	21.14	17.32	17.08	16.45	22.73	16.60	16.60	16.03	19.79
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.4

MORBIDITY TREND (%) IN THE BRONG-AHAFO REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

					YEAR					
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	48.54	42.56	46.47	47.48	47.11	28.44	49.61	46.19	49.14	45.04
Upper Respiratory Infections	5.51	4.49	5.52	5.61	6.37	4.11	8.05	7.13	6.91	7.53
Diseases of the skin	3.89	6.65	4.42	4.08	4.24	n/a	6.17	5.38	5.57	4.42
Diarrhoeal diseases	7.92	6.99	7.48	5.90	5.18	2.96	4.22	3.98	4.74	4.41
Accidents	4.22	4.36	5.61	5.15	6.40	3.51	5.84	5.31	5.62	4.81
Pregnancy related complications	2.64	2.20	2.21	2.99	2.55	1.39	2.59	2.54	2.19	3.20
Intestinal worms	3.33	3.46	3.64	3.10	3.34	2.26	3.75	2.83	3.18	3.38
Gynaecological disorders	1.12	1.09	1.27	1.79	1.84	1.30	1.93	2.01	2.19	2.17
Diseases of the eye	1.50	1.45	1.38	1.28	1.30	0.80	1.32	1.20	1.26	1.46
Hypertensive diseases	0.56	0.61	0.61	0.87	1.08	0.71	1.07	1.01	1.06	1.09
Rheumatic diseases	0.94	1.36	1.39	1.71	1.84	1.15	1.77	1.68	1.92	1.66
Anaemia	n/a	1.06	1.40	0.53	1.18	0.72	1.27	1.10	1.18	1.19
Diseases of oral cavity	0.44	0.41	0.42	0.40	0.37	0.24	0.42	0.36	0.40	1.02
Measles	n/a	1.22	n/a	1.03	0.77	0.44	0.83	0.72	1.03	0.33
Diseases of the ear	0.89	0.92	1.04	1.07	1.11	0.65	1.12	1.02	0.81	0.99
Other diseases	18.51	21.16	17.16	17.01	15.31	51.31	10.03	17.55	12.80	17.30
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.5

MORBIDITY TREND (%) IN THE NORTHERN REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

					YEAR					
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	42.54	46.09	42.94	46.27	44.61	41.20	41.97	44.77	48.35	38.74
Upper Respiratory Infections	6.58	6.49	5.52	5.45	6.38	7.25	7.09	7.86	7.80	6.27
Diseases of the skin	5.08	4.81	4.88	3.68	3.94	n/a	4.31	4.13	4.14	3.21
Diarrhoeal diseases	13.02	11.01	10.10	7.89	8.74	8.75	8.49	8.45	8.15	6.40
Accidents	0.42	3.93	3.91	3.14	3.68	3.60	3.60	3.10	3.41	1.87
Pregnancy related complications	2.35	2.28	2.43	2.00	1.90	2.12	1.72	1.82	2.04	1.64
Intestinal worms	2.46	3.13	2.23	3.09	3.32	3.43	2.94	3.95	3.21	2.64
Gynaecological disorders	1.52	1.80	1.65	1.42	1.82	1.63	1.67	1.77	1.62	1.47
Diseases of the eye	1.41	1.92	1.40	1.14	1.73	1.37	1.21	1.14	1.05	1.08
Hypertensive diseases	1.47	1.41	1.61	1.48	1.87	2.11	2.31	1.54	1.54	1.26
Rheumatic diseases	1.58	1.46	1.12	1.04	1.02	1.24	1.07	0.95	0.92	0.81
Anaemia	n/a	2.06	1.55	1.62	2.30	2.95	2.82	2.62	2.06	2.05
Diseases of oral cavity	0.37	0.55	0.78	0.53	0.62	0.80	0.71	0.69	0.51	0.25
Measles	n/a	0.66	n/a	1.96	2.69	1.31	1.49	2.76	1.30	0.19
Diseases of the ear	1.06	1.11	0.88	0.79	0.93	1.16	1.11	0.92	0.91	0.57
Other diseases	20.15	11.28	19.00	18.50	14.46	21.06	17.49	13.51	13.00	31.56
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.6

MORBIDITY TREND (%) IN THE UPPER EAST REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

					YEAR					
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	37.97	35.57	34.83	32.95	31.51	41.47	40.03	41.65	23.55	44.59
Upper Respiratory Infections	9.08	6.29	4.99	5.65	7.53	6.71	7.36	7.34	8.41	8.42
Diseases of the skin	4.74	4.85	4.65	4.39	6.63	n/a	6.54	4.83	5.98	5.56
Diarrhoeal diseases	10.62	6.92	7.41	5.24	4.80	0.44	4.29	4.71	4.59	4.92
Accidents	2.70	4.14	3.23	3.74	2.01	1.80	1.73	1.34	2.44	1.32
Pregnancy related complications	3.19	5.33	4.90	4.65	5.07	3.74	2.22	2.54	1.41	1.85
Intestinal worms	3.38	4.18	2.16	2.71	4.25	3.16	2.26	2.17	1.85	2.01
Gynaecological disorders	1.87	2.18	3.96	3.24	2.16	1.26	1.45	0.88	1.49	0.94
Diseases of the eye	1.20	5.70	3.05	4.38	5.01	5.56	1.62	2.45	1.29	2.51
Hypertensive diseases	0.91	0.86	0.44	0.79	0.87	0.94	0.98	0.84	0.94	0.83
Rheumatic diseases	2.99	1.48	0.91	0.83	1.18	0.75	0.95	0.76	0.97	1.09
Anaemia	n/a	1.37	1.16	1.23	1.58	2.16	1.39	1.64	1.18	2.04
Diseases of oral cavity	0.42	0.56	0.51	0.26	0.97	0.36	0.37	0.36	0.30	0.99
Measles	n/a	1.54	n/a	0.43	1.22	1.53	1.74	0.73	0.72	0.59
Diseases of the ear	0.72	0.70	0.42	0.50	0.66	0.88	0.76	0.72	0.65	0.63
Other diseases	20.22	18.32	27.39	29.01	24.55	29.24	26.31	27.03	44.22	21.71
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.7

MORBIDITY TREND (%) IN THE EASTERN REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

					YEAR					
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	47.06	42.97	40.58	39.17	41.27	28.41	36.11	35.75	33.76	37.28
Upper Respiratory Infections	7.88	7.11	4.95	6.30	7.20	5.30	7.42	7.45	6.59	6.41
Diseases of the skin	3.79	3.94	3.36	3.57	4.12	n/a	5.49	5.00	3.39	3.95
Diarrhoeal diseases	5.94	6.64	5.55	4.44	3.84	3.59	4.06	3.45	3.04	3.49
Accidents	4.40	4.60	4.55	4.43	4.31	0.14	4.93	5.04	3.88	4.90
Pregnancy related complications	3.17	3.80	4.16	3.12	2.10	1.87	4.13	3.92	4.72	5.16
Intestinal worms	4.67	4.11	3.39	4.42	3.71	1.68	2.36	2.76	1.92	2.07
Gynaecological disorders	2.03	3.03	3.11	2.86	2.09	1.63	2.32	2.77	1.92	2.46
Diseases of the eye	1.53	2.46	2.50	2.10	2.33	1.31	2.26	2.43	1.94	2.89
Hypertensive diseases	1.82	1.89	2.13	2.54	2.37	1.62	1.74	1.65	1.87	2.26
Rheumatic diseases	1.66	1.67	1.64	1.77	1.69	0.71	0.20	2.15	1.55	1.93
Anaemia	n/a	2.00	2.11	2.52	1.55	0.87	1.09	0.80	1.13	1.14
Diseases of oral cavity	0.83	1.35	1.17	0.77	0.85	0.49	1.38	1.46	1.23	1.11
Measles	n/a	1.23	n/a	0.64	1.11	0.65	0.65	0.56	0.56	0.48
Diseases of the ear	0.33	0.91	0.70	0.97	0.89	0.34	0.94	0.92	0.85	1.01
Other diseases	14.90	12.28	20.09	20.37	20.57	51.41	24.92	23.90	31.64	23.47
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.8

MORBIDITY TREND (%) IN THE VOLTA REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

	YEAR									
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	39.26	38.52	36.82	38.28	40.27	40.22	40.08	40.44	40.08	39.98
Upper Respiratory Infections	7.38	7.24	7.02	7.56	8.26	8.28	7.91	6.34	7.18	7.26
Diseases of the skin	5.22	4.77	5.12	5.10	5.27	n/a	6.15	5.98	5.53	5.32
Diarrhoeal diseases	5.73	6.66	5.44	4.81	4.62	4.18	3.67	3.58	3.24	3.75
Accidents	3.85	4.23	4.65	4.75	4.11	2.54	4.07	4.20	3.91	3.82
Pregnancy related complications	4.44	3.44	3.36	3.23	2.61	4.57	3.19	3.65	3.50	3.61
Intestinal worms	4.43	3.97	3.82	3.98	4.14	2.00	4.02	3.83	3.69	2.80
Gynaecological disorders	2.18	2.11	1.94	1.85	1.72	1.73	1.95	2.13	3.15	2.64
Diseases of the eye	1.50	1.34	1.20	1.45	1.34	2.41	1.61	1.51	2.44	2.64
Hypertensive diseases	2.01	2.06	3.04	3.34	2.71	2.79	2.46	2.57	2.94	2.52
Rheumatic diseases	3.17	2.32	2.57	2.60	2.64	1.54	2.29	1.87	1.87	1.12
Anaemia	n/a	2.58	2.16	2.71	2.00	0.73	1.42	1.41	1.51	1.61
Diseases of oral cavity	0.71	0.64	0.54	0.56	0.69	0.68	0.76	0.63	0.59	0.49
Measles	n/a	0.74	n/a	1.01	0.69	0.82	0.88	0.30	0.53	0.91
Diseases of the ear	0.64	0.93	2.33	1.03	0.93	0.41	0.77	2.94	0.69	0.73
Other diseases	19.47	18.45	19.99	17.76	18.01	27.10	18.77	18.63	19.16	20.81
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.9

MORBIDITY TREND (%) IN THE CENTRAL REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

	YEAR									
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	37.15	37.19	38.00	36.53	36.06	38.07	37.61	43.26	43.07	37.65
Upper Respiratory Infections	6.42	6.44	5.54	6.64	9.35	8.65	9.47	8.69	7.36	8.67
Diseases of the skin	6.65	6.06	6.39	6.40	8.53	n/a	10.29	7.64	7.37	7.26
Diarrhoeal diseases	7.75	7.62	7.41	5.68	4.92	2.71	4.66	3.47	4.16	4.52
Accidents	3.24	4.27	5.03	4.68	3.17	2.73	4.35	4.92	4.53	2.38
Pregnancy related complications	4.42	4.24	4.06	4.25	2.51	2.35	2.31	2.03	1.62	2.02
Intestinal worms	4.67	4.50	4.40	3.71	2.74	2.28	2.25	2.37	2.15	1.74
Gynaecological disorders	1.51	2.20	3.22	3.32	2.09	1.61	2.41	2.16	1.90	1.88
Diseases of the eye	1.45	1.51	1.44	1.62	1.67	1.65	1.43	1.77	2.02	2.06
Hypertensive diseases	1.31	1.77	2.10	1.83	1.87	1.86	1.75	1.87	1.78	1.94
Rheumatic diseases	2.85	2.12	1.72	1.65	1.99	2.09	1.84	2.11	2.16	2.31
Anaemia	n/a	1.61	1.60	1.61	1.74	0.69	1.69	2.03	1.87	1.97
Diseases of oral cavity	0.56	0.46	0.61	0.72	0.68	1.13	0.64	0.66	1.16	1.05
Measles	n/a	1.11	n/a	1.54	1.13	0.99	1.32	0.74	1.03	0.73
Diseases of the ear	0.69	1.05	0.98	0.97	1.08	0.66	1.09	1.19	1.17	1.10
Other diseases	21.33	17.85	17.52	18.86	20.45	32.52	16.90	15.09	16.67	22.71
Total # of all cases	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Table A.10

MORBIDITY TREND (%) IN THE UPPER WEST REGION OF GHANA
TOP FIFTEEN (15) CAUSES OF OUT-PATIENT CONSULTATION, 1989-1998

					YEAR					
DISEASE	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Malaria	41.05	40.76	40.40	39.59	39.67	n/a	39.72	38.87	40.57	38.64
Upper Respiratory Infections	7.88	6.68	6.31	6.18	7.32	n/a	7.76	8.95	8.52	8.92
Diseases of the skin	4.69	4.75	6.58	5.10	5.25	n/a	6.01	6.02	5.28	5.55
Diarrhoeal diseases	13.06	14.53	10.41	9.94	7.46	n/a	7.66	6.69	5.99	5.18
Accidents	3.70	3.03	2.49	2.87	2.74	n/a	2.94	2.72	2.62	2.85
Pregnancy related complications	3.22	3.33	3.39	2.81	1.72	n/a	1.92	1.63	2.03	1.46
Intestinal worms	1.16	1.93	2.20	2.10	2.06	n/a	2.15	1.63	2.03	1.70
Gynaecological disorders	0.89	0.68	0.49	0.73	1.15	n/a	1.12	1.14	1.23	1.34
Diseases of the eye	1.44	2.61	1.64	1.52	2.29	n/a	2.08	2.05	2.30	3.23
Hypertensive diseases	0.75	0.60	0.89	1.17	1.73	n/a	0.88	0.72	0.70	0.65
Rheumatic diseases	0.65	1.37	1.25	1.06	1.00	n/a	0.89	0.64	0.49	0.53
Anaemia	n/a	1.02	2.03	1.54	2.20	n/a	2.37	2.11	2.04	1.40
Diseases of oral cavity	0.45	0.45	0.48	0.65	0.65	n/a	0.54	0.54	0.84	0.75
Measles	n/a	0.79	n/a	0.81	1.56	n/a	1.32	0.83	1.66	0.98
Diseases of the ear	1.75	0.88	0.40	1.21	1.20	n/a	1.04	1.02	1.41	1.68
Other diseases	19.33	16.57	21.04	22.72	22.01	n/a	21.59	24.44	22.29	25.15
Total # of all cases	100.00	100.00	100.00	100.00	100.00	n/a	100.00	100.00	100.00	100.00

Source: Ministry of Health. Centre for Health Information Management Policy, Planning, Monitoring and Evaluation, Accra, Ghana.

Appendix B

Computation of Weights

Let M_i = Number of Census Households in the i^{th} selected EA.

M_i = Number of Listed households in the i^{th} selected EA.

a = Number of EAs selected for the survey at the first stage.

i.e., a = 588

b = Number of households selected in a given EA at the second stage.

i.e., b = 25

P_{1i} = First stage probability of selection of the i^{th} selected EA.

P_{2i} = Second stage probability of selection of households.

Then, $P_{1i} = \frac{aM_i}{\Sigma M_i}$ and $P_{2i} = \frac{b}{M_i}$

where P_{1i} and P_{2i} are the first and second stage probabilities respectively.

The overall probability of selection of households is given by

$$F_i = P_{1i} \bullet P_{2i} = \frac{ab}{\Sigma M_i} \bullet \frac{M_i}{M_i}$$

The Weighting Factor for the i_{th} EA, W_i, is the reciprocal of the overall probability of selection.

$$\text{Hence, } W_i = \frac{1}{F_i} = \frac{\Sigma M_i}{ab} \bullet \frac{M_i}{M_i}$$

Now a = 588, b = 25 and ΣM_i = 2,444,836 (from Census Data)

$$\therefore W_i = 166.3 \bullet \frac{M_i}{M_i}$$

In a few cases, the number of households interviewed in an EA differed slightly from 25. In such cases, the correct values of b were used in computing weights.

Appendix C

Cum $\sqrt{f(y)}$ - First Combination (Rural)

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
2.243	**2357**	**48.549**	**48.549**
2.384	9	3.000	51.549
2.525	79	8.888	60.437
2.666	948	30.790	91.227
2.807	2758	52.517	143.743
2.911	95	9.747	153.490
2.947	78	8.832	162.322
2.948	**860**	**29.326**	**191.648**
2.973	**139**	**11.790**	**203.438**
3.052	11	3.317	206.754
3.088	2	1.414	208.168
3.089	9	3.000	211.168
3.114	7	2.646	213.814
3.193	38	6.164	219.979
3.229	5	2.236	222.215
3.255	15	3.873	226.088
3.334	94	9.695	235.783
3.370	73	8.544	244.327
3.396	110	10.488	254.815
3.475	72	8.485	263.300
3.511	182	13.491	276.791
3.537	203	14.248	291.039
3.615	17	4.123	295.162
3.616	132	11.489	306.651
3.641	26	5.099	311.750
3.651	9	3.000	314.750
3.652	65	8.062	322.812
3.677	21	4.583	327.395
3.678	99	9.950	337.345
3.703	5	2.236	339.581
3.757	5	2.236	341.817
3.782	12	3.464	345.281
3.793	1	1.000	346.281
3.819	1	1.000	347.281
3.844	1	1.000	348.281
3.897	8	2.828	351.110
3.923	26	5.099	356.209
3.933	1	1.000	357.209
3.959	5	2.236	359.445
4.038	**19**	**4.359**	**363.803**
4.064	**39**	**6.245**	**370.048**
4.074	1	1.000	371.048
4.100	37	6.083	377.131

First Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
4.126	4	2.000	379.131
4.143	1	1.000	380.131
4.179	11	3.317	383.448
4.205	22	4.690	388.138
4.215	13	3.606	391.744
4.241	50	7.071	398.815
4.267	13	3.606	402.420
4.284	1	1.000	403.420
4.320	21	4.583	408.003
4.345	6	2.449	410.453
4.346	49	7.000	417.453
4.356	1	1.000	418.453
4.381	2	1.414	419.867
4.382	28	5.292	425.158
4.407	3	1.732	426.890
4.408	9	3.000	429.890
4.450	1	1.000	430.890
4.486	20	4.472	435.362
4.487	1	1.000	436.362
4.565	2	1.414	437.777
4.591	2	1.414	439.191
4.627	9	3.000	442.191
4.663	2	1.414	443.605
4.732	1	1.000	444.605
4.768	19	4.359	448.964
4.794	4	2.000	450.964
4.804	10	3.162	454.126
4.830	2	1.414	455.540
4.847	1	1.000	456.540
4.873	1	1.000	457.540
4.883	3	1.732	459.273
4.909	10	3.162	462.435
4.935	1	1.000	463.435
4.945	11	3.317	466.751
4.971	3	1.732	468.483
5.024	4	2.000	470.483
5.049	1	1.000	471.483
5.050	14	3.742	475.225
5.076	5	2.236	477.461
5.086	7	2.646	480.107
5.111	1	1.000	481.107
5.112	2	1.414	482.521
5.118	2	1.414	483.935
5.154	2	1.414	485.350
5.180	1	1.000	486.350
5.190	10	3.162	489.512
5.191	1	1.000	490.512

First Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
5.216	2	1.414	491.926
5.259	1	1.000	492.926
5.295	1	1.000	493.926
5.331	1	1.000	494.926
5.400	6	2.449	497.376
5.410	1	1.000	498.376
5.436	4	2.000	500.376
5.472	5	2.236	502.612
5.498	1	1.000	503.612
5.541	2	1.414	505.026
5.577	1	1.000	506.026
5.583	1	1.000	507.026
5.603	1	1.000	508.026
5.613	2	1.414	509.440
5.681	1	1.000	510.440
5.682	2	1.414	511.854
5.754	1	1.000	512.854
5.822	4	2.000	514.854
5.927	1	1.000	515.854
5.963	1	1.000	516.854
6.006	1	1.000	517.854
6.104	3	1.732	519.586
6.140	1	1.000	520.586
6.209	1	1.000	521.586
6.288	1	1.000	522.586
6.386	7	2.646	525.232
6.412	1	1.000	526.232
6.422	1	1.000	527.232
6.484	1	1.000	528.232
6.490	1	1.000	529.232
6.526	11	3.317	532.549
6.588	1	1.000	533.549
6.772	1	1.000	534.549
6.877	1	1.000	535.549
6.919	8	2.828	538.377
7.018	1	1.000	539.377
7.090	1	1.000	540.377
7.194	3	1.732	542.109
7.201	1	1.000	543.109
7.256	2	1.414	544.523
7.483	2	1.414	545.938
7.623	2	1.414	547.352
7.643	1	1.000	548.352
8.144	**1**	**1.000**	**549.352**
Total	9162		

Cum $\sqrt{f(y)}$ - First Combination (Urban)

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
-0.880	**6**	**2.449**	**2.449**
-0.442	342	18.493	20.943
-0.176	1	1.000	21.943
-0.161	2	1.414	23.357
-0.117	63	7.937	31.294
-0.004	166	12.884	44.178
0.262	26	5.099	49.277
0.277	73	8.544	57.821
0.321	461	21.471	79.292
0.434	210	14.491	93.784
0.587	7	2.646	96.429
0.602	19	4.359	100.788
0.700	13	3.606	104.394
0.715	13	3.606	107.999
0.759	63	7.937	115.937
0.872	54	7.348	123.285
0.966	2	1.414	124.699
0.981	14	3.742	128.441
0.996	7	2.646	131.087
1.025	53	7.280	138.367
1.040	311	17.635	156.002
1.084	4	2.000	158.002
1.138	11	3.317	161.319
1.153	49	7.000	168.319
1.197	440	20.976	189.295
1.291	2	1.414	190.709
1.306	12	3.464	194.173
1.310	5	2.236	196.409
1.321	3	1.732	198.141
1.365	6	2.449	200.591
1.419	3	1.732	202.323
1.434	1	1.000	203.323
1.463	11	3.317	206.639
1.478	46	6.782	213.422
1.522	1	1.000	214.422
1.576	4	2.000	216.422
1.591	**38**	**6.164**	**222.586**
1.635	**176**	**13.266**	**235.853**
1.685	2	1.414	237.267
1.729	4	2.000	239.267
1.744	92	9.592	248.859
1.748	216	14.697	263.555
1.759	12	3.464	267.020
1.788	1	1.000	268.020
1.803	19	4.359	272.378
1.842	3	1.732	274.111

First Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
1.847	1	1.000	275.111
1.857	8	2.828	277.939
1.901	58	7.616	285.555
1.916	307	17.521	303.076
1.960	2	1.414	304.490
2.010	2	1.414	305.905
2.029	3	1.732	307.637
2.069	3	1.732	309.369
2.073	116	10.770	320.139
2.128	2	1.414	321.553
2.138	1	1.000	322.553
2.167	1	1.000	323.553
2.182	16	4.000	327.553
2.197	1	1.000	328.553
2.241	5	2.236	330.789
2.280	1	1.000	331.789
2.295	6	2.449	334.239
2.310	2	1.414	335.653
2.339	41	6.403	342.056
2.354	176	13.266	355.323
2.398	3	1.732	357.055
2.448	16	4.000	361.055
2.452	16	4.000	365.055
2.467	22	4.690	369.745
2.507	10	3.162	372.907
2.511	120	10.954	383.862
2.551	1	1.000	384.862
2.561	1	1.000	385.862
2.566	19	4.359	390.221
2.605	6	2.449	392.670
2.620	94	9.695	402.366
2.635	12	3.464	405.830
2.679	19	4.359	410.189
2.723	1	1.000	411.189
2.733	2	1.414	412.603
2.748	1	1.000	413.603
2.773	1	1.000	414.603
2.777	38	6.164	420.767
2.792	174	13.191	433.958
2.832	2	1.414	435.372
2.836	3	1.732	437.104
2.886	1	1.000	438.104
2.901	2	1.414	439.519
2.945	1	1.000	440.519
3.004	2	1.414	441.933
3.043	3	1.732	443.665
3.058	**71**	**8.426**	**452.091**

First Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
3.073	**4**	**2.000**	**454.091**
3.117	7	2.646	456.737
3.156	2	1.414	458.151
3.171	6	2.449	460.600
3.186	1	1.000	461.600
3.211	3	1.732	463.332
3.215	14	3.742	467.074
3.230	54	7.348	474.423
3.270	30	5.477	479.900
3.274	1	1.000	480.900
3.285	1	1.000	481.900
3.314	1	1.000	482.900
3.324	10	3.162	486.062
3.329	3	1.732	487.794
3.339	2	1.414	489.208
3.383	11	3.317	492.525
3.398	2	1.414	493.939
3.427	1	1.000	494.939
3.442	19	4.359	499.298
3.481	2	1.414	500.712
3.496	125	11.180	511.893
3.511	7	2.646	514.538
3.536	1	1.000	515.538
3.540	1	1.000	516.538
3.555	18	4.243	520.781
3.599	6	2.449	523.231
3.762	10	3.162	526.393
3.767	2	1.414	527.807
3.777	3	1.732	529.539
3.811	1	1.000	530.539
3.821	7	2.646	533.185
3.865	1	1.000	534.185
3.880	19	4.359	538.544
3.890	1	1.000	539.544
3.919	1	1.000	540.544
3.934	15	3.873	544.417
3.949	2	1.414	545.831
3.974	4	2.000	547.831
3.989	1	1.000	548.831
3.993	3	1.732	550.563
4.033	4	2.000	552.563
4.087	2	1.414	553.977
4.146	13	3.606	557.583
4.161	1	1.000	558.583
4.200	24	4.899	563.482
4.205	2	1.414	564.896
4.215	3	1.732	566.628

First Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
4.259	10	3.162	569.790
4.303	10	3.162	572.953
4.318	66	8.124	581.077
4.362	1	1.000	582.077
4.412	2	1.414	583.491
4.481	4	2.000	585.491
4.525	2	1.414	586.905
4.584	20	4.472	591.377
4.599	1	1.000	592.377
4.638	6	2.449	594.827
4.643	3	1.732	596.559
4.693	1	1.000	597.559
4.697	1	1.000	598.559
4.756	2	1.414	599.973
4.850	4	2.000	601.973
4.865	1	1.000	602.973
4.899	3	1.732	604.705
4.909	2	1.414	606.119
4.919	1	1.000	607.119
4.978	1	1.000	608.119
5.007	3	1.732	609.851
5.022	127	11.269	621.121
5.037	8	2.828	623.949
5.066	3	1.732	625.681
5.081	11	3.317	628.998
5.288	5	2.236	631.234
5.303	3	1.732	632.966
5.337	2	1.414	634.380
5.347	1	1.000	635.380
5.406	2	1.414	636.794
5.460	3	1.732	638.526
5.603	1	1.000	639.526
5.613	1	1.000	640.526
5.682	2	1.414	641.941
5.726	56	7.483	649.424
5.741	19	4.359	653.783
5.770	2	1.414	655.197
5.785	5	2.236	657.433
6.051	1	1.000	658.433
6.164	1	1.000	659.433
6.179	1	1.000	660.433
6.213	2	1.414	661.847
6.445	22	4.690	666.538
6.489	4	2.000	668.538
6.651	1	1.000	669.538
6.917	1	1.000	670.538
6.932	2	1.414	671.952

First Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
7.089	2	1.414	673.366
7.370	2	1.414	674.780
7.621	**1**	**1.000**	**675.780**
Total	5352		

Appendix D

Cum $\sqrt{f(y)}$ - Second Combination (Rural)

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
-22.213	**1**	**1.000**	**1.000**
-3.339	1	1.000	2.000
-1.018	1	1.000	3.000
-0.787	1	1.000	4.000
-0.323	1	1.000	5.000
0.141	2	1.414	6.414
0.277	1	1.000	7.414
0.382	1	1.000	8.414
0.431	1	1.000	9.414
0.681	1	1.000	10.414
0.721	4	2.000	12.414
0.837	1	1.000	13.414
0.855	1	1.000	14.414
1.011	2	1.414	15.828
1.127	1	1.000	16.828
1.277	1	1.000	17.828
1.301	1	1.000	18.828
1.359	1	1.000	19.828
1.435	1	1.000	20.828
1.504	1	1.000	21.828
1.533	2	1.414	23.243
1.591	4	2.000	25.243
1.615	1	1.000	26.243
1.616	1	1.000	27.243
1.727	1	1.000	28.243
1.736	6	2.449	30.692
1.823	1	1.000	31.692
1.870	1	1.000	32.692
1.881	13	3.606	36.298
1.910	1	1.000	37.298
1.939	1	1.000	38.298
1.968	3	1.732	40.030
2.011	1	1.000	41.030
2.026	8	2.828	43.858
2.055	3	1.732	45.590
2.084	2	1.414	47.004
2.113	9	3.000	50.004
2.142	1	1.000	51.004
2.171	24	4.899	55.903
2.200	10	3.162	59.066
2.229	19	4.359	63.425
2.258	13	3.606	67.030
2.262	1	1.000	68.030
2.287	30	5.477	73.507

Second Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
2.307	1	1.000	74.507
2.316	38	6.164	80.672
2.334	1	1.000	81.672
2.345	49	7.000	88.672
2.374	42	6.481	95.153
2.403	61	7.810	102.963
2.432	31	5.568	108.531
2.437	1	1.000	109.531
2.461	1118	33.437	142.967
2.479	2	1.414	144.381
2.537	1	1.000	145.381
2.563	1	1.000	146.381
2.566	1	1.000	147.381
2.595	4	2.000	149.381
2.597	2	1.414	150.795
2.615	1	1.000	151.795
2.624	1	1.000	152.795
2.640	4	2.000	154.795
2.650	1	1.000	155.795
2.673	82	9.055	164.851
2.708	1	1.000	165.851
2.711	3	1.732	167.583
2.736	1	1.000	168.583
2.740	6	2.449	171.032
2.769	8	2.828	173.861
2.776	1	1.000	174.861
2.798	6	2.449	177.310
2.800	1	1.000	178.310
2.809	1	1.000	179.310
2.819	20	4.472	183.782
2.827	9	3.000	186.782
2.842	1	1.000	187.782
2.852	3	1.732	189.514
2.853	2	1.414	190.929
2.856	5	2.236	193.165
2.866	1	1.000	194.165
2.881	5	2.236	196.401
2.885	717	26.777	223.178
2.887	4	2.000	225.178
2.910	1	1.000	226.178
2.911	1	1.000	227.178
2.935	1	1.000	228.178
2.940	1	1.000	229.178
2.945	1	1.000	230.178
2.968	1	1.000	231.178
2.974	2	1.414	232.592
2.997	2	1.414	234.006

Second Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
2.998	404	20.100	254.106
3.003	3	1.732	255.838
3.021	2	1.414	257.252
3.026	4	2.000	259.252
3.031	15	3.873	263.125
3.032	1	1.000	264.125
3.055	3	1.732	265.857
3.061	1	1.000	266.857
3.064	2	1.414	268.271
3.068	1	1.000	269.271
3.074	1	1.000	270.271
3.079	1	1.000	271.271
3.084	4	2.000	273.271
3.090	1	1.000	274.271
3.098	1	1.000	275.271
3.099	1	1.000	276.271
3.113	5	2.236	278.507
3.119	2	1.414	279.922
3.126	25	5.000	284.922
3.148	3	1.732	286.654
3.156	28	5.292	291.945
3.171	57	7.550	299.495
3.177	1479	38.458	337.953
3.210	95	9.747	347.700
3.214	1	1.000	348.700
3.240	2	1.414	350.114
3.243	**44**	**6.633**	**356.747**
3.253	**1**	**1.000**	**357.747**
3.269	1	1.000	358.747
3.290	1	1.000	359.747
3.298	1	1.000	360.747
3.305	1	1.000	361.747
3.305	2	1.414	363.161
3.315	1	1.000	364.161
3.330	1	1.000	365.161
3.338	19	4.359	369.520
3.350	2	1.414	370.934
3.356	364	19.079	390.013
3.360	1	1.000	391.013
3.364	1	1.000	392.013
3.368	11	3.317	395.330
3.383	11	3.317	398.646
3.389	147	12.124	410.771
3.398	1	1.000	411.771
3.422	438	20.928	432.699
3.456	2	1.414	434.113
3.464	1	1.000	435.113

Second Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
3.484	7	2.646	437.759
3.489	2	1.414	439.173
3.514	1	1.000	440.173
3.517	1	1.000	441.173
3.529	6	2.449	443.623
3.535	2	1.414	445.037
3.543	2	1.414	446.451
3.547	1	1.000	447.451
3.550	50	7.071	454.522
3.562	4	2.000	456.522
3.566	1	1.000	457.522
3.568	65	8.062	465.585
3.572	1	1.000	466.585
3.580	36	6.000	472.585
3.586	1	1.000	473.585
3.591	1	1.000	474.585
3.595	42	6.481	481.065
3.601	1094	33.076	514.141
3.610	1	1.000	515.141
3.611	1	1.000	516.141
3.621	1	1.000	517.141
3.663	19	4.359	521.500
3.693	25	5.000	526.500
3.696	18	4.243	530.743
3.708	53	7.280	538.023
3.722	1	1.000	539.023
3.726	2	1.414	540.437
3.729	8	2.828	543.265
3.741	6	2.449	545.715
3.747	1	1.000	546.715
3.759	1	1.000	547.715
3.771	1	1.000	548.715
3.774	1	1.000	549.715
3.780	424	20.591	570.306
3.821	3	1.732	572.038
3.829	1	1.000	573.038
3.836	10	3.162	576.200
3.842	23	4.796	580.996
3.851	2	1.414	582.410
3.866	10	3.162	585.573
3.872	89	9.434	595.007
3.875	23	4.796	599.803
3.881	1	1.000	600.803
3.887	111	10.536	611.338
3.905	14	3.742	615.080
3.908	13	3.606	618.685
3.920	15	3.873	622.558

Second Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
3.938	3	1.732	624.290
3.953	3	1.732	626.023
3.959	6	2.449	628.472
4.005	1	1.000	629.472
4.008	1	1.000	630.472
4.015	5	2.236	632.708
4.021	35	5.916	638.624
4.022	1	1.000	639.624
4.033	8	2.828	642.453
4.048	9	3.000	645.453
4.051	22	4.690	650.143
4.054	14	3.742	653.885
4.063	2	1.414	655.299
4.066	37	6.083	661.382
4.078	3	1.732	663.114
4.084	22	4.690	667.804
4.087	51	7.141	674.946
4.093	1	1.000	675.946
4.099	16	4.000	679.946
4.117	34	5.831	685.776
4.132	40	6.325	692.101
4.194	1	1.000	693.101
4.200	2	1.414	694.515
4.209	1	1.000	695.515
4.224	1	1.000	696.515
4.227	5	2.236	698.751
4.233	37	6.083	704.834
4.245	6	2.449	707.284
4.260	**7**	**2.646**	**709.929**
4.263	**14**	**3.742**	**713.671**
4.266	34	5.831	719.502
4.272	1	1.000	720.502
4.275	4	2.000	722.502
4.278	14	3.742	726.244
4.290	7	2.646	728.889
4.296	70	8.367	737.256
4.311	71	8.426	745.682
4.315	1	1.000	746.682
4.326	1	1.000	747.682
4.358	3	1.732	749.414
4.373	14	3.742	753.156
4.391	6	2.449	755.605
4.403	13	3.606	759.211
4.406	17	4.123	763.334
4.417	1	1.000	764.334
4.418	3	1.732	766.066
4.436	2	1.414	767.480

Second Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
4.439	2	1.414	768.894
4.445	59	7.681	776.576
4.475	26	5.099	781.675
4.490	45	6.708	788.383
4.503	1	1.000	789.383
4.531	2	1.414	790.797
4.537	5	2.236	793.033
4.552	5	2.236	795.269
4.561	1	1.000	796.269
4.567	3	1.732	798.001
4.570	6	2.449	800.451
4.576	2	1.414	801.865
4.582	21	4.583	806.447
4.585	13	3.606	810.053
4.597	9	3.000	813.053
4.603	2	1.414	814.467
4.615	9	3.000	817.467
4.618	8	2.828	820.296
4.624	3	1.732	822.028
4.648	2	1.414	823.442
4.654	1	1.000	824.442
4.669	1	1.000	825.442
4.710	3	1.732	827.174
4.716	2	1.414	828.588
4.731	14	3.742	832.330
4.743	2	1.414	833.744
4.746	1	1.000	834.744
4.749	2	1.414	836.158
4.761	6	2.449	838.608
4.764	4	2.000	840.608
4.768	1	1.000	841.608
4.776	3	1.732	843.340
4.779	3	1.732	845.072
4.782	9	3.000	848.072
4.794	12	3.464	851.536
4.797	11	3.317	854.853
4.812	1	1.000	855.853
4.827	15	3.873	859.726
4.842	1	1.000	860.726
4.859	1	1.000	861.726
4.889	4	2.000	863.726
4.898	1	1.000	864.726
4.919	1	1.000	865.726
4.922	13	3.606	869.331
4.928	10	3.162	872.493
4.931	1	1.000	873.493
4.943	14	3.742	877.235

Second Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
4.955	2	1.414	878.649
4.961	4	2.000	880.649
4.973	8	2.828	883.478
4.976	13	3.606	887.083
4.988	1	1.000	888.083
4.991	7	2.646	890.729
5.006	17	4.123	894.852
5.021	4	2.000	896.852
5.038	1	1.000	897.852
5.056	2	1.414	899.266
5.068	3	1.732	900.998
5.071	1	1.000	901.998
5.083	1	1.000	902.998
5.098	2	1.414	904.413
5.101	4	2.000	906.413
5.104	1	1.000	907.413
5.113	1	1.000	908.413
5.126	2	1.414	909.827
5.134	4	2.000	911.827
5.140	9	3.000	914.827
5.155	19	4.359	919.186
5.185	13	3.606	922.791
5.200	4	2.000	924.791
5.202	1	1.000	925.791
5.217	1	1.000	926.791
5.232	1	1.000	927.791
5.247	3	1.732	929.523
5.277	5	2.236	931.759
5.280	10	3.162	934.922
5.292	2	1.414	936.336
5.295	3	1.732	938.068
5.310	3	1.732	939.800
5.313	1	1.000	940.800
5.334	1	1.000	941.800
5.343	1	1.000	942.800
5.345	1	1.000	943.800
5.405	1	1.000	944.800
5.411	2	1.414	946.214
5.426	4	2.000	948.214
5.441	2	1.414	949.628
5.444	1	1.000	950.628
5.456	2	1.414	952.043
5.459	4	2.000	954.043
5.471	1	1.000	955.043
5.474	1	1.000	956.043
5.489	5	2.236	958.279
5.492	6	2.449	960.728

Second Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
5.522	5	2.236	962.964
5.537	1	1.000	963.964
5.557	1	1.000	964.964
5.584	1	1.000	965.964
5.587	1	1.000	966.964
5.617	7	2.646	969.610
5.623	1	1.000	970.610
5.632	2	1.414	972.024
5.638	7	2.646	974.670
5.650	1	1.000	975.670
5.653	1	1.000	976.670
5.656	1	1.000	977.670
5.668	1	1.000	978.670
5.671	3	1.732	980.402
5.683	1	1.000	981.402
5.695	1	1.000	982.402
5.701	1	1.000	983.402
5.703	3	1.732	985.134
5.716	1	1.000	986.134
5.736	1	1.000	987.134
5.763	1	1.000	988.134
5.799	1	1.000	989.134
5.814	1	1.000	990.134
5.829	2	1.414	991.548
5.835	1	1.000	992.548
5.850	3	1.732	994.280
5.865	2	1.414	995.695
5.880	4	2.000	997.695
5.882	1	1.000	998.695
5.888	1	1.000	999.695
5.915	2	1.414	1001.109
5.930	1	1.000	1002.109
5.942	1	1.000	1003.109
5.945	4	2.000	1005.109
5.974	1	1.000	1006.109
5.975	2	1.414	1007.523
5.978	1	1.000	1008.523
6.029	1	1.000	1009.523
6.061	1	1.000	1010.523
6.073	1	1.000	1011.523
6.124	1	1.000	1012.523
6.127	1	1.000	1013.523
6.154	1	1.000	1014.523
6.187	1	1.000	1015.523
6.202	1	1.000	1016.523
6.210	1	1.000	1017.523
6.219	1	1.000	1018.523

Second Combination (Rural) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
6.252	1	1.000	1019.523
6.306	1	1.000	1020.523
6.323	1	1.000	1021.523
6.333	1	1.000	1022.523
6.351	1	1.000	1023.523
6.401	1	1.000	1024.523
6.464	3	1.732	1026.255
6.547	1	1.000	1027.255
6.610	3	1.732	1028.987
6.640	1	1.000	1029.987
6.705	1	1.000	1030.987
6.735	3	1.732	1032.719
6.756	2	1.414	1034.133
6.831	1	1.000	1035.133
6.947	5	2.236	1037.369
6.968	4	2.000	1039.369
6.992	1	1.000	1040.369
6.998	1	1.000	1041.369
7.058	2	1.414	1042.784
7.105	1	1.000	1043.784
7.116	2	1.414	1045.198
7.159	3	1.732	1046.930
7.180	1	1.000	1047.930
7.195	1	1.000	1048.930
7.424	1	1.000	1049.930
7.434	1	1.000	1050.930
7.474	1	1.000	1051.930
7.487	1	1.000	1052.930
7.540	4	2.000	1054.930
7.663	1	1.000	1055.930
7.815	1	1.000	1056.930
7.824	3	1.732	1058.662
7.869	2	1.414	1060.076
8.164	1	1.000	1061.076
8.235	1	1.000	1062.076
8.256	2	1.414	1063.490
8.847	1	**1.000**	**1064.490**
Total	9162		

Cum $\sqrt{f(y)}$ - Second Combination (Urban)

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
-1.235	**4**	**2.000**	**2.000**
-1.019	2	1.414	3.414
-0.794	182	13.491	16.905
-0.686	45	6.708	23.613
-0.578	112	10.583	34.196
-0.540	1	1.000	35.196
-0.481	36	6.000	41.196
-0.400	1	1.000	42.196
-0.373	18	4.243	46.439
-0.353	77	8.775	55.214
-0.292	1	1.000	56.214
-0.265	9	3.000	59.214
-0.245	21	4.583	63.796
-0.137	68	8.246	72.043
-0.099	16	4.000	76.043
-0.067	32	5.657	81.699
-0.040	255	15.969	97.668
0.009	6	2.449	100.118
0.041	20	4.472	104.590
0.068	139	11.790	116.380
0.088	113	10.630	127.010
0.117	4	2.000	129.010
0.149	19	4.359	133.369
0.176	64	8.000	141.369
0.196	27	5.196	146.565
0.214	4	2.000	148.565
0.246	6	2.449	151.014
0.304	68	8.246	159.260
0.322	3	1.732	160.993
0.342	9	3.000	163.993
0.354	12	3.464	167.457
0.374	4	2.000	169.457
0.401	26	5.099	174.556
0.412	1	1.000	175.556
0.462	1	1.000	176.556
0.473	1	1.000	177.556
0.482	5	2.236	179.792
0.509	25	5.000	184.792
0.529	23	4.796	189.588
0.554	1	1.000	190.588
0.558	4	2.000	192.588
0.590	4	2.000	194.588
0.596	1	1.000	195.588
0.601	1	1.000	196.588
0.617	12	3.464	200.052
0.628	10	3.162	203.214

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
0.637	15	3.873	207.087
0.655	24	4.899	211.986
0.687	101	10.050	222.036
0.704	1	1.000	223.036
0.714	1	1.000	224.036
0.736	3	1.732	225.768
0.745	15	3.873	229.641
0.763	24	4.899	234.540
0.768	2	1.414	235.954
0.783	8	2.828	238.782
0.795	162	12.728	251.510
0.815	22	4.690	256.201
0.822	2	1.414	257.615
0.842	220	14.832	272.447
0.844	1	1.000	273.447
0.871	5	2.236	275.683
0.876	5	2.236	277.920
0.885	1	1.000	278.920
0.891	2	1.414	280.334
0.903	46	6.782	287.116
0.923	8	2.828	289.944
0.930	1	1.000	290.944
0.941	5	2.236	293.181
0.941	1	1.000	294.181
0.950	158	12.570	306.750
0.970	3	1.732	308.482
0.973	1	1.000	309.482
0.999	1	1.000	310.482
1.000	1	1.000	311.482
1.017	2	1.414	312.897
1.031	18	4.243	317.139
1.049	7	2.646	319.785
1.058	57	7.550	327.335
1.069	1	1.000	328.335
1.078	2	1.414	329.749
1.081	1	1.000	330.749
1.096	5	2.236	332.985
1.108	4	2.000	334.985
1.128	11	3.317	338.302
1.155	1	1.000	339.302
1.177	1	1.000	340.302
1.189	1	1.000	341.302
1.204	4	2.000	343.302
1.224	2	1.414	344.716
1.227	1	1.000	345.716
1.236	29	5.385	351.101
1.256	17	4.123	355.224

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
1.283	81	9.000	364.224
1.285	1	1.000	365.224
1.290	1	1.000	366.224
1.312	2	1.414	367.638
1.317	**1**	**1.000**	**368.638**
1.323	**1**	**1.000**	**369.638**
1.332	1	1.000	370.638
1.344	4	2.000	372.638
1.346	2	1.414	374.053
1.350	3	1.732	375.785
1.364	10	3.162	378.947
1.382	28	5.292	384.238
1.391	75	8.660	392.899
1.405	1	1.000	393.899
1.411	104	10.198	404.097
1.414	3	1.732	405.829
1.440	1	1.000	406.829
1.441	4	2.000	408.829
1.472	11	3.317	412.145
1.478	1	1.000	413.145
1.490	51	7.141	420.287
1.499	19	4.359	424.646
1.510	4	2.000	426.646
1.517	1	1.000	427.646
1.519	14	3.742	431.387
1.522	4	2.000	433.387
1.537	29	5.385	438.773
1.539	1	1.000	439.773
1.549	13	3.606	443.378
1.553	2	1.414	444.792
1.566	1	1.000	445.792
1.569	91	9.539	455.332
1.576	1	1.000	456.332
1.586	2	1.414	457.746
1.596	2	1.414	459.160
1.598	11	3.317	462.477
1.609	1	1.000	463.477
1.618	1	1.000	464.477
1.623	1	1.000	465.477
1.627	84	9.165	474.642
1.630	4	2.000	476.642
1.636	1	1.000	477.642
1.645	21	4.583	482.225
1.657	2	1.414	483.639
1.661	1	1.000	484.639
1.677	166	12.884	497.523
1.695	1	1.000	498.523

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
1.697	1	1.000	499.523
1.708	1	1.000	500.523
1.724	65	8.062	508.585
1.726	1	1.000	509.585
1.726	3	1.732	511.317
1.729	1	1.000	512.317
1.753	8	2.828	515.146
1.754	1	1.000	516.146
1.785	47	6.856	523.001
1.791	1	1.000	524.001
1.796	1	1.000	525.001
1.803	2	1.414	526.415
1.805	1	1.000	527.415
1.823	6	2.449	529.865
1.832	43	6.557	536.422
1.852	1	1.000	537.422
1.862	1	1.000	538.422
1.882	3	1.732	540.154
1.906	1	1.000	541.154
1.913	2	1.414	542.569
1.919	1	1.000	543.569
1.931	9	3.000	546.569
1.940	7	2.646	549.214
1.951	3	1.732	550.946
1.963	1	1.000	551.946
1.978	18	4.243	556.189
1.983	1	1.000	557.189
1.990	2	1.414	558.603
2.010	60	7.746	566.349
2.023	1	1.000	567.349
2.039	1	1.000	568.349
2.059	3	1.732	570.081
2.073	1	1.000	571.081
2.077	1	1.000	572.081
2.086	21	4.583	576.664
2.091	1	1.000	577.664
2.106	2	1.414	579.078
2.118	88	9.381	588.459
2.122	1	1.000	589.459
2.136	3	1.732	591.191
2.138	5	2.236	593.427
2.145	3	1.732	595.159
2.163	2	1.414	596.573
2.165	65	8.062	604.636
2.176	1	1.000	605.636
2.185	12	3.464	609.100
2.194	2	1.414	610.514

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
2.195	6	2.449	612.963
2.205	1	1.000	613.963
2.214	6	2.449	616.413
2.226	23	4.796	621.209
2.232	3	1.732	622.941
2.244	6	2.449	625.390
2.246	3	1.732	627.122
2.264	34	5.831	632.953
2.273	43	6.557	639.511
2.282	1	1.000	640.511
2.293	3	1.732	642.243
2.296	5	2.236	644.479
2.303	12	3.464	647.943
2.320	1	1.000	648.943
2.322	7	2.646	651.589
2.323	4	2.000	653.589
2.340	3	1.732	655.321
2.352	1	1.000	656.321
2.354	12	3.464	659.785
2.372	52	7.211	666.996
2.381	12	3.464	670.460
2.392	1	1.000	671.460
2.404	2	1.414	672.874
2.411	1	1.000	673.874
2.419	28	5.292	679.166
2.431	11	3.317	682.482
2.451	59	7.681	690.164
2.458	1	1.000	691.164
2.478	2	1.414	692.578
2.480	8	2.828	695.406
2.498	1	1.000	696.406
2.500	1	1.000	697.406
2.512	3	1.732	699.138
2.527	10	3.162	702.300
2.539	3	1.732	704.033
2.550	1	1.000	705.033
2.557	2	1.414	706.447
2.559	66	8.124	714.571
2.579	1	1.000	715.571
2.586	1	1.000	716.571
2.604	1	1.000	717.571
2.617	4	2.000	719.571
2.626	1	1.000	720.571
2.658	1	1.000	721.571
2.667	46	6.782	728.353
2.671	1	1.000	729.353
2.673	2	1.414	730.767

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
2.685	1	1.000	731.767
2.705	27	5.196	736.963
2.718	**1**	**1.000**	**737.963**
2.737	**2**	**1.414**	**739.378**
2.744	2	1.414	740.792
2.750	1	1.000	741.792
2.764	2	1.414	743.206
2.775	1	1.000	744.206
2.781	1	1.000	745.206
2.801	2	1.414	746.620
2.813	42	6.481	753.101
2.831	2	1.414	754.515
2.833	2	1.414	755.929
2.845	2	1.414	757.344
2.860	4	2.000	759.344
2.872	3	1.732	761.076
2.890	9	3.000	764.076
2.892	16	4.000	768.076
2.919	1	1.000	769.076
2.921	2	1.414	770.490
2.922	1	1.000	771.490
2.930	1	1.000	772.490
2.939	1	1.000	773.490
2.941	1	1.000	774.490
2.949	2	1.414	775.904
2.959	2	1.414	777.318
2.968	6	2.449	779.768
2.980	2	1.414	781.182
2.991	2	1.414	782.596
2.998	18	4.243	786.839
3.000	21	4.583	791.422
3.018	4	2.000	793.422
3.025	1	1.000	794.422
3.045	1	1.000	795.422
3.049	3	1.732	797.154
3.050	1	1.000	798.154
3.067	7	2.646	800.799
3.067	1	1.000	801.799
3.076	4	2.000	803.799
3.077	3	1.732	805.531
3.081	1	1.000	806.531
3.106	3	1.732	808.263
3.108	17	4.123	812.387
3.112	1	1.000	813.387
3.114	1	1.000	814.387
3.121	1	1.000	815.387
3.126	7	2.646	818.032

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
3.146	46	6.782	824.815
3.158	1	1.000	825.815
3.162	1	1.000	826.815
3.165	1	1.000	827.815
3.175	1	1.000	828.815
3.178	1	1.000	829.815
3.185	10	3.162	832.977
3.205	9	3.000	835.977
3.216	1	1.000	836.977
3.232	5	2.236	839.213
3.252	1	1.000	840.213
3.254	59	7.681	847.894
3.281	1	1.000	848.894
3.286	4	2.000	850.894
3.293	6	2.449	853.344
3.304	1	1.000	854.344
3.313	7	2.646	856.989
3.330	1	1.000	857.989
3.340	1	1.000	858.989
3.344	1	1.000	859.989
3.362	19	4.359	864.348
3.390	1	1.000	865.348
3.394	2	1.414	866.762
3.400	2	1.414	868.177
3.417	1	1.000	869.177
3.421	2	1.414	870.591
3.459	2	1.414	872.005
3.498	1	1.000	873.005
3.508	6	2.449	875.455
3.518	7	2.646	878.100
3.529	1	1.000	879.100
3.540	2	1.414	880.515
3.567	4	2.000	882.515
3.585	1	1.000	883.515
3.587	2	1.414	884.929
3.594	1	1.000	885.929
3.619	1	1.000	886.929
3.626	10	3.162	890.091
3.644	3	1.732	891.823
3.646	3	1.732	893.555
3.648	1	1.000	894.555
3.663	1	1.000	895.555
3.675	1	1.000	896.555
3.693	2	1.414	897.969
3.695	10	3.162	901.132
3.706	1	1.000	902.132
3.713	1	1.000	903.132

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
3.725	1	1.000	904.132
3.734	2	1.414	905.546
3.752	1	1.000	906.546
3.772	3	1.732	908.278
3.776	1	1.000	909.278
3.801	1	1.000	910.278
3.803	3	1.732	912.010
3.821	1	1.000	913.010
3.831	2	1.414	914.424
3.835	1	1.000	915.424
3.841	9	3.000	918.424
3.857	1	1.000	919.424
3.873	1	1.000	920.424
3.880	9	3.000	923.424
3.900	6	2.449	925.874
3.904	1	1.000	926.874
3.912	1	1.000	927.874
3.927	9	3.000	930.874
3.936	1	1.000	931.874
3.949	10	3.162	935.036
3.959	20	4.472	939.508
3.981	2	1.414	940.922
3.986	1	1.000	941.922
3.988	1	1.000	942.922
4.008	3	1.732	944.654
4.035	1	1.000	945.654
4.048	1	1.000	946.654
4.057	3	1.732	948.386
4.067	30	5.477	953.864
4.116	1	1.000	954.864
4.127	1	1.000	955.864
4.134	2	1.414	957.278
4.175	15	3.873	961.151
4.206	2	1.414	962.565
4.213	10	3.162	965.727
4.235	2	1.414	967.142
4.262	2	1.414	968.556
4.272	1	1.000	969.556
4.282	4	2.000	971.556
4.312	1	1.000	972.556
4.321	8	2.828	975.384
4.343	1	1.000	976.384
4.353	1	1.000	977.384
4.380	2	1.414	978.798
4.390	2	1.414	980.213
4.429	2	1.414	981.627
4.449	1	1.000	982.627

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
4.467	2	1.414	984.041
4.508	2	1.414	985.455
4.526	1	1.000	986.455
4.562	1	1.000	987.455
4.575	1	1.000	988.455
4.592	2	1.414	989.869
4.607	1	1.000	990.869
4.622	2	1.414	992.284
4.634	1	1.000	993.284
4.654	56	7.483	1000.767
4.681	3	1.732	1002.499
4.683	1	1.000	1003.499
4.686	2	1.414	1004.913
4.694	1	1.000	1005.913
4.700	1	1.000	1006.913
4.713	1	1.000	1007.913
4.730	1	1.000	1008.913
4.735	1	1.000	1009.913
4.762	53	7.280	1017.193
4.784	1	1.000	1018.193
4.794	2	1.414	1019.608
4.821	10	3.162	1022.770
4.870	18	4.243	1027.012
4.902	3	1.732	1028.745
4.908	1	1.000	1029.745
4.925	2	1.414	1031.159
4.940	2	1.414	1032.573
4.991	1	1.000	1033.573
5.016	4	2.000	1035.573
5.026	1	1.000	1036.573
5.048	1	1.000	1037.573
5.075	1	1.000	1038.573
5.099	1	1.000	1039.573
5.134	1	1.000	1040.573
5.142	1	1.000	1041.573
5.179	1	1.000	1042.573
5.203	2	1.414	1043.987
5.311	1	1.000	1044.987
5.349	15	3.873	1048.860
5.376	2	1.414	1050.274
5.381	3	1.732	1052.006
5.408	3	1.732	1053.738
5.430	2	1.414	1055.153
5.437	1	1.000	1056.153
5.457	30	5.477	1061.630
5.489	5	2.236	1063.866
5.516	2	1.414	1065.280

Second Combination (Urban) continued

Interval	Frequency (y)	$\sqrt{f(y)}$	Cum $\sqrt{f(y)}$
5.565	10	3.162	1068.442
5.587	1	1.000	1069.442
5.597	9	3.000	1072.442
5.770	1	1.000	1073.442
5.898	1	1.000	1074.442
5.915	1	1.000	1075.442
6.023	1	1.000	1076.442
6.038	1	1.000	1077.442
6.076	4	2.000	1079.442
6.184	7	2.646	1082.088
6.211	2	1.414	1083.502
6.292	11	3.317	1086.819
6.319	2	1.414	1088.233
6.356	1	1.000	1089.233
6.502	1	1.000	1090.233
6.532	1	1.000	1091.233
6.534	2	1.414	1092.647
6.577	1	1.000	1093.647
6.689	1	1.000	1094.647
6.797	1	1.000	1095.647
6.974	1	1.000	1096.647
6.975	1	1.000	1097.647
7.083	1	1.000	1098.647
7.165	1	1.000	1099.647
7.239	1	1.000	1100.647
7.413	1	1.000	1101.647
9.930	1	1.000	1102.647
10.560	1	1.000	1103.647
24.702	1	1.000	1104.647
25.397	**1**	**1.000**	**1105.647**
Total	5352		

Appendix E

Marital Status and Malaria Prevalence

Marital Status	Rural	Urban
Single/Never Married	98 (16.6%)	97 (13.9%)
Living Together	37 (10.9%)	24 (14.9%)
Married (Monogamous)	428 (9.4%)	243 (9.6%)
Married (Polygamous)	130 (9.2%)	63 (11.9%)
Divorced/Separated	170 (14.7%)	121 (16.0%)
Widowed	166 (15.3%)	111 (16.8%)
Total	1029 (11.2%)	659 (12.3%)

Appendix F

STATISTICAL SERVICE
ACCRA, GHANA

PLEASE USE NO. 2 PENCIL

RIGHT	WRONG
● ■ ■	✓ ○ ☒ ○

A.12 Reference Number

CONFIDENTIAL

REPUBLIC OF GHANA

CORE WELFARE INDICATORS QUESTIONNAIRE (CWIQ)

A - GENERAL INFORMATION

A.1 ENUMERATOR'S NAME ____________________

A.2 Enumerator's ID number

0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

A.3 RESPONDENT'S NAME ____________________

A.4 REGION NAME ____________________

A.5 DISTRICT NAME ____________________

A.6 ENTER TODAY'S DATE

DAY MONTH YEAR

0	0	0	0	0	0
1	1	1	1	1	1
2	2		2	2	2
3	3		3	3	3
	4		4	4	4
	5		5	5	5
	6		6	6	6
	7		7	7	7
	8		8	8	8
	9		9	9	9

A.7 ENTER TIME NOW

HOURS MIN

0	0	0	0
1	1	1	1
	2	2	2
	3	3	3
	4	4	4
	5	5	5
	6		6
	7		7
	8		8
	9		9

○ A AM

○ P PM

A.8 RESPONDENT NUMBER (from household roster on next page)

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

QUESTIONNAIRE INSTRUCTIONS

STEP 1: BUBBLE IN ALL THE ANSWERS. VERIFY THERE IS ONLY ONE ANSWER PER QUESTION, UNLESS OTHERWISE SPECIFIED.

STEP 2: EXAMINE ALL NUMBER GRIDS AND MAKE SURE THE NUMBERS BUBBLED IN MATCH THE NUMBERS WRITTEN IN THE BOX ABOVE EACH GRID.

A.9a REGION ID		A.9b DISTRICT ID		A.10 EA's ID			A.11 HOUSEHOLD	
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9

!!! IMPORTANT!!!

Create a unique reference number above, by combining region, district, ea, and household number. Write this number NOW on top of all odd numbered pages, including this one.

COMMENTS

B - INFORMATION ON HOUSEHOLD MEMBERS

Write down names of all persons who normally live and eat together in this household, starting with the head. EXCLUDE VISITORS.

	1 (Head)	2	3	4	5	6	7	8	9	10	11	12
MEMBER NUMBER MEMBER'S FIRST NAME												

B.1 ENTER THE SEX OF EACH MEMBER LISTED IN THE BOXES ABOVE

Male	M	M	M	M	M	M	M	M	M	M	M	M
Female	F	F	F	F	F	F	F	F	F	F	F	F

B.2 How long has *[NAME]* been away in the past 12 months ?

Never	1	1	1	1	1	1	1	1	1	1	1	1
Less than 6 months	2	2	2	2	2	2	2	2	2	2	2	2
6 months or more	3	3	3	3	3	3	3	3	3	3	3	3

B.3 Who contributes most to the household income ? *Interviewer, check one member*

○	○	○	○	○	○	○	○	○	○	○	○

B.4 In the absence of the head, who is making decisions for the household ? *Skip if 1 member household*

○	○	○	○	○	○	○	○	○	○	○	○

B.5 What is *[NAME]*'s relationship to the head of the household

Head	1	1	1	1	1	1	1	1	1	1	1	1
Spouse	2	2	2	2	2	2	2	2	2	2	2	2
Child	3	3	3	3	3	3	3	3	3	3	3	3
Parent	4	4	4	4	4	4	4	4	4	4	4	4
Other relative	5	5	5	5	5	5	5	5	5	5	5	5
House help	6	6	6	6	6	6	6	6	6	6	6	6
Not related	7	7	7	7	7	7	7	7	7	7	7	7

B.6 AGE at last birthday (in years)

Fill 00 if under 1 year old.

Begin with 0 for ages <=9. Fill 99 for all ages > 99

0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2	2 2
3 3	3 3	3 3	3 3	3 3	3 3	3 3	3 3	3 3	3 3	3 3	3 3
4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4	4 4
5 5	5 5	5 5	5 5	5 5	5 5	5 5	5 5	5 5	5 5	5 5	5 5
6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6	6 6
7 7	7 7	7 7	7 7	7 7	7 7	7 7	7 7	7 7	7 7	7 7	7 7
8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8
9 9	9 9	9 9	9 9	9 9	9 9	9 9	9 9	9 9	9 9	9 9	9 9

B.7 Marital Status

Single / Never Married	1	1	1	1	1	1	1	1	1	1	1	1
Living together	2	2	2	2	2	2	2	2	2	2	2	2
Married (monogamous)	3	3	3	3	3	3	3	3	3	3	3	3
Married (polygamous)	4	4	4	4	4	4	4	4	4	4	4	4
Divorced /Separated	5	5	5	5	5	5	5	5	5	5	5	5
Widowed	6	6	6	6	6	6	6	6	6	6	6	6

Reference Number ☐☐☐☐☐☐☐☐☐

C - EDUCATION

School Codes
00 Pre Primary
01 P1
02 P2
03 P3
04 P4
05 P5
06 P6
07 JSS1
08 JSS2
09 JSS3
10 M1
11 M2
12 M3
13 M4
14 SSS1
15 SSS2
16 SSS3
17 S1
18 S2
19 S3
20 S4
21 S5
22 L6
23 U6
24 Vocational/ Technical/ Commercial.
25 Teacher training
26 Nursing
27 Post secondary

MEMBER NUMBER	1	2	3	4	5	6	7	8	9	10	11	12
C.1 Can *[NAME]* read and write ? (Members 15 and older only)												
YES	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ
NO	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ
C.2 Has *[NAME]* ever attended school?												
YES	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ
NO (Go to next section)	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ
C.3 What is the highest grade *[NAME]* completed ? *Indicate last or latest year's level for members currently in school.*												
	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐
	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪
	①①	①①	①①	①①	①①	①①	①①	①①	①①	①①	①①	①①
	②②	②②	②②	②②	②②	②②	②②	②②	②②	②②	②②	②②
	③③	③③	③③	③③	③③	③③	③③	③③	③③	③③	③③	③③
	④④	④④	④④	④④	④④	④④	④④	④④	④④	④④	④④	④④
	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤
	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥
	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦
	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧
	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨
C.4 Did *[NAME]* attend school last year ?												
YES	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ
NO	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ
C.5 Is *[NAME]* currently in school ? *(Skip to C.9 if NO)*												
YES	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ
NO (Go to C.9)	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ
C.6 What is the current level *[NAME]* is attending ? *(see school codes)*												
	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐
	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪	⓪⓪
	①①	①①	①①	①①	①①	①①	①①	①①	①①	①①	①①	①①
	②②	②②	②②	②②	②②	②②	②②	②②	②②	②②	②②	②②
	③③	③③	③③	③③	③③	③③	③③	③③	③③	③③	③③	③③
	④④	④④	④④	④④	④④	④④	④④	④④	④④	④④	④④	④④
	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤	⑤⑤
	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥	⑥⑥
	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦	⑦⑦
	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧	⑧⑧
	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨	⑨⑨
C.7 Who runs the school *[NAME]* is attending ?												
Government	①	①	①	①	①	①	①	①	①	①	①	①
Church/Religious Organization	②	②	②	②	②	②	②	②	②	②	②	②
Private	③	③	③	③	③	③	③	③	③	③	③	③
Community	④	④	④	④	④	④	④	④	④	④	④	④
Other	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤
C.8 Did *[NAME]* meet any problems with the school ? *Interviewer probe respondent and estimate answer. SKIP TO NEXT SECTION* *Interviewer you may mark more than one answer*												
No problem (Satisfied)	①	①	①	①	①	①	①	①	①	①	①	①
Lack of books/supplies	②	②	②	②	②	②	②	②	②	②	②	②
Poor teaching	③	③	③	③	③	③	③	③	③	③	③	③
Lack of teachers/Overcrowding	④	④	④	④	④	④	④	④	④	④	④	④
Facilities in bad condition	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤
Other problem	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥
C.9 If *[NAME]* is not currently in school (see C.5), explain why. *Interviewer you may mark more than one answer*												
Not of school age/Completed school	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ
Too far away	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ
Too expensive/Cannot afford	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ
Is working (home or job)	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ
School is useless/uninteresting	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ
Illness	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ
Pregnancy	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ
Failed exam	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ
Got married	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ
Other__________	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ

D - HEALTH

MEMBER NUMBER	1	2	3	4	5	6	7	8	9	10	11	12
D.1 Is *[NAME]* physically or mentally handicapped or disabled ? *Include member only if handicap prevents him/her from undertaking a significant activity or schooling*												
YES	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
NO	N	N	N	N	N	N	N	N	N	N	N	N
D.2 Is/was *[NAME]* currently or recently pregnant (less than 6 months ago) ?												
Currently pregnant	1	1	1	1	1	1	1	1	1	1	1	1
Was pregnant less than 6 months ago	2	2	2	2	2	2	2	2	2	2	2	2
D.3 What kind of care does/did *[NAME]* receive during/after pregnancy? *Interviewer, you may mark more than one answer*												
Pre/Post natal care	1	1	1	1	1	1	1	1	1	1	1	1
Delivery care	2	2	2	2	2	2	2	2	2	2	2	2
D.4 Was *[NAME]* unable to engage in normal activities (work, school, taking care of family) because he/she was sick/injured in the past 4 weeks? *(Skip to D.7 if NO)*												
YES	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
NO (Go to D.7)	N	N	N	N	N	N	N	N	N	N	N	N
D.5 What sort of sickness/injury did *[NAME]* suffer? *Interviewer, you may mark more than one answer*												
Fever/Malaria	1	1	1	1	1	1	1	1	1	1	1	1
Diarrhoea/Gastro Intestinal	2	2	2	2	2	2	2	2	2	2	2	2
Accident/ Injury	3	3	3	3	3	3	3	3	3	3	3	3
Cereb. Spin. Menengitis	4	4	4	4	4	4	4	4	4	4	4	4
Dental	5	5	5	5	5	5	5	5	5	5	5	5
Skin condition	6	6	6	6	6	6	6	6	6	6	6	6
Eye	7	7	7	7	7	7	7	7	7	7	7	7
Ear Nose and Throat	8	8	8	8	8	8	8	8	8	8	8	8
Other__________	9	9	9	9	9	9	9	9	9	9	9	9
D.6 How many days did *[NAME]* miss from work/school due to illness in the past 4 weeks?												
None	1	1	1	1	1	1	1	1	1	1	1	1
1 week or less	2	2	2	2	2	2	2	2	2	2	2	2
1 to 2 weeks	3	3	3	3	3	3	3	3	3	3	3	3
More than 2 weeks	4	4	4	4	4	4	4	4	4	4	4	4
D.7 Has *[NAME]* consulted a doctor, nurse, pharmacist, health professional, dentist or traditional healer for any reason during the past 4 weeks? *(Skip to D.11 if NO)*												
YES	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
NO (Go to D.11)	N	N	N	N	N	N	N	N	N	N	N	N
D.8 What kind of health provider did *[NAME]* see ?												
Public Hospital / Clinic	1	1	1	1	1	1	1	1	1	1	1	1
Community Health Center	2	2	2	2	2	2	2	2	2	2	2	2
Private Hospital / Clinic	3	3	3	3	3	3	3	3	3	3	3	3
Private doctor/dentist	4	4	4	4	4	4	4	4	4	4	4	4
Missionary Hospital	5	5	5	5	5	5	5	5	5	5	5	5
Pharmacist/Drugstore/Chemist	6	6	6	6	6	6	6	6	6	6	6	6
Traditional Healer	7	7	7	7	7	7	7	7	7	7	7	7
Other__________	8	8	8	8	8	8	8	8	8	8	8	8
D.9 How many times did *[NAME]* use the service in the past 4 weeks?												
1 to 3	1	1	1	1	1	1	1	1	1	1	1	1
4 to 6	2	2	2	2	2	2	2	2	2	2	2	2
More than 6	3	3	3	3	3	3	3	3	3	3	3	3
D.10 Did *[NAME]* meet any problems at the time of the visit ? *Interviewer, probe respondent and estimate answer* *Interviewer, you may mark more than one answer*												
No problem (Satisfied)	1	1	1	1	1	1	1	1	1	1	1	1
Facilities were not clean	2	2	2	2	2	2	2	2	2	2	2	2
Long waiting time	3	3	3	3	3	3	3	3	3	3	3	3
No trained professionals	4	4	4	4	4	4	4	4	4	4	4	4
Too expensive	5	5	5	5	5	5	5	5	5	5	5	5
No drugs available	6	6	6	6	6	6	6	6	6	6	6	6
Treatment unsuccessful	7	7	7	7	7	7	7	7	7	7	7	7
Other	8	8	8	8	8	8	8	8	8	8	8	8
D.11 If *[NAME]* did not use medical care in the past 4 weeks, explain why. *Interviewer, you may mark more than one answer*												
No need	1	1	1	1	1	1	1	1	1	1	1	1
Too expensive	2	2	2	2	2	2	2	2	2	2	2	2
Too far	3	3	3	3	3	3	3	3	3	3	3	3
Other	4	4	4	4	4	4	4	4	4	4	4	4

E - EMPLOYMENT

Reference Number ☐☐☐☐☐☐☐☐☐

MEMBER NUMBER	1	2	3	4	5	6	7	8	9	10	11	12

(5 years and older)

E.1 Mark here members who are 5 years or older and continue with these members *(refer to age on page 2)*

	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤

E.2 What was *[NAME]*'s main work status during the past 4 weeks?

Unemployed/Child not in school	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ
Employer	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ
Own Account Worker	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ
Regular Employee	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ	Ⓓ
Casual Employee	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ	Ⓔ
Unpaid Family Worker/Homemaker	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ
House help	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ	Ⓖ
Student/Apprentice	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ	Ⓗ
Pensioner	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ	Ⓘ
Investor	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ	Ⓙ

E.3 Has *[NAME]* been looking for work in the past 4 weeks ?

YES	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ	Ⓨ
NO	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ

E.4 Has *[NAME]* been working full time (roughly 5 full days a week) or part time during the past 4 weeks?

Part time work means either number of days worked per week is less than 5 or number of hours worked per day is less than 8

Full time	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ	Ⓕ
Part time	Ⓟ	Ⓟ	Ⓟ	Ⓟ	Ⓟ	Ⓟ	Ⓟ	Ⓟ	Ⓟ	Ⓟ	Ⓟ	Ⓟ
Not currently working	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ	Ⓝ

E.5 If *[NAME]* was working part time during the past 4 weeks or is not currently working, explain the main reason why.

No need / Too old	①	①	①	①	①	①	①	①	①	①	①	①
No work available	②	②	②	②	②	②	②	②	②	②	②	②
Sick	③	③	③	③	③	③	③	③	③	③	③	③
Student	④	④	④	④	④	④	④	④	④	④	④	④
Working in home/holding	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤
Other	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥

E.6 What industry was *[NAME]* mainly working in during the past 4 weeks ?

Agriculture, Forestry and Fishing	①	①	①	①	①	①	①	①	①	①	①	①
Mineral Industries	②	②	②	②	②	②	②	②	②	②	②	②
Construction industries	③	③	③	③	③	③	③	③	③	③	③	③
Manufacturing	④	④	④	④	④	④	④	④	④	④	④	④
Transportation/ communications/utilities	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤
Wholesale trade	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥
Retail trade	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦
Financial, Insurance, Real Estate	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧
Service industries	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨

E.7 What sector was *[NAME]* mainly working in during the past 4 weeks?

Public	①	①	①	①	①	①	①	①	①	①	①	①
Private Formal	②	②	②	②	②	②	②	②	②	②	②	②
Private Informal	③	③	③	③	③	③	③	③	③	③	③	③
Parastatal/Semi-Public	④	④	④	④	④	④	④	④	④	④	④	④

F - HOUSEHOLD ASSETS

F.1 Does the household or a household member own this dwelling ?

Own the dwelling	1
Does not own and pays rent	2
Uses dwelling without paying rent	3

F.2 How many separate rooms are there in your dwelling?

	0	1	2	3	4	5	6	7	8	9
	0	1	2	3	4	5	6	7	8	9

F.3 How many acres of land are owned by the household (with 1 decimal , e.g 24.7) ?

	0	1	2	3	4	5	6	7	8	9
	0	1	2	3	4	5	6	7	8	9
●	0	1	2	3	4	5	6	7	8	9

F.4 How does the amount of land owned compare with one year ago?

N/A	1
Same now	2
Less now	3
More now	4
Don't know	5

F.5 Does the household operate land it does not own?

N/A	1
Rented	2
Sharecropped	3
Private land provided free	4
Open access land	5

F.6 Number of acres of non-owned land the household operates.

	0	1	2	3	4	5	6	7	8	9
	0	1	2	3	4	5	6	7	8	9
●	0	1	2	3	4	5	6	7	8	9

F.7 How does the amount of land operated but not-owned compare with one year ago?

N/A	1
Same now	2
Less now	3
More now	4
Don't know	5

F.8 How many heads of cattle and other large livestock are owned currently by the household?

	0	1	2	3	4	5	6	7	8	9
	0	1	2	3	4	5	6	7	8	9
	0	1	2	3	4	5	6	7	8	9

F.9 How does this number of livestock compare to the number one year ago?

N/A	1
Same now	2
Less now	3
More now	4
Don't know	5

F.10 How many sheep, goats and other medium size animals are owned currently by the household?

	0	1	2	3	4	5	6	7	8	9
	0	1	2	3	4	5	6	7	8	9
	0	1	2	3	4	5	6	7	8	9

F.11 How does this number of animals compare with one year ago?

N/A	1
Same now	2
Less now	3
More now	4
Don't know	5

F.12 Does the household own any of the following ? *Interviewer: include items only if they are in working order*

	Owned and more than 1 year old	Owned and 1 year old or less
Electric Iron	A	A
Refrigerator	B	B
Television	C	C
Video deck	D	D
Radio	E	E
Stereo system	F	F
Mattress or bed	G	G
Watch or clock	H	H
Sewing machine	I	I
Modem stove	J	J
Bicycle	K	K
Motorcycle	L	L
Car or truck	M	M

G - HOUSEHOLD AMENITIES

Reference Number ☐☐☐☐☐☐☐☐☐

G.1 What is the material of the roof of the house ?

- Mud 1
- Thatch 2
- Wood 3
- Iron sheets 4
- Cement / concrete 5
- Roofing tiles 6
- Asbestos 7
- Other________ 8

G.2 What is the material of the walls of the house ?

- Mud/Mud bricks 1
- Stone 2
- Burnt bricks 3
- Cement / Sandcrete 4
- Wood / Bamboo 5
- Iron sheets 6
- Cardboard 7
- Other 8

G.3 What is the main source of drinking water?

- Piped into dwelling or compound 1
- Public outdoor tap 2
- Borehole 3
- Protected well 4
- Unprotected well 5
- River, lake, pond 6
- Vendor, truck 7
- Other______________ 8

G.4 What kind of toilet facility does your household use?

- None (bush) 1
- Flush toilet (WC) 2
- Pan/Bucket 3
- Covered pit latrine 4
- Uncovered pit latrine 5
- K V I P 6
- Other____________ 7

G.5 What is the main source of cooking fuel?

- Firewood 1
- Charcoal 2
- Kerosine/Oil 3
- Gas 4
- Electricity 5
- Crop residue/Sawdust 6
- Animal waste 7
- Other 8

G.6 What is the main source of lighting fuel?

- Kerosine/Paraffin 1
- Gas 2
- Electricity 3
- Candles 4
- Firewood 5
- Other____________ 6

G.7 How long does it take from here to reach the nearest:

A. supply of drinking water?

- Near the dwelling 1
- 10 Minutes 2
- 20 Minutes 3
- 30 Minutes 4
- 40 Minutes 5
- 50 Minutes 6
- 60 Minutes or more 7

B. Food Market *Interviewer code to nearest 10 minutes*

- Near the dwelling 1
- 10 Minutes 2
- 20 Minutes 3
- 30 Minutes 4
- 40 Minutes 5
- 50 Minutes 6
- 60 Minutes or more 7

G.7 How long does it take from here to reach the nearest:

C. Public transportation

- Near the dwelling 1
- 10 Minutes 2
- 20 Minutes 3
- 30 Minutes 4
- 40 Minutes 5
- 50 Minutes 6
- 60 Minutes or more 7

Include average waiting period if applicable.

D. Primary School *Interviewer code to nearest 10 minutes*

- Near the dwelling 1
- 10 Minutes 2
- 20 Minutes 3
- 30 Minutes 4
- 40 Minutes 5
- 50 Minutes 6
- 60 Minutes or more 7

E. Secondary School

- Near the dwelling 1
- 10 Minutes 2
- 20 Minutes 3
- 30 Minutes 4
- 40 Minutes 5
- 50 Minutes 6
- 60 Minutes or more 7

F. Health clinic or hospital

- Near the dwelling 1
- 10 Minutes 2
- 20 Minutes 3
- 30 Minutes 4
- 40 Minutes 5
- 50 Minutes 6
- 60 Minutes or more 7

H - POVERTY PREDICTORS

H.1 Does the household use toilet paper rolls?	YES Y NO N	***H.7 How many times was a meal w/ meat prepared in your hhld in the past week? (exclude fish and chicken)***	0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
H.2 Does the household use toothbrush and toothpaste ?	YES Y NO N	***H.8 Can your household afford 2 decent meals per day ?***	YES Y NO N
H.3 Does the household use packaged soap for bathing?	YES Y NO N	***H.9 Can your household afford decent clothing ?***	YES Y NO N
H.4 Can the household afford transport on a regular, as needed basis ?	YES Y NO N	***H.10 Does the household have access to drinking water for the most part of the year ?***	YES Y NO N
H.5 Do you have any savings or easily convertible assets ?	YES Y NO N	***H.11 Do you owe individuals and/or intitutions (Banks, schools etc.) for which you are unable to pay despite constant reminders?***	YES Y NO N
H.6 Can you afford medical care (doctor/dentist) and medication on a regular, as needed basis ?	YES Y NO N		

I - CHILD ROSTER (Children under 5)

I.1 Enter Here the child number from the household roster / Enter mother number to the right of each child number

Enter 00 if the child's mother is deceased or is not a member of the household

		MOTHER NUMBER				MOTHER NUMBER				MOTHER NUMBER				MOTHER NUMBER	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

I.2 Enter the child's date of birth

D	D	M	M	Y	Y	D	D	M	M	Y	Y	D	D	M	M	Y	Y	D	D	M	M	Y	Y
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2		2	2	2	2	2		2	2	2	2	2		2	2	2	2	2		2	2	2
3	3		3	3	3	3	3		3	3	3	3	3		3	3	3	3	3		3	3	3
	4		4	4	4		4		4	4	4		4		4	4	4		4		4	4	4
	5		5	5	5		5		5	5	5		5		5	5	5		5		5	5	5
	6		6	6	6		6		6	6	6		6		6	6	6		6		6	6	6
	7		7	7	7		7		7	7	7		7		7	7	7		7		7	7	7
	8		8	8	8		8		8	8	8		8		8	8	8		8		8	8	8
	9		9	9	9		9		9	9	9		9		9	9	9		9		9	9	9

I.3 What was the place of child delivery ?

Hospital / Maternity	1	1	1	1
At home	2	2	2	2
Other ______________	3	3	3	3

I.4 Who delivered the child ?

Doctor	1	1	1	1
Nurse	2	2	2	2
Midwife	3	3	3	3
T.B.A	4	4	4	4
Self	5	5	5	5

I.5 What is the child's weight (in kilos, with one decimal point, i.e 4.6 kilos) and height (in cm, with one decimal point, i.e 24.8 cm)

WEIGHT			HEIGHT				WEIGHT			HEIGHT				WEIGHT			HEIGHT				WEIGHT			HEIGHT			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

I.6 Did the child participate in the following ?

Nutrition program	1	1	1	1
Weigh-ins	2	2	2	2

A.13 Result Code

Completed w/ selected household	1
Completed with replacement household because of refusal	2
Completed with replacement household because not found	3
Partially completed	4

A.14 Has a supplemental form been used (HH has more than 12 members)

YES Ⓨ
NO Ⓝ

A.15 Enter time now

H		0 1
H		0 1 2 3 4 5 6 7 8 9
M		0 1 2 3 4 5
M		0 1 2 3 4 5 6 7 8 9

Ⓐ AM Ⓟ PM