

# HOUSING AND HEALTH

## THE RELATIONSHIP BETWEEN THE RESIDENTIAL ENVIRONMENT AND THE HEALTH STATUS OF HOUSEHOLDS

A STUDY OF JERICHO ESTATE, UMOJA ESTATE, AND LINDI VILLAGE

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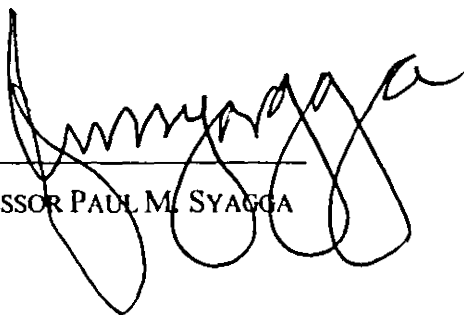
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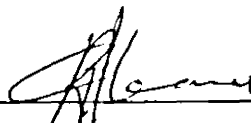
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# **DEDICATION**

**TO MY FAMILY KYALO, NZIOKI AND KAMAU**

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## OPERATIONAL DEFINITIONS

***Housing/residential environment:*** - "the physical structure that uses for shelter and the environs of that structure including all necessary services, facilities, equipment and devices needed or desired for the physical and mental health and social well-being of the family and individual".

***Health:*** - "a state of complete physical, mental and social well being and not merely the absence of diseases or infirmity".

***Pathogen:*** - A pathogen or pathogenic organism is an organism that causes diseases.

***Endemic:*** - The constant presence of diseases or infectious agent within a given geographic area. It also refers to the usual presence of a given disease within a given area.

***Household:*** - This refers to a person or group of persons who live together under one or several roofs in the same compound, who share the same budget and are answerable to the same head.

***Household-head:*** - This refers to the head of particular household. It may be a male or female-headed household.

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## ABSTRACT

Provision of shelter in all its different forms is a major problem in many urban areas of the developing countries. In Kenya the housing problem in urban areas has reached alarming proportions. The country has experienced rapid growth in its urban population without the corresponding expansion in public provision. The result is that in almost every urban centre, Nairobi, the capital city being the most affected, many people live in poor housing neighbourhoods with relatively little or no provision of the infrastructure, services and facilities that are essential for health. Though the public and private sectors have made attempts to increase the supply of adequate and affordable housing, this has not been sufficient due to the rapid population growth and deteriorating economic conditions. This has led to the proliferation and increase in size of informal settlements that are characterized by poor housing conditions, inadequate services and overcrowding. The once well-planned, middle-income housing estates are also characterized by similar problems such as overcrowding, deteriorating housing and living conditions, and inadequate infrastructural services. These poor and unhygienic living conditions impose a heavy burden on the residents. The morbidity rates caused by diseases stemming from environmental conditions are significantly on the increase.

This study examines housing conditions and the state of residential environment and how they affect the health of the inhabitants. Various inadequacies in housing and the residential environment of the study areas were found to have an influence on the health status of the residents. Residents living in poor housing in a deplorable residential environment have higher morbidity rates than residents living in good quality housing and cleaner residential environments. The intra-urban differences in the health status of the residents stemmed mainly from the inadequacies in housing and the residential environment. It is therefore important to ensure that the conditions that increase the resident's susceptibility to the environment-related diseases are minimised. This would also ensure that the country has a productive and healthy population and health population for development purposes. To contribute positively towards the goal of "Health for All", every effort should be made to improve the living environment and economic conditions.

# CHAPTER ONE

## INTRODUCTION AND PROBLEM STATEMENT

### 1.1 INTRODUCTION

Rapid urbanisation and the concentration of the urban population into cities that are sprawling into wider geographical areas are among the most significant transformations of human settlements. The rapid rate of urbanisation in many Third World cities is putting enormous strains on the institutional and natural resources that support them. Coupled with rapid growth in urban populations, estimated at 3.5% per year in the developing world as opposed to less than 1% in the more developed regions has made the situation worse (World Resources Institute, 1996). Urbanisation is at the very heart of development and has been associated with economic and social progress, yet along with the benefits of urbanisation come environmental and social ills. These changes bring vast implications for human well being and the environment. This can be in the way people live, the quality of the water they drink, the air they breathe and the housing in which they live. As a result, some of the environmental problems experienced in urbanised cities and those in the urbanisation process are of staggering proportions. These changes may have negative or positive implications for the health of city resident (World resourced Institute, 1996).

The rate of urbanisation has been rapid. In 1948 there were 17 towns with a population of 276,240 representing 5.1% of the total population. By 1989, however, the number of towns had risen to 139 with a population representing 18.1% of the total population. This trend is likely to be maintained. Sessional Paper No. 1 of 1986 on "Economic Management for Renewed Growth" estimates that by the year 2000, the urban population will reach 9 million (over 25% of the total population) compared to only 3 million (15% of the total population) in 1984 (GOK 1986). However due to the slow growth of the economy, the country has not managed to develop the necessary institutional and infrastructural capacity to sustain the large urban population. Nairobi the capital city is considered as one of the world's most rapidly growing city with indicators of chronic overcrowding in human settlement areas (UNCHS-Habitat, 1996). There is also a serious service squeeze in urban centres. It is estimated that 47% of Kenya's urban population lives in very low-income neighbourhoods and 30-40% of them are estimated to be absolutely poor (Malombe, 1996). These people have been forced into unplanned and

uncontrolled settlements on the outskirts of the city or into more crowded living space in an already deteriorating housing stock in established high density areas. The result is that only a small proportion of the urban population has direct access to clean piped water, regular collection of garbage and good health services.

Provision of shelter for protection of occupants from weather elements and the creation of an enclosed environment in which man can be safe has been a primary concern of man for a long period of time. The relationship of shelter to health is made both intimate and complex by a myriad of factors interwoven in physical, socio-cultural and economic environments as well as the nature and severity of major health problems (WHO, 1987). Many communicable diseases are related to poor environmental conditions such as contaminated water supply, inadequate waste disposal, excessively cold and draughty houses and overcrowding among others. These factors, which may be detrimental to human health, are found within the residential environment. The house should therefore not be viewed narrowly as only the physical structures otherwise the health-housing links are not identified. This link only becomes apparent when considering the impact on health of the physical environment provided by the house, the services and facilities it contains and its surroundings (Satterwaite and Hardoy, 1987). They further say that the importance of housing to health has been dismissed while stress has been laid on a sufficient and safe domestic water supply, hygienic food storage practices, washing and personal hygiene and the hygienic disposal of human waste. These aspects are treated as if they will not be related to housing. The World Health Organisation, also recognised this important aspects and thus WHO's "Expert Committee on Public Health Aspects of Housing" in Geneva recommended substituting the term "housing" with "residential environment" which was defined as *"the physical structure that man uses for shelter and the environs of that structure including all necessary services, facilities, equipment and devices needed or desired for the physical and mental health and social well-being of the family and individual"* (WHO,1961, pp 6). Housing is therefore intimately related to health, though the relationship is complex. Adequate housing of minimum acceptable standard contributes directly to improved health and productivity, which are important for the economic development of any country. At its best, appropriate housing promotes physical and mental health (WHO, 1989).

This has been recognised in various government policies in Kenya. For example the first comprehensive housing policy for Kenya enunciated in 1966/67 as Sessional paper No. 5 stressed the aim of the government *"to provide the maximum number of people with*

*adequate shelter and a healthy environment at the lowest possible cost" (GOK, 1966).* The 1969-74 Development Plan also puts forward a policy of "Decent Housing" for all where it is the prime objective of the government to move towards a situation where every family will live in a decent home providing the basic standards of health, privacy and security (GOK, 1969). The policy goal has not changed although a little has been achieved due to other factors. The country has been faced with economic hardships and rapid population growth coupled with increased rural-urban migration. These factors, among others, have considerably strained the provision of decent housing, leading to overcrowding, unplanned and haphazard developments, dirty residential environments and the emergence of slums in most urban areas.

## **1.2 PROBLEM STATEMENT**

Various studies carried out in Kenya indicate that in many urban areas in the country, there is overcrowding, unauthorised construction of unplanned dwelling units, use of unsuitable materials and poor design, lack of basic infrastructure, low standards of the environment, heaps of uncollected garbage and danger of epidemic diseases, (Wangombe, 1996, Syagga et al, 1995, DSA, 1992, AMREF, 1992, Lamba, 1994, Gatabaki-Kamau, 1995). The conditions are worst in the vast slum areas found in most towns in Kenya. Nairobi the capital city being the most affected. These conditions represent some of the most obvious manifestations of the serious environmental health problems affecting the urban population.

The overall impact of the above has been evident in the huge backlog of unfulfilled housing needs in urban areas. Due to this, the population has the option of doubling up and overcrowding in the few available housing units with dire consequences on health (Syagga et al, 1995). Half of Nairobi's population lives in informal settlements lacking basic infrastructure, services and legal recognition. The informal settlements range in size from small squatter villages to crowded slums of 50,000 people or more (Lamba, 1994). Access to safe drinking water in Kenya's low-income and high population density areas is poor. In terms of sanitation, it is estimated that 94% of the population in informal settlements do not have access to adequate sanitation (GOK, 1995). On average 1 pit latrine is shared by approximately 50 people (Lamba, 1994). These conditions increase the risk of epidemics by providing breeding grounds for diseases causing vectors. In



Nairobi a significant amount of morbidity is related to poor sanitation and lack of water (Munguti, 1996).

The five leading causes of diseases in Kenya causing high morbidity rates are environmentally related. These are malaria (27%), respiratory infections (23%), skin infections (9%), intestinal worms (4%), and diarrhoeal diseases (4%). These diseases also account for 76% of all new cases reported in government health facilities (GOK, 1991). In a study conducted on formulating a strategic health plan for Nairobi in 1992, it was found that cases of diarrhoea, intestinal worms, and skin infections could be greatly reduced by environmental improvements and health education (DSA, 1992). The lack of sanitary services has led to environmental hazards through improper disposal of wastes causing environmental pollution and creating conditions conducive for the spread of diarrhoeal and other water-borne diseases. An adequate supply of water, which is important for the protection against and to overcome trachoma, skin infections and gastro-enteric diseases, is lacking in most low-income settlements in Nairobi exposing the inhabitants to the possibility of contracting these diseases.

AMREF (1992) reports that children of the slums are frequently ill and those less than five years old have on average 11 episodes of diarrhoea per year. The 1992 Rapid Assessment Report on child survival in Nairobi's slums further found a high incidence of diarrhoea. In the two weeks prior to the survey, mothers reported that 44% of the children had experienced diarrhoea (AMREF, 1992). Other common ailments include worm infestations, acute respiratory problems, and skin disorders. The "sick environment" witnessed in Kenya's urban areas where there is uncollected garbage, untreated drinking water, increasing substandard housing and overcrowding are some of the major contributing factors which undermine people's health. This also largely explains why the leading cause of morbidity in urban areas is socio-environmentally related (Munguti, 1996).

These housing-health related problems are not only experienced in the slum areas. The city estates have not been spared from these woes. A resident of the Nyayo High-rise flats in Nairobi, comments, "Many families have in the past complained of stomach-ache and other health complications as a result of using the water" (Kenya times, 12<sup>th</sup> July 1996, pg13). The taps in this estate are normally dry and the people have to buy water from water vendors from the nearby Kibera slum. However, despite the high cost of this water said to go for between 10 - 20 Ksh per 25-litre jerry can, it is not safe for human consumption. In another article further depicting the woes of city dwellers it was

reported that a three-year-old boy died as a result of drinking water the mother had bought from a hawker. Four other members of the same family were admitted to Kenyatta National Hospital in serious conditions (Kenya Times 12<sup>th</sup> July 1996). This shows the grievous nature of the problem. Diarrhoeal diseases such as cholera and typhoid are reportedly on the increase. This comes as no surprise because the City Council has never made a serious or systematic attempt to provide an adequate water supply, sanitation, drainage, health care or other services in poverty areas. Lamba (1994) says that apart from limited water connections, the Nairobi City Council has never provided these facilities and services in the fear that provision of these would confer legitimacy and legality to their existence. The city authorities thus neglect to serve all its citizens equitably.

Health problems related to the residential environment have not just begun but have been with us since the pre-colonial years. In the colonial days, nobody cared about the housing condition of the African village and Indian bazaar where there was acute overcrowding. The site was also badly drained resulting in disease such as malaria and gastro-intestinal disease being a common occurrence in the Indian bazaar. The slums contained dark, damp, unventilated and overcrowded buildings, which were situated on filth, soaked and rubbish strewn grounds (Kingorriah, 1987). These conditions resulted in a break up of a plague epidemic in 1902 that killed 50 people. The Nairobi Municipal Committee then burned down the old Bazaar. Another slum developed and in 1904, another plague broke out. This and other epidemics of Malaria and gastric diseases were recorded all over. During this time the European settlements were not left out. From that time onwards there was an attempt to deal with the public health problems occasioned by housing conditions in the Indian Bazaar (Kingorriah, 1987).

Data obtained from the Nairobi City Council dispensaries and health centres for the period 1969-72 showed a preponderance of respiratory tract infections followed by Alimentary Tract Infections and Helminthiasis which is a faecal-oral diseases caused by worms. The data that was available (covering about 90% of the lower and middle income groups) showed that the major public health problems in the city arise from diseases that thrive and spread due to poor sanitation, overcrowding, illiteracy and low standards of social ethics. The major causes of morbidity in children were Respiratory infections and diarrhoeal diseases (Vogel et al, 1974). Another study carried out in 1992 by Development Solutions fore Africa, epidemiologically ranked the major environmentally determined diseases. It indicated that Respiratory Infections are responsible for 30% of

all environmentally caused diseases and being air-borne are readily transmitted in low-income residential areas where overcrowding in single rooms is a major public health hazard. Diarrhoeal diseases that are responsible for a further 12% are caused by poor sanitary conditions, especially the shortage of latrines and clean water, while skin disorders accounted for 8% (DSA, 1992).

These examples evidently indicate that the health problems arising from the residential environment have been in existence for a long time and are still bearing a heavy toll on the health of urban dwellers. It is now 20 years since Kenya endorsed the Primary Health Care Strategy for achieving the objective of "Health for All by the year 2000" at the Alma Ata Conference in the Soviet Union. However the government has not achieved this goal. Thus there is need to focus on environmental conditions that aggravate these health problems as one of the means through which the goal of providing health for all can be achieved.

The poor construction standards and flammable materials used in many slum and squatter settlements in our city further expose the inhabitants to injury and sometimes death. The problem is compounded further by overcrowding where more than one family or at times up to ten people share a single room (Kunguru and Mwiraria, 1991). The inaccessibility of these sites due to few, narrow and impassable roads lead to serious injuries and/or loss of life in the event of accidental fires. The following are excerpts from newspaper articles that show the extent of injuries inflicted and problems of homelessness suffered by the slum dwellers as a result of fires.

*"...Three people were yesterday injured and more than 400 left homeless when fire swept through 20 houses at Mashimoni", (Sunday Nation, 25th August 1996, pg20)*

*"Three children were burnt to death while their mother was seriously injured after their house caught fire in Nairobi's Kibera slum village". The report further said "...It was reportedly difficult to save the children as their house is located in an impassable area", attributed to Dr Michael Wanga of Kibera clinic, (Daily Nation 7<sup>th</sup> February 1996).*

Once homeless these people are exposed to hazardous living places and lifestyles, which may directly and adversely affect their health and well-being. They also remain disproportionately vulnerable to infection. Homelessness confers exposure to bacterial and viral infection, susceptibility to respiratory and skin diseases and added risks to stressful living (Smith, 1989). Apart from accidental fires, evictions are a common

occurrence for slum dwellers. Many evictions in Nairobi are carried out in the presence of administration police and incidents occur where scuffles between the police and slum dwellers end up in injuries. Many evictions world over are violent, with injuries and accidental deaths being part of the eviction process (UNCHS-Habitat, 1996). Exposure to the cold especially in the night affects the young children who end up getting colds and being exposed to the risk of getting pneumonia. The unsanitary conditions also result in a high incidence of diarrhoea, the young being the highest risk group.

Evidence also shows that homeless women are twice as likely to experience difficulties in pregnancy and three times more likely to be admitted in hospital during pregnancy than their better housed counterparts (Lowry, 1989). In a recent incident it was reported that "a woman had a miscarriage on Wednesday night because of chilly weather", (Daily Nation 23<sup>rd</sup> August 1996 pg28). This was as a result of the demolition of the Mukuru Kwa Njenga Village in Embakasi, Nairobi.

Though the Government of Kenya recognises that well planned housing of reasonable standards promotes health and increases productivity, there is no clear policy statement relating housing to the health conditions of occupants. The 1969-74 Development Plan puts forward a policy of "Decent Housing" for all in the following words: "*The prime objective of the government policy on housing is to move towards a situation where every family in Kenya will live in a decent home whether privately built or state sponsored, which provides at least the basic standards of health, privacy and security*". However this has not been achieved. One need not go to the slum areas to see this as some parts of the city centre are lined with garbage while the back streets are overflowing with dirt. The once well planned housing estates such as *BuruBuru*, *Donholm*, and *Golf Course* have not been left out as uncollected garbage lies all over, with blocked or broken down sewers in some areas threatening the health of the people they are meant to serve. The 1983 Urban Housing Survey revealed the extent of the so-called illegal or substandard housing in Kenya. For example, it showed that 75% of houses in Nairobi did not have durable walls and only a quarter had flush toilets. The situation has not changed much meaning that most residents of Nairobi live in dwellings that do not offer them adequate protection from climatic elements and may expose them to conditions, which make them more susceptible to diseases arising from the living conditions. This calls for urgent action to be taken to ensure that diseases caused by poor environments are reduced so as to avoid a situation where they would end up being endemic.

There is therefore need to have a strong policy statement relating housing to health and the empowerment of an institution which will ensure that the maximum health benefits are achieved through housing improvements. Though the housing policy was recently reviewed, little attention was paid to this issue. The Urban Housing Indicators Programme touched on issues such as child mortality, number of hospital beds, water and sewage connections, etc. but did not give a good insight into the health problems arising from the residential environment conditions prevalent in urban centres in Kenya today. The time to address these problems seriously is running out if the twin goals of equitable development and sustainable human settlements are to be achieved.

### **1.3 OBJECTIVES**

This study aims at investigating the association between housing, the residential environment and the health status of households. In order to investigate this association, the following will be the specific study objectives.

1. To investigate the housing conditions, the available services and facilities in the study areas.
2. To find out the health problems suffered by the residents in the study areas.
3. To find out the impact of housing conditions on the prevalent health problems of households in the study areas.
4. To relate the prevalent health problems in these areas to the existing environmental determinants of diseases.
5. To find out the socio-economic and demographic factors in the study areas and the effect they have on housing and the health status of inhabitants in these areas.
6. To come up with suggestions on ways and means of minimizing the health burden arising from the residential environment.

## **1.4 HYPOTHESIS**

### **NULL HYPOTHESIS**

Housing environmental conditions do not influence the health status of household members.

### **ALTERNATIVE HYPOTHESIS**

Housing environmental conditions do influence the health status of household members.

## **1.5 RESEARCH METHODOLOGY**

### **1.5.1 RESEARCH DESIGN**

#### **STUDY AREAS**

The three areas that were selected are Jericho Lumumba and Umoja Estates and Lindi village in Kibera slums. The criteria used to select these areas are the presence of public health centres or clinics where information regarding the incidence and prevalence of diseases prevalent in the areas was acquired. Another reason for their selection was the high possibility of the inhabitants of these areas attending the Nairobi City Council's health centres for their medical needs. The housing qualities and residential environment in the areas of study are different in terms of housing quality, socio-economic character and level of service provision. Umoja 1 is a Site and Service scheme estate that was built to cater for the housing need of low-income earners. The estate has however changed considerably since it was built, deteriorating considerably and through the gentrification process has catered for higher income groups than those intended for. Jericho estate on the other hand is an older City Council housing estate which has remained basically the same as there are no housing extensions that have been put up. Lindi village is a typical slum and squatter settlement.

#### **SAMPLING**

Sampling was necessary. This became necessary because to survey every individual in the population would have been too expensive in terms of time, money and personnel. Multi-

stage sampling approach was adopted. The statistics obtained were then used to make inferences.

Systematic random sampling was used to select the particular locations in the study area. The unit of study was the household in which was assumed to occupy a dwelling unit. The population of dwelling units which constituted our sampling frame was as follows: - Jericho Lumumba: 1,600 houses, Umoja 1: 3,000 houses, and Lindi village of Kibera slums approximately 7,200 housing units. Out of this total population, 40 houses were selected from Umoja 1 estate, 30 from Jericho estate and 80 from Lindi village, Kibera slums.

In Jericho estate the houses are organized in a systematic manner in blocks of both single and double storied houses. The estate is divided into seven sections. A housing unit was randomly selected in each section and a questionnaire administered to the head of the household. Two sections were administered with five questionnaires while in the remaining five sections, four houses in each section were randomly selected. The number of houses selected in Jericho Lumumba estate were 30. Umoja estate is also divided into 15 different sections. Though the original plan of the estate has changed considerably as a result of uncontrolled and haphazard developments, the original plan was used for sampling purposes. The illegal housing connections that are now common place in the estate were not considered. Eight sections were selected and from each of these, five houses were randomly selected and questionnaires administered. 40 households were interviewed in Umoja 1 estate. On the other hand, in Lindi village as is typical in any slum and squatter settlements, housing is built in a haphazard manner. At the time of conducting the research, the village was divided into blocks from A upto I making up nine different sections and housing approximately 7,200 housing units. Each section has approximately 8 blocks housing approximately 100 rooms in total. Out of the 9 sections 9 housing units were randomly selected from sections A to H and 8 units from section I which was still being developed making all the questionnaires administered in Lindi village 80 in total. Simple random sampling was used to pick out the houses to be interviewed. The sampling unit was the housing unit while the sample size was 150 houses. The questionnaire was administered to the household heads.

Field observations were conducted in all the areas, where the house structure and its surrounding environment was studied for any defects or shortcomings that may lead to or result in the proliferation of diseases.

## DATA COLLECTION

The study entailed the collection of both primary and secondary data. The study began with documentary research. The sources from which information was obtained include the university libraries, HABRI (Housing and Building Research Institute) Documentation Centre, UNEP, HABITAT and WHO libraries and various related Ministries among others. This entailed reviewing literature to housing the residential environment and how this affects the health of those who live in that environment

The main method of collecting primary data was through a survey where questionnaires were administered to selected households in the study areas and interviews carried out. Both closed and open-ended questions were asked. Pre-coded questions were used to ensure that the data is more amenable to data analysis and the questions less likely to be ambiguous. An interview schedule was administered to a few medical personnel in the health centres in order to get a general picture of the most frequent illnesses treated in the health centres and their possible causes.

Data was first acquired from the health centres located in the three selected areas with the permission of the Chief Medical Officer of Health of the Nairobi City Council. Past medical records or attendance registers were perused for evidence of diseases resulting or caused by poor residential environment. Diseases whose pathological conditions are normally associated with poor housing conditions and inadequacies in the residential environment were already known from literature. This was used as a checklist against the occurrence of diseases on the attendance registers. A high level of confidentiality was maintained as health issues are considered very personal and private matters. Records dating back two years i.e. 1995-96 were used. Particular interest was paid to those illnesses known or suspected of being associated with poor housing e.g. respiratory diseases, accidents in the home, diarrhoeal diseases etc. The next step involved going to the estates to find out the conditions under which the people in the neighbouring environment live. The study took into account two aspects. First the character of the residential environment and associated health risks, and secondly, the relationship of the environment to the concrete health problems of the population.



## DATA ANALYSIS AND PRESENTATION

The Statistical Package for Social Scientists (SPSS) was used to analyse the data. Quantitative techniques are employed in analysing the data obtained in order to make the relevant inferences. Cross-tabulations are also used to show the relationship between the dependent and independent variables. The analysed data is presented in the form of graphs, tables, pie charts and narrative form. Pictorial presentation became useful for empirical analysis.

### 1.6 JUSTIFICATION OF THE STUDY

The literature reviewed shows that direct and indirect relationships exist between housing and health. This is the case in developing countries where rapid rates of urbanisation and population growth are putting excess strain on the available services, housing, infrastructure and the associated health problems. Gaps in knowledge exist in our country in this area. Though certain community-based studies have been carried out relating to health, little has been done relating specific pathological conditions to housing in Kenya. The housing health-link has been ignored in Kenya while it is a problem experienced in various areas of the world (Satterwaite and Hardoy 1989). Professionals such as architects and planners rarely have a clear idea of the health problems that low-income groups face even though they recognize that their work has important health risks. Health problems have also been deemed the responsibility of health professionals for a long period of time. This attitude should change as health is an integral part of the development process, which should be given adequate consideration. As John Briscoe (1986) has pointed out, this is illustrated in the idea of "selective primary health care", through which non-medical activities such as community water supply, sanitation and nutritional supplementation which are critical parts of the primary health care package.

The World Health Organisation has also urged member states to promote health through improvement of living conditions, establish regional research on health and housing and carry out studies to analyse existing legislation concerning health and building regulations (WHO 1987). There are ailments whose control or eradication in the community lies further outside the scope of health workers in the traditional (curative approach) set up. Water supply, sewerage and rubbish disposal, housing standards, etc. all involve non-medical sectors that are very crucial to health (Njoroge, 1995). This study will increase the information base on the relationship between conditions of the residential environment

and health. When combined with findings from other studies, this can produce site-specific knowledge which can be used by planners, programme managers and personnel dealing with housing studies for the implementation of housing programmes which are more sensitive to the health needs of the community. Health problems have been deemed the responsibility of health professionals hence inhibiting the involvement of other professionals who could help alleviate health-related problems in their areas of interest. If Kenya is to attain its goal of "Health For All", the whole professional fraternity should play its role in the development process.

## **1.7 SCOPE AND ORGANISATION OF THE STUDY**

This study was conducted in three residential areas in Nairobi. It dealt with issues pertaining to the house, the service provision in the home and conditions of the living environment. In terms of diseases only environment-related diseases were considered. Although these diseases often afflict the people who spend most of their time in the home, e.g. mothers and children, the study does not limit itself to this group but considers all household members. This study differs from studies especially those carried out by the medical fraternity in that no clinical tests will be carried out e.g. by collecting specimen such as stool for clinical analysis.

The report is organized into seven chapters. The first chapter contains the introduction and gives the role that housing plays in health. It then outlines the problem statement, and describes the objectives and how the study was carried out. Chapter Two contains the literature review and the theoretical framework of the study examining different aspects of the house structure and those of the entire residential environment and the health risks that they may expose the inhabitants to. Chapter Three gives a brief overview on the background information about the three study areas. Chapter Four gives a description of housing, services and facilities available in the study areas and the morbidity rates. Chapter Five and Six presents the findings of the study, while chapter seven gives the study conclusions and recommendations which would facilitate better health through housing.

## CHAPTER TWO

### LITERATURE REVIEW AND THEORETICAL FRAMEWORK

#### 2.1 THE IMPACT OF THE HOUSING ENVIRONMENT ON HEALTH

Man's total environment has been recognized as being a dominant force in influencing human health and well being. Shelter in all its different forms is one element of the environment, which exerts the most immediate influence on the health of man. Although any person's state of health is an interaction between their human biology (including their genetic inheritance), lifestyle, the health-care system and the environment, historically, the environment has always played a major role (Huntington, 1991). Indisputable evidence ties ill health to deficiencies in the physical environment including inadequate water and sanitation, overcrowded housing, air pollution, uncollected garbage and dangerous workplaces (World Resources Institute, 1996). Housing however remains one of the most complex elements of environmental health. This is due to the fact that housing programmes are intimately linked with economics, social conditions, planning policies, zoning regulations, customs and traditions among other factors.

Safe, secure and adequately serviced housing is very important for the health of inhabitants. However, the importance of everyone's quality of life and health is often forgotten. The importance of housing to health is questionable taking into account that there is no human function which requires a house for its performance. However, in the context of the WHO's definition of health, the significance of the residential environment encompasses a much broader meaning. Although it is almost impossible to attribute a specific health condition to housing alone, we know that there are relationships between housing conditions and morbidity. For example, diarrhoeal diseases, respiratory and infectious diseases as well as accidents are health problems that can be related to poor housing and living environments (WHO, 1987).

The link between health and the residential environment is more apparent in poorer illegal sub-divisions, and squatter settlements where a high incidence of environment related diseases can be found. Most of the housing occupied by poorer households offers insufficient protection against physical and biological agents of diseases from the environment due to poor design and construction standards rendering them inadequate. Makeshift structures almost invariably fail to safeguard against the extremes of heat and

cold, which can increase sickness and death rates. Such structures are also highly vulnerable to hazards of nature such as floods, rain, wind, and fires. They also lack insulation against noise, and intrusion of dust, insects and rodents. These areas lack sanitation, adequate means of waste disposal, and lack of safe piped water supply. These are conditions that facilitate the spread of pathogens in the environment. Such pathogens are mainly responsible for the diseases transmitted through the faecal oral route. These diseases include diarrhoea, typhoid, hepatitis and cholera (WHO, 1987).

Approximately two-thirds of the third world's urban population have no hygienic means of disposing faecal matter and an even greater number lack adequate means to dispose off waste-waters (Mitlin et al, 1992). The crowded and cramped living conditions of poorer groups means that diseases such as tuberculosis, influenza, meningitis, and other airborne infections are transmitted faster from one person to another (UNCHS-Habitat, 1996). The low-income groups have low resistance due to malnutrition, hence aiding their spread. Though ill health is associated with many factors such as genetic predisposition, age, sex, occupation, income, and consumption habits, some of these factors are likely to co-vary with housing conditions (Byrne et al, 1986). The underlying factors condemning people to these deteriorating housing conditions include high population growth rates, rapid urbanization, inadequate socio-economic development, poverty and inappropriate public policies.

Evidence shows that in the poor cities of the developing world, infectious and parasitic diseases related to deficiencies in the residential environment continue to exact an enormous toll on human life and health. Housing in these countries is characterized by some factors, which make their housing problem hard to deal with. The World Health Organization (WHO) recognized that housing in it's present day concept is more than just the physical structure and hence shouldn't be viewed too narrowly. Hardoy (1987) further expounded that a better understanding of the links between housing and health demands a better understanding of the housing problem which goes beyond the inaccurate stereotype of the poor living in "slums and squatter settlements".

The living conditions in most residential areas of the poor in many developing countries are in a pathetic state. Many people in poor areas lack basic needs and facilities such as clean potable water and have poor or inadequate sanitation systems and very poor housing among others, exposing the residents to many health problems. For instance, in a study on environmental health in Nairobi's poverty areas, Lamba (1994) found that for the city as a whole, upper respiratory tract illnesses are the most commonly reported

outpatient disorders followed by diarrhoea, malaria accidents, and skin disorders. Other common ailments include eye infections, rheumatism/joint pains, accidents/fractures, and intestinal worms. The high incidence of diarrhoea, worm infestation, and skin disorders is related to poor sanitary conditions and inadequate water supplies. The high levels of congestion and overcrowding in these areas make the problems worse. Increasing numbers of studies in third world cities shows the degree to which lower-income groups lives and are dominated by ill-health, disablement or premature death and the extent to which environmental factors are major causes or contributors (Amref, 1987, Akhtar R, 1986, Benneh et al 1993, Pedro J, 1990).

Many studies have shown that poor housing is associated with high rates of morbidity and mortality. This clearly shows that the residential environment has a great impact on the health of the occupants and more so on those who spend most of their time within the home environment. According to the World Health Organisation, in many illegal settlements, a child is 40-50 times more likely to die before the age of five than a child born in a western nation (WHO, 1989). This is as a result of the disparities in the quality of housing and the living environment in the two different settings. The WHO has estimated that if all housing was brought to minimum acceptable standards, there would be five million fewer disabilities annually on a global basis (Cairncross, 1990). It is therefore paramount that safe, decent and clean housing that is large enough for the needs of a family is provided not only because it is a basic human right but also as one of the means of ensuring a healthy population.

## **2.2 THE HOUSE AND ITS ENVIRONMENT**

### **2.2.1 HOUSE SITES**

Millions of low-income people the world over live on sites with natural or human-induced hazards. The sites are chosen due to many factors which include their close location to places of work so as to save on transportation costs, the need to pay as little as possible on rent and the fact that many have hope of one day owning a house of their own. Many settlements develop on sites close to solid waste dumps, next to factories with high levels of air pollution or which dispose off their wastes on the sites where the poor live as a result of lax environmental health measures. These settlements at risk are seen in many cities of the world such as Caracas in Venezuela, Lima in Peru, Monrovia in Liberia, Accra in Ghana etc. (Hardoy et al, 1992). Others develop on or close to quarries, and

near open sewers, which easily fill with water. All these sites provide ideal breeding grounds for disease-causing vectors. The impact on health of unsuitable sites is as a result of many natural and human induced hazards such as landslides, floods and accidents.

Due to the rapid rate of industrial production in many Third World nations and the absence of an effective planning and regulatory system, toxic or hazardous wastes from factories and hospitals may end up as liquid wastes in streams, rivers, open sewers or are dumped on vacant land sites (CSE, 1983). There are often none or few structural safeguards to protect those living near these sites or those who depend on these streams as their water sources. Ineffective systems to control the disposal of the wastes means that those living near dump sites may directly or indirectly ingest the wastes which contain heavy metals such as mercury, lead, etc. which are harmful to health. The wastes may also get into the food chain affecting unsuspecting consumers.

Where drains are available and solid waste collection is poor, garbage blocks the drains creating ideal feeding and breeding grounds for flies, rats, cockroaches and other insect which invade houses and may contaminate food. If such food is ingested, it can cause diseases. These insects are also responsible for the fast spread of contagious diseases. Solid waste dumps in many low-income settlements are often contaminated with human excreta. Children in these settlements lack playgrounds exposing them to high chances of contracting diseases of the faecal-oral route through ingesting pathogens from faecal matter contaminating the land on which they play. Lack of clean potable water in adequate quantities means that personal hygiene is very poor, worsening the situation. Accidental injuries from broken glass, old tins etc. also afflict the children and those who make a livelihood from waste picking (UNICEF, 1992). Other accidents may be from motor vehicles and dangerous garbage tips containing toxic substances. Hillsides lacking drainage, steps and paved roads are hazardous especially when wet and the young and elderly may have difficulties avoiding accidental falls and subsequent injuries (Mitlin, 1992).

Some settlements develop on steep hillsides prone to landslides or low-lying lands prone to flooding. These sites may either be a direct or indirect risk to life as they may cause diseases arising from waterlogged conditions by creating ideal breeding and feeding grounds for diseases vectors. Damp housing conditions due to poor drainage also contribute significantly to poor health. Direct death may also occur as a result of landslides or drowning.

### 2.2.2 HOUSE DESIGN

The design, material, construction and maintenance of houses can all be said to have health implications on the inhabitants of dwellings. As well as sheltering people against the elements, housing should provide adequate protection against any hazard to health resulting from its design and construction components. Housing design can cause domestic accidents in the home especially involving children, the infirm, and the elderly (Ranson, 1987). Poor design and overcrowding provide little chance for protection to occupants especially children from open fires, kerosene stoves and accidental poisoning from medicine and household chemicals (Stephens et al, 1996). For instance the health risks associated with glass doors greatly outweighs their aesthetic value while high rise buildings pose the risk of falling and breaking limbs especially to children at play (Byrne et al, 1986). Children in high-rise buildings lack areas for safe play under the watchful eyes of their parents or guardians hence causing unnecessary stress and anxiety to their parents.

Housing both traditional and modern can offer a wide range of habitats that may be exploited by arthropods, pests and vectors of diseases as indicated in Table 2.1. One of the diseases that is strongly associated with poor housing conditions is the Chaggas' disease, (American Trypanosomiasis) a debilitating parasitic disease that is widespread only in Latin America (WHO, 1992). This disease is caused by the bites of the triatomine bug a blood-sucking insect that is a vector of this disease. The insect rests and breeds in cracks in house walls and the risk of infection can be reduced by preventive actions like plastering walls and spraying insecticides as there is no effective treatment for this diseases.

Of the vast range of vector-borne pathogens, there are relatively few for which the residential environment does not offer an important site for transmission to humans (Schofield et al, 1990). The housing environment also offers a habitat that is an abundant source of potential food in the form of humans, domestic animals and products in the home. It is therefore important that houses are located as far away as possible from sites where pests thrive so that less stringent and affordable measures are taken to avoid them. Modes of entry should also be adequately inhibited by the physical structure of the house. The structure should be well maintained to ensure that both the internal and external environment is not conducive for pest habitation.

Another design requirement that would reduce the number of resting insects indoors is a well-lit and well-ventilated house. This ensures that the nocturnal arthropods such as certain species of mosquitoes and triatomine bugs among others have fewer places to hide and rest by day while waiting to attack unsuspecting victims at night. The table below gives a number of arthropods within the domestic environment, the impact they have on the health of inhabitants and the control measures in the domestic environment which would reduce the disease they cause.

### 2.2.3 CONSTRUCTION MATERIALS

Certain construction materials have been associated with various diseases. Most of these are either building or/and insulating materials, which release substances, which may be toxic or harmful to human health. Among the most serious is asbestos. There is no evidence that asbestos that has been ingested has any adverse effects on human health. However it is known to present a danger to health when the microscopic fibre's of which it is formed are inhaled. They cause diseases such as asbestosis or various cancers particularly in the bronchi pleurae (WHO, 1987).

Radon a naturally occurring gas also poses danger to health. Radon is a short-lived natural radioactive gas, which can induce lung cancer. Its concentration within dwellings due to seepage through floors is encouraged by slightly below average indoor pressures. Ventilation systems may also be an important contributing factor (Damber et al, 1987). In the United Kingdom for instance, the public average exposure to ionising radiation could be responsible for 6% of the annual incidence of lung cancer (Clarke et al, 1989).

Lead is also of particular concern to health especially of children since relatively low lead concentrations in the blood may have a damaging and permanent effect on their mental development (Needleman et al 1979). This can be through inhaling contaminated air from emissions of motor vehicles burning leaded gasoline. Many settlements housing poor households are located close to major highways hence exposing the inhabitants to gas emissions, while those located close to industries where industrial emissions contain toxic fumes also face the risk of contracting respiratory diseases.



Table 2.1 Summary of Domestic and Semi-Domestic Arthropods of Medical Importance

I BREEDING ON THE BODY	CAUSE/ CARRIER OF	CONTROL MEASURES IN THE DOMESTIC ENVIRONMENT
Head Lice <sup>1</sup>	Head-Louse infestation	Improved water supply
Body Lice <sup>1</sup>	Typhus, Trench Fever, Relapsing Fever	Improved water supply
Pubic Lice <sup>1</sup>	Phthiriasis	Improved water supply
Scabies Mites <sup>2</sup>	Scabies	Improved water supply and adequate drainage
Follicle Mites <sup>2</sup>	Acne	Improved water supply
II BREEDING IN THE HOUSE	CAUSE/ CARRIER OF	
Fleas <sup>1</sup>	Plague, Typhus	Improved housing e.g. build away from garbage sites, plastering walls and floors
Cockroaches <sup>3</sup>	Shigellosis, Salmonellosis, & other enteric infections, Viruses: Hepatitis A, Poliomyelitis etc. Legionnaire's Diseases	Improved housing Treatment of excreta prior to discharge or reuse and improved domestic water supply Provision of toilets and sanitary disposal of excreta
Triatomine Bugs <sup>1</sup>	Chagas Diseases	Improve housing by plastering walls
Soft Ticks <sup>1</sup>	Relapsing Fever	Improved water supply and adequate drainage
Dust Mites <sup>2</sup>	House Dust Mite Allergy.	Improve housing by plastering walls and floors

<b>III BREEDING IN THE PERI-DOMESTIC ENVIRONMENT</b>	<b>CAUSE/ CARRIER OF</b>	<b>CONTROL MEASURES IN THE DOMESTIC ENVIRONMENT</b>
Jiggers <sup>1</sup>	Jiggers	Improve housing by plastering floors and walls
Mosquitoes <sup>1</sup> Aedes Culex Anopheles	Yellow Fever, Dengue, Bancroftian Filariasis Malaria	Improve housing by adequate screening of all openings Build on well drained sites Ensure adequate drainage
Sandflies <sup>1</sup>	Sandfly Fever, Leshminiasis.	Adequate drainage and sanitary disposal of solid and human waste
Mothflies <sup>3</sup>	Allergy to Mothflies	Adequate drainage
Blowflies <sup>3</sup>	Intestinal Myiasis	Sanitary disposal of wastes
Houseflies <sup>3</sup>	Dysentery Viruses: Hepatitis A, Poliomyelitis etc.	Sanitary disposal of excreta and adequate water supply
Latrine Flies <sup>3</sup>	Dysentery	Sanitary disposal of excreta and adequate water supply
Face Flies <sup>3</sup>	Yaws, Trachoma. Septicemia, Infective Dermatitis.	Adequate water supply
Stable Flies <sup>1</sup>	Bites only	
Poisonous Spiders <sup>3</sup>	Spider Bites	
<b>IV ADVENTITIOUS- ENTERING THE HOUSE TO FEED.</b>	<b>CAUSE/ CARRIER OF</b>	
Mosquitoes <sup>1</sup> Aedes Anopheles Culex	Bancroftian Filariasis Malaria Brugarian Filariasis	Build on suitable sites Improve housing
SandFlies <sup>1</sup>	Cutaneous & Visceral Leishmaniasis	Sanitary disposal of solid waste
Scorpions <sup>3</sup>	Scorpion Stings	

<sup>1</sup> Blood Sucking. <sup>2</sup> Dermaphagous <sup>3</sup> Scavenging

Source: Adapted from C. J. Schofield and G. B. White, "House Design and Domestic Vectors of Diseases" Tropical Medicine and Hygiene Vol. 78. In The Poor Die Young.

Children's exposure to lead comes not only from exhausts of petrol-engine motor vehicles where lead additives are still used but also from lead pipes (especially where water is acidic) and where lead is a component in paint. Lead's principal threat other than acute lead poisoning is neurological damage in children (Needleman et al, 1979). Children with elevated dentine lead levels are reported to have a deficit in intelligence scores, speech and language processing skills compared to children with low lead levels.

#### 2.2.4 OVERCROWDING AND HEALTH.

Crowding is one of the environmental factors that influence health and has been linked epidemiologically to a number of biological mechanisms, which may cause problems of their own. These have been laid down by (UNCHS- Habitat, 1995, pp 7-8) as follows: -

1. *Overcrowding increases the risk of multiple infection* - overcrowding increases the risk of infection because the number of potential transmitters is increased. Synergistic effects from contracting several infections can complicate each infection causing more severe disease than under less crowded conditions.
2. *Overcrowding increases proximity and risk of disease transmission* - for some infection proximity to people by living in small rooms and sleeping in the same bed increases the risk of disease transmission.
3. *Overcrowding increases the risk of infection early in life* - children in overcrowded households are exposed to risks of getting more severe infections with a higher case fatality ratio.
4. *Overcrowding increases the risk of intensive exposure and severe diseases* - research on infectious diseases like Measles, Chickenpox, Whooping cough, and Polio has indicated that intensive exposure at home increases the severity of infection presumably due to higher doses of infection absorbed under such conditions.
5. *Overcrowding increases the risk of long-term adverse effects of infection* - some infections increase the risk of morbidity and mortality long after the acute infection. Overcrowding is an important risk factor because long-term excess morbidity and mortality are connected to the intensity of exposure during acute infection.

Crowded cramped living conditions are a common characteristic of most kinds of housing used by poorer groups in many developing countries. Overcrowding tends to bring with it problems of inadequate refuse collection, water supply and sanitation. The vast range of health problems afflicting these groups are associated with overcrowding hence communicable diseases such as tuberculosis, influenza, meningococcal meningitis, and other airborne infections are easily spread from one person to the other, their spread often aided by low resistance due to malnutrition (Hardoy et al, 1989).

Acute respiratory infections of which pneumonia is the most serious are a major cause of infant and child death in rural and urban areas. In a study carried out on respiratory tract infections in Thai children, among the population of a socio-economically depressed community in Bangkok, Thailand, it was found that factors associated with a higher risk of acute respiratory infections were low incomes, chronic malnutrition, and crowding in the home (Vathanophas et al, 1990). Women in rural and low-income areas are most susceptible because they spend most of their time in the cramped residential neighbourhoods. For those children who survive, their growth is often set back since a severe case of one of the infections will weaken their body and make them more susceptible to further infection and malnutrition (UNICEF, 1986). In low-income areas in many cities, overcrowding and poor ventilation means that T.B infections are transmitted to more than half the family members (Cauthen, 1988). The incidence of tuberculosis is not only linked to overcrowding but also to a high number of social contacts (WHO, 1992), which is common in neighbourhoods of poor people. The vaccine preventable childhood diseases such as Mumps, Measles, Diphtheria, and Whooping Cough also spread rapidly in overcrowded urban areas (Mitlin, et al, 1992).

A combination of overcrowding and poor quality housing greatly increases the risk of accidents within the homes. These problems are worse in the slum areas where the small rooms hardly protect the inhabitants from human induced accidents such as fires. The materials used in the construction of these shacks do not provide the structural protection to the residents against some elements such as heavy rains, storms and fires. The risk of accidental fires is further increased because the structures are partially or wholly constructed with flammable materials such as wood, plastic sheets, cardboard's, etc. Therefore once fires begin they spread very fast. Some materials used in home based industries are easily flammable and may result in fires or accidental injuries to children. The few inaccessible roads in many illegal settlements make it difficult to send life-saving

services in the event of fires or accidents. The poor and inadequate health care services to provide emergency treatment is another problem.

Under conditions of overcrowding, all the members of a dwelling have to share in what each does, as privacy is minimal. For instance children's hours of sleep may be interrupted or disturbed by various activities in the home. In many slums and squatter settlements, all activities are carried out in one room creating ideal conditions for mental health problems or stress which may result in violent behaviour (Smith, 1989). This clearly shows that efficient design, good structural characteristics proper maintenance and roominess of a dwelling can have positive health implications on the inhabitants of a dwelling.

### 2.2.5 INDOOR AIR POLLUTION

Indoor air pollution in the home can be as a result of the presence of certain compounds which include radon gas, mineral fibres, carbon monoxide, and tobacco smoke amongst others. Indoor air pollution also arises by burning biomass fuels indoors or from inadequate venting of heating and cooling devices. The combustion of raw biomass products produces hundreds of chemical compounds including suspended particulate matter, carbon monoxide, and oxides of nitrogen, and sulphur, hydrocarbon, aldehydes, benzene, phenol and more complex hydrocarbons compounds (WHO, 1992). Although indoor air concentrations vary considerably, it is very common for health guidelines to be exceeded.

In the developing world biomass fuels are the major and most often the only source of domestic energy that is cheaply available. The adverse effects of the combustion of biomass fuels indoor are respiratory problems. In many developing countries, Kenya included, many households use open fires or inefficient stoves for cooking or/and heating. Statistics from the 1989 census indicate that 68.4% of Nairobi's population uses paraffin as cooking fuel while 2.9% and 8.7% use firewood and charcoal respectively. Evidence of the health risks posed by indoor air pollution is available. This has further been supported by a study carried out by Wafula (1990), who notes that in developing countries, the largest problem of air pollution occurs indoors within individual households during cooking and heating. The smoke from this biomass fuel can contribute to respiratory diseases. In another study carried out by Kinyanjui (1993) to find the influence of improved stoves on acute respiratory infections, conjunctivitis and accidental

burns, the findings indicated that households using the improved stoves suffered significantly lower rates of the above named illnesses compared to their counterparts using the traditional 3-stone cooking stove. For instance the prevalence of acute respiratory infections in children was 23.1% and 59.1% in households using the improved stove and traditional 3-stone cooking stove respectively. Among the mothers the findings indicated that the prevalence of acute respiratory infections was 13.5% and 38% in households using the improved stove and 3-stone traditional cooking stove respectively. Acute respiratory infections are said to be one of the major causes of infant mortality in developing countries though the precise linkage with indoor air quality requires further investigation (WHO, 1987).

The severity of such health problems depends on the provision for ventilation, where in the room time is spent, and the length and level of exposure from the fuel. This exposes the inhabitants to three major problems. First by irritating the respiratory passage and facilitating the spread of acute respiratory infections. Chronic effects include inflammation of the respiratory tract caused by continued exposure to irritant gases and fumes, which reduce resistance to acute respiratory infections. Infection in turn enhances susceptibility to inflammatory effects of smoke and fumes, establishing a vicious cycle of pathological changes. These processes may lead to emphysema and chronic obstructive pulmonary diseases, which can progress to a stage where impaired lung function reduces the circulation of blood through the lungs, causing right-side heart failure (Cor Pulmonale). Cor Pulmonale is a crippling disease, characterized by a prolonged period of distressing breathlessness preceding death (WHO, 1992). Secondly, long term exposure may contribute to chronic bronchitis, emphysema and asthma and finally long-term exposure is a risk factor for cancer, (World Resources Institute, 1996). Studies of coal use in China have produced some of the most convincing evidence of a link between domestic fuel and cancer (Kirk et al, 1996). This shows that the quality of indoor air is a major causative factor in acute respiratory infections.

Women, girls and children who remain with their mothers at home are the highest risk groups due to long hours spent preparing and tending fires and cooking. They inhale higher concentrations of these pollutants than other members of the household do. As the women and girls crouch close to the fire, the heat may damage the cornea and conjunctiva and become chronically inflamed. Prolonged exposure may lead to Keratitis, impaired vision, increase in the risk of recurrent infection, Cataract, and finally blindness, (Kirk et al, 1996).

In poorly constructed houses where ventilation is poor or non-existent, heating of rooms used for sleeping by charcoal can lead to carbon monoxide poisoning which is another health hazard. In poorly ventilated houses, pollutants transported from outside may be found in higher concentrations indoors. Other sources of indoor air pollution are pollutants from building and insulating materials. The smoking habits of some household members may expose children to an increased risk of respiratory problems. The added exposure combined with malnutrition may retard growth, lead to smaller lungs and greater prevalence of chronic bronchitis, (Kirk Et al, 1996). The personal behaviour of smoking indoors and the state of the physical structure of the house are other factors that may have an impact on a person's health. Statistical evidence links respiratory disorders with parental smoking habits and the presence of damp conditions in the house. Burr et al (1981) found that in South Wales the occupants of homes with damp were more likely than others to complain of wheezing and breathlessness. In another study carried out in Britain by Byrne et al (1986, pp 111), the health problems most closely connected with structural defects and inadequate heating were various forms of respiratory disorders. These problems were experienced more in the "difficult to let" council housing. This was housing which had deteriorated and the environment had become increasingly barren and deprived physically and socially. Insecticides used in the home are another source of indoor air pollutants.

The health hazards posed by indoor air pollutants in the poor regions of the developing world are adverse. Though there are many risk factors, which contribute to acute respiratory problems, such as crowding, malnutrition, poor ventilation, and use of inadequate building materials and sanitation among others biomass fuel combustion is the greatest contributor to this problem.

### **2.2.6 THE INDOOR ENVIRONMENT**

The primary purpose of housing is to provide protection for the inhabitants from climatic factors and to create an enclosed internal environment that is not only safe and healthy but also comfortable to live in. Fulfilment of the physiological needs of man include a thermal environment that is not only conducive to good health but one that is comfortable and promotes efficiency of living. The humidity in the house should be healthy and comfortable and the air movement assist in maintaining the desired thermal conditions while the air purity should provide for the necessary air changes, (WHO, 1961).

## VENTILATION

Poor housing does not provide adequate protection against these changes, which are necessary for a healthy residential environment. An adequate quality and quantity of air is necessary for health. A well-ventilated house keeps the concentration of harmful substances such as toxins, smoke fumes unpleasant odours etc. in the air to levels that which will not affect human health. In poorly ventilated and crowded houses, the inhabitants are exposed to high risks of contracting infectious diseases especially those of the Upper Respiratory Tract.

## THERMAL CONDITIONS

Thermal conditions within the house should be adequate enough to ensure maximum comfort for all the different ages in the home. However, in many towns and cities of the developing world, housing in low-income settlements does not provide a comfortable indoor environment due to inadequate building materials and poor design. This creates very uncomfortable thermal conditions exposing the residents' to extreme cold and heat hence creating conditions under which they can suffer from colds, pneumonia and heat waves. Physiologically the heart may have difficulty coping with the increased vascular volume generated by heat. When the effort required exceeds the capabilities of the pump, one may die from heart failure (Kirk et al, 1996).

In temperate countries, extreme cold during winter is a risk factor. This occurs in homes that are poorly constructed and inadequately heated. The majority of excess winter mortality occurs through coronary and cerebral thrombosis and respiratory conditions (Smith, 1989). Cold increases stress and may thus affect the response to infections and other environmental aggressions. Therefore improvements to housing can reduce a variety of pathological conditions observed during winter though it may not significantly reduce the seasonal peak of morbidity and mortality, (Smith, 1989). Houses are supposed to moderate climatic extremes and it is therefore essential that they provide these requirements so as to protect occupants of dwellings.

### 2.2.7 DAMPNES

The location, design, layout and methods of construction used may give rise to the accumulation of large quantities of moisture within the house. If the proper degree of



moisture is not maintained and the thermal conditions are also poor, these conditions give rise to dampness within the dwelling unit. Therefore there is a clear link between temperatures in the house and dampness. Dampness is one of the most common health hazards associated with poor housing. Martin et al (1987) investigated the relationship between housing and health in Edinburgh in an area predominantly with flats and found no clear evidence that damp affected the physical health of adults although women living in same houses were clearly afflicted by high levels of respiratory symptoms. Children in the damp houses were clearly affected by high levels of respiratory symptoms and the association was independent of smoking. It was also found that headaches, diarrhoea and aches and pains were more common among children in damp houses, (Martin et al, 1987).

Further research in Glasgow, Edinburgh and London combined showed that children living in damp housing suffer disproportionately high incidence of headache, wheeze, sore throat, fever, cough, vomiting, irritability, tiredness, unhappiness and poor appetite. Adults in such environments were found to suffer from aching joints, nausea, bad nerves, fainting, constipation, breathlessness and blocked nose (Platt et al, 1989). Damp conditions lead to the formation of moulds on indoor surfaces, which may lead to allergic asthma in children and adults. This makes it clear that plausible causal explanations exist on the effects of cold, damp, and mould on the health of inhabitants.

## **2.3 SERVICES AND FACILITIES WITHIN THE HOME ENVIRONMENT**

Provision of water, sanitation, drainage and the disposal of solid and liquid wastes are all necessary services and facilities for good housing, healthy conditions, and to meet minimum health standards. Water supply, its drainage and sanitation are all inter-related, and it is difficult to consider each of them independently.

### **2.3.1 WATER SUPPLY**

The provision of a safe, convenient and adequate water supply is the single most important activity that can be undertaken for the health of the people wherever they live. The quantity available to a household and the price they have to pay for it has been proved to be as important to a family's health as it's quality (Cairncross, 1990). This is because the price influences the quantities used and especially for poor families living in poor neighbourhoods where public agencies do not provide any water supply and

households have to buy water from unsanitary water vendors who sell the commodity exorbitantly.

To fully maximize the benefits of water supply it should be easily accessible to a household. Water intended for human consumption should be free of chemical substances and micro organisms in amounts which would constitute a hazard to health. It is recommended that domestic water supply meet at least the standards specified in the International Standards for Drinking Water, (WHO, 1958). To maintain the needs of washing and bathing, in order to maintain personal hygiene, the water should be available at all times and in such quantities as will be adequate for all household uses and the removal of the wastes which could be a threat to health.

Though difficult to measure, the link that exists between water and health is indisputable. Many health problems are linked to water- its quality, quantity, availability, and the ease of obtaining it and provision for its removal. Many pathogenic organisms have been isolated from raw water supplies. Examples include Typhoid, fever, dysentery, diarrhoea, amoebic dysentery, infectious hepatitis and cholera among others (Feachem et al, 1983).

Water-related infections can be classified into four different groups.

#### (1) WATER-BORNE DISEASES

Water-borne infections occur when a person or animals drink the pathogens in the water. When such water is ingested in sufficient quantities, it infects the drinker. The majority of these pathogens reach the water through contamination with human excreta and ultimately enter the body from water orally, in the form of faecal-oral transmission, (DANIDA, 1989). Potentially water-borne diseases include classical infections notably cholera and typhoid, but also include a wide range of diseases such as infectious hepatitis, diarrhoeas and dysentries (Cairncross et al, 1983).

However many faecal-oral diseases are readily transmitted by other means such as contaminated food, or by hands to mouth. It is therefore essential to grasp that water-borne transmissions are merely the transmission of drinking faecal material in water. And that any diseases that can be water-borne can also be transmitted by any other faecal-oral route, e.g. through dirty hands, contaminated foods, dirty cooking utensils etc. Provision of adequate supplies of potable water that is easily accessible would greatly reduce this type of transmissions through better personal and domestic hygiene.

## (2) WATER-RELATED DISEASES.

In this case, the pathogen spends a part of its life in an aquatic animal. These diseases are as a result of infection by parasitic worms (Helminthes), which depend on aquatic intermediate hosts to complete their life cycles. Examples of diseases spread in this way are the guinea worm and schistosomiasis. The guinea worm is spread through drinking contaminated water and can therefore be controlled by improving the quality of drinking water. Schistosomiasis control is not only complex but also site specific. It requires improving safe access to domestic water supplies, improving drainage to reduce snail habitats, treatment of infected persons and improved excreta disposal among others (Kolsky, 1992).

## (3) WATER-WASHED DISEASES

Water washed diseases are those whose transmissions will be reduced following an increase in the volume of water used for hygienic purposes irrespective of the quality. Many infections of the intestinal tract and the skin fall under this category. The improvement in hygiene of the individual and at the household level is based on the volume of water used.

Water-washed diseases can be divided further into three different types: -

- a) Infections of the intestinal tract e.g. diarrhoeal diseases. Though these are fecal –oral in their transmission, they're potentially water-borne or water washed.
- b) A variety of skin diseases such as scabies and various fungal infections and eye diseases such as trachoma. These infections are related to poor hygiene and can be reduced by increasing the amount of water used for personal hygiene.
- c) Infections carried by mice and mites. Mites cause Scabies and also promote Asthma, while mites and lice are vectors of various forms of Rickettsial Typhus. However it is the Louse-borne epidemic Typhus which is most likely to be affected by improved personal hygiene.

## (4) WATER-RELATED INSECT VECTOR DISEASES

Water-related Insect Vector Diseases are spread by insects, which breed or bite near water. Mosquitoes are responsible for diseases such as Malaria, Filariasis and Dengue

Fever. Sleeping sickness on the other hand is transmitted by the riverine Tsetse fly that bites near water.

All these water related diseases could be reduced or eliminated by provision of clean potable water in adequate quantities, which is easily accessible to users. The disposal of this water once used is also of vital importance to ensure that insects that breed near water do not have a chance to survive. These measures coupled with good personal and domestic hygiene habits would ensure that the home is a safer and healthier place to live in.

### **2.3.2 HUMAN WASTE DISPOSAL AND DRAINAGE.**

The provision of hygienic means to dispose off excreta and adequate means to dispose off wastewater are prerequisite to a healthy residential environment. Removing and disposing of excreta in ways that prevent human contact is central in reducing the burden of diseases. Human excreta, is the principal vehicle for the transmission and spread of many communicable diseases (Feachem et al, 1983). It is a principal source of the pathogenic organisms of many communicable diseases and also one of the most dangerous substances with which people can come into contact with. Infection may occur when fecal matter containing pathogenic organisms contaminate food, water, or the fingers and is subsequently ingested. Public provision for removing and disposing off both solid and liquid wastes is very poor in many poor urban neighbourhoods of the developing world, which are characterized by overcrowding and high-density levels. Some studies carried out in some third world cities reflect the inadequacy of water supply and sanitation. In India, for example, defecating in the open is common practice since one third of the population, over 50 million people, have no latrine of any kind while another third rely on bucket latrines which are not a very hygienic method of excreta waste disposal. In Dar es Salaam, virtually all the population relies on pit latrines but these regularly overflow and the public authorities only have the capacity to empty a tiny proportion of them. In Jakarta Indonesia, there is no waterborne sewage system and a large section of the population uses the canals for bathing, washing clothes and defecation (Hardoy, 1992). These examples indicate the gross health problems, which may be endemic in these poor regions. It is therefore little wonder that Cairncross (1990) noted that the children in these areas suffer frequently, or fatally from diarrhoea diseases. Safe and sufficient water and adequate sanitation could reduce infant and child mortality by

more than 50% and prevent a quarter of all diarrhoea episodes. Of the 30 or so major diseases in the developing world 21 are water and sanitation related (ODA, 1995). Hence the health risks as a result of lack of sanitation facilities are very high for those living in the informal and illegal settlements. Surface water close to these areas also faces high chances of being contaminated with human and animal excreta. Removal and safe disposal both of wastewater and excreta is a crucial issue in environmental health.

Another study carried out by Njoroge (1995) further shows the importance of having a water and sanitation system in a community. He examined the nutritional status of pre-school children by the type of environmental conditions of the households, in two peri-urban communities living in Kayole. One of the groups consisted of households in the site and service scheme while the other was in the adjacent slum area. He found that the nutritional status which was translated to mean the health of children, differed significantly in the legal site and service scheme having valid title deeds, laid out roads, water mains, etc. to that in the slum area. The percentage of those wasted and stunted in the site and service scheme was half of those found in the adjacent Soweto slum village. The findings pointed strongly to the importance of environmental sanitation of peri-urban habitation as a factor in childhood nutritional status. Other studies further show that lack of sanitation among the urban poor living in overcrowded illegal settlements is one of the factors that has contributed to the numerous health afflictions suffered by the residents. In Manila, for example, diarrhoea among the urban poor was observed to be twice as common as in the rest of the city. In Villa El Salvador, a low-income settlement developed by squatters on the outskirts of Lima, Peru, the observed infant mortality rate was twice that of the city average (Sinnatamby, 1990).

To fully realize the benefits of an adequate water supply an efficient sanitary system must be in place. Basic hygiene principles must also be practiced in order to keep diseases at bay. This is illustrated in a study carried out by Dr. Niemi (1995) to find out the health impact of a water and sanitation programme in Kakamega District. She tried to find out if the presence of latrines in the household has a positive health impact on the children living in the households. Results of the study showed that children from households with latrines had less hookworm infections as compared to those from households without latrines, 78.8% and 74.2% respectively. The results were however not statistically significant. The difference observed was very small and other factors such as socio-economic status of the two groups may have played a role. This difference can also be attributed to poor hygienic habits where children do not wash hands after defecation.

It should be noted that water supply and sanitation are services that are closely related and inadequate facilities for excreta disposal for instance reduce the benefits of a safe water supply system. In many developing countries, most of the diseases are infectious diseases caused by living organisms such as bacteria, viruses, protozoa, and parasitic worms. It is important to prevent the transmission cycle. An adequate water supply is therefore essential to maintain adequate hygiene and to prevent the transmission of any diseases, which are water-borne.

Many neighbourhoods of poor people lack or have inadequate drains to drain away the surface runoff and wastewater. This leads to waterlogged soils ideal for the transmission of Hookworms. Hookworms and Schistosomiasis are a few infections that can penetrate through the skin (Feachem et al, 1983). Pools of standing water may become contaminated and convey enteric diseases and also provide ideal breeding grounds for mosquitoes. Inadequate drainage also leads to damp environmental surroundings, which are hazardous to health. Stagnant water encourages breeding of both insect and snail vectors, which cause diseases. In the case of schistosomiasis, (*Bilharzia*) if stagnant water is contaminated with faeces of an infected person, (or in one species of the disease, the urine), it enables the schistosomes, the microscopic parasites which cause infection to reach the small aquatic snails in whose bodies they multiply. The parasites then swim in water and penetrate people's skin when they step into the water, (Hardoy et al, 1990). Surface drainage and the proper disposal of human excreta is the only solution to this problem, as it would ensure that faeces of infected persons do not get into contact with humans.

Mosquitoes transmit diseases related to poor drainage. There are various species of the mosquito and each transmits a different disease. The *Aedes* species transmits Yellow Fever and Dengue Viruses. The *Aedes* mosquitoes are known to breed in clear water such as domestic water storage containers, in the peri-domestic area such as cans, discarded tyres, etc. They also multiply rapidly in swampy flooded areas. Malaria is a vector borne disease transmitted by the *Anopheles* species. *Anopheles* mosquitoes' breed in areas where there is standing water such as pools swamps, etc. In Africa most of the transmissions (75%) result from indoor bites, whereas in Latin America malaria is associated with outdoor bite (WHO, 1987). Mosquitoes of the genus *Culex* transmit Lymphatic Filariasis, which is a parasitic disease. *Culex* breed in heavily polluted water bodies such as sewage, latrines, sullage wastewater etc. Other debilitating disorders of Filariasis include Elephantiasis, the irreversible swelling of the legs.

Diseases transmitted by mosquitoes present an intricate relationship between humans and the environment. It is therefore important to reduce the amount of still water around the house so that the mosquitoes have nowhere to lay their eggs. Housing conditions can influence mosquito borne diseases in two ways. First by preventing mosquitoes from entering the home in the case of endophilic species (i.e., species which bite in the house), and secondly, by using sanitary engineering techniques to prevent the development of species which breed in effluents and other domestic man-made water collections (WHO, 1987). Insects and rodents such as flies, mosquitoes and cockroaches, are attracted by manmade environments with innovations such as sanitation and waste disposal units, which they invade and colonize from the more natural breeding places. These sites provide rich organic material and water which is important for their development. For instance, large numbers of flies breed in environments associated with waste disposal systems causing nuisances to households close-by and may cause allergy with sensitisation reactions, (skin rash and asthma), as a response to the presence of the bodies of flies (Feachem et al, 1983). Proper drainage construction and the disposal of wastewater and an effective system to dispose off human waste are effective ways of controlling many diseases. This would go a long way into reducing transmission levels, as the toll of the diseases caused by poor drainage is enormous. The provision of a clean and easily accessible water supply and sanitary disposal of wastewater are one of the fundamental requirements in the maintenance of sustainable human settlements. These needs should be adequately provided both in the legal and illegal settlements in order to have a healthy and productive population.

### **2.3.3 SOLID WASTE**

The production and accumulation of wastes in urban areas has far outstripped the ability of the natural environment to assimilate them. The municipal authorities on the other hand are unable to dispose off the wastes in a safe manner. This deplorable state of affairs is worst in poor areas of developing countries where in the absence of a regular solid waste collection system, waste is dumped in open spaces, access roads, and along watercourses. There are many different types of hazardous wastes. Most domestic solid waste is not a direct danger to health, but it should be avoided. Solid waste should not contain faecal matter, but in many slums and squatter settlements of the developing world where provision of sanitary and sewage systems is poor, solid waste is frequently contaminated with human and animal excreta. This creates a situation whereby children

and waste-pickers are highly at risk of contracting diseases transmitted through the faecal-oral route.

Due to irregular collection of garbage or lack of it altogether, the small garbage dumps slowly grow into mountains blocking roads and spilling into little spaces between houses in the low-income area. Dumps are invaded by scavengers and animals, which scatter the wastes leading to unhealthy living environments. Flies and cockroaches feeding on such garbage may subsequently contaminate food (UNCHS-Habitat, 1988). Additional hazards created are the smells from rotting garbage and subsequently, when households try to ease the garbage problem by burning it increasing to air pollution and exposing them, to higher chances of getting respiratory problems. Leachate (leached material) from decomposing and putrefying garbage percolates into the soil and nearby water sources. This leads to contamination of food, water and soil, which can lead to transmission of many diseases, (UNCHS-Habitat, 1988).

If garbage is allowed to block drainage channels, this situation creates perfect feeding and breeding grounds for *Culex* mosquitoes, the vectors of Lymphatic Filariasis. Other disease vectors and pests attracted by garbage are rats. Rats may be a reservoir of pathogenic organisms for Plague, Murine Typhus and Leptospirosis (WHO 1987). Accidents are another health risk posed by improperly disposed refuse not only from cuts and bruises but also from fires may spread uncontrollably.

Uncollected solid waste creates one of the most visible environmental problems in neighbourhoods. The most appropriate methods of solid waste collection and disposal have two main objectives. First, is to reduce or eliminate direct disease transmission and disease vectors and secondly, to create a clean sanitary environment (WHO, 1987). It is imperative that more effective systems to remove the garbage within municipal budgets are created. The large sophisticated collection trucks and solid waste treatment plants are not ideal for all residential areas. Different types of refuse collection modes are needed for different areas, e.g. manually pulled carts for slum areas. The community should also actively participate in the collection and disposal of solid wastes so as to reduce to minimal levels the associated health risks from their homes.



## **2.4 HEALTH PRINCIPLES OF HOUSING**

In light of the deteriorating housing conditions especially in the developing countries, the World Health Organization set forth in six major principles the relationships that exist between housing conditions and human health and the health needs that are necessary in human dwellings (WHO, 1989 pp2-22). The health principles of housing specify the health needs to be met in human dwellings. The subjects of the major principle are:

### **1. PROTECTION AGAINST COMMUNICABLE DISEASE.**

Adequate housing should provide protection against exposure to agents and vectors of communicable diseases through: -

- A safe and adequate potable water supply, which can assist in the preventing the spread of gastrointestinal diseases, support domestic and personal hygiene and provide improved standard of living.
- Sanitary disposal of excreta reduces the fecal-oral transmission of disease and the breeding of insect vectors.
- Adequate and safe disposal of solid domestic wastes reduces health risks and helps to provide a more pleasant living environment. Appropriate methods of storage and disposal also discourage insect and rodent vectors of disease and protect people against poisonous substances and objects likely to cause accidental injury.
- Efficient drainage of surface water helps to control communicable diseases, safety hazards, and damage to home and property
- Adequate housing should include facilities for personal and domestic hygiene, and the inhabitants educated on hygienic practices.
- Healthy premises should provide facilities for the safe preparation and storage of food, to enable householders employ sanitary food-handling practices.
- Adequate housing should provide structural safeguards against the transmission of disease, including enough space to avoid overcrowding

## 2. PROTECTION AGAINST INJURIES, POISONINGS AND CHRONIC DISEASE.

Adequate housing provides protection against injuries, poisonings and thermal and other exposures that may contribute to chronic disease and malignancies. Special attention should be paid to: -

- The proper siting, structure and furnishing of dwellings to protect health promote safety and reduce hazards. While adapting to various constraints, building design, materials, and construction techniques should produce durable structures, which are dry, safe and comfortable to protect against vermin's, extremes of temperatures and recurring hazards of nature.
- Adequately designed, constructed and ventilated dwellings free of toxic and irritating substances reduce the risk of respiratory diseases and malignancies.
- Sensible precautions in the house in order to reduce exposure to hazardous chemicals as exposure to toxic and caustic substances may lead to poisoning, burns, and chronic effects all of which are not known.
- Where a dwelling is also used as a workplace, those who live in it should also be protected against hazards and contamination. Adequate separation of working premises from living areas is necessary for protection against disease, poisoning and fires.

## 3. REDUCING PSYCHOLOGICAL AND SOCIAL STRESSES TO A MINIMUM.

Adequate housing helps people's social and psychological development and reduces to a minimum the psychological and social stresses connected with the housing environment. To reduce this stress to a minimum, dwelling environment's should: -

- Provide adequate living space, properly ventilated and lit, decently equipped and furnished, with a reasonable degree of privacy and comfort.
- Provides a sense of personal and family security, reinforced by the community structure.
- Provide space for children's play sports and recreation, with minimum risks of injury and infection.
- Be so sited as to reduce exposure to noise, provide contact with greenery and enable people to have access to community amenities and

- Be easy to keep clean and in good order.

#### 4. IMPROVING THE HOUSING ENVIRONMENT.

Suitable housing environments provide access to places of work, essential services and amenities that promote good health. Three provisions of special concern to health are: -

- Security and emergency services to protect against bodily harm victimization and substances harmful to health, as well as fire, rescue and emergency medical services.
- Health and social services should be physically accessible for both preventive and curative purposes. Transport provided should enable residents' get to their places of work and to these supportive services.
- Access to cultural and other amenities

#### 5. MAKING INFORMED USE OF HOUSING.

Only if residents make proper use of their housing can its health potential be fully utilized to the full. This can be achieved by ensuring proper maintenance and ensuring that the structural defences against health hazards are not allowed to deteriorate. Hygienic facilities should also be used for personal and domestic cleanliness for the best benefits to be realized.

#### 6. PROTECTING POPULATION AT RISKS

Housing should reduce to a minimum, hazards to the health of groups at special risks from the conditions they are living in. Inadequacies in housing have been found to pose special health risks to certain groups. This may derive from unusual exposures, biological states or social circumstances. This group includes: -

- Women and children mainly because they spend more time in the home and their activities involve greater exposure to whatever safety deficiencies and health hazards that are present.
- Those who live in substandard housing. These are mainly the urban poor who live in urban slums and shantytowns and squatter settlements. They are exposed to special health risks from the run-down overcrowded and ramshackle dwellings they live in.

- Displaced and mobile populations such as refugees.
- The aged, chronically ill and disabled whether living in marginal or affluent circumstances have special needs for health protection, safety, access to services and the means of pursuing as active and rewarding a life as possible.

## 2.5 A SIMPLE DIAGRAMMATIC MODEL OF FACTORS THAT AFFECT HEALTH

This diagrammatic presentation shows the factors that affect health. It clearly shows that there is a relationship between health, housing and service provision and the environmental conditions within which man lives. The most immediate environment of the house can have an impact on health depending on the quality of the house structure i.e., building design, materials used, quality of construction, site, layout etc. The services and facilities offered within the home and its environment can also have either a positive or negative effect on the health of inhabitants living in that environment. The health-care system, environment in places of employment, personal behaviour and the socio-economic environment have a bearing on health. This clearly indicates that a broad range of factors and policies, which cannot be considered in isolation, as they are all inter-related with each other, determines health.

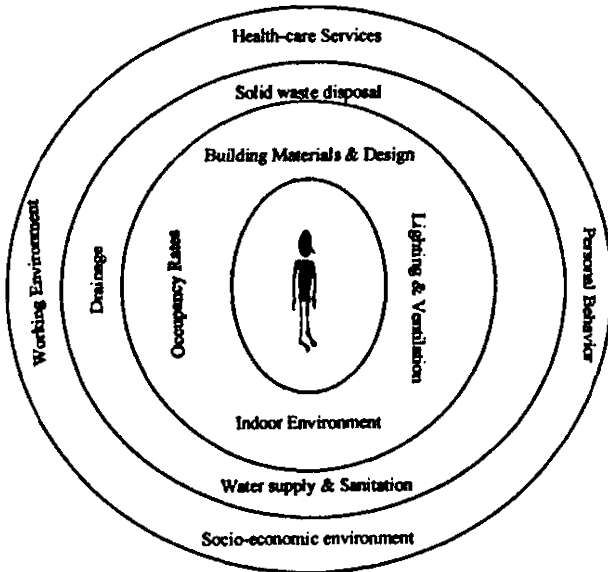


Figure 2.1 Factors affecting health

In view of all the above mentioned parameters, one can conclusively say that for a house and its environment to protect and promote health, and the well being of the inhabitants, it should meet the following criteria based on the building stipulations laid down: -

- The site on which a house is built shall wherever dampness or position of the site renders necessary, be effectively drained in a manner not detrimental to adjoining property. This is in order to ensure that the building is protected from dampness. All buildings should also be so sited in a manner that ensures that hygienic and sanitary conditions are observed (GOK 1968).
- Buildings should be at a level or so constructed as to allow the construction of a drain or drains sufficient for the effectual drainage of that building. Plans of every building must also show satisfactory provision for drainage of the building.
- The house should be adequately designed and constructed to produce durable structures that offer adequate protection for residents and reduce exposure to danger and transmission of diseases to a minimum.
- All parts of a domestic building i.e., the walls, areas of the walls joining floors, floors, and the ceiling should be finished to a habitable standard.
- Habitable room sizes are determined by the nature of occupancy. For single room occupancy, all habitable rooms should have a minimum superficial area of 7.0sqm and a minimum internal dimension of 2.1sqm. The number of persons in such a room should be calculated on the basis of 3.5sqm per person. In the case of multipurpose room occupancy a habitable room shall have a minimum area of 10.5sqm, (GOK 1995).
- The building code (1968), also states that all walls built of stone, bricks or blocks should be hard, durable and suitable for the purposes for which they are built. Walls should adequately resist the penetration of rain and damp. Walls should also be capable of supporting the roof and be resistant to vermin.
- Party walls should be constructed such that they are non-combustible and will restrict the spread of fire to adjoining property. All internal walls should also be finished with a smooth and even surface, (GOK 1995).
- The roofs of buildings should be weather proof, properly constructed to support the load of the roof covering material and be resistant to destruction by vermin, wind, and corrosion.

- The roof covering material should be capable of resisting the penetration of weather elements.
- Roofs should also be provided with appliances for drainage so as to prevent rain from causing dampness in any part of the building or damage to the foundations.
- A house consisting of two or more habitable rooms shall be provided with a kitchen of not less than 60Sq ft.
- In high-density low-income housing areas, sufficient and properly designed cooking areas should be provided with suitable provision for storage of food and be adequately ventilated.
- All habitable rooms in a dwelling should be adequately ventilated. This is achieved by through or cross ventilation. Windows should be constructed so that there are at least one-tenth of the total floor area. Through or cross-ventilation shall be provided by ventilators or openable windows.
- Every habitable room should have a window opening or windows opening directly to the external wall for the purpose of daylight. The total openable area should not be less than 1/20<sup>th</sup> of the floor area.
- Sec. 143 of the building code, (GOK 1995), states that an appropriate supply of wholesome water should be provided for the purpose to which the building has been put up. Every building should also be provided with a stored supply of cold water for domestic purposes taken from the main water supply of the building. This stored water should be sufficient to meet a twenty-four hours demand from the occupiers.
- In high-density or low-income residential areas, the supply of water shall be to the satisfaction of the local authority, and if required, provisions should be made for water storage, (GOK, 1995).
- Where water supply is piped to a dwelling plot, the tap should be close but outside the latrine cubicle. Such a tap should discharge into a washing slab or splash area constructed of impervious, smooth material of sufficient size to allow the filing of water vessels, washing of clothes and utensils. However, where water supply can't be piped to the dwelling plot, it must be provided through a system of public standpipes and the maximum distance to any dwelling served

must not exceed 100m. The volume of supply shall be sufficient to provide a minimum of 30 Liters per person per day during any 12hrs period, (GOK 1986).

- The building code, 1968, states that every dwelling shall be provided with a bathroom of not less than 25sqft in area having a minimum dimension of 3ft 6in. Sufficient and satisfactory latrine accommodation should also be provided, while hand-washing facilities should be readily accessible from the latrine.
- In high-density low-income areas, all dwellings shall be provided with sufficient and properly constructed sanitary accommodation and washing facilities. A latrine and washing facility shall be provided either in separate compartments or in a combined compartment (GOK, 1995). This requirement is deemed satisfied by the provision of 1 latrine or WC and 1 shower for 4 habitable rooms and 1 latrine and 1 shower in addition for each additional 2 or 1. (GOK, 1986).
- Where a combined compartment is provided, a separate provision for the washing of utensils shall be made to the satisfaction of the local authority. The floors of all latrines and showers should be constructed of a smooth waterproof surface and laid to all. The walls of each compartment should also resist penetration of water up-to a height of 0.5m above the finished floor level, (GOK, 1995).
- All dwelling should be provided with sufficient facilities for washing clothes and utensils and such facilities shall be adequately drained.
- Every domestic building shall be provided with approved means of refuse disposal. If refuse collection services are available, every premises should have a container plinth of permanent construction with adequate falls for each container. The container plinth should be readily accessible for removable of the dustbins.
- In high-density or low-income residential areas, suitable provisions should be made to accommodate refuse bins.
- Sec 32 of the Public Health Act (Cap 242), states that municipal authorities should provide hospitals/health centers for the use of inhabitants of that area. This will have a catchment population of 2000 people.

It is from this perspective that the analysis of the research will be carried out. Of special interest to this study will be to examine the housing conditions, the residential environment, and the state of health households. When referring to health, the WHO definition of health as "a state of complete physical, mental and social well being and not

merely the absence of disease or infirmity" (WHO, 1961, pp 7) will be adopted. The residential environment as defined by the WHO will also be used.



## CHAPTER THREE

### BACKGROUND TO THE STUDY AREAS

#### 3.1 INTRODUCTION

Kenya's housing development process shows that there have been no major changes in housing policy, an indication that housing has not been accorded its importance and its role is not fully recognized in national development planning. During the colonial period, housing provision was inadequate and the scenario has not changed rather it has continued to worsen. This is evidenced by the numerous slum and squatter settlements that have sprung up in our major towns, especially the capital city of Nairobi. Clearly most low and middle-income housing units in Kenya consist of only one or two rooms. Taking into consideration that the national median household size from the 1989 population Census was four persons; the resultant must be overcrowding. The inadequacy of shelter provision is compounded by poor and inadequate systems of supportive and facilitative infrastructure and services. Figure 3.1 shows the zones in which the study areas are located.

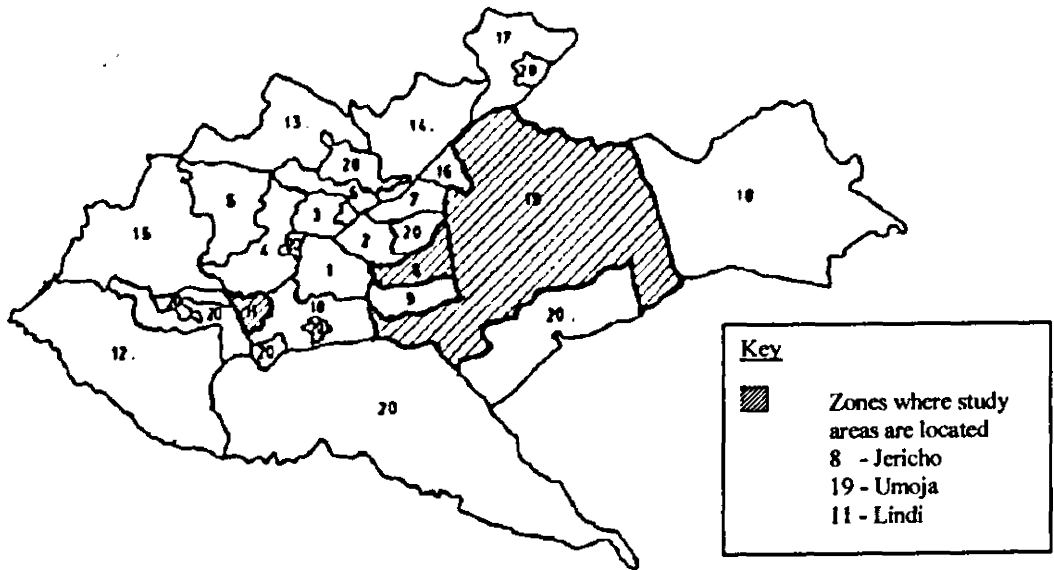


Figure 3.1 Nairobi Planning Zones -Showing the Study Areas

### 3.2 KIBERA SLUMS

Kibera slums are one of the largest and oldest settlements in Nairobi. The settlement is located approximately 7 Kms. southwest of the central business district. It covers an area of approximately 3 Sq Kms and is the largest major concentration of low-income inhabitants. It is bounded to the south by the steep valley of the Motoine river, to the east by high and middle-income residential housing units, to the west by the ASK showground at the Jamhuri Park and to the north by Woodley and Joseph Kangethe estates (See Figure 3.2).

Kibera has been associated with the Nubian community who were settled here between 1912 and 1934 when Nubian soldiers were informally given the right to stay there with their families by the colonial government. However, they were not given any records or title deeds which they could use as proof (HRDU, 1980). Members of other Kenyan Communities started moving into Kibera in 1956 as squatters. The name Kibera means forest in Kinubi due to the fact that the original site occupied in 1913 was a wooded (HRDU, 1980). Kibera is a ridge and the entire site belongs to the government of Kenya though there are different claims to the land. Kibera comprises a series of villages, which include Makina, Kisumu Ndogo, Lindi, Lini-Saba, Mashimoni, Kambi Muru, Siranga, Soweto and Katwikira, and Kiandaa. It is divided into an upper area, the original Nubian settlement of Makina on one side of the railway line, and the lower area, which is densely settled by a heterogeneous community.

The settlement is overcrowded due to the high population and continuing influx of migrants who come to the city in search of employment opportunities. As a result, the area lacks critical facilities and services to make it a comfortable residential environment. The 1989 population census estimated the population of Kibera/Woodley area to be 122,643 people consisting of 42,722 households. These households are located on 3 Sq Kms. Vehicular access is minimal and almost exclusively by Kibera drive which runs through the settlement. A hierarchy of murrum roads and footpaths serves the entire village. These are accessible though dusty in the dry season while they are virtually impassable during the rainy season. . The area is characterized by shortage of accommodation, high rents, overcrowding, and a critical lack of facilities and services. Conditions are widely thought to have deteriorated significantly in recent years, mainly due to the continuing influx of low-income migrants and associated mushrooming of squatters.

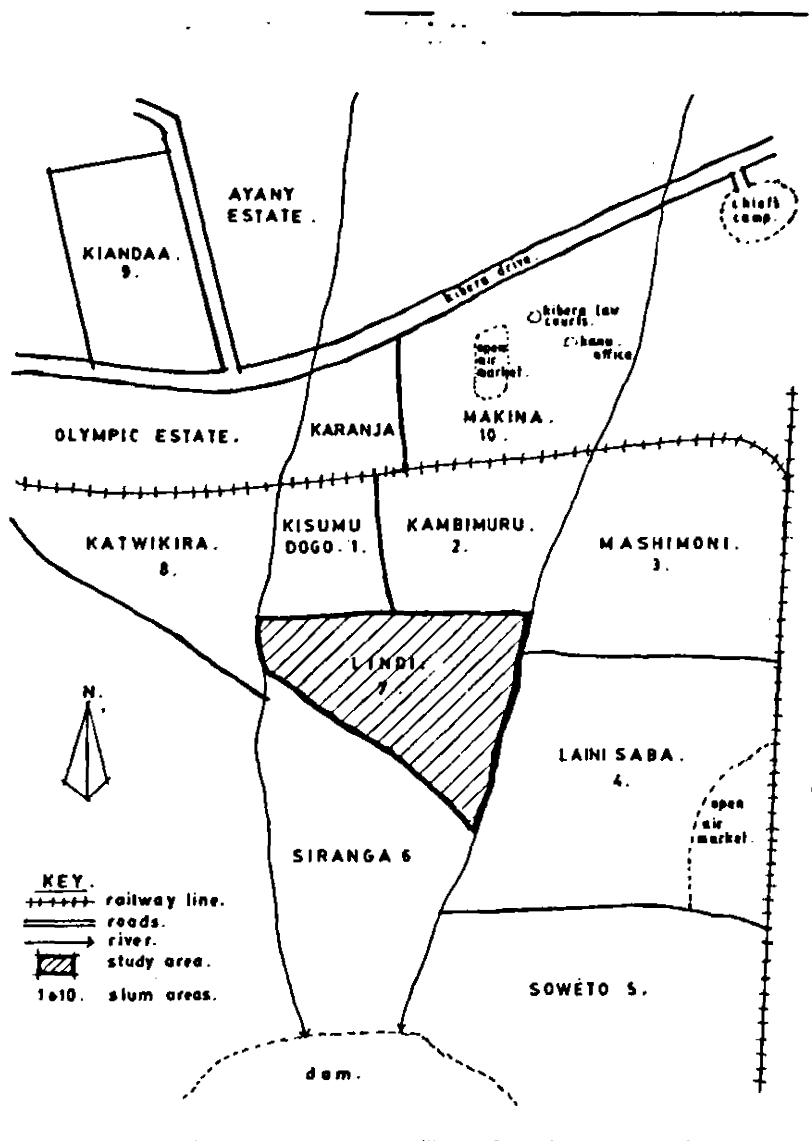


Figure 3.2 A Sketch Map of Kibera Slum Area

### 3.2.1 HOUSING

Dwelling units in Kibera are grouped together in a dense linear pattern of houses basically L, U, or I shaped (See picture L.1). They are primarily semi-permanent single rooms located in long narrow single storey blocks, which are generally unplanned. The average

number of rooms per structure ranges from 10 –12 rooms. Most room sizes vary, although the average room size varies between 1.5 by 2.0 m to 2.0 by 2.5 Sq. m. The blocks are separated by narrow paths, which are often littered with garbage, human excreta and are almost impassable during the rainy season (See picture L.5). The dwelling units are mainly constructed with mud and wattle walls, corrugated iron sheets for the roof, and earth floors. Only a few have the floors rendered with plaster and the floors concreted hence the rents for these types are higher. The rooms are multi-purpose, being used for all activities in the home. However it is common practice for households to separate the rooms into compartments. Most of the houses are poorly ventilated having only one small window while others have none and leave their doors open for ventilation purposes and to let in natural lighting. The rooms are uncomfortably during the day due to the iron sheets used for roofing.

### **3.2.2 DRAINAGE**

Kibera is an unauthorized settlement and is therefore not recognized by the government or the Nairobi City Council. Consequently the provision for public infrastructure and services is extremely low. The existing drainage channels are disrupted causing many blockages and leading to stagnation of water. Most households pour their wastewater outside their houses or in dugout drainage channels that often become clogged up with garbage resulting in the muck overflowing and waterlogged damp surroundings. In the recent past certain a local Non Governmental; Organizations (NGO), Kenya Water for Health Organization (KWAHO) has been trying to construct basic drainage channels as well as improving the availability of water by motivating trained resident health volunteers to form water committees to establish water kiosks (Schuringa, 1996).

### **3.2.3 GARBAGE COLLECTION**

There is no formal or organized garbage collection and disposal system in Kibera. Most households throw their garbage anywhere either in the existing garbage dumps or in drainage channels. This not only leads to blockages but also results in an unbearable stench of rotting garbage. In turn it poses health risks to the residents and especially children who lack playing grounds. The garbage remains uncollected and in large quantities often containing human excreta exposing the residents to serious health risks. During the rainy season, most of the garbage is washed downstream easing the problem lightly but in turn polluting the river. Most residents do not make an effort to clear the

garbage by. When garbage blocks the few available drainage channels impeding the flow of water, stagnation occurs providing breeding grounds for flies, rats, cockroaches, mosquitoes, and other disease causing vectors.

#### **3.2.4 WATER SUPPLY**

Private water kiosks licensed by Nairobi City Council are operating in the area and sell water in Kibera. Water is sold for between Ksh 3 and Kshs 5 per 20 litre container which is very expensive. This is about 6 times the price of individual water connections, (Schuringa, 1996). Availability is restricted to the period when there is water in the mains, as most kiosks do not have storage tanks. Even when water is available, some of the water points have very little water for restricted hours per day usually in the morning. The households' income levels and the distances to water collection points dictate the amount of water used in the home. When people cannot afford the high prices charged especially when there are shortages, they draw water from a nearby polluted river, (Kunguru, 1991). The levels of water use in Kibera as in any other slums endangers personal and environmental hygiene. Hence water and sanitation related diseases and skin infections are very common health problems experienced in the slums.

#### **3.2.5 TOILET FACILITIES**

The level of sanitation in Kibera as sited earlier is very poor. There is no water-borne system in the area, hence pit latrines serve the entire slum area. However not all landlords provide this facility and those lacking are either forced to defecate in the open or use the so called "flying toilets", (Lamba, 1994) where one defecates on a paper in the dwelling and then throws it into a drainage channel, garbage heaps or stream. This creates a very unhygienic environment as children play anywhere, as there are no designated playgrounds exposing them to the risk of contracting diseases of the faecal-oral route.

The pit latrines available are primitively and crudely constructed and most are neither ventilated nor covered, offering little privacy. Due to poor planning they are located close to dwelling units. As the latrines are for communal use, nobody is responsible for their cleanliness and maintenance and are therefore often in a disgusting state leaving people no option but to defecate and urinate outside. This results in smelly surroundings and nuisance from flies in the toilets. Once full the landlords do not provide alternative latrines. The latrines that are available are therefore grossly inadequate in number, are

over-utilized and create further sanitation problems. Extensive soiling of the latrines is a common occurrence both within and outside (See picture No. L.4 in Appendix A). The communal toilets have limited use especially at night because of the high incidence of thuggery (Mairura, 1988). This means that despite the presence of the toilets they are not utilized at all times.

Most compounds have no bathroom facilities for the residents as the landlord do not provide this facility. Where bathing facilities exist they are in such bad state that residents hardly use them. Many residents bathe either inside the house or outside at night though the latter is not very common due to the fear of being attacked by thieves.

### **3.2.6 HEALTH FACILITIES.**

Kibera slums are not served by any City Council health center within the settlement. The Langata Health Center and Woodely Health Center are near the slum though not very easily accessible especially during the wet season. Many residents use the Langata Health Center especially when the center has medicine so that the patients do not have to incur expenses on buying medicine. The settlement is also served by many small private clinics. Crescent Medical Aid, CPK Church, Kibera Catholic Mission, a local NGO KWAHO, and Family Planning Association of Kenya are active in the promotion of health-oriented programs.

## **3.3 UMOJA ESTATE**

Umoja estate is located on the east side of Nairobi approximately 9 Kms from the city center. The estate is in an area adjacent to several other major housing projects such as Kariobangi South estate, Buru-Buru estate, Doonholm, and Uhuru estates among others (See Figure 3.3). It is therefore located in an area of rapid housing development. The site is part of the Athi Kapiti plains mainly grassland with wooded vegetation. The area has high daytime temperature, colder nights and less rain than other parts of Nairobi. The site is covered with black cotton soils with impeded drainage, low carrying capacity and marked considerable shrink and swell characteristics (Grootenhuis, 1983). The black cotton soils had to be completely excavated around the house foundations and replaced with more stable granular soils.

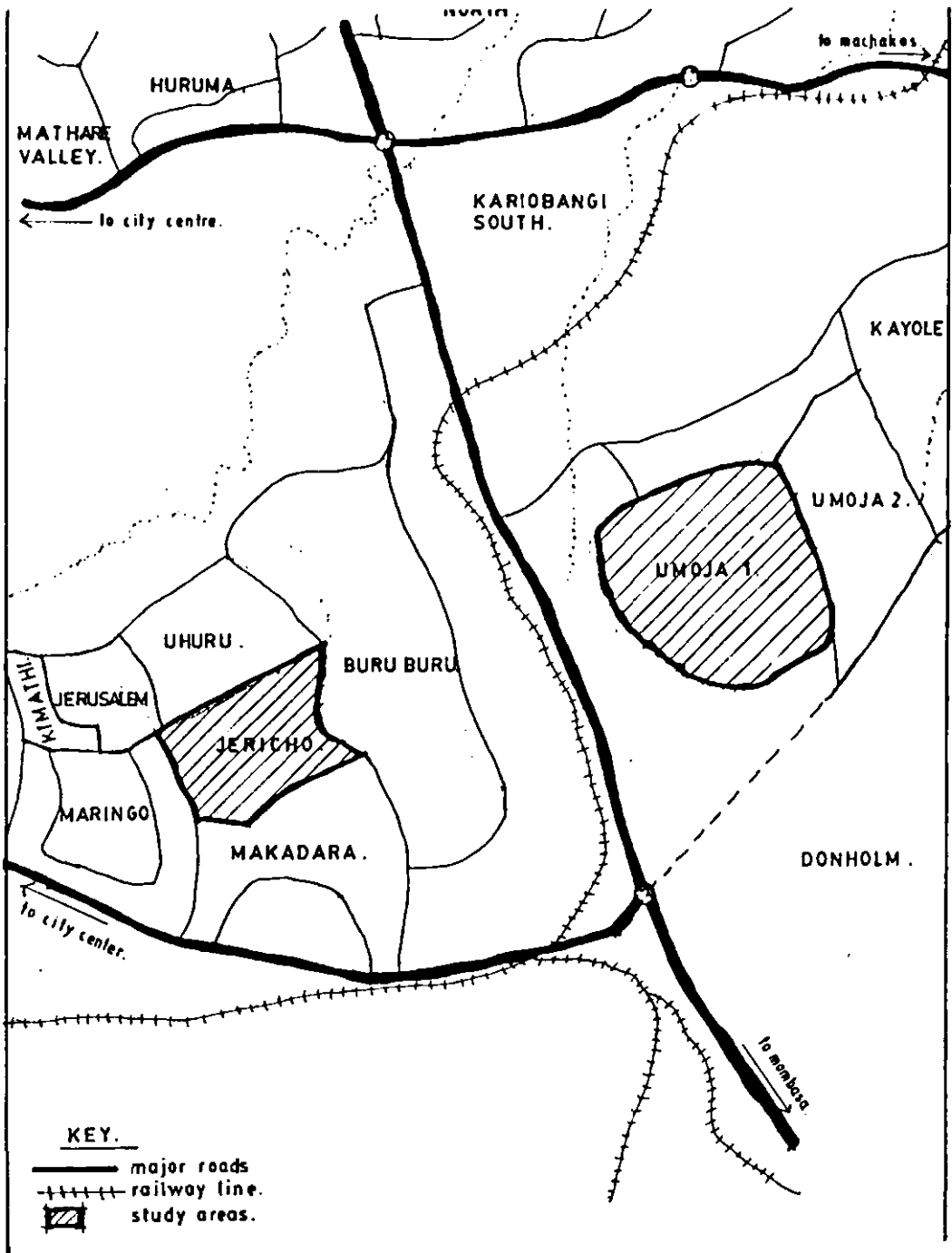


Figure 3.3 Location of Umoja and Jericho Estates

The housing project was conceived in 1971 when the government of Kenya through the Nairobi City Council attempted to alleviate the housing problems faced by the low and middle-income groups in Nairobi. The project was approved in 1972 and financed by the Housing Guarantee Program of the United States Agency for International Development, (USAID). Umoja I was a core housing tenant purchase project whose construction was co-ordinated by the Nairobi City Council engineers. It was developed in four phases. The first phase was finished in 1975 while the last one was completed in 1979. Though the houses were meant for the low-income groups, high-income groups now occupy the project as a result of the gentrification process. Results of the 1989 Population Census indicated that Umoja area had a population of 43,526 people comprising of 11,149 households. The entire Umoja residential area is located on 18 Sq Kms.

### 3.3.1 HOUSING

Umoja I consisted of approximately 3,000 housing units and were varying in price from Ksh 30,030 for a one-room core housing unit to Ksh 39,030 for a complete three roomed house. It was designed to be available to people with incomes of Ksh 800-1,600 per month. The houses were of three different types either with one, two or three rooms. Each type had a different price, and two of the houses were expandable. Each house type had a kitchen, shower and a toilet with a squat plate cistern. All the houses were fitted with individual water, sewerage and electricity connections. As a cost cutting measure 73% of the houses were built with only one room, a kitchen and wet cores (Grootenhuis, 1983). The allottee was then expected to add the other rooms when he could afford them. In addition to expansion, certain interior work was left undone. The purchaser was expected to complete the interior wall plastering, ceiling, and flooring of the core house. The houses are constructed of externally plastered concrete block walls while the floor is a concrete slab. The roof is of asbestos roofing panels supported by wooden framing with wooden doors and window frames. The estate is divided into 14 sections, which are difficult to identify. There is little distinction as the layout of the estate and the house designs are virtually identical. Moi Drive, which is the major road in the estate, gives access to the houses. Road reserves in the estate are however hardly wide enough to walk along and leave room for motorists. Though the original layout of the estate still exists, the estate looks confused and haphazard due to the rapid growth of the area where many illegal housing extensions are being put up. High rise flats are being put up in the area against the zoning regulations on plot ratio given by the City Council (See picture



U.2). The transformation that has taken place has resulted in a very congested and overcrowded estate whose infrastructure and services cannot support the present population.

The Nairobi City Council had allowed the original allottees of Umoja I to rent the rooms provided that the owner remained on the plot. However by 1978 over half of the owners were renting out the entire house to tenants who generally paid 65% more for their rental housing than did the owner on his mortgage, (Dennis, 1983). The original plan specified the plot coverage to be achieved leaving an open space for each plot even after extension of the original house plans. This design was meant to provide and maintain a healthy environment around and within the housing units. However this has not been maintained and there are currently uncontrolled and haphazard developments through construction of illegal housing extensions on the original plots. This had not been catered for and has led to plot coverage beyond the levels that were stipulated in the plan designs and it was not long before some owners expanded their houses beyond the allowable size. This was the beginning of the construction of housing extensions in Umoja I estate. In June 1982, 160 owners were cited for violations involving the addition of new rooms and the construction of a boundary wall well above the allowable 5 Ft 6 inches height (Dennis, 1983).

### **3.3.2 DRAINAGE**

This is a legal estate (a site and service scheme), and is therefore provided with a drainage system. However the drains along the roads are often blocked with garbage blocking the free flow of water and creating ideal breeding and feeding grounds for mosquitoes, flies, rats and other diseases causing agents. The drains are sometimes blocked with building materials from the numerous constructions taking place in the estate. During the rainy season, the drainage provided is not able to dispose off the rainwater adequately due to blockages and poor maintenance.

### **3.3.3 GARBAGE COLLECTION.**

Garbage collection in the estate is very poor. The city council used to provide garbage collection services once a week but the service no longer exists. Some residents pay a private company to collect and dispose off the garbage. Those who do not pay for this service dispose off their garbage right from the footpaths, roads and in the available garbage dumps in the estate giving the already congested estate a dirty appearance (See

picture U.2). Rubbish is also thrown in the drains leading to blockages, overflows and stagnation. Poor garbage collection and dumping has noticeably had a negative influence on the general living conditions of the entire estate. Unsightly, ordourous and unhygienic garbage piles have been a source of complaints over a long period of time now. The black cotton soils excavated to put up foundations are dumped in sporadic piles all over the estate where space is available occupying private and public land which could otherwise be used for recreation, gardening etc. and blocking access in some areas. In addition to the problem of soil and garbage dumping, is the problem of building materials used for construction blocking the narrow footpaths and roads (See picture U.2).

#### **3.3.4 WATER SUPPLY AND SANITATION.**

Umoja I housing estate was provided with individual water connections to all houses. However water supply as in any other estate in Nairobi is not constant. There are frequent shortages. The inadequate supplies can be attributed to the high population in the area as a result of illegal extensions which are factors that had not been considered hence rendering the infrastructural support to the present population inadequate. Apart from poor storm water drainage, sewers in the estate also frequently block and overflow and repairs are not undertaken quickly leading to unhygienic surroundings which may expose the residents of this area to various health risks.

#### **3.3.5 HEALTH FACILITIES.**

Umoja I estate is served by the Umoja Health Center a City Council Clinic, which is located in the estate next to the market. The health center does not only serve residents of Umoja I and II estates but also the residents of neighbouring estates such as Kayole, Buru-Buru, Soweto slums etc. Small private clinics in the area and in the neighbouring estates are also easily accessible to the residents of Umoja.

### **3.4 JERICHO ESTATE**

Jericho estate is located in the Eastland's area of Nairobi and is located approximately 6 Kms from the city center. The estate is adjacent to Uhuru, Harambee, Jerusalem, Makadara, and Buru-Buru estates. (See Figure 3.3). Jericho Estate is a lower middle-income housing estate which falls under the Nairobi City Council and was among the first estates to be built for the Africans providing more space than the bed sitter housing that

was common during the colonial period. The estate was developed in 1961 and is one of many city council housing estates in Nairobi. Results of the 1989 Population Census indicated that the population of Jericho Lumumba estate is 18,100. There are 3,538 households located on 1 Sq Kilometre.

### **3.4.1 HOUSING**

This estate was developed based on the principle of the "Neighbourhood Unit" complete with a social center, shopping center beer shop nursery school etc. The estate has maintained the original layout. All the open spaces have not been interfered with and no housing extensions have been put up (See picture J.1). Many of the trees and shrubs in the estate were planted prior to the estate's completion and the layout has not changed. However the estate shows evidence of considerable private planting of shrubs and trees in addition to vegetable gardening (See picture J.3).

The houses are arranged in blocks grouped round open spaces planted with trees, shrubs and grass which are mainly used as playgrounds. The estate is divided into seven sections while the housing blocks are either single or double storeyed. The houses are constructed of externally plastered and painted walls while the floor is a concrete slab. The roofing is of asbestos sheets and the houses vary from one to three bedrooms with a toilet, shower and kitchen all fitted with individual water, electricity and sewer connections.

### **3.4.2 DRAINAGE**

Jericho estate has a well laid out drainage system. However due to poor garbage disposal practices and poor maintenance, the drains are frequently blocked and stagnated especially during the rainy season.

### **3.4.3 GARBAGE COLLECTION**

Garbage collection by the Nairobi City Council is almost non-existent and many households dump their garbage in certain garbage dumps, which are sometimes burnt. Though the garbage is hardly ever collected the estate appears much cleaner than other city estates. This can be attributed to the fact that there has been no construction of illegal extensions in the estate which leads to overcrowding.

#### **3.4.4 WATER SUPPLY AND SANITATION.**

Each house has individual water connections and the estate has a water-borne sewerage system. Water supply is however not constant and there are frequent shortages. The sewers in the estate are frequently blocked and overflow leading to unhygienic surroundings, which are a risk to health.

#### **3.4.5 HEALTH FACILITIES**

The estate is served by the Jericho Health Center a City Council Clinic, which is located in the estate near the shopping center. This center also serves residents of neighbouring estates and operates on a twenty-four hour basis. It is one of the city council clinics that has an operational laboratory and is therefore often very busy. The Makadara health Center another City Council Clinic as well as the private Metropolitan Hospital, which was opened recently located in Buru-Buru next to Jericho estate, are also easily accessible to residents of the estate.

### **3.5 SUMMARY**

This background information on the study areas gives an insight into the kind of housing offered and service provision in the three areas. The conditions of the living environment are also outlined. Lindi village has the poorest housing quality in the study areas. Other services and facilities required in the residential environment are also inadequate in Lindi village. Umoja and Jericho estates have better quality housing, though the state of the living environment was better in Jericho estate than in Umoja 1 estate. This can be attributed to the construction of housing extensions in the Umoja 1 area, which have led to overcrowding. The following chapter outlines the findings of the field survey.

## CHAPTER FOUR

### SURVEY FINDINGS ON HOUSING CONDITIONS, SERVICE PROVISION, ENVIRONMENTAL CONDITIONS AND MORBIDITY RATES IN THE STUDY AREAS

#### 4.1 INTRODUCTION

This chapter gives a description on the housing quality in the three study areas. This includes the services and facilities related to housing which constitute the residential environment. The health facilities serving the three areas and the most common diseases treated are also outlined. A brief overview on morbidity rates of residents in the study areas is also given.

#### 4.2 HOUSING QUALITY IN THE STUDY AREAS

Various difficulties are encountered in an attempt to define housing quality. In view of this fact, the study adopted the housing quality index used in the 1989 Housing and Population Census. The stipulations laid down in the Building Code (1968) and the Local Government Adoptive By-laws Order of 1995 were also put into consideration (See chapter 2 sec 2.5).

This study appreciated the difficulties encountered in defining housing quality. Housing quality has been considered in terms of durability of the house structures and the services and facilities provided in the homes. The questions related to housing in this study centred on the types of walls, floors and roof while the services and facilities considered included water supply, solid and liquid waste disposal and the toilet facilities available to the household. Each of these aspects was then given a code and awarded scores. The best material and the most ideal related amenity was given the lowest score e.g. 1 or 2. On the other hand the worst building material and inadequate related services were given higher scores e.g. 5 or 6. The scores of all the seven different aspects were then added up to have a total score. The total score for any one house consisted of the following:

Total Score=Roof + Wall + Floor + Source of water + Waste-water disposal method + Solid-waste disposal method + Human-waste disposal method

Good quality housing had the lowest score while poor quality housing had higher scores. The ranking is as follows:

Very good	7-10 scores
Good	11-14 scores
Poor	15-17 scores
Very poor	Over 17 scores

Table 4.1 Housing Quality in the Study Areas (In Percentages).

HOUSING CONDITIONS	AREAS		
	UMOJA	JERICHO	LINDI
Very Good	100	100	2.5
Good	-	-	12.5
Poor	-	-	76
Very Poor	-	-	9
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Survey, 1997.

In Umoja 1 and Jericho estates, the housing quality is considered very good as shown on Table 4.1 above. The houses are constructed with durable materials. The walls are made of concrete blocks, while the roofs are covered with roofing tiles. The flooring materials vary from cement to tiles. In terms of the related services and facilities, Umoja 1 and Jericho estates are connected to the water mains and have piped water, as seen in Table 4.3. Both estates also have a water-borne sewerage system. Though the estates should be provided solid-waste disposal services, this is rarely done. The Nairobi City Council is no longer able to offer adequate and effective solid waste disposal services due to the large volume of solid waste produced in the city as a result of an increase in the population. Many residents therefore dispose off their solid waste outside anywhere as shown on Table 4.2.

Table 4.2 Solid waste disposal Methods in the Study Areas (In Percentages).

SOLID WASTE DISPOSAL METHODS	AREAS		
	UMOJA	JERICO	LINDI
Collected by City Council	12.5	17	0
Collected by Private Company	50.0	0	0
Thrown Anywhere	32.5	74	98
Burnt	5.0	9	2
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Survey, 1997

In Lindi village, only 2.5% of houses were found to be in very good condition as shown on Table 4.1 above. These houses belong to households who live in Kibera slums. The houses are better designed, built with durable materials and have different rooms for different purposes. However, the majority, i.e. 85% of housing units in Lindi village were in poor condition the material of construction being G.C.I. roofing sheets, mud and wattle walls and an earth floor making domestic hygiene difficult. The 12.5% of houses in Lindi village that were considered in good condition were those whose walls were plastered though they were still made of mud and wattle. Some housing units also had a cement screed floor hence improving their quality compared to that had an earth floor.

Lindi village is situated in Kibera and like any other slum and squatter settlement, is not connected to the water mains and sewer lines. Therefore the residents do not have piped water. The residents buy water from water kiosks as shown on Table 4.3. The water points are many as 95% of the respondents said that the water supply was within 100m, hence easily accessible.

Table 4.3 Sources of Water in the Study Areas (In Percentages)

SOURCE OF WATER	AREAS		
	UMOJA	JERICO	LINDI
Piped water	100%	100%	-
Public Stand Pipe	-	-	3
Water Kiosk	-	-	97
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: - Field Survey, 1997

The slum residents have no organised method of solid waste and garbage is strewn all over the village. As indicated on Table 4.3, 98% of respondents in Lindi village dispose

off their garbage by throwing it anywhere. This garbage is often contaminated with human waste as a result of inadequate toilet facilities, causing a very unhealthy living environment especially for children who spend their time playing outside. During the rainy season, the garbage is often washed downstream therefore contaminating river Motoine.

The village does not have a water-borne sewerage system, therefore, the residents dispose off their wastewater in pit latrines, outside anywhere or in the few available drains as shown on Table 4.4. below. This creates waterlogged conditions, which are unhealthy, as they favour the breeding and nesting of various disease vectors. Due to poor solid waste disposal methods, garbage blocks the drains making the drainage problem worse.

Table 4.4 Methods of Wastewater Disposal in the Study Areas (In Percentages).

METHODS OF LIQUID WASTE DISPOSAL	AREAS		
	UMOJA	JERICO	LINDI
Sewer Connection	100	100	-
Pit Latrines	-	-	1.05
In Drains	-	-	55
Outside Anywhere	-	-	34.5
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: - Field Survey, 1997.

### 4.3 HOUSE DESIGN AND MAINTENANCE

Housing in Umoja 1 and Jericho estates is well designed. The houses have been built on well-drained sites. The stipulated by-laws on Siting and Space About buildings were put into consideration both in Jericho Estate and in Umoja 1 estate when the estates were built. However, in Umoja 1 estate where numerous housing extensions have been put up in a haphazard way, the by-laws on plot coverage, siting and space about buildings have gradually been sidelined. This has resulted in overcrowding in the area. In Lindi village on the other hand the houses are poorly designed and built exposing the residents to danger and unhealthy living conditions. The houses are built in blocks which are located very close to each other living little space between the housing blocks. This high building density results in congestion and overcrowding.

The housing units are not built on well-drained sites resulting in damp conditions. For instance, some houses in Lindi village are built very close to the river exposing the



residents to injury or death in the event of floods (See picture L.3). The building by-laws stipulate that buildings should be sited in a manner that ensures hygienic and sanitary conditions are observed. In Lindi village, however, the housing units are located close to drainage channels and pit latrines creating unhealthy living conditions for inhabitants (See pictures Nos. L.5 and L.6). It is therefore clear that the living environment in Lindi Village like any other slum and squatter settlement is in a deplorable state. This means that even for the households' who live in well designed and built houses that are in a good state of repair and maintenance, the surrounding environment exposes them to various health risks.

Housing maintenance is a problem in all the three areas. To determine the maintenance conditions of the houses, the state of repair and maintenance of the building components were rated as good, fair, or poor. Housing whose maintenance needs are never addressed were rated as poor, while those that have their maintenance needs not fully addressed were rated fair. The houses whose maintenance needs are always addressed were rated good. Observations were also made to determine the maintenance conditions of the houses in the three study areas are shown on Table 4.5.

After construction, many structures in Lindi village are not kept in a good state of repair. However, Umoja estate did not have very poor maintenance conditions compared to Jericho estate and Lindi village, as shown on Table 4.5 below. This can be attributed to the fact that 87% of houses in the estate are meant for rental purposes. This can be attributed to the fact that 87% of houses in the estate are meant for rental purposes. The landlords therefore try to maintain their houses well so as to that they can attract tenants and fetch high rents for their houses. Housing in Umoja 1 estate mainly caters for the middle-income earners who would demand reasonable maintenance compared to tenants in Lindi village.

Jericho estate on the other hand is an old city council housing estate and is not very well maintained due to lack of resources and the various problems facing local authorities in the country. This can expose residents to poor health because even the most adequate of structures will not serve health purposes if it is not well maintained and if it's defences against health hazards are allowed to deteriorate. In Lindi village, the houses are poorly designed and built posing maintenance problems right from the onset. Landlords aim at maximising rents from the poorly constructed and maintained houses. Respondents said that their complaints on anything that needs repairs or maintenance falls on deaf ears.

The tenants have no choice but to live in the poorly maintained housing units, as they have no alternative.

Respondents in all the three areas said that their houses were hot during the day causing discomfort. The condition was worst in Lindi village as a result of using G.C.I roofing sheets. This makes the houses too hot during the day and too cold at night. Poor ventilation was cited in Lindi village as most housing units have only 1 small window, which is sometimes kept shut for security reasons. The houses are therefore inadequately lit during the day forcing the inhabitants to strain their eyes. Leaking roofs are a major problem, as cited by 52% and 70% of respondents in Lindi village and Jericho estate respectively. The leakage problems end up causing damp conditions in the houses. From the survey, 43% and 23% of respondents in Lindi village and Jericho estate respectively, reported that their houses were damp.

In the absence of national housing maintenance standards, the study adopted standards used in previous studies carried out on housing maintenance in the country (Syagga & Aligula 1993 and Syagga & Aligula 1995). In addition to the questions asked and observations made the maintenance conditions of the components were determined by defects such as cracks on walls, floors, and tiles. Defects on paintwork on the walls included fading, flaking, staining and discoloration. Observations were also made on leakages in piping and roofing and signs of dampness noted.

Table 4.5 Maintenance Conditions of Housing in the Study Areas

FEATURE	STUDY AREA		
	UMOJA	JERICO	LINDI
<b>FLOORS</b>			
Good	17.5	20	13
Fair	65	53.0	15
Poor	17.5	27.0	72
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>WALLS</b>			
Good	22.5	26	5
Fair	57.5	47	14
Poor	20	27	81
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>ROOF</b>			
Good	25	17	10
Fair	50	33	24
Poor	25	50	66
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>WINDOWS</b>			
Good	40	50	15
Fair	50	40	31
Poor	10	10	54
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>TOILETS</b>			
Good	30	33	6
Fair	42.5	30	18
Poor	27.5	37	76
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>BATHROOMS</b>			
Good	41.0	33	6
Fair	38.5	30	23
Poor	20.5	37	71
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: - Field Survey, 1997.

#### 4.4 HOUSING OCCUPANCY

House sizes varied in all the three areas as shown on Table 4.6 below. In Umoja estate the basic house consisted of a living room, two bedrooms, a kitchen, toilet and shower room. In Jericho estate on the other hand, the housing unit is made up of a living room, 1 bedroom, a kitchen, shower, toilet, and a small store next to the kitchen, which is used as a bedroom in most households due to limited space. Due to the high number of household members, the living room is used for multiple purposes i.e. living and sleeping. 37% of respondents in Jericho estate said that they used the rooms for multiple purposes. In Lindi village on the other hand, 95% of respondents lived in one roomed housing units used for multiple purposes. Though the housing units in Lindi village varied in size, the average room size measured 2.0 by 2.5 Sq. meters. Only 3% of respondents as shown on Table 4.6 below had houses with more than 3 rooms.

Table 4.6 Dwelling Unit Sizes in the study areas (In Percentages)

DWELLING UNIT	AREAS		
	UMOJA	JERICO	LINDI
NO. OF ROOMS			
1	-	13	95
2	25	47	1
3	67.5	40	1
More than 3	7.5	-	3
TOTALS	100	100	100

Source: Field Survey. 1997.

Household sizes in Lindi varied from 1 to 19 persons with the average household size being 4 persons. The Local Government Adoptive By-laws, (1995), for high-density low-income areas stipulate that in the case of multipurpose room occupancy, a habitable room should have a minimum area of 10.5 Sq m. This requirement is not met as some houses were as small as 5.0 Sq meters resulting in overcrowding. Housing units in Jericho estate were also overcrowded. The household sizes varied from 1 to 15 persons while the average household size was 6 persons. The housing by-laws stipulate that each person should have at least 3.5 Sq. meters of living space. This regulation is contravened in Lindi village and Jericho estate due to the large households accommodated in the housing units. Umoja estate had the smallest household size with households ranging from 1 to 9 persons with the average household size of 5 people. The large household

sizes observed especially in Lindi village and Jericho estate create ideal conditions for the easy spread of air-borne infections.

#### 4.5 ENVIRONMENTAL CONDITIONS

Solid waste disposal as mentioned earlier is one of the most evident environmental problem in the three areas (see pictures L.5, I2 & U.3 in Appendix A). Though Umoja 1 and Jericho estates are legal settlements that should be provided with this service by the City Council, this is rarely the case. The Nairobi City Council can no longer manage to cope with the large volumes of solid waste produced in the city. Some residents engage the services of private solid waste collection companies at a fee. However, the majority of residents dispose off their solid waste in garbage heaps. This has resulted in dirty neighbourhoods, which have many heaps of uncollected garbage. Scavengers and dogs make the situation worse by strewing the garbage all over hence creating an unhealthy living environment. In Lindi village, there is no formal solid waste collection hence the contaminated garbage is strewn all over the village exposing the residents especially children to very serious health risks.

The uncollected garbage blocks drains in the three areas resulting in flooding especially during the rainy season. The situation is worse in Lindi village where the volume of garbage is high due to the large population and the fact that 98% of residents throw their garbage anywhere. This creates ideal breeding grounds for mosquitoes and other insect disease vectors. These sites are both unsightly and odorous. Broken down sewers are also common in Jericho and Umoja estates. The poorly maintained roads, which have huge potholes in Umoja estates quickly, fill with water during the rainy season and create ideal conditions for the breeding of various disease vectors. Residents in the three areas are dissatisfied with the state of the environment. Table 4.7 shows how the respondents perceived the conditions of the residential environment.

Table 4.7 Residents perception of the condition on the living environment

ENVIRONMENTAL CONDITIONS	AREAS		
	UMOJA	JERICO	LINDI
Very Good	3	13	-
Very Good	21	26	4
Poor	58	48	9
Very Poor	18	13	87
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Survey, 1997.

In the absence of national guidelines or standards on environmental quality in the residential environment, the researcher relied on observations and the residents perceptions to determine the quality of the residential environment. It is clear from the table above that only a minimal percentage of people in the three areas think that the residential environment is in good condition. Jericho estate had the highest percentage (39%), of respondents who said that the environment is in good condition. This can be attributed to the fact the estate does not have housing extensions which results in overcrowding and a dirtier living environment as a result of inadequate services and facilities. In Umoja estate where there are numerous housing extensions, the services and facilities originally installed in the estate can no longer cope with the large population. This has resulted in frequent blockages, broken down sewers and the huge piles of uncollected garbage. The soil excavated from building sites is often left lying around the estate in small and big piles resulting in a dirty and unsightly living environment. The soils also partly block some roads and drains.

The conditions are worst in Lindi village where 87% of respondents considered the living environments to be in very poor condition. Only a small number i.e. 4% of respondents said that the environmental conditions are good. It is important to note that though ones housing conditions may be good, a poor residential environment may expose the inhabitants to various health risks.

In view of the poor residential environment in Lindi village, residents gave various priority intervention measures which if implemented would make the residential environment a better place to live in. The intervention measures are given in the order of frequency. These are given on Table 4.8.

Table 4.8 Residents Views on Measures that would Improve the Conditions of the Residential Environment.

INTERVENTION MEASURES TO IMPROVE THE ENVIRONMENT	%		
	UMOJA	JERICO	LINDI
Collect garbage	48	41	30
Provide & maintain drainage system	26	29	10
Improve & maintain housing	5	18	24
Improve water supply	-	12	2
Provide toilets	-	-	19
Repair roads	5	-	15
Community clean-up campaign	16	-	-
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Survey 1997.

Residents in all the three areas considered garbage collection to be the most important aspect that would improve the conditions on the living environment as shown on Table 4.8 above. In Umoja and Jericho estates proper maintenance of the drainage system was the second priority intervention measure cited by 26% and 29% of respondents in Umoja and Jericho estates respectively. In Lindi village however, improved housing and the provisions of toilets bore more importance, due to the poor housing conditions and inadequate toilet facilities in the village. Environmental awareness programs, which would include community clean-up campaigns would go a long way into easing the environmental problems in the living environment of the three neighbourhoods.

## 4.6 UTILISATION OF HEALTH FACILITIES AND MORBIDITY RATES IN THE STUDY AREAS

### 4.6.1 UTILISATION OF HEALTH FACILITIES

The use of health facilities varied in all the settlements. Umoja estate had the highest number of people, (76%) visiting private hospitals with only 24% using the public health facilities. This can be attributed to the fact that residents in this area have higher incomes and can therefore afford to pay for services offered in private hospitals. Lindi villager had the highest number of people, (36%), utilising the services of the public health

institutions. This can be attributed to the affordable services offered there. However, the utilisation of the health facilities depends a lot on the availability of drugs.

Table 4.9 Use of Health Facilities in the Study Areas (in Percentages)

HEALTH FACILITY USED	AREAS		
	UMOJA	JERICHO	LINDI
Public	24	30	36
Private	76	66	59
Public & Private	-	4	5
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Survey, 1997.

Residents of all the three settlements said that the public health facilities were easily within reach, hence accessible to them. Medical personnel from the health centres visited said that overall, there is uneven utilisation of the health facilities offered by the Nairobi City Council resulting in congestion and under-utilisation in others. Low utilisation of public health facilities was observed in all the study areas as indicated on Table 4.9. Residents interviewed in the study areas cited various reasons for the low utilisation of the City Council health clinics. These included poor quality of services, lack of drugs, rude medical personnel and shortage of medical equipment among others.

#### 4.6.2 MORBIDITY RATES

44% of households interviewed in Umoja estate had one or more household members who were sick two weeks prior to conducting the study. In Jericho estate and Lindi village, 37% and 57% of households respectively had members of their households who were also unwell. Out of all those people who were sick two weeks prior to the study, 51% of them were from Lindi village while 25 % and 24% were from Umoja 1 and Jericho estates respectively. Table 4.10 shows the number of people who were sick and what they were suffering from two weeks prior to the study period.



Table 4.10 Diseases Afflicting Residents who were Sick Two Weeks Prior to the Study

DISEASES	AREAS			TOTALS
	UMOJA	JERICO	LINDI	
RTI	22	18	24	64
Malaria	5	2	13	20
Diarrhoeal Diseases	-	1	9	10
Other Diseases	1	5	10	16
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Survey, 1997.

Out of the sick in Jericho estate, 93% sought medical attention while 64% in lindi village and 68% in Umoja 1 estate did the same. Those who did not seek medical attention cited various reasons such as considering the diseases as not being serious, faith in God to heal, or inability to afford medical expenses etc. Table 4.11 shows the diseases that the respondents said were afflicting the residents of the three study areas on a regular basis. They also correspond to the diseases, which were afflicting those who were ill two weeks prior to the study in the three study areas, as shown on Table 4.10.

Table 4.11 Rate of Common Diseases Occurrence by Study Areas

ILLNESS SUFFERED	AREAS		
	UMOJA	JERICO	LINDI
RTI	82	62	65
Malaria	18	24	27
Diarrhoeal Diseases	-	-	7
Other Diseases	-	5	1
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Survey, 1997.

Infections of the respiratory tract are the most common problem in all the three areas. These are followed by malaria, diarrhoea and Other diseases, which include headaches, hypertension, eye and skin infections etc. However, diarrhoea did not seem to be a common problem in Jericho and Umoja estates as none of the respondents reported that it was a common health problem. It was however cited as a health problem by residents of Lindi village. This can be attributed to the inadequate water supply and poor sanitary facilities in Lindi village.

The respondents were not totally ignorant of the possible causes of the illnesses that afflict them on a frequent basis. Though some did not know what could be the possible cause of the diseases, some cited the following possible causes. Presence of mosquitoes as a result of stagnant water and blocked drains and sewers which create ideal breeding grounds, cold weather, air pollution, poor ventilation, dirty surroundings, easy spreading of diseases and a poor diet leading to low resistance of diseases in the slum areas.

Respondents were also aware that their health could be affected by the state of their residential environment. This shows that the residents are not totally ignorant of the fact that the environment has a relationship with the health status of the inhabitants. Therefore, if the residents are given various incentives, and support from municipal authorities and other interested partners, they can help maintain their environment in order to prevent diseases arising from inadequacies in the living environment.

Langata, Jericho and Umoja City Council health Centre are the public health facilities used by the residents in the three areas. Data collected from the three health facilities in the three health centres for the years 1995 and 1996, shows that Respiratory Tract Infections, Malaria, and diarrhoeal diseases in that order were the three most commonly reported diseases in the health centres. This is shown on Fig 4.1 below. In a comparable survey carried out by Lamba, (1994) he found that respiratory tract infections, diarrhoea, malaria, accidents, and skin disorders were the most common illnesses reported in the outpatient clinics in Nairobi.

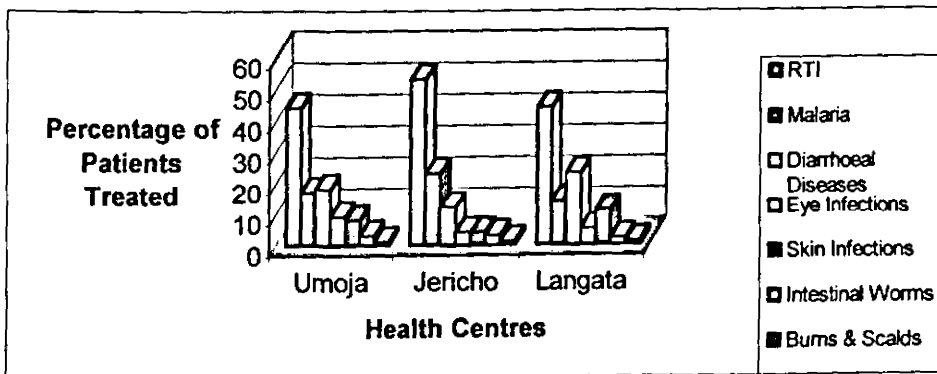


Figure 4.1 Diseases Treated at Umoja, Jericho and langata Health Centres (1995-96)

Source: Field Survey

Langata health centres mainly serves the residents of Kibera slums and a very minimal number from Southlands area. The health centre treats a higher percentage of diarrhoeal diseases than the other two health centres, as they are more common in the slum areas. The percentage treated for skin infections is also higher here than in the other two health centres because of the poor hygiene habits and inadequate water problems in the slums. Umoja Health Centre also serves residents in the slum areas located in Eastlands area of Nairobi. This most probably explains for the high number of patients treated for diarrhoeal diseases, and skin and eye infections at the health centre. Jericho health centre has a higher attendance than the other two health centres because the clinic is equipped with a laboratory and is also open for 24 hours. It therefore caters for a higher population than the other health centres. Attendance in all the health centres is not consistent due to lack of drugs. When drugs are available attendance is high, whereas when there are none, attendance is very low especially at Langata Health centre. The slum residents opt to visit private doctors who have opened up clinics in the Kibera slums.

#### 4.7 SUMMARY

The foregoing description has shown that housing quality in Umoja and Jericho estate is comparable. The only major difference is in maintenance conditions whereby housing in Umoja estate is better maintained than that in Jericho estate. However, there is a clear distinction between the housing quality and service provision in Umoja and Jericho estate and housing and service provision in Lindi village. The housing units in Lindi are poorly designed, built and maintained. Service provision is also poor and the environmental conditions deplorable. All these conditions combine to make the living conditions in Lindi village very poor.

These inadequacies in service provision and the residential environment are contributory factors to the high morbidity rates in Lindi village compared to Umoja and Jericho estates. Table 4.10 clearly shows that the residents of Lindi village formed the largest number of people who were suffering from various illnesses two weeks prior to the study period. This may indicate the close relationship between housing conditions and health.

## CHAPTER FIVE

### THE IMPACT OF HOUSING, SERVICE PROVISION AND THE RESIDENTIAL ENVIRONMENT ON HEALTH

#### 5.1 INTRODUCTION

Housing and environmental conditions in the study areas have been described. Various differences were observed in housing and environmental conditions in the study areas. This section seeks to establish whether or not a relationship exists between the prevalent health problems among the residents and the housing and environmental conditions.

#### 5.2 HOUSING AND HEALTH

Housing design was poorest in Lindi Village where houses are poorly designed and built. Many housing units do not have any screening on opening such as windows. This is well illustrated on picture L 2 in Appendix A. This enables easy entry of insects which can cause or spread diseases. Examples include mosquitoes which gain easy entry in the houses and feed on unsuspecting inhabitants causing malaria. Flies may also contaminate food and drink which can cause diarrhoeal diseases. The temporary house structures in Lindi village are not only poorly designed and built but also have many maintenance problems. Leaking roofs are a major problem in Lindi village, leading to damp housing, a condition that is injurious to health. Damp conditions were reported by 43% of respondents in Lindi village, while 52% said that their roofs are leaking. Damp conditions favour the spread and infection of diseases of the respiratory tract which affected many residents in this area. Table 5.1 shows the different diseases suffered by inhabitants living in different types of housing in the study areas. Table 5.1 below shows the different diseases suffered by inhabitants living in different types of housing in the study areas.

Table 5.1 Relationship between Housing Quality and Common Disease Incidences in the Study Areas

HOUSING CONDITIONS					
DISEASE	UMOJA ESTATE				TOTALS
	VERY GOOD	GOOD	POOR	VERY POOR	
RTI	22	-	-	-	22(78%)
Malaria	5	-	-	-	5(18%)
Diarrhoea	-	-	-	-	-
Others	1	-	-	-	1(4%)
<b>TOTALS</b>	<b>28(100%)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>28(100%)</b>
JERICHO ESTATE					
RTI	16	2	-	-	18(69%)
Malaria	2	-	-	-	2(8%)
Diarrhoea	1	-	-	-	1(4%)
Others	5	-	-	-	5(19%)
<b>TOTALS</b>	<b>24(92%)</b>	<b>2(8%)</b>	<b>0</b>	<b>0</b>	<b>26(100%)</b>
LINDI VILLAGE					
RTI	1	1	9	13	24
Malaria	-	-	5	8	13
Diarrhoea	-	-	7	2	9
Others	-	1	4	5	10
<b>TOTALS</b>	<b>1(2%)</b>	<b>2(4%)</b>	<b>25(44%)</b>	<b>28(50%)</b>	<b>56(100%)</b>

Source : Field Survey, 1997.

This table shows the relationship between housing quality and health in the study areas. Respiratory Tract Infections affected both, those in good and poor housing. This may be explained by the proximity of both Umoja and Jericho estates to Nairobi's major industrial area. Furthermore, it should be noted that though housing in Umoja and Jericho estates is structurally more stable than housing in Lindi, overcrowding in Jericho estate was noted to be almost as high as in Lindi village. Nevertheless, 37.5% of all those who were suffering from respiratory infections were from Lindi village where housing conditions are poor. The damp conditions and overcrowding in the small housing units in Lindi village means that infections of the respiratory tract are easily transmitted from one person to the next. Ventilation is very poor in Lindi village. The windows are not only small but are often kept shut due to insecurity in the area. In Lindi, 3% of respondents had no window at all and live in poorly ventilated and dark rooms. Furthermore, 50% of

the respondents in Lindi said that their houses are poorly ventilated. This is another contributory factor to the high incidence of Respiratory Tract Infections in Lindi village.

In Jericho estate on the other hand, the high incidence of Respiratory Tract Infections can also be attributed to overcrowding in the housing units. For instance, 37% of residents used their rooms for multiple purposes indicating that there is overcrowding. In addition, the average household size was 6 persons. This is far above the requirement of 2.5 persons per room laid down in Kenya's housing standards and it favours the transmission of infections of the respiratory tract. In Umoja estate, where housing conditions were considered to be of good quality, accounted for 34% of the Respiratory Tract Infections. The numerous construction sites both in Umoja 1 and the neighbouring Umoja 2 estates generate a lot of dust which may irritate the respiratory tract. The estate is located close to Nairobi's Industrial area. This indicates that the residents are more exposed to industrial air pollution than residents of Jericho estate and Lindi village. This may be a contributory factor to the high number of people suffering from Respiratory Tract Infections in Umoja Estate. Okello (1988) indicates that people living in settlements located close to industries have a higher incidence of diseases of the respiratory tract because some of the industries emit poisonous gases into the atmosphere, thus accelerating the level of air pollution.

Malaria was the second most common disease and accounted for 18% of residents who were sick two weeks prior to the study. The incidence of malaria was higher in poor quality housing than in the good quality housing. Though malaria cannot be related directly to housing quality per se, other aspects of the residential environment such as sanitation have a role to play. Sanitation was better in the good quality housing areas of Umoja 1 and Jericho estates which both accounted for 35% of the people suffering from malaria. However, in Lindi village where drainage was poor, malaria accounted for 65% of all the cases in the study period. The high incidence of malaria in Lindi village can also be attributed to the poor housing design and construction, where the openings are inadequately screened to prevent entry of mosquitoes into the house

Diarrhoea, the third most common disease afflicted residents of Lindi village more than the other two areas. Lindi village accounted for 90% of all the cases. Diarrhoeal diseases are very closely related to inadequate water supply, poor sanitation and poor hygiene habits. All these conditions are commonly found in slum and squatter settlements which lack many basic provisions.

Other diseases which included headaches and skin and eye infections among others were also higher in poor quality housing. Lindi village accounted for 62.5% of all "other" diseases reported. For instance skin and eye infections are diseases that are often associated with inadequate water supply and poor hygiene habits. These factors are found in poor quality housing areas such as Lindi than in areas with good quality housing. It is therefore clear that people living in poor quality housing are more prone to illness than people living in good quality housing. This is supported by the high number of people who were sick in poor quality housing compared to those in good quality housing as shown on Table 5.1 above. Therefore this leads to rejecting the null hypothesis and accepting the alternative that poor housing and environmental conditions have a relationship with the health status of the inhabitants. Results of this study show that environmentally related diseases afflict inhabitants of poor quality housing and neighbourhoods more than people living in adequately serviced residential areas which have good housing conditions. Of course other variables such as income, and educational levels may play a role. However, there wasn't a good reason to doubt the apparent relationship between environmental conditions and the health of inhabitants.

### 5.3 CROWDING AND HEALTH

Crowding can be defined as the number of persons per room or housing unit. It is however difficult to have stringent measures on which housing units are and aren't overcrowded. Average room occupancy can therefore be used as a measure of overcrowding. The minimum legal housing unit Kenya consists of two rooms, a kitchen, toilet and shower. This housing unit is suitable for 5 persons.

Household sizes varied in the three study areas. Lindi village had the largest household sizes ranging from 1 to 19 persons. This was followed by Jericho estate whose household sizes ranged from 1 to 15 persons with the average household size being 6 persons. Umoja estate had the smallest household sizes amongst the three study areas with household sizes ranging from 1 to 9 persons and an average of 5 persons per household. It is therefore clear that housing in Lindi village is overcrowded. Lindi village also had the highest percentage (37.5%) of people suffering from Respiratory Tract Infections as shown on Table 5.2 below. Overcrowding which is one of the predisposing factors to infections of the respiratory tract has therefore played a role in the high incidence of Respiratory tract Infections in Lindi. Although the rooms varied in size, the average size

of the housing units measured 2 by 2.5 sq meters. In Lindi, 96% of the respondents used the single room housing units for multiple purposes i.e. living, sleeping, cooking etc. This indicates that the available living space per person is too small. The Local Government Adaptive by-laws (1995) requires that the minimum space per person in high-density low income areas be 3.5sq meters per person and that housing units used for multiple purpose occupancy, measure at least 10.5 Sq. M. With an average of 4 people per housing unit, and an average of one room per household, Lindi village falls far below the basic requirements creating unhealthy living conditions for the occupants. The quality of the indoor environment is also poor due to poor ventilation. 3% of respondents in Lindi village had no window at all making the situation worse. This can lead to an increase in Respiratory Tract Infection that are air-borne and can spread very fast in small congested housing units. The high number of Lindi residents suffering from respiratory infections can therefore be explained by the fact that in large households, persons sleeping in close proximity in poorly ventilated rooms which are sometimes damp are more exposed to the spread of air-borne infections.

It is clear from Table 5.2 below that the larger household sizes in Jericho estate and Lindi village had more household members suffering from respiratory infections. The high occupancy ratio also observed in Jericho estate creates ideal conditions for the easy spread of respiratory infections. 78% of all those people suffering from Respiratory Tract infections in Jericho estate were from households who had between 5 and 10 members. This is a high number considering the available living space in the houses. The ideal situation is 2.5 persons per room, hence an indication of overcrowding in Jericho estate. This overcrowding increases the proximity and risk of disease transmission



Table 5.2 Incidence of Common Diseases by Household sizes in the Study Areas

HOUSEHOLD SIZES				
DISEASES	UMOJA ESTATE			
	LESS THAN 5	5-10	10-15	TOTALS
RTI	12	10	-	22(78%)
Malaria	2	3	-	5(18%)
Diarrhoea	-	-	-	-
Others	-	1	-	1(4%)
<b>TOTALS</b>	<b>14(50%)</b>	<b>14(50%)</b>	<b>0</b>	<b>28(100%)</b>
JERICHO ESTATE				
RTI	4	14	-	18(69%)
Malaria	-	1	1	2(8%)
Diarrhoea	1	-	-	1(4%)
Others	3	2	-	5(19%)
<b>TOTALS</b>	<b>8(31%)</b>	<b>17(65%)</b>	<b>1(4%)</b>	<b>26(100%)</b>
LINDI VILLAGE				
RTI	10	13	1	24
Malaria	11	2	-	13
Diarrhoea	4	5	-	9
Others	7	3	-	10
<b>TOTALS</b>	<b>32(57%)</b>	<b>23(41%)</b>	<b>1(2%)</b>	<b>56(100%)</b>

Source, Field: - Survey, 1997.

On the other hand, though the house sizes in Umoja estate were bigger than Jericho's there were more people suffering from respiratory infections in Umoja estate than in Jericho estate. This may be as a result of air pollution as mentioned earlier due to the close proximity of Umoja estate to Nairobi's industrial area where some industries produce toxic gases.

Cooking fuel is also one of the most significant sources of household air pollution. High levels of exposure due to high concentrations of particulate concentrations in the vicinity of the stove are hazardous to health. In general, wealthier households use cleaner fuels such as gas and electricity. However, paraffin was the principal cooking fuel for the majority of respondents. 65%, 90% and 94% of respondents in Umoja, Jericho and Lindi respectively use paraffin for cooking. The use of paraffin for cooking in Lindi village is another contributory factor to the high number of people suffering from respiratory infections. The level of exposure depends on cooking practices. In Lindi village for

Table 5.2 Incidence of Common Diseases by Household sizes in the Study Areas

HOUSEHOLD SIZES				
DISEASES	UMOJA ESTATE			
	LESS THAN 5	5-10	10-15	TOTALS
RTI	12	10	-	22(78%)
Malaria	2	3	-	5(18%)
Diarrhoea	-	-	-	-
Others	-	1	-	1(4%)
<b>TOTALS</b>	<b>14(50%)</b>	<b>14(50%)</b>	<b>0</b>	<b>28(100%)</b>
JERICHO ESTATE				
RTI	4	14	-	18(69%)
Malaria	-	1	1	2(8%)
Diarrhoea	1	-	-	1(4%)
Others	3	2	-	5(19%)
<b>TOTALS</b>	<b>8(31%)</b>	<b>17(65%)</b>	<b>1(4%)</b>	<b>26(100%)</b>
LINDI VILLAGE				
RTI	10	13	1	24
Malaria	11	2	-	13
Diarrhoea	4	5	-	9
Others	7	3	-	10
<b>TOTALS</b>	<b>32(57%)</b>	<b>23(41%)</b>	<b>1(2%)</b>	<b>56(100%)</b>

Source, Field: - Survey, 1997.

On the other hand, though the house sizes in Umoja estate were bigger than Jericho's there were more people suffering from respiratory infections in Umoja estate than in Jericho estate. This may be as a result of air pollution as mentioned earlier due to the close proximity of Umoja estate to Nairobi's industrial area where some industries produce toxic gases.

Cooking fuel is also one of the most significant sources of household air pollution. High levels of exposure due to high concentrations of particulate concentrations in the vicinity of the stove are hazardous to health. In general, wealthier households use cleaner fuels such as gas and electricity. However, paraffin was the principal cooking fuel for the majority of respondents. 65%, 90% and 94% of respondents in Umoja, Jericho and Lindi respectively use paraffin for cooking. The use of paraffin for cooking in Lindi village is another contributory factor to the high number of people suffering from respiratory infections. The level of exposure depends on cooking practices. In Lindi village for

instance cooking takes place as all other activities. The level of exposure in the houses is high. The small rooms are overcrowded and poorly ventilated increasing the level and intensity of exposure to respirable particles hence increasing the inhabitants susceptibility to respiratory infections. The use of paraffin stoves in poorly ventilated rooms combined with overcrowding and damp conditions in Lindi village increases the number of predisposing factors. This may increase the risk of intensive exposure, severity of infection as well as increasing the number of potential transmitters especially among mothers and children who spend most of their time in the houses and who are present during cooking. The findings on respiratory infections in Lindi compare well to those from a study carried out by JICA/KEMRI (Daily Nation, August 1998). This study found that paraffin is the most commonly used fuel in Kibera slums and is one of the contributory causes to the high cases of respiratory infections in the area.

Though paraffin was the main cooking fuel used in Umoja and Jericho estates also, the houses are better ventilated and cooking takes place in the kitchens. Therefore the level of indoor air pollution is reduced. This underlines the importance of well designed good quality housing large enough for a family's needs and functions. This would reduce the level of exposure to air-borne infections. For all the study areas combined, 81% of those who had suffered from Respiratory Tract Infections two weeks prior to the study used either paraffin or charcoal as shown on Fig. 5.3 below. In addition, 50% of the people who were suffering from Respiratory Tract Infections two weeks prior to the study were children aged below 5 years. This indicates the high level of susceptibility to children who are spend most of the time at home and who are also present during cooking.

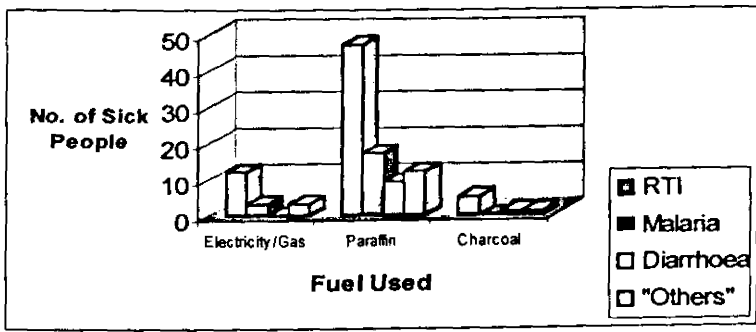


Figure 5.1 Diseases Suffered by Households Using Different Types of Cooking Fuel  
 Source: Field Survey, 1997

#### 5.4 WATER SUPPLY AND DISEASE

Water supply in Umoja 1 and Jericho estates is available directly to households, as they have piped water. However residents of Lindi village, which is a slum and squatter settlement, do not have piped water connected to their houses. They buy their water from water kiosks. These different sources of water have various limitations to the users. Residents in Umoja and Jericho estate are more advantaged than those in Lindi village because the water is easily accessible and can be used on demand. In Lindi village, though water is within 100m, there are cost constraints which limit its use. The problems associated with inadequate water supply in Lindi have various health implications. Table 5.3 shows the different sources of water and the implications that they have on the health of users.

Malaria and diarrhoeal diseases are water-related diseases. These are diseases which are related to the source of water, its quality, availability, and the provisions available for its removal. In Umoja and Jericho estate where residents have piped water and housing is also connected to the main sewer line, the incidence of water-related diseases is less than that observed in Lindi village. This is clearly indicated in the Table 5.3. In Umoja estate for instance there were only 5 cases of malaria and none of diarrhoeal diseases. In Jericho estate on the other hand there were only 2 cases of malaria and 1 case of diarrhoea. Lindi village had the highest incidence of malaria and diarrhoeal diseases in the study areas and this can be attributed to various factors.

Table 5.3 Incidence of Diseases Suffered by Sources of Water in the Study Areas

SOURCE OF WATER	DISEASES				
	UMOJA ESTATE				
	RTI	MALARIA	DIARRHOEA	OTHERS	TOTALS
Piped water	22	5	-		28(100%)
Public Stand-pipe	-	-	-		-
Water Kiosk	-	-	-		-
<b>TOTALS</b>	<b>22(78%)</b>	<b>5(18%)</b>	<b>0</b>	<b>0</b>	<b>28(100%)</b>
JERICHO ESTATE					
Piped water	18	2	1	5	26(100%)
Public Stand-pipe	-	-	-	-	-
Water Kiosk	-	-	-	-	-
<b>TOTALS</b>	<b>18(69%)</b>	<b>2(8%)</b>	<b>1(4%)</b>	<b>5(19%)</b>	<b>26(100%)</b>
LINDI VILLAGE					
Piped water	1	-	-	-	1(2%)
Public Stand-pipe	10	1	1	1	13(23%)
Water Kiosk	13	12	8	9	42(75%)
<b>TOTALS</b>	<b>24(43%)</b>	<b>13(23%)</b>	<b>9(16%)</b>	<b>10(18%)</b>	<b>56(100%)</b>

Source: Field Survey, 1997.

The high incidence of diarrhoeal diseases in Lindi can be attributed to the source of water supply. Residents buy their water from water kiosks at an average cost of three shillings per 20-litre jerry can. When there are water shortages, the cost rises up to KShs. 10 to 20 per 20-litre jerry can which is very expensive compared to KShs 12 per 1,00 litres charged by the Nairobi City Council to other Nairobi residents.

UNICEF (1990) showed that the per capita water consumption in Kibera slums was 38.1 litres per day per household reflecting low utilisation due to cost constraints. This proves that the quantity of water available to the household and the price is just as important to a family's health as its quality. Though 95% of the respondents said that the distance to the water source is less than 100m, the average amount of water used in a day in the area is 65 litres per household. If an average household size is 4 people in Lindi village that means that each person's water consumption level is approximately 16.25 litres per day.

This is below the World Health Organisations daily minimum requirement of 20-25 litres per person per day required for healthy living. This indicates that though water is now much closer to the residents, the amount used is restricted by the costs, hence increasing the incidence of water-related diseases. It is well known that hygiene behaviour is closely linked to the provision of water and sanitation facilities and more generally economic constraints as cited above. However, the most obvious difference between the situation in poor and wealthy households that increases their susceptibility to water-related diseases is not that wealthier households are more aware of good hygiene practices, but that they have facilities which make good hygiene practices comparatively simple.

Another factor that can lead to an increase in diarrhoeal diseases is that of water shortage. Frequent water interruptions and shortages are experienced in the entire city in both the planned and unplanned settlements of Nairobi. However, water shortages are experienced more in Lindi Village than in Umoja and Jericho estate and the problem is most severe during the dry season. Owing to the unreliable water supplies, the practice of water shortage is widespread even among households who have piped water in their homes. 72% and 86% of respondents in Umoja 1 and Jericho estates respectively said that due to irregular water supply, they store water for use. In Lindi village on the other hand, though 90% of the respondents said that they stored water in covered containers, it was observed that many more were not covered and water was observed that many were not covered and water was also stored in uncovered cooking pots. This indicates that though the acceptable and ideal ways of storing water are known, they are not fully practised. The water shortages mean that in addition to the inconvenience of fetching and storing water, this practice creates danger of contamination. One would therefore anticipate significant in-house water contamination especially in Lindi where water is stored in uncovered containers, resulting in a higher incidence of diarrhoeal diseases.

Table 5.3 indicates that 90% of all the respondents who were suffering from diarrhoeal diseases were from Lindi village. This indicates that among other factors, the source of water storage and handling practices have an influence on the health of users. Water purification can reduce the incidence of water-related diseases. However, the practice of water purification is hardly carried out especially in low-income areas. In Lindi village for instance, only 17% of respondents said that they boil water for drinking purposes. Given the unhygienic storage, handling and lack of the practice of purifying water for drinking purposes in most households, it is no wonder that many residents of this area suffer from diarrhoeal diseases.

The findings of this study are similar to findings from earlier studies. For example, Munguti (1996), reports that diarrhoea which is a result of drinking unsafe water and poor personal hygiene accounts for high death rates in children in Kenya. The 1992 "Children and Women in Kenya" report also attributes the high prevalence of diarrhoea in Nairobi's slums to poor sanitation (UNICEF, 1992). Amref's Baseline I Study in Nairobi's slums showed that 44.7% of children under 5 years had diarrhoea in the past one month prior to the study periods. The recurrence was common and persistent and affected the nutritional status of the children. The same study tried to correlate episodes of diarrhoea with sources of water, its storage and methods of dispensation. It was found that about 8% of households stored it in uncovered containers and a significant proportion of diarrhoea was observed in those households.

This study also further found out that out of 90% of diarrhoeal cases in Lindi village, 60% were children below 5 years. Children are most affected and this can be attributed to the fact that children's awareness of hygiene practices is poor. They defecate outside anywhere and do not wash their hands most of the time. Hence, they constitute a high-risk group. These children also play outside where there is a lot of garbage contaminated with human waste. In addition to this, the contaminated environment, inadequate and poorly maintained toilets and presence of flies in Lindi village increases the chances of getting diarrhoeal diseases, (See pictures L.4, L.5, and L.6 in Appendix A). It is clear that access to water for the residents of Lindi is compromised by the pricing system while having to fetch water reduces water consumption levels thereby creating various hygiene problems to them compared to residents of better quality housing in Umoja 1 and Jericho estates. These factors make Lindi residents more susceptible to diarrhoeal diseases. Water is life and a basic human necessity and it is the responsibility of the public sector to provide it at prices affordable to all in order to reduce the health burden associate with inadequate water supply.

## **5.5 WASTE-WATER DISPOSAL AND HEALTH**

Umoja 1 and Jericho estates are planned settlements which are connected to the main sewer line. However, though the estates have a water-borne sewerage system, it is plagued by a lot of problems, among them poor maintenance. In Umoja 1 estate, the over-development and high population presents a challenge to the sewerage disposal

system. It was originally planned for a smaller population than it has at the moment and cannot cope with the pressure from the increased population.

Table 5.4 Methods of Waste-water Disposal Used by Residents Suffering from Malaria in the Study Areas

DISEASES	AREAS			TOTALS
	UMOJA	JERICO	LINDI	
Sewer Connection	5	2	-	7 (35%)
Pit Latrines	-	-	1	1 (5%)
Outside	-	-	12	12 (60%)
<b>TOTALS</b>	<b>5 (25%)</b>	<b>2 (10%)</b>	<b>13 (65%)</b>	<b>20 (100%)</b>

Source: Field Study, 1997.

This coupled with poor maintenance results in frequent leaks, blockages and burst pipes resulting in pools of stagnant wastewater around the estate hence creating unhealthy conditions. These are not only smelly but pose as a public health hazard.

Table 5.4 shows that Umoja estate accounted for 25% of the people suffering from malaria two weeks prior to the study compared to Jericho estate which accounted for only 10%. This may be as a result of the poor state of road maintenance where the huge potholes fill with water especially during the rainy season providing ideal breeding grounds for mosquitoes.

Drains available in the three areas are often blocked by garbage due to poor solid-waste disposal methods. The situation is worse in Lindi village where there is no organised solid waste disposal method and a lot of garbage ends up in drains while the rest is littered all over (See picture No. L.5) in Appendix A. Once the drains are blocked, the pools of stagnant water create ideal breeding grounds for diseases carrying vectors such as flies and mosquitoes. Lindi village had the largest number of people suffering from malaria compared to Umoja and Jericho which had better sanitation facilities. This is illustrated on Fig 5.2.



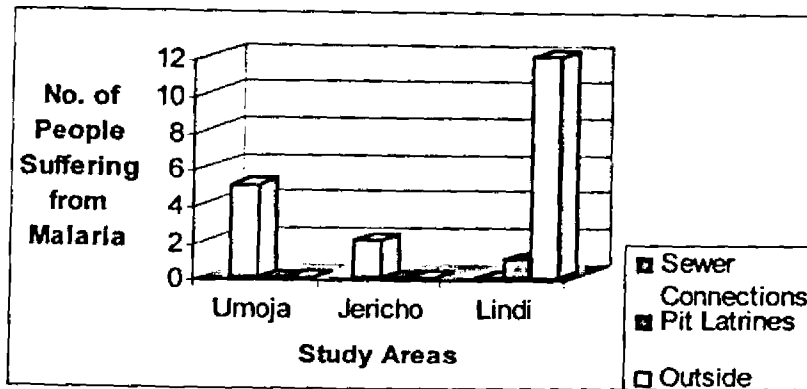


Figure 5.2 Residents Suffering from Malaria and their Methods of Waste-water Disposal  
Source: Field Survey, 1997

The high number of people suffering from Malaria in Lindi village can be associated with the poor drainage in the area and the poor quality of housing which does not provide adequate screening for pests and insects. Mosquitoes therefore gain easy entry into the darkly lit overcrowded housing units causing and easily spreading malaria. Part of Lindi village is also located next to river Motoine and mosquitoes may also breed along the riverbanks where there is slow movement of water.

Overcrowding in Nairobi as a whole has resulted in the over-utilisation of the available services and facilities, resulting in many public health hazards. The sewerage systems in areas such as Umoja estate were not planned to cater for such a large population hence frequent leakages and blockages which result in unhealthy living environments and contamination of potable water.

## 5.6 HUMAN-WASTE DISPOSAL AND HEALTH

Umoja 1 and Jericho estates are part of the formal housing sector in Nairobi and are therefore planned settlements which have a sewerage system. The housing units are provided with flushable toilets in the houses. Lindi village, which is in a slum area, does not have a water-borne sewerage system. Thus, 98.5% of residents in Lindi village use pit latrines for excrete disposal, while the remaining 1.5% use the bush. 87% of respondents using pit latrines said that they share the toilets with other households. The number of users per pit latrine ranged from 2 to 90 households though some could not

tell the exact number of people who shared the latrine. The large number of users shows that the methods of disposing human waste are grossly inadequate.

Human excreta is the principal vehicle for the transmission of a wide range of communicable diseases. It is therefore important to ensure the sanitary disposal of human waste. Inadequate disposal of human waste exposes the residents to unhygienic living conditions and the risk of contracting diseases of the faecal-oral route especially in areas where inadequate water supply is also common. In lindi village for instance, where all these factors are present, the incidence of diarrhoeal diseases is higher than that in Jericho estate. Lindi accounted for 90% of all the cases while Jericho estate accounted for 10 % of all the cases. This is clearly indicated in Table 5.5.

Table 5.5 Methods of Human Waste Disposal used by Residents Suffering from Diarrhoea in the Three Study Areas.

METHOD OF HUMAN WASTE DISPOSAL	AREAS			TOTALS
	UMOJA	JERICHO	LINDI	
Toilet Connected to Sewer	-	1	-	1(10%)
Pit Latrine	-	0	9	9(90%)
Bush	-	0	-	0
<b>TOTALS</b>	<b>0</b>	<b>1(10%)</b>	<b>9(90%)</b>	<b>10(100%)</b>

Source: Field Survey, 1997.

This table indicates that residents of Jericho estate who have adequate toilet facilities for use by single household's have a lower chance of contracting diarrhoeal diseases; as there were less cases reported than in households using pit latrines. Water supply in Jericho estate is adequate and easily within reach hence basic hygiene is easily practised. All the respondents in Lindi village who were suffering from diarrhoeal diseases two weeks prior to the study used pit latrines for excrete disposal. The high number of users makes the latrines very dirty as no one takes the responsibility of cleaning them. Very few respondents's (6%) said that the pit latrines are well maintained. Due to poor maintenance the latrines are therefore not fully utilised. The dirty latrines expose the users to the dangers of contracting various communicable diseases such as diarrhoeal diseases. Once these pit latrines fill up, they are rarely emptied and when the rains come

the overflow becomes a major public health hazard (See picture No. L.6 in Appendix A). This therefore exposes the non-users of pit latrines to the risk of contracting diseases.

The pit latrines are poorly designed and built and do not also provide adequate privacy for user's (See picture L.4 in Appendix A). The heavily soiled floors attract a lot of flies which breed and feed in the toilet and in turn contaminate food and drink which can result in the fast spread of diseases in unsanitary conditions. Flies are diseases carriers and are important in transmitting cholera, diarrhoeal diseases, conjunctivitis and trachoma among other diseases. Many food vendors cook and sell their food close to garbage and blocked drains and the vast number of flies in the neighbourhood may play an important role in transmitting diseases. Flies easily contaminate food in places with low standards of hygiene and sanitation and where excreta and other infected materials as well as foods are exposed to flies. Once such food is ingested it can lead to diarrhoeal diseases. All the above mentioned factors explain for the high incidence of diarrhoeal diseases in Lindi village compared to Jericho estate.

Another important factor that explains the high incidence of diarrhoeal diseases is the inadequate water supply in Lindi village. Despite the fact that water supply is inadequate, it's use is also prohibited by the costs. It was noted earlier that the amount of water used in a day in Lindi village averages 65 litres per household. This water is for all purposes in the home i.e. cleaning, cooking, washing etc. This clearly indicates that basic hygiene practices such as washing hands is rarely practiced. This can lead to an increase in diarrhoeal diseases whose mode of transmission is through the faecal-oral route. Since the means of disposing human excrete are grossly inadequate in Lindi, provision of adequate supply of potable water at an affordable prices would greatly reduce transmission of diarrhoeal diseases through better personal and domestic hygiene.

Residents in Lindi village like other slum areas in Nairobi also defecate in polythene bags due to inadequate toilet facilities. These then thrown away in drains, garbage heaps or in spaces in-between houses. This practice is common with children who cannot use the pit latrines. For instance, in Lindi village only 36% of respondents said that they allow their children who are below 5 years to use the pit latrines. That means that the remaining 64% either defecate outside or use the polythene bags. Lamba (1994) describes this in the report on environmental health in Nairobi's poverty areas and refers to them as "flying toilets". Residents result to this method because of the poor state of the pit latrines and the insecurity at night as also cited in Mairura, (1993). These "flying toilets" are very evident when one visits the area. There are many discarded polythene

bags and small heaps of human waste littered in the neighbourhood. This indicates that the practice of open defecation is not reported, as this is an issue that people don't want to discuss. This practice does not only help spread communicable disease but also pollutes the whole environment.

As a result of poor planning and the high building density in the area, there are hardly any open spaces left for children to use as playgrounds. Children therefore play in the polluted environment where there is contaminated garbage. This exposes them both to the risk of contracting diarrhoeal diseases and from injuries from broken glass, old tins, etc. The high susceptibility of children is clear from the results of the study. Overall children under 5 years of age formed 60% of those people suffering from diarrhoea, and all of them were from Lindi village. The open defecating habits of children pose a higher health risk because their faeces have a higher health risk because their faeces have a higher concentration of dangerous pathogens (Benneh et al, 1993). Children in low-income settlements suffer more from diarrhoeal diseases, because the mothers have low levels of education and therefore lack basic knowledge on many health issues. Doctors from the City Council health centres visited said that in most instances, the children are taken to hospital when the diarrhoea is severe and the children are very weak.

It is therefore clear from the survey that the methods of disposing off human excreta has a relationship with diarrhoeal diseases. This is clearly shown on Fig. 5.3 below.

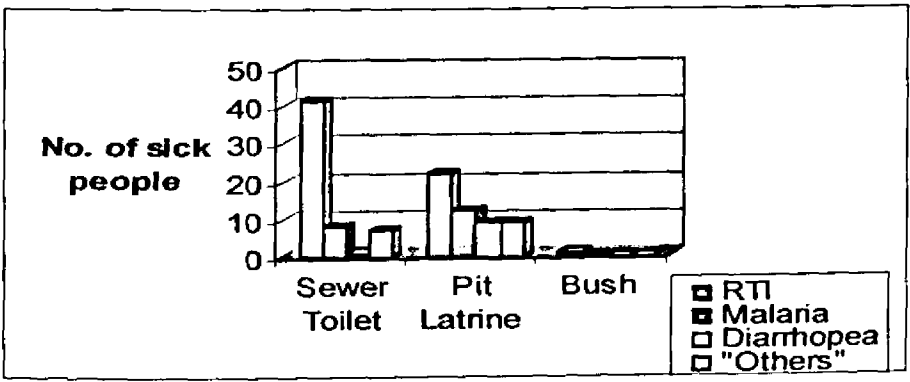


Figure 5.3 Diseases Suffered by Households using Different Methods of Human-Waste Disposal  
 Source: Field Survey, 1997

It is explicit that residents who used pit latrines had the highest number of diarrhoeal cases compared to those who had toilet facilities within their homes. The number of users per toilet facility and its maintenance condition also have a bearing on whether or

not users can contract diseases from them. Another important factor raised is the availability of potable water which makes both domestic and personal hygiene easier thereby reducing the chances of contracting diseases of the faecal-oral route.

## 5.7 SOLID-WASTE DISPOSAL AND HEALTH

The disposal of solid waste was inadequate in all the areas. However, the problem was worst in Lindi village where there is no organised form of solid waste disposal. The garbage remains strewn all over the village creating very unhealthy and unhygienic conditions to all. Solid waste is not known to cause any direct hazard but it provides breeding and feeding grounds for many diseases causing vectors. For instance, uncollected solid waste is an ideal breeding and feeding site for flies which may in turn contaminate food. If such food is ingested, one faces the risk of contracting communicable diseases.

Though diarrhoeal diseases cannot be directly related to solid waste disposal methods, in low-income neighbourhoods where garbage heaps are often contaminated with human waste, they may cause diarrhoeal diseases. Table 5.6 below shows that all the residents who suffered from diarrhoea two weeks prior to the study in Lindi village had inadequate means of solid waste disposal.

Table 5.6 Methods of Solid Waste Disposal Used by Residents Suffering From Diarrhoea in the Three Study Areas.

METHOD OF SOLID WASTE DISPOSAL	AREAS			
	UMOJA	JERICO	LINDI	TOTALS
Collected by City Council	-	-	-	0
Collected by Private company	-	-	-	0
Thrown Anywhere	-	-	8	8
Burnt	-	1	2	2
<b>TOTALS</b>	<b>0</b>	<b>1</b>	<b>9</b>	<b>10</b>

Source:- Field Survey, 1997.

Solid waste in Lindi village is contaminated with human excreta due to inadequate toilet facilities. The garbage is not in designated areas but is strewn all over in the

neighbourhood even right next to houses. This contaminated garbage provides ideal feeding ground for flies, which in turn contaminates food sold by food vendors and in houses where openings are inadequately screened from insects. Once ingested, this food can cause a vast range of communicable diseases such as diarrhoea which is common in Lindi village. Children under five as mentioned earlier formed 60% of these people suffering from diarrhoeal diseases and all of them were from Lindi. These children play outside in contaminated garbage increasing their susceptibility to contracting diarrhoeal diseases. 90% of all the diarrhoeal diseases were found in Lindi where a combination of inadequate means of solid waste disposal, low water utilisation, inadequate toilet facilities and a contaminated environment increase the risk factors.

In Jericho estate there was only one case of diarrhoea reported. Though the means of solid waste disposal was also inadequate, the other risk factors that increase susceptibility to diarrhoeal diseases were less. This is because the area has better water supply, which makes personal and domestic hygiene easier, and toilets are provided for each household.

It is clear that inadequate means of solid waste disposal combined with other inadequacies in the residential environment can cause diarrhoeal diseases.

## **5.8 SUMMARY**

The incidence of environment-related diseases was observed to be higher in poor quality housing and housing environment, than in good quality housing and environment. Residents of good quality housing also had better services and facilities than those in poor quality housing. The inadequacies in service provision and facilities such as toilet, water and sanitation exposed the residents in Lindi to higher chances of contracting environment-related diseases compared to their counterparts in Umoja 1 and Jericho estate. It is important to note that though a house may be well designed, built and maintained, if the environmental conditions in the neighbourhood are poor and unhygienic, the inhabitants are still susceptible to contracting diseases that emanate from inadequacies in the residential environment. This points to the importance of having both good quality housing and a clean residential environment to ensure the good health of residents.

## CHAPTER SIX

### THE IMPACT OF SOCIO-ECONOMIC AND DEMOGRAPHIC FACTORS ON HOUSING AND HEALTH

#### 6.1 INTRODUCTION

The study has shown that housing and environmental conditions have a bearing on the health status of the inhabitants. However, we also recognize that socio-economic and demographic factors did play a role in determining the health status of the residents in the study areas. This would particularly be so because incomes influence the amount and quality of food that can be afforded as well as other standards of living. This chapter therefore looks at various socio-economic factors which may have a bearing on the type of housing one lives in and other effects of these factors on health.

#### 6.2 INCOME, EDUCATION AND EMPLOYMENT STATUS

Income levels in the three study areas differed significantly. These are shown on Table 6.1, which shows the income levels, education and the employment status of household heads in the three study areas. Umoja estate had the highest levels of income with 76% of the population having a household income of more than Kshs. 15,000 per month while 45% of households had one person as the sole breadwinner. Only 6% of the households in Umoja estate had incomes ranging from Kshs 3,000 and KShs 5,00. In Jericho estate on the other hand, 52% of households had a monthly income ranging from Kshs 4,000-10,000, while 29% of households had a monthly income of more than 15,000 per month. There is a big difference in these income levels compared to those for Umoja. In Umoja a large percentage of households had incomes of more than Kshs 15,000 per month. Lindi village had the lowest incomes in the three study areas. Thus, there was a big contrast between Lindi, Umoja and Jericho estates in terms of household incomes. Only 4% of the households interviewed earned more than Kshs 10,000 per month. This is a very small percentage compared to those in Umoja estate where 76% of the residents earn more than Kshs 15,000 per month. In Lindi village, 77% of households had only one breadwinner. This could be a contributory factor to the low-income levels in Lindi village as only one member of the large households earns an income. Furthermore, only 20% of the households in Lindi earn less than Kshs 2,000 per month. The low incomes in Lindi

are indications of poverty and they are not adequate to cater for all family needs. The difference in the income levels in the three areas are clearly shown on Table 6.1.

Table 6.1 Income, Education, and Employment Status of Household Heads in the Study Areas.

INCOME LEVELS	PERCENTAGE PER ESTATE		
	UMOJA	JERICO	LINDI
>500	0	0	16
501-1,000	0	0	0
1,001-2,000	0	0	4
2,001-3,000	0	0	21
3,001-4,000	4	3	9
4,001-5,000	2	5	21
5,001-10,000	12	47	25
10,001-15,000	6	16	2
over 15,000	76	29	2
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>EDUCATION LEVEL</b>			
None	2.5	0	4
Standard 1-8	7.5	25	69
Form 1-4	45	54	25
Form 5-6	5	3	1
College	27.5	18	0
University	12.5	0	1
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>EMPLOYMENT STATUS</b>			
Formal	37.5	43	38
Informal	37.5	28.6	24
Unemployment	25	28.6	38
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Study, 1997.

In terms of unemployment, Lindi village had the highest level of unemployment with 38% of household heads being unemployed. In Umoja and Jericho estates, 25% and 29% of household heads respectively were also unemployed. This indicates that there are high unemployment rates in Nairobi and that unemployment is not only common in the slum and squatter settlements anymore, but is now common place all over as a result of the hard economic times. The unemployment trends correspond to the education levels in the three study areas as shown on Table 6.1. In Umoja and Jericho estates, 90% and 75% of



respondents respectively had post-secondary education while the majority that is 69% had only primary education. This clearly explains for the low-income levels and high unemployment rates in Lindi village. The links between income levels, employment status and education levels are clear. For instance, Umoja estate had the highest level of education and the highest income levels in the three study areas. In Lindi village on the other hand, where 69% of household heads only had primary education and 4% had no education at all, household's incomes were very low. One can therefore conclude that the level of income determines income levels and employment status. The higher the level of education, the higher the employment status and the higher the income levels and vice versa.

### **6.3 IMPLICATIONS OF DIFFERENT LEVELS OF INCOME ON HOUSING**

The survey showed that the three areas of study had different levels of income. Incomes determine the way people live in various ways. For instance, it may be in the kind of diet consumed, services and facilities used and housing among others. All these aspects are tied to affordability issues. Housing is often used as a measure of socio-economic conditions. One of the socio-economic aspects that determine or has a bearing on the type of house that one lives in is income. In Umoja estate for instance where income levels were highest among the study areas, the housing quality was good. They can therefore afford to live in this estate where the average rent is Kshs 4,500 per month. The building structures were stable and the houses were also well maintained as most households interviewed said that their houses were in a good state of maintenance and repair.

Lindi village on the other hand the lowest income levels and the poorest housing conditions in the three areas. 71% of households had a monthly income of less than Kshs 5,000 per month. These incomes are very low and can therefore only afford to pay for the kind of housing offered in the slum and squatter settlement of Lindi village. The average rent is Kshs 500 per month. The little incomes compete with other family needs such as food, health, and education, among others, hence a factor that leads them to live in this kind of housing. 85% of housing in Lindi village was in a very poor state with the basic materials of construction being mud and wattle for the walls, and an earth floor and Galvanized Corrugated iron Sheets (GCI) for roofing. The houses are both poorly designed and built (See pictures L.2 & L.5). This shows that low incomes force people

to live in accommodation that exposes them to infection hence lowering their resistance to diseases. Children are the most affected as their immune systems are not fully developed especially in poor neighbourhoods where they do not receive all the immunizations against the common childhood diseases.

The survey revealed that 51% of all those who were sick two weeks prior to the study were from Lindi village. The diseases they were suffering from are related to the residential environment. For instance, 37% of people suffering from respiratory infection were from Lindi village. This was as a result of various factors such as poor housing conditions with inadequate ventilation, household size and fuel used. The low incomes of the residents force them to live in this kind of housing which does not offer adequate protection against exposure to agents and vectors of communicable diseases. Lindi village also accounted for 90% of all diarrhoeal diseases. One of the contributory factors to this high incidence was the presence of contaminated garbage in the residential environment. Due to the low incomes in Lindi village, residents may be unable to afford private solid waste collection services which would greatly reduce the health burden associated with the contaminated solid waste.

Though Umoja and Jericho estates have good housing, they are also experiencing a lot poor environmental conditions (See pictures J.2 &U.3 in Appendix A). The disposal of wastewater and solid waste are major problems especially in Umoja estate where the estate has many heaps of garbage which create ideal breeding and feeding grounds for diseases causing vectors. Though 50% of respondents have their garbage collected by private companies, a lot of garbage still remains strewn all over the place. This is due to the large population in the estate. The environmental conditions in Umoja estate have deteriorated rapidly as a result of the numerous extensions that are now commonplace in the area. This has led to overcrowding and the over-utilization of the services and facilities that were originally installed in the estate. This has aggravated the problems leading to frequent water shortages, broken and blocked sewers, poor drainage etc. This creates ideal conditions for diseases causing vectors hence exposing the residents to various health risks.

It is clear that good housing conditions do not only include the house structure but other services and facilities which make the entire residential environment such as water supply, sewerage facilities, solid waste disposal etc. Hence, all these factors need to be in place for inhabitants to fully maximize the benefits of good housing. Even if the house structure is stable and well maintained, but the living environment is in poor condition,

the health of the inhabitants is affected, irrespective of whether their incomes are high or low. Income determines where one lives and to a certain extent also determines the state of the residential environment due to the affordability of services e.g. solid waste collection which can improve and help maintain a clean living environment. Poor housing conditions can in part be seen as a reflection of poverty. Poverty can be viewed as a major reason for inadequate shelter and degradation of the environment, which in turn affects the health status of the inhabitants. Poverty eradication is a key issue in the search for alternative solutions to improving and enhancing the twin goal of sustainable environment and sustainable health status. Various housing intervention measures can also be used to promote public health.

#### **6.4 IMPLICATIONS OF DIFFERENT LEVELS OF INCOME ON HEALTH**

Residents living in the three areas had varying incomes and suffered from various diseases as shown on Table 6.2 below. Lindi village, which had the lowest incomes, also had the highest number of people (51%), who were sick two weeks prior to the study. This was followed by Umoja estate, which had the highest incomes, with 25% of the morbidity rates and then Jericho estate with 24% of morbidity rates. Though the income levels in Umoja estate were higher than those of Jericho estate, Umoja had a higher percentage of people who were sick than Jericho estate. This difference can be as a result of the poorer environmental conditions in Umoja estate than in Jericho leading to a higher number of environment related diseases.

Respiratory Tract Infections affected people in all the different income groups in all the three study areas both those in low and high-income levels. Though malaria also affected both those in high and low-income groups in all the study areas, in Lindi village, it affected those earning less than Kshs 5,000 per month most. This can be attributed to the low incomes which restrict the residents from seeking medical attention when health problems arise. The high number of malaria sufferers in Lindi village can be attributed to the low incomes which make people live in a poor residential environment where drainage is poor creating ideal breeding grounds for mosquitoes. The low incomes can only afford the poorly designed and constructed houses in Lindi, which do not provide adequate screening from mosquitoes.

Table 6.2 Disease Incidence by Income Levels in the Three study Areas.

DISEASES					
UMOJA ESTATE					
INCOME LEVELS	RTI	MALARIA	DIARRHOEA	OTHERS	TOTALS
>500	-	-	-	-	-
501-1,000	-	-	-	-	-
1,001-2,000	-	-	-	-	-
2,001-3,000	-	-	-	-	-
3,001-4,000	1	1	-	-	2
4,001-5,000	-	-	-	-	-
5,001-10,000	3	-	-	-	3
10,001-15,000	1	-	-	-	1
over 15,000	17	4	-	1	22
<b>TOTALS</b>	<b>22(78%)</b>	<b>5(18%)</b>	<b>0</b>	<b>11(14%)</b>	<b>28(100%)</b>
JERICHO ESTATE					
>500	-	-	-	-	-
501-1,000	-	-	-	-	-
1,001-2,000	-	-	-	-	-
2,001-3,000	-	-	-	-	-
3,001-4,000	-	-	-	1	1
4,001-5,000	2	-	-	-	2
5,001-10,000	10	-	1	-	11
10,001-15,000	2	-	-	2	4
over 15,000	4	2	-	2	8
<b>TOTALS</b>	<b>18(69%)</b>	<b>2(8%)</b>	<b>1(4%)</b>	<b>5(19%)</b>	<b>26(100%)</b>
LINDI VILLAGE					
>500	7	1	1	2	11
501-1,000	-	-	-	-	0
1,001-2,000	2	1	-	-	3
2,001-3,000	6	1	3	2	12
3,001-4,000	3	-	-	-	3
4,001-5,000	3	6	1	1	9
5,001-10,000	3	4	4	5	18
10,001-15,000	-	-	-	-	0
over 15,000	-	-	-	-	0
<b>TOTALS</b>	<b>24(43%)</b>	<b>13(23%)</b>	<b>9(16%)</b>	<b>10(18%)</b>	<b>56(100%)</b>

Source: Field Survey, 1997.

Umoja estate though having higher incomes than Jericho estate has higher morbidity rates due to the poorer living conditions in Umoja estate. The overcrowded conditions in Umoja have put enormous strain on the drainage system leading to frequent blockages hence creating ideal breeding grounds for mosquitoes. The poor solid waste disposal methods also block the drains leading to stagnant water. The survey also revealed that most roads have huge potholes in Umoja estate which also create ideal breeding grounds for mosquitoes causing malaria. There were however no diarrhoeal cases in Umoja estate and only 1 case in Jericho estate. 90% of the diarrhoeal cases were from Lindi village where incomes are low and the residential environment in a poor state. Diarrhoeal diseases are caused by among other factors inadequate water supplies and poor hygiene habits. In Lindi village, residents have to buy water which is more expensive than in other areas of Nairobi. Due to the low incomes in this village, the amount of water used is too low due to the cost constraints. This implies that basic hygiene practices are not observed hence leading to higher chances of contracting diarrhoeal diseases. The situation is made worse due to the poor means of disposing human waste which exposes the residents especially children to diarrhoeal diseases. The low incomes limit the ability of the residents to pay for garbage collection by private companies. Diarrhoea can therefore be said to be a disease of poverty as it is often found in poor neighbourhoods where the residents have inadequate water supplies, poor hygiene habits and inadequate drainage worsened by lack of toilet facilities. Other diseases which include skin and eye infections, fevers, hypertension etc. also affected people in different income groups, both low and high income.

The survey data indicates that incomes determine the kind of housing that one lives in and hence their health. Income levels can further determine the health status of the inhabitants due to affordability of health services. Out of all those people who were sick two weeks prior to the study, 31%, 7%, and 36% in Umoja, Jericho, and Lindi village respectively said that they did not seek medical attention. Lindi village had the highest number who did not seek medical attention. Various reasons were given for not seeking medical attention by those who were sick as shown on Table 6.3.

Table 6.3 Reasons for not Seeking Medical Attention

REASON	PERCENTAGE PER ESTATE		
	UMOJA	JERICO	LINDI
Could not Afford	20	0	45
Sickness not Serious	60	100	44
Home Treatment	0	0	11
Faith in God	20	0	0
<b>TOTALS</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Field Survey, 1997.

In Lindi village, 45% said that the lack of money was the reason for not seeking medical attention, whereas, in Umoja estate, only 20% said that they could not afford. In Jericho estate on the other hand, the sick did not seek medical attention, as they did not consider the illness serious. The results indicate that the low incomes of the residents of Lindi village adversely affects their health, as health needs have to compete with other basic needs in the home. Low-income earners therefore seek medical attention less frequently than households whose incomes are much higher do. They may often seek alternative methods such as home treatment which is much cheaper or consider the illness as not being serious. Many seek medical attention when they are already very ill and the diseases have progressed.

## 6.5 AGE AND DISEASES

The sampled household members in the three study areas had varying ages ranging from one month to 90 years. Table 6.4 shows the diseases that afflicted the different age groups in each area. Respiratory Tract Infections affected people in all the different age groups in all the three areas. However, children below five years formed the biggest number comprising of 50% of all respiratory infections reported. In Umoja estate for instance, 50% of all respiratory infections afflicted children below 5 years of age. In Lindi village, the trend was similar with 62.5% of all Respiratory Tract Infections afflicting children below 5 years of age. This corresponds to findings in a report by UNICEF/GOK, where it was reported that Acute Respiratory Infections are the leading causes of in-patient admissions in children wards in Kenya (UNICEF/Republic of Kenya 1992). The poor housing conditions in Lindi village where ventilation is poor, and the houses too small for the occupants increases the susceptibility of inhabitants to

respiratory infections. Overcrowding in the housing units in Lindi village therefore increases proximity and risk of transmission of respiratory infections. Children below 5 years spend most of their time in the home environment hence increasing their susceptibility to respiratory infections in the overcrowded housing conditions.

Table 6.4 Diseases Afflicting Different Age groups Among the Sick in the Study Areas.

PERCENTAGE PER DISEASE					
AGE GROUPS	RTI	MALARIA	DIARRHOEA	OTHERS	TOTALS
<b>UMOJA ESTATE</b>					
>5	13	1	-	-	14
5.1-15	3	-	-	-	3
15.1-25	3	3	-	-	6
25.1-35	2	1	-	1	4
35.1-45	1	-	-	-	1
Over 45	-	-	-	-	0
<b>TOTALS</b>	<b>22</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>28</b>
<b>JERICHO ESTATE</b>					
>5	4	-	-	1	5
5.1-15	1	-	-	-	1
15.1-25	4	1	-	2	7
25.1-35	3	1	1	-	5
35.1-45	4	-	-	1	5
Over 45	2	-	-	1	3
<b>TOTALS</b>	<b>18</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>26</b>
<b>LINDI VILLAGE</b>					
>5	15	2	6	-	23
5.1-15	2	1	-	3	6
15.1-25	3	4	1	1	9
25.1-35	2	3	1	2	8
35.1-45	1	2	1	3	7
Over 45	1	1	-	1	3
<b>TOTALS</b>	<b>24</b>	<b>13</b>	<b>9</b>	<b>10</b>	<b>56</b>

Source: - Field Survey, 1997.

Malaria, which was the second leading disease in the three study areas, also affected residents in all the age groups. Umoja and Jericho estates however, had very few malaria cases compared to Lindi village. As noted previously, this high malaria morbidity rate is as a result of poor sanitation and poorly designed housing in Lindi. Malaria poses great

health risks to the entire population in the malaria prone areas. It is therefore important that factors that lead to the spread of this disease are addressed urgently.

In the case of diarrhoeal diseases, children below 5 years of age are the most vulnerable forming 60% of all the diarrhoeal cases. All the children below 5 years of age suffering from diarrhoea were from Lindi village, where there is inadequate water supply and a contaminated environment, hence increasing their susceptibility. The high morbidity rates among children below five years can be attributed to their lack of knowledge on basic hygiene habits, low resistance and lack of playgrounds forcing them to play in the contaminated environment. This corresponds to the reports from the Nairobi City Commission health facilities in 1986 which all indicated that diarrhoea was the third leading cause of mortality in Nairobi among all the age groups. However, it affected children below 5 more because of their low resistance (UNICEF/GOK, 1990). Another study by the Nairobi City Council in two slum areas in Nairobi found that  $\frac{2}{3}$  of all children under the age of 5 years were suffering from acute respiratory infection, diarrhoea and malaria. The poor and unhealthy living environments in these areas was found to be the cause (NCC, 1992). Other diseases also affected people in the different age groups irrespective of locality. However, the highest number of people suffering from other diseases also came from Lindi village which comprised of 62.5% of all the people suffering from other diseases.

These findings indicate that there is a close relationship between age and the environment-related diseases. This is clearly seen on Fig 6.1, which shows that environment related diseases were found to afflict children below 5 years more than any other age group.

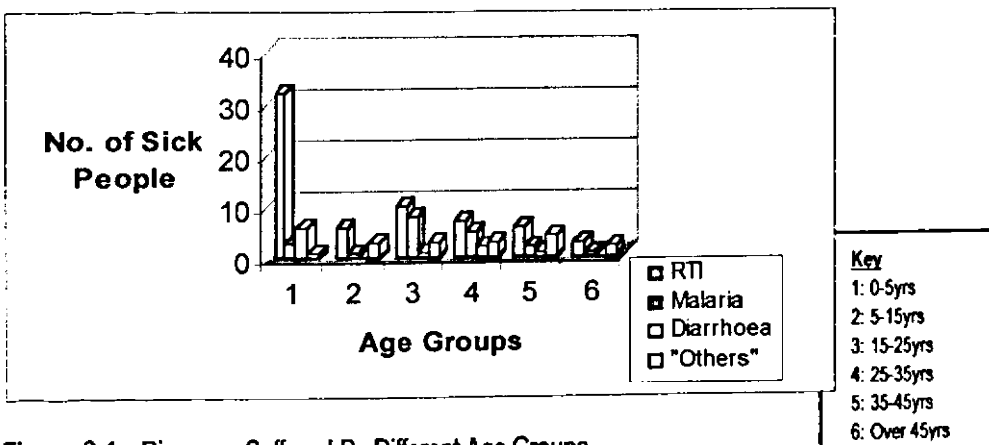


Figure 6.1 Diseases Suffered By Different Age Groups

Source: Field Survey, 1997



Those aged above 45 years did not seem to be greatly affected by diseases arising from the residential environment as they formed only 5.5% of the morbidity rates in the study areas two weeks prior to the study. However, children below 5 years formed the majority (38%) of those who were ill. This may be as a result of various factors. One is the fact that children below 5 years (especially in the poor neighbourhoods where they attend school at a late age) spend most of their time playing in the home environment. Secondly, children's immunity against diseases is greatly reduced by the lack of immunizations of common childhood diseases, and thirdly, malnutrition in many low-income households greatly reduces their immunity. In Lindi village for instance, where housing and the environmental conditions are poor, 41% of all those who were ill in this village two weeks prior to the study were children aged below 5 years. Fig 6.2 shows the diseases that the children below 5 years were suffering from in the three study areas. Children from Lindi village have higher morbidity rates than those in Umoja and Jericho estates. This shows how vulnerable children living in poor neighbourhoods are from dangers exposed to them by their living environment.

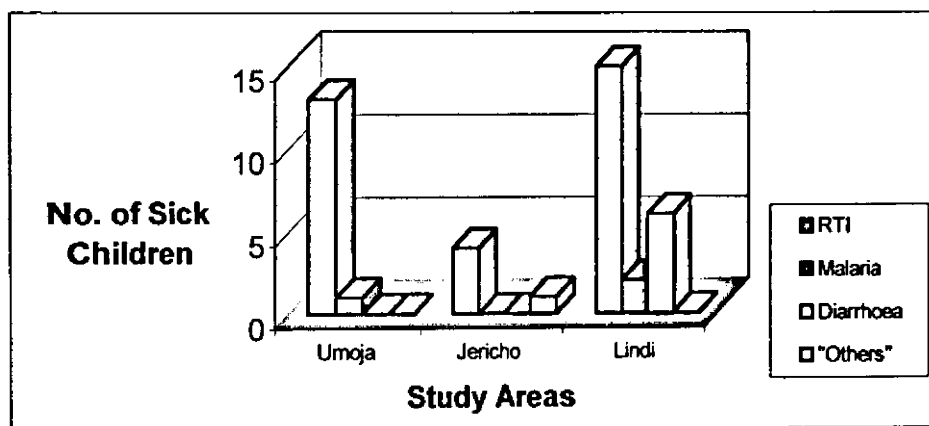


Figure 6.2 Diseases Suffered by Children below 5 Years by Study Areas

Source: Field Survey, 1997

Jericho estate had the lowest number of children less than 5 years who were sick. However, it is clear that Respiratory Tract Infections (RTI) were the most common and afflicted children in all the study areas. Lindi village accounted for 46% of all the respiratory infections affecting children below 5 years. This was followed by Umoja estate, which accounted for 41%, while Jericho estate had the lowest with 13%. The pie chart of figure 6.3 shows the percentage share of respiratory tract infections in the three areas of study.

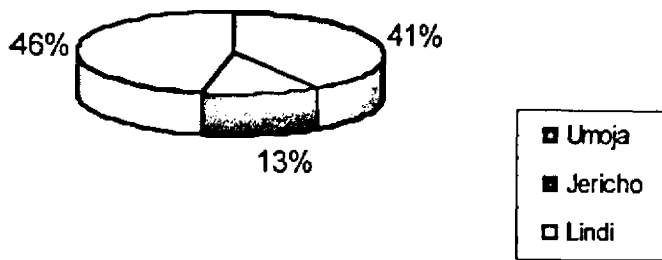


Figure 6.3 Percentage of Children below 5 Years Suffering from RTI in the Study Areas  
Source: Field Survey, 1997

Results of diseases afflicting children below five years in Lindi correspond to several studies carried out by AMREF in Nairobi's slum area. It was found that respiratory infections account for a high percentage of diseases afflicting children below five years. Diarrhoea prevalence was also observed to be high (AMREF, 1987, 1989, 1990,1992). The incidence of acute respiratory infection reflected crowded living conditions, a polluted environment and indoor air pollution due to the use of paraffin stoves for cooking.

## 6.6 SUMMARY

The study areas had different levels of income with Umoja estate having the highest level and Lindi village the lowest levels. The income levels affect the type of housing one lives in due to affordability. The higher the income levels the better the quality of housing. This in turn affected the health of the inhabitants as poor housing conditions predisposed the inhabitants to air-borne infections. The state of the residential environment was also found very important because although the housing structure may be well designed, built, and maintained, if the environmental conditions are poor, then inhabitants are still exposed to environment related diseases. This is supported by the results of the study which showed that even though housing quality was good in Umoja estate, the residents of Umoja estate suffered more than those of Jericho estate due to the poor environmental conditions in Umoja estate. Children below five years are however the most affected especially in the slum areas where incomes are low hence poorer diets, poor housing conditions and a very dirty and contaminated environment.

## CHAPTER SEVEN

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 7.1 SUMMARY

The study has come up with findings based on the stated objectives and hypotheses. People living in poor quality housing suffer poorer health than residents of better quality housing do. In the poor quality housing in Lindi village, the available living space per person is too small. In Umoja and Jericho estates, though the structural characteristics were better than those of housing in Lindi village, overcrowding and poor maintenance was noted. The overcrowding that was noted favours the transmission rates of airborne infections such as Respiratory Tract Infections in Jericho estate which was also the most common illness that afflicted residents in all the areas. Air pollution from industrial emissions is another possible factor. However, poorer groups are more at risk from Respiratory Tract Infections than wealthier households because of their limited health and financial resources which limit their ability to seek medical attention. It is also clear that the scale and nature of health problems associated with indoor air pollution are closely linked to household's income, as more households prefer cleaner and healthy fuels if they can afford them.

In terms of water supply, residents who did not have piped water had a higher incidence of diarrhoeal diseases than the residents who had water piped to their houses. 90% of all the diarrhoeal diseases reported two weeks prior to the study were from Lindi village. These are still the same people who occupy poor quality housing and use pit latrines for human waste disposal. This illustrated the health risks that inadequate water supply and poor methods of disposing off human waste pose to inhabitants. Residents who have poor means of disposing off waste-water have a higher incidence of Malaria and Diarrhoeal diseases than the residents connected to the sewer lines. This is as a result of poor drainage, which provides ideal breeding grounds for insect-vector diseases. In terms of solid waste disposal, all the residents who were suffering from Diarrhoea had no service provision for the removal of solid waste. This shows that inadequacies in solid waste disposal especially in areas where solid waste is contaminated with human excreta created ideal breeding grounds for insects such as flies which thrive in latrines. This may in turn contaminate food which once consumed can cause illness. The cooking fuel used in the home also causes diseases of the respiratory tract through inhaling impurities which

irritate the respiratory tract especially if the house is poorly ventilated and cooking takes place in the same room as other activities. The survey indicated that the poor residential environment that many poor people live in imposes a heavy burden on the inhabitants. All these factors underline the important role that adequate housing conditions and a suitable residential environment play in the health of inhabitants.

The simple diagrammatic model of factors affecting health (Fig. 2) shows the factors that have an effect on the health of man in the residential environment. These factors were found lacking in the three areas though at varying levels. For instance, Lindi village, a slum and squatter settlement was lacking many of the basic provisions of an ideal residential environment exposing the residents to conditions which can lead to ill health. The living environment here is in an appalling state. It is for these reasons that inhabitants of this area suffered poorer health than those people living in a better residential environment. Though Umoja 1 and Jericho estates provide a better living environment than Lindi village, the estates are also plagued by inadequacies that cause conditions ideal for causing and spreading certain environment-related diseases. This shows that the people living in low-income areas with inadequate facilities and poor housing invariably have poorer health than people living in good quality housing served by better facilities. The scale of these disparities can be reduced by ensuring that low-income groups obtain reasonable quality housing, and are served by water supply, provision for sanitation and drainage and health care.

The various inadequacies that have been observed in the residential areas studied lead us to rejecting the null hypotheses and accepting the alternative that housing environmental conditions do have an influence on the health status of inhabitants. It is therefore conclusive to say that poor housing conditions tend to cause chronic diseases such as respiratory infections which are air-borne while the poor state of the residential environment tends to cause endemic diseases such as malaria and diarrhoeal diseases.

The three most common illnesses afflicting residents also result in high morbidity rates in the study areas. The morbidity incidence is also largely prevalent among the low-income residents. Neither of these three health problems are simple effects of the individual environmental risk factors. They are the outcome of a complex combination of interrelated factors that clearly indicate the importance of environmental inadequacies in causing diseases. These are also in turn related to non-environmental factors such as age, malnutrition, etc. The study has also revealed that Intra-urban differences in health status exist in different residential areas in Nairobi. These Intra-Urban differences are

present because of the differences in the provision of infrastructural facilities and housing conditions. These differences can be reduced by improving housing and the equitable distribution of services and infrastructural facilities.

## 7.2 CONCLUSION

The findings of this study show that a large proportion of Nairobi's population is living under poor human settlement conditions and a worsening urban environment. Consequently, this population is exposed to various environment-related diseases. The low income groups are affected most as they live in substandard housing with very inadequate services and facilities. Incomes were also found to have an impact on the quality of housing that one lives in and the affordability of services. Those with higher levels of income live in better quality housing with better service provisions whereas those with lower incomes live in deplorable conditions. The study also showed that environment-related diseases have a relationship with age. Children below five years of age living in poor quality housing environments were most affected by the environment related diseases as they spend most of their time in the home environment.

Poverty and a poor residential environment were found to be inextricably linked as was evidenced by the low income, education and employment levels in the low income areas. Therefore, poverty eradication is an essential issue in searching for alternative solutions. Although the prevailing economic conditions are not conducive, and the government is experiencing difficulties in providing infrastructural services, such as water, drainage, solid waste disposal and health care facilities, priority should be given to slum areas where the morbidity rates increase with the rising population

In order for the situation to be improved, there is need to focus on housing in its totality. Programmes geared towards improving health would for example have limited impact if they do not address the problem of poor and deteriorating housing conditions. It is clear that there is need for changes in housing policy and implementation programmes. Housing programmes should also focus on project designs geared at ensuring healthier living environments. The provision of essential services and facilities should be a prerequisite requirement in both the formal and informal areas if healthy living conditions are to be achieved and maintained.

### 7.3 RECOMMENDATIONS

From the findings, summary and conclusions of this study the following are the recommendations that imply changes on policy, institutional and implementation issues.

1. The central government and municipal authorities should change their views about illegal settlements and accept them as permanent features of urban life, which should be included in planning efforts and budgetary allocations in the urban development. This would be an incentive to residents of these settlements who will take the initiative to improve their housing conditions and develop a responsible attitude towards a sustainable residential environment.
2. There is need to ensure provision of services and facilities in these settlements in partnership with the local authorities, communities, and other interested stakeholders. Care should also be taken to ensure provision of adequate water supplies, solid waste disposal and management and sanitation among others in all human settlements.
3. There is also need to start employment and income generating projects especially in the low-income areas so as to empower the people to improve their living conditions.
4. Security of tenure for the urban poor should also be addressed so as to give security and incentives to the urban poor to invest in their housing and their environment.
5. The local authorities should adopt strict development control measures to ensure that illegal extensions in planned areas are reduced. The community should be involved in the design process so as to incorporate inputs and views so as to stem the problems arising from extensions early enough.
6. The municipal authorities should examine the pricing of water in the poor areas so as to reduce the cost. This would ensure that water is available at reasonable costs to residents in poor areas. This would therefore increase their water utilization levels and consequently improve their health status.
7. The health sector should have a rigorous educational/awareness campaign on the interdependencies between the environment and health. These programmes should develop within the communities; the knowledge, attitudes and practices that are needed to improve personal and community health with special attention to hygiene. Preventive and curative services should also be placed within the context of environmental policy and can be supported by effective management systems and plans of action, which include community participation so as to reflect local needs and

capacities. This would ensure that less is spent on curative care and more invested in sustainable preventive measures.

8. An intersectoral strategy to address poverty and assist the poor to attain higher standards of living is the only reasonable long-term solution. This involves improved provision of infrastructural services and facilities such as water, sanitation, road and transport systems, income generating activities, improved educational opportunities and increased availability of jobs at reasonable wages among others.

#### **7.4 SUGGESTIONS FOR FURTHER RESEARCH**

The following areas of research have been suggested to further the understanding of the relationship between the residential environment and health. These areas could have enriched the study further but it was not possible to include them due to time and resource constraints. These include:

1. The effect of the working environment on the employee and that of his family. A large number of people living in slum areas work in industries where they are not provided with adequate clothing and are exposed to industrial air pollution which may lead to skin infections and infections of the respiratory tract. Once the employees go home in areas where there is overcrowding and poor ventilation, the diseases are transmitted fast to other household members. Hence, a study of the health status of these workers and that of their families would bring out the issues more clearly.
2. Many Psycho-social disorders such as rape, child abuse, wife mistreatment, delinquency, and depression among others have been associated with poor housing conditions. A study on the effect of overcrowding on mental health and psychological stress would provide invaluable information, and give a more holistic approach to housing-health studies.
3. A longitudinal community-based study with more detailed analytical field studies is required to investigate more specific associations between the environment and health. The health data can be taken every two weeks and the life histories taken as case studies on specific group such as mothers and children. Though the study would require more financial and manpower resources, it would come up with results which can help in the design of effective interventions.

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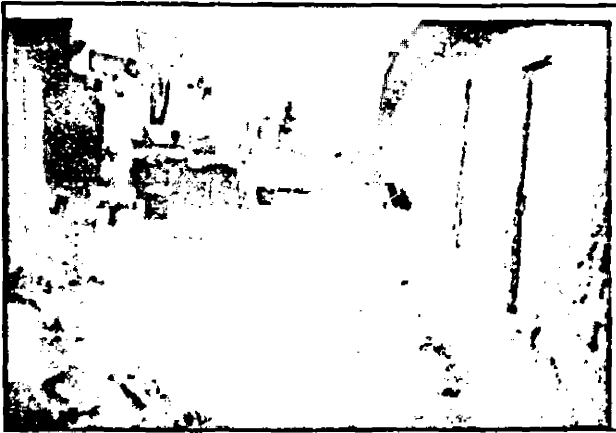
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## **APPENDIX A**

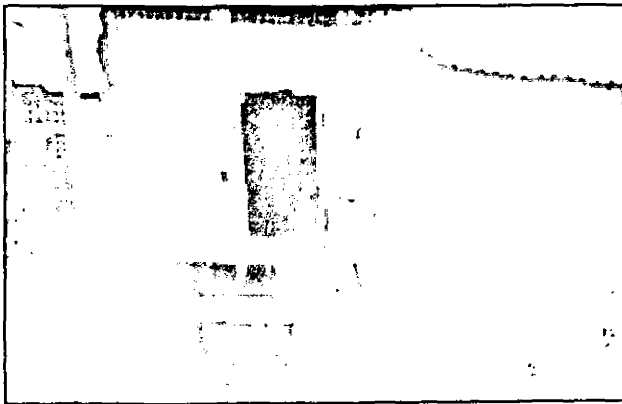
### **SAMPLE PICTURES OF FIELD OBSERVATIONS**

1. Lindi Village
2. Umoja Estate
3. Jericho Estate

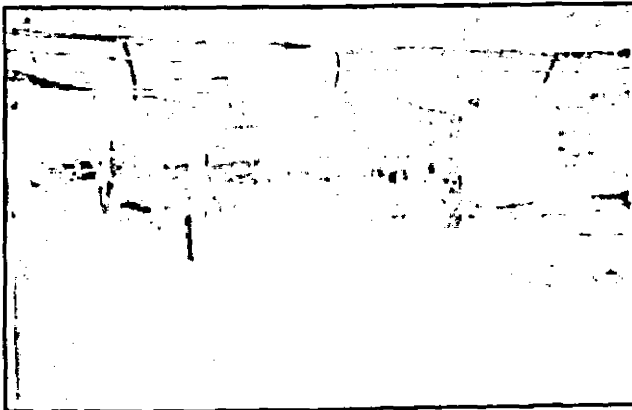
**1. LINDI VILLAGE, KIBERA SLUMS**



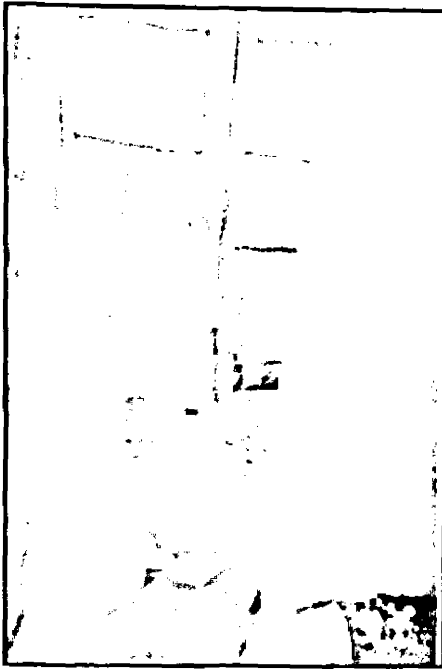
**Picture L.1** A typical U-shaped layout of housing units in Lindi village, Kibera Slums



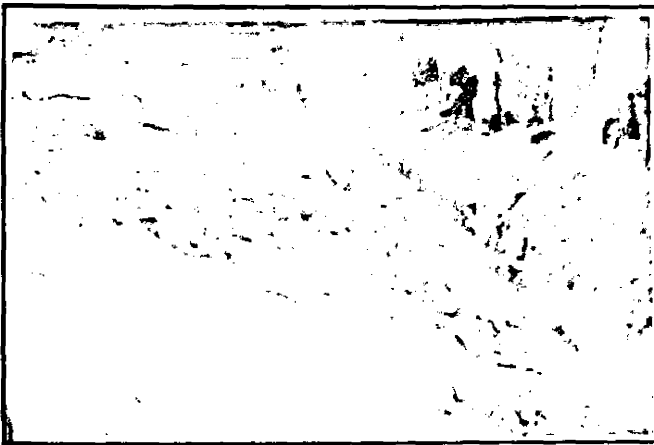
**Picture L.2** A close view of a housing block in Lindi village. Notice the poorly designed house built above a dugout drainage channel exposing the inhabitants to danger: notice the house has no screening of the window opening.



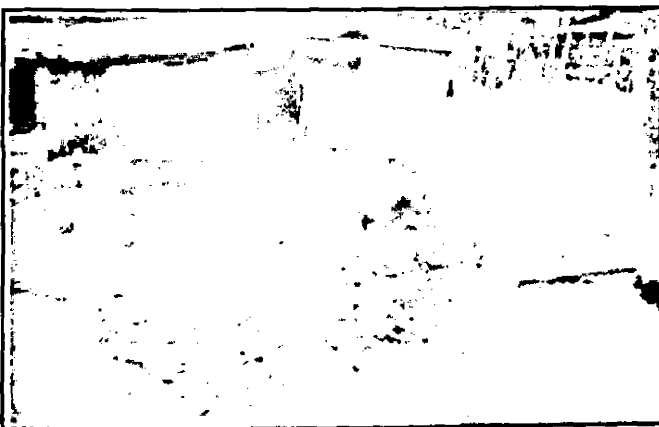
**Picture L.3** Housing units destroyed by floods in Lindi village, these were located close to Motoine river



**Picture L.4** A close view of a poorly designed and built pit latrine in Lindi village. *notice the overflow from the latrine making it virtually unusable and a public health hazard.*



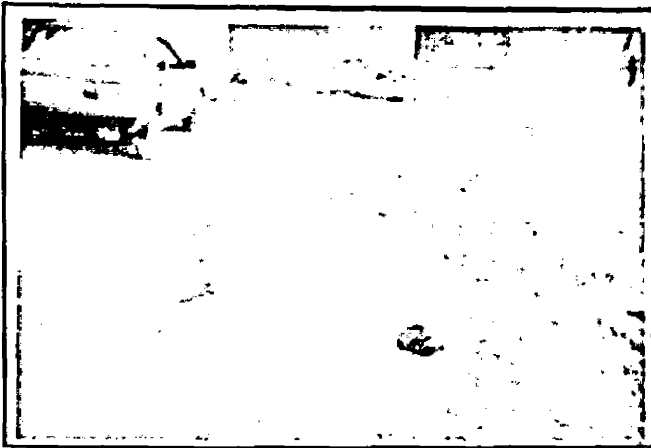
**Picture L.5** Poorly designed and maintained housing units separated by narrow paths filled with garbage. *notice a toilet on the right located close to the dwelling units and a drainage channel lined with garbage.*



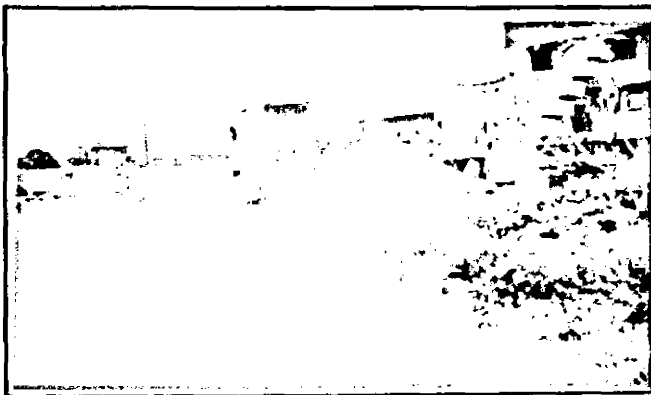
**Picture L.6** A close view of an overflowing toilet with the discharge flowing towards the drainage channel and housing units creating very unhygienic living conditions. *notice the garbage next to a house.*



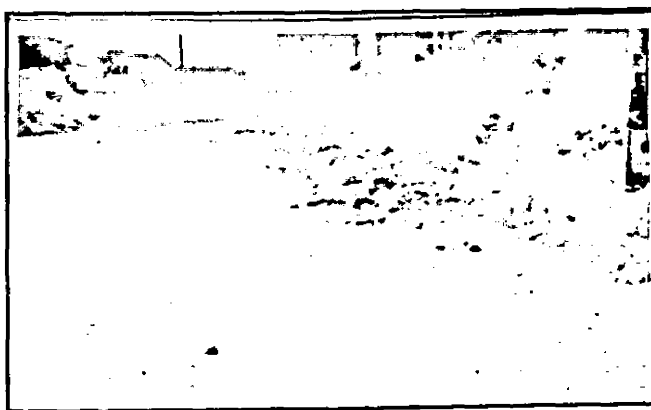
## 2. UMOJA ESTATE



**Picture U.1** Typical housing units in Umoja 1 estate. *notice the poor road filled with water mixed with garbage*

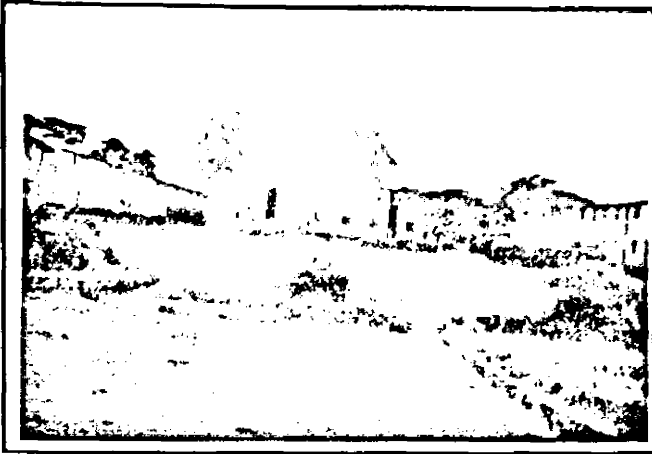


**Picture U.2** An impression of typical haphazard development in Umoja estate almost dwarfing the original housing units and building materials blocking footpaths

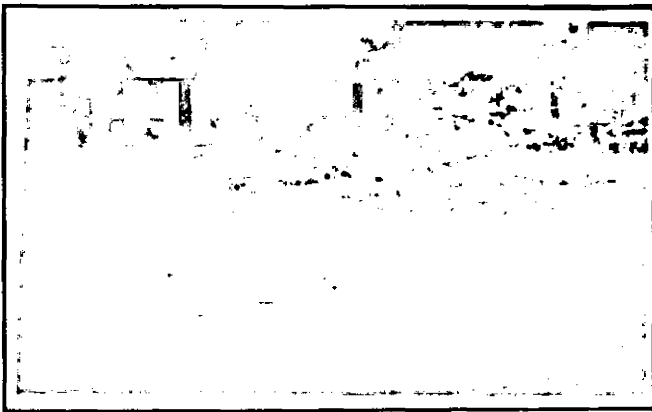


**Picture U.3** Uncollected garbage lying on the roadside in Umoja 1 estate

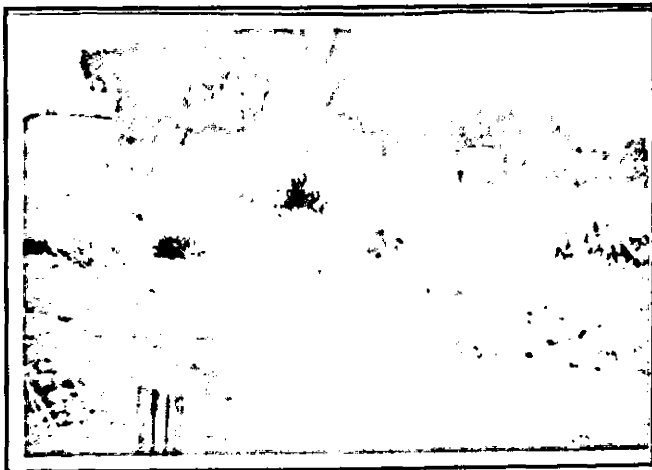
### 3. JERICO ESTATE



**Picture J.1** Typical housing units in Jericho estate with open spaces planted with trees and shrubs



**Picture J.2** A typical site of uncollected garbage lying in dumps in the estate creating unhealthy living conditions for the residents.



**Picture J.3** A view of the open spaces showing unkempt surroundings, long grass, garbage and gardening

**APPENDIX B**

**HOUSEHOLD QUESTIONNAIRE**

# HOUSEHOLD QUESTIONNAIRE

## PRELIMINARIES

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Interviewer (Name) \_\_\_\_\_

Date of Interview \_\_\_\_/\_\_\_\_/\_\_\_\_

Questionnaire No. \_\_\_\_\_

Name of Settlement \_\_\_\_\_

A - Umoja Estate

B - Jericho Estate

C - Lindi Village

### Instructions to interviewer

This questionnaire should be administered to the household head or spouse.

### Instructions to Interviewee

My name is \_\_\_\_\_. I am a member of a study team from the University of Nairobi carrying out a survey on the residential environment and the health of household members. This is in partial fulfilment of the requirements of University education.





3. a) How many members of your family contribute to household income? \_\_\_\_\_
- b) How much does their income add up to in one month? Kshs \_\_\_\_\_
- c) What is your personal monthly income? Kshs \_\_\_\_\_
4. Kindly give us a breakdown of your family's monthly expenses on the following?

ITEM	AMOUNT(Estimate)
Food	
Water	
Electricity	
Rent	
Transport	
Cooking Fuel (e.g. gas, charcoal)	
Health (e.g. Medicine, hospital fee)	

#### HOUSING/AMENITIES

5. a) Does the house you live in belong to you or is it rented? \_\_\_\_\_
1. Own
  2. Rented
  3. Others
- b) If tenant how much rent do you pay per month? \_\_\_\_\_
6. How long have you lived in the present house? \_\_\_\_\_
7. How many rooms does your household occupy excluding the kitchen? \_\_\_\_\_
8. What are the different rooms used for?

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#### Type of construction

(Record Observation)

9. What is the main material for the floor?

	Material Used	Scoring
1.	Cement	Score 1
2.	Earth	Score 3
3.	Wood	Score 2
4.	Tiles	Score 1
5	Other(Please specify)	Score 4

10. What is the main material for the Walls?

	Material used	Scoring
1.	Stone	Score 1
2.	Brick/Concrete Block	Score 1
3.	Mud only	Score 2
4.	Wood only	Score 3
5.	Iron Sheets	Score 3
6.	Grass/Reeds	Score 4
7.	Other (Please specify)	Score 5

11. What is the main material used for the roof?

	Material Used	Scoring
1.	Iron Sheets	Score 2
2.	Tiles	Score 1
3.	Concrete tiles	Score 1
4.	Asbestos Sheets	Score 1
5.	Grass/Makuti	Score 3
6.	Others(Please specify)	Score 4

12. How many Windows does the house have? \_\_\_\_\_

(Observe whether they are open to let in adequate ventilation)

13. Do you experience any of the problems stated below in your house?

	Condition	Yes	No
1.	Dampness		
2.	Overheating		
3.	Poor Ventilation		
4.	Leaking roofs		
5.	Other(Please specify)		

14. What is the maintenance condition of the following:-

	Element	Maintenance Condition		
		Good	Fair	Poor
1.	Floors			
2.	Walls			
3.	Roof			
4.	Windows			
5.	Toilets			
6.	Bathrooms			

15. What is your main source of water supply?

	Type	Scoring
1.	Own tap connected to water mains	Score 1
2.	Shared/metered connection on plot	Score 2



3.	Public stand pipe	Score 3
4.	Well	Score 4
5.	Bore-hole	Score 4
6.	Water Kiosk	Score 5
7.	Other(Please specify)	Score 6

16. If not connected to water mains or metered connection on plot how much does it cost per 20 litre container? \_\_\_\_\_
17. If not individual connection or on plot, how far is the source of water?
1. Less than 100 meters away.
  2. More than 100 meters away.
18. How long does it take to collect the water?

	Type	Travel time	Waiting time	Scoring
1.	5 min or less			Score 1
2.	6-14 min			Score 2
3.	15-30 min			Score 3
4.	31-60 min			Score 4
5.	1-2 hours			Score 4
6.	More than 2 hours			Score 5
7.	Other(Please specify)			Score 6

19. How much water do you collect in a day? \_\_\_\_\_
20. If you have individual or on-plot water connection how often do you receive your water supply?
1. Throughout the day.
  2. At particular times of the day or night(indicate time) \_\_\_\_\_
  3. Irregularly
  4. Not at all
  5. Others(Please specify).
21. What do you do when you do not receive your water supply?
1. Fetch when available and store.
  2. Purchase from water vendors.
  3. Fetch from friends.
  4. Others(Please specify).
22. How do you store water in your house?
1. Covered container
  2. Uncovered container
  3. None Stored.
- (Observe cleanliness of containers)
23. Do you undertake any treatment of water before using it?
1. Yes

2. No⇒25

24. If yes state what the form of treatment and purpose for which treated water is used.

	Form of treatment	Purpose for which treated water is used.
1.	Boiling	
2.	Filtering	
3.	Other (Please specify)	

25. What in your opinion is the main problem with the water supplied in this area? (E. g is it adequate, water colour, too much chemicals, leaks, etc.) \_\_\_\_\_

26. How do you dispose off your waste water? (Make observations)

1. Municipal sewer
2. Septic tank
3. Other (Please specify)

27. What are the main problems experienced with the current means of waste water disposal? \_\_\_\_\_

28. What type of toilet facility does your household use? (Make observations on the conditions of the toilets).

	Type	Scoring
1.	Toilet connected to main sewer	Score 1
2.	Toilet connected to septic tank	Score 1
3.	Pit latrine	Score 2
4.	Bush	Score 3
5.	Other(Please specify)	Score 4

29. Do you have to share your toilet facility with any other household?

1. Yes
2. No⇒Q32

30. How many households share this toilet? \_\_\_\_\_

31. If yes are your young children (below 5 years) allowed to use this facility unsupervised?

1. Yes
2. No

32. Do your children wash their hands after visiting the toilet?

1. Yes
2. No
3. I don't Know

33. How do you dispose off the household's solid waste(garbage)?
1. Collected by City Council
  2. Collected by private operator
  3. Thrown in open, common dumping ground
  4. Thrown anywhere in the estate/village where space is available
  5. Burnt
  6. Others(Please specify)

34. In situations where garbage is collected how often is solid waste collected in your estate/village?

1. More than once per week
2. Once per week
3. Less than once per week
4. Others

35. What are the main problems experienced with the current method of solid waste disposal?
- 
- 

36. What type of fuel does your household use for cooking?

	Type of fuel	Scoring
1.	Electricity	Score 1
2.	Gas	Score 1
3.	Paraffin	Score 2
4.	Firewood	Score 3
5.	Charcoal	Score 4
6.	Other(Please specify)	Score 5

37. Why do you use that particular fuel?(Tick appropriately as answered by respondent)

1. Affordable
2. Clean
3. Easily available
4. Safety
5. Others(Please specify) \_\_\_\_\_

38. What are the main problems experienced with the cooking fuel currently being used? \_\_\_\_\_
- 

39. What is your main source of lighting?

	Type of lighting used	Scoring
c	Electricity	Score 1
2.	Paraffin Lamps	Score 3
3.	Fuel wood	Score 4
4.	Candle	Score 4
5.	Solar	Score 2
6.	Other(Please specify)	Score 5

40. (a) How would you rank the cleanliness conditions of the surroundings of your home (*Make observations*)

	Condition	Scoring
1.	Very good	Score 1
2.	Good	Score 2
3.	Poor	Score 3
4.	Very poor	Score 4
5.	Other(Please specify)	Score 5

- (b) How would you rank the surroundings of the estate/village in which you live? (*Make observations*)

	Condition	Scoring
1.	Very good	Score 1
2.	Good	Score 2
3.	Poor	Score 3
4.	Very poor	Score 4
5.	Other(Please specify)	Score 5

41. What do you think requires the most immediate attention to make the house and the residential environment a better place to live?

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#### HEALTH FACILITIES AND HEALTH STATUS OF HOUSEHOLD MEMBERS

42. Which health facility does your household visit?

43. How far away is the health facility located?

1. Less than ½ km
2. More than 1 km

44. Is it easily accessible to your household? (*In terms of service availability, affordability, etc.*)

1. Yes
2. No

45. Are you satisfied with the services of the health facility?

1. Yes
2. No

46. If no what are the reasons?

- 
47. Has any member of your household been sick for the last two weeks?

1. Yes
2. No ⇒ Q 51

48. If yes what was the person suffering from?

	Household member	Age (In Years)	Diseases suffered from	Frequency
1.			Upper respiratory tract infections e.g. coughs, colds etc.	
2.			Pneumonia	
3.			Tuberculosis	
4.			Malaria	
5.			Diarrhoea	
6.			Intestinal worms	
7.			Skin problems e.g. rashes	
8.			Others(Please specify)	
9.			None	

49. Was the sick person given any medical attention?

1. Yes⇒Q 51

2. No

50. If no what was the reason for not getting medical attention?

1. Could not afford

2. Sickness not serious

3. Other(Please specify) \_\_\_\_\_

51. What are the most common health problems that your family suffer from? \_\_\_\_\_

52. What do you think are the causes of the above mentioned diseases? \_\_\_\_\_

53. Do you think that any health problem could arise from lack or the poor state of any of the following?

	Aspect	Health problem arising from it.
1.	Water supply	
2.	Solid waste disposal	
3.	Disposal of human excreta/toilet facility	
4.	Type of cooking fuel used	
5.	Type of lighting fuel used	
6.	Maintenance condition of the house	
7.	Others(Please specify)	

54. Do you think the general state of the residential environment in your estate/village can affect your health?

1. Yes⇒Q55

2. No

55. In what ways? \_\_\_\_\_

**THANK YOU VERY MUCH FOR YOUR CO-OPERATION.**