SANITATION PRACTICES AMONG PUBLIC PRIMARY SCHOOL WITHIN NYERI MUNICIPALITY, NYERI DISTRICT, KENYA

BY

NYAGUTHII MIRIAM RUKWARO (HND IN PAEDIATRICS)
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SEPTEMBER 2005
DECLARATION

I, Nyaguthii Miriam Rukwaro, do hereby declare that, this is my original work and has not been presented for a degree or any other award in any other university.

Signature: Rukwaro

Date: 28th Sept 2005

SUPERVISORS' APPROVAL

We confirm that the candidate, under our supervision, carried out the work. This thesis has been submitted for examination with our approval as university supervisors.

DR. (MRS.) ZIPPORAH NG'ANG'A
SCHOOL OF PURE AND APPLIED SCIENCES
BIOLOGICAL SCIENCES DEPARTMENT
KENYATTA UNIVERSITY

Signature: Ng'ang'a

Date: 28th Sept 2005

DR. (MRS.) JEMIMAH SIMBAUNI
SCHOOL OF PURE AND APPLIED SCIENCES
BIOLOGICAL SCIENCES DEPARTMENT
KENYATTA UNIVERSITY

Signature: Simbauni

Date: 28th Sept 2005
DEDICATION

This thesis is dedicated to God the father of Jesus Christ who is the source of my inspiration and to my late mother Esther Nyawira Wanjohi who laid a foundation to my early education both formally and informally, the family of Mr. and Mrs. John Kimeria who took over from my mother and have seen this work accomplished, not forgetting, my beloved and affectionate husband Rev. Peter Rukwaro and my dear children Samuel Kihumba, Isaac Wanjohi and Grace Wanjiku for their concern and ceaseless prayers during the time of the study.
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“Now unto Him that is able to do far more
Abundantly above all that we ask or think. Ephs. 3v20
And in who are hid all the treasures of wisdom and knowledge
Unto Him be glory and honor throughout all generations
Forever and Ever Amen” Col. 2 v3
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ACRONYMS

AHRTAG  Appropriate health Resource and Technology Action Group
CBS       Central Bureau of Statistics
D C       District Commissioner
DDO       District Development Officer
DEO       District Education Officer
DFID      Department for International Development.
DMOH      District Medical Officer of Health
DPHO      District Public Health Officer
GOK       Government of Kenya
IRC       International Resource Center
KCPE      Kenya Certificate of Primary Education
MOEST     Ministry of Education Science and Technology
MOH       Ministry of Health
NETWAS    Network For Water and Sanitation
NYEWASCO  Nyeri Water and Sewerage Company
PMO       Provincial Medical Officer
UNESCO    United Nations Educational Scientific and cultural Organization
UNICEF    United Nations Children's Fund
UPE       Universal Primary Education
VIP       Ventilated Improved Latrine
WASH      Water Sanitation and Hygiene
WHO       World Health Organization
WSP-AF    Water and Sanitation Programme Africa
DEFINITION OF TERMS

Adequate water supply  Water that is enough for the intended use.

Disease  An illness affecting living organisms often caused by an infection.

Drainage  The process of removal of wastewater, storm water, sewerage and any other effluent from human environment.

Effective sanitation  Disposal of various wastes resulting from human activities in such away that pathogens are prevented from contaminating water supply, food and the general environment.

Environment  The earth and its surroundings. These include animals, plants, water bodies and the air.

Health  Is a state of complete physical, mental, social and spiritual well being of an individual or community but not mere absence of disease or infirmity.

Hygiene  The degree of cleanliness expressed by an individual or a community. This involves personal cleanliness and that of the environment.

Practice  A usual way or approach of doing one common habit/behavior. This becomes a custom if repeated many times.

Public primary school  Is one where government provides teachers and the community provides physical facilities and support.
staff. The funds are public funds and are subject to audit by the government.

**Pupil**

A person attending a primary day or boarding school for learning purposes.

**Sanitation**

Refers to the safe collection, storage and disposal of various wastes resulting from human activities. These include solid wastes, liquid wastes effluent from sewerage works, kitchen sinks and even hazardous wastes from industries those manufacturing nuclear products. It also refers to the general maintenance of the human environment in a safe condition free of pollution.

**Sanitation Coverage**

The percentage coverage of a specific area by a specific method of wastes removal e.g. the area served by a specific drainage system in municipality or pit latrine percentage coverage in a specific location.

**School**

A premise where learning is intended to take place and provision of learning facilities has been provided.

**Toilet**

Facility used for collection, storage and sometimes disposal of human wastes particularly feaces and urine.
ABSTRACT

A variety of physical, emotional, social and environmental factors influence pupils who spend a large part of their life at school. Sanitation is an intervention to reduce exposure to diseases by providing a clean environment. This includes hygienic management of human excreta, refuse, and waste water, the control of disease vectors and provision of washing facilities for personal and domestic hygiene. Diseases related to water and sanitation have been reported countrywide. The prevalence of diarrheal diseases and intestinal worms within Nyeri municipality is 3.3% and 7.7% respectfully. There is substantial loss of school time because of water and sanitation diseases among pupils. A cross sectional descriptive study was carried among public primary schools within Nyeri Municipality to determine sanitation facilities and hygienic practices following massive school enrolment due to Free Primary Education offered by the Kenya Government. A total 400 pupils selected randomly using probability proportion to size for schools and classes from the two education zones within the municipality were included in the study. Data was collected using pre-tested open and close-ended questionnaires and observation checklists. Data was processed using SPSS software and analyzed using chi-square to determine associations. The results of this study showed a significant relationship between water frequency and type of the school ($\chi^2 = 22.46; df = 2, p= 0.0001$), between availability of water outside the toilets and type school ($\chi^2 = 6.63; df = 2, p = 0.0363$). The toilet pupil ratio was significantly different for boys and girls and depended on the type and management system of the school ($\chi^2 = 11.6, df = 3, p = 0.0089$). The presence of waste water drainage among schools was influenced by the management system of the school ($\chi^2 = 7.4; df = 1, p =0.0065$), while dustbin availability depended on the type of the school ($\chi^2 = 25.5; df = 2, p =0.0001$). There was a significant relationship between sanitation facilities and mean examination score among schools ($\chi^2 = 25.49; df = 4, p =0.0001$). The results showed a statistically significant relationship between hand washing among pupils after visiting the toilet and presence of water outside the toilet ($\chi^2 = 35.139; df = 1, p =0.0001$), between feeding places and type of the school ($\chi^2 = 277.6; df = 6, p=0.0001$), and between the practice of wearing shoes among pupils and type of school ($\chi^2 = 88.13;df = 2, p=0.0001$). Diarrhea and sanitation related diseases were common among pupils. There was a statistically significant relationship between water availability and incidence of diarrhea ($\chi^2 = 14.6; df = 1, p=0.0001$), between practice of wearing of shoes and presence of intestinal worms among pupils ($\chi^2 = 7.84;df = 1, p=0.0051$). Girls’ boarding and mixed day / boarding schools had better sanitation facilities and practiced most of the hygienic practices and had better examination mean-scores compared with mixed day schools. The study has shown that the schools with adequate sanitation facilities had higher examination mean-scores compared with those without. Sanitation practices among school children greatly influence the learning process. The results of this study suggest that there is need for public schools to adhere to the Public Health Act, Education Act and promote sanitation and hygienic practices. This study have revealed that schools with adequate sanitation facilities have a higher examination mean-score.
1.1 Background Information

In many developing countries, there exists a high prevalence of water and sanitation related diseases, causing lots of morbidity and mortality (WHO, 1987). Every year millions of the world’s poorest die from preventable diseases caused by inadequate water supply and sanitation services. Hundreds suffer from regular bouts of diarrhoea and parasitic worm infections. Children are the main victims of the sicknesses that result (DFID, 1998). Waterborne diseases are the single most important cause of death and illness in the developing world. More than three million people are dying annually due to waterborne diseases. Adequate sanitation facilities combined with proper hygiene training is a prerequisite to improving the situation (Winblad, 1996).

The major causes of morbidity and mortality in Kenya are diseases and conditions that are preventable through proper environmental management, or basic hygiene. The existing environmental problems relate to the low level of safe drinking water, poor environmental sanitation and refuse disposal. As a result, water-borne diseases such as typhoid and cholera have become major threats. Closely linked to the lack of safe water supply is the problem of poor sanitation resulting in poor disposal of faecal matter near homes and sources of water in urban areas. The inadequate and poorly maintained sewerage systems as well as lack of toilet facilities lead to water-borne diseases (GOK, 1999). Infections such as diarrhoea, ascariasis, drancunculiasis, hookworm, schistosomiasis and trachoma spread fast where environmental conditions are poor (Cairncross & Feachem, 1996). Lack of sanitation is responsible for most of the diseases and death in developing countries today. Sanitation together with hygiene education will
break the cycles of diseases (Mayling & Herbert, 1998). There are many infections, which depend on their persistence on passing from the excreta of one person to the mouth of another. All of these are likely to be affected by excreta disposal methods (Pacey, 1981).

In Kenya, the prevalence of diarrhea diseases is 5% and intestinal worms account for 5% of all illnesses among adults and children (MOH, 2001). In Central Province, the prevalence of diarrhea diseases and intestinal worms is 3.5% and 5.2% respectively. In Nyeri District, the prevalence of diarrhea disease and intestinal worms is 3.3% and 7% respectively (MOH, 2001). The outbreak of typhoid and diarrhea diseases in Nyeri Municipality in 2003 was due to contaminated water and lack of sufficient latrines (DMOH, 2003).

Schools are among the places where children learn key skills and gain knowledge about the world, and where they are 'socialized, ' and made aware of the society's future expectations of them (UNICEF, 2003a). One of the major problems faced by hundreds of millions of school-aged children is infestation by parasites. These parasites consume nutrients from the children they infect aggravating malnutrition and retarding children's physical development. Water and sanitation related diseases-affecting children include Diarrhoea, trachoma, schistosomiasis, scabies, and guinea worm disease. All of these have compromised children's attendance and performance in schools (Torres et al., 2002).

According to a 1995 pilot survey of 14 countries in the developing world, the average number of children to each toilet in the urban school was more than 50 (Wijk et al.,
None of the 14 countries had increased the number of school toilets by more than 8% since 1990, suggesting they were barely managing to keep up with the rise in students' population. Inadequate sanitation and water jeopardizes not only students' health but also school attendance. Girls in particular are likely to be kept out of school if there are no sanitation facilities (UNEP et al., 2002).

In many countries where sanitation has not been emphasised, schools often experience insufficient water supply and lack of proper sanitation and hand-washing facilities. Poor hand-washing habits and practices in such schools where sanitation has not been emphasised lead to transmission of water and sanitation-related diseases. Hygiene education in these schools is not seriously promoted. The school compound and classrooms are dirty and therefore pose a danger to the health of the school children (Wjik et al., 2003).

A survey among school children in India revealed that about half of the ailments found among children are related to unsanitary conditions and lack of personal hygiene (UNICEF, 2003 b). If school sanitation and hygiene facilities are absent, or badly maintained, schools become risky places where diseases are transmitted. Schools can pollute the natural environment and cause hazards to the community at large. Improved facilities in themselves are not sufficient. Reduction of the incidence of sanitation and hygiene-related diseases and protection of the natural environment also includes behavior change, leading to proper use of the facilities (UNICEF, 1998).
1.2.1 Problem Statement

Outbreaks of diseases related to water and sanitation have been reported country wide. The prevalence of diarrhoeal diseases and intestinal worm is 3.3% and 7.7% respectfully (MOH, 2001).

The school years are a formative time in the development of a human being; the school setting provides an efficient means of improving young people’s health, and self-esteem, life-skills and behaviour. Latrines, safe water for drinking, sufficient water for hand-washing, means of waste collection disposal and effective insect control are the minimum requirement of establishing and maintaining a healthy environment (WHO, 1987). When the basic elements of a healthy environment such as safe water and sanitary facilities are absent it is difficult to describe a school as health promoting (WHO, 1987). It is estimated that, in Kenya, 1.3 million children who were out of school have been enrolled raising national school population from 5.9 to 7.2 million (CBS, 2003). The mass enrolment will have implications on school sanitation facilities (MOEST, 2003 a ). The availability of water, hygiene and sanitation facilities greatly influences the learning environment and has direct consequences on the health and school performance among pupils. A cross sectional study was therefore carried out among public primary schools within Nyeri municipality, Kenya to determine sanitation facilities and hygiene practices among public primary schools following the mass enrolment of children in 2003.

1.2.2 Justification of the Study

More than 1.4 billion children from age five to fourteen (87% of all children) live in developing countries where most of the environmental challenges exist (UNEP et al., 2002). In Kenya, children of school going age (5-14 years), comprise 30% of the national
population (Vynckt & Nkinyangi, 1995). Studies have shown that as compared to the post-primary education, investing in primary education yields higher returns for individual households and society (GOK, 1998). The benefits of educating girls and improved literacy level are reflected in terms of lower level fertility rate, lower infant mortality and maternal mortality rates (CBS, 2002b).

A school child educated on the benefits of sanitation and good hygienic behavior will carry those messages far beyond the school walls, bringing lasting improvement not only to his or her health and well-being but also to her family and the wider community (Wijk et al., 2003). The effectiveness of children's participation in life and society in later years depends upon the participation encouraged at the start (UNICEF, 2003a).

Health is inextricably linked to education achievements, quality of life and economic productivity. By acquiring health related knowledge, values, skills and practices, children can be empowered to pursue health and to work as agents of change for the health of the communities (WHO, 1997). Schools are often more than just places for learning and behavior change. Kenya is a signatory to the outcome of International conferences held within the past decade particularly the 1990 summit for children (WSC) the World Social on Social Development, Millennium Development Goals (GOK, UNICEF, 2003). No studies have been carried out to determine sanitation practices in Nyeri Municipality. The aim of this study was to determine sanitation facilities and hygiene practices among public primary schools within Nyeri Municipality. The findings of this study will provide valuable information concerning
the sanitation practices in public primary schools. These will be of use to the policy makers in formulating clear guidelines for school sanitation standards and practices.

1.3 Research Questions

1. What are the sanitation facilities among public primary Schools within Nyeri Municipality?
2. What are the hygienic practices by the children in the schools?
3. What is the occurrence of water-borne diseases among the school children?

1.4 Null hypotheses

1. Public primary schools in Nyeri Municipality do not have adequate sanitation facilities.
2. Pupils in public primary schools within Nyeri Municipality public primary schools do not observe hygienic practices.
3. Pupils in public primary schools within Nyeri Municipality public primary schools do not suffer from water and sanitation related diseases.

1.5 Objectives of the study

1.5.1 General objective

To determine the sanitation practices among public primary schools within Nyeri Municipality.
1.5.2 Specific objectives

1. To determine water supply among public primary schools within Nyeri Municipality.

2. To determine waste water drainage among public primary schools within Nyeri Municipality.

3. To determine excreta disposal methods among public primary schools within Nyeri Municipality.

4. To determine solid waste disposal methods among public primary schools within Nyeri Municipality.

5. To identify hygienic practices by the pupils in the schools.

6. To determine the occurrence of water and sanitation related diseases among the pupils.
CHAPTER 2: LITERATURE REVIEW

2.1 Sanitation

Sanitation refers to the safe collection, storage and disposal of various wastes resulting from human activities. These include solid wastes, refuse, and liquid wastes effluent from sewage works, kitchen sinks and even hazardous waste from industries (WHO, 1987). It also refers to the general maintenance of the human environment in a safe condition; free from pollution (Nyamwaya et al., 1999). Sanitation involves behavior change and availability of adequate facilities that ensure a hygienic environment (MOH, 1999a).

Sanitation is more than just building latrines to dispose human excreta. It is a process, which is people-centered, aimed at keeping people and the environment clean. The process includes building, use and maintenance of latrines and other sanitation facilities. Sanitation also involves learning, behavior change, organization and collective action with other community members (WSP-AF, 2000). Sanitation comprises not only toilets, but also waste disposal, drainage and public health or hygiene measures (Charles, 1995).

Safe water supply and sanitation is necessary for the existence of all living things. In developing countries, a large number of illnesses and death are due to infections related to poor sanitation practices. Some of the illness caused by poor water supply and sanitation are infectious diseases caused by bacteria, viruses, protozoa and intestinal parasites (Feachem, 1977). Sanitation is effective when human feaces and urine are disposed in such a way that organisms that cause diseases are prevented from contaminating food, water supply and general environment (Booth & Lankerster, 2001).
In order to combat diseases caused by contaminated water or related to inadequate water supply and sanitation more efficiently, the installation of sanitary excreta disposal facilities should be encouraged with measures taken to dispose off wastes and improve personal and food hygiene (Charles, 1995).

2.1.1 Key concepts of sanitation

2.1.1.1 Water supply

Water is necessary for the existence of all living things. The human body requires 10 liters of water per-day for normal physiological functions depending on the climate and the workload (Rukunga, 2001). Water consumption per day is determined by several factors such as availability, quality, cost and means of distribution. A range of 20-40 liters of fresh water per person per-day is considered to be the necessary minimum to meet the needs for drinking and sanitation, bathing and cooking. Natural water sources include rainwater, surface water that includes rivers, stream, ponds, dams, lakes and seas presumed most unsafe due to exposure to contamination (Rukunga, 2001). If schools do not have their own water supply, pupils may be forced to use the local water source, which may be polluted. Hand-washing facilities need to be placed close to latrines, since hand washing with soap is most important after defecation (UNICEF, 1998).

2.1.1.2 Waste water drainage

Wastewater accumulates when produced at a faster rate than it can be eliminated. The function of a satisfactory system of drainage is to convey all fecal matter and waste liquids from a building or premise into a sewer or other means of disposal as quickly as possible
without endangering health. Pools of sullage in lanes or open drains may provide breeding sites for vectors for water borne diseases (Pickford, 1995).

Waste water in schools comes from heavy down-pour especially during the rainy season, household waste-water comes from bathing and washing, run-off from leaking water taps and over-flowing sewage from septic tanks or blocked sewage systems (Booth & Lankerster, 2001).

2.1.1.3 Excreta disposal

Human excreta is an important cause of environmental, soil and water pollution. Contamination of foods with human excreta is a source of sanitation related diseases (Kapoor, 2001). The purpose of latrines is to break cycles of infection and infestation. In a proper latrine, the excreta are deposited out of reach so that the pathogenic organisms they contain do not spread any further (Nordberg & Finer, 1990)

2.1.1.4 Solid waste

Solid waste is defined as materials that no longer have any value to the person who is responsible for it, and is intended to be disposed off. It does not normally include human excreta. It is generated by domestic, commercial, industrial, health care, agricultural and mineral extraction activities and accumulates in streets and public places (Juerg, 2004). In schools, solid garbage disposal may be more complex because they have a wider variety of material that need to be disposed off. Waste bins placed in every classroom and around the school compound should be used to facilitate collection before treatment (UNICEF, 1998).
2.1.1.5 **Hygiene education**

The provision of safe water and sanitation facilities in schools is the first step towards a healthy physical learning environment, benefiting both learning and health. However the mere provision of facilities does not make them sustainable or produce the desired impact. It is the use of latrines and related appropriate hygiene behaviour that provides health benefits (Wijk *et al.*, 2003).

Hygiene education primarily aims at changing behavior towards good or safe practices in relation to personal, water, food and domestic hygiene. Hand washing with soap after defecation and before taking food has proved to be effective in reducing incidences of diarrhoeal diseases (WHO, 2002a).

Studies on impact of water supply and sanitation improvement on health have generally found that, for maximum health impact, the new hygienic facilities have to be linked with promotion of personal and domestic hygiene (Nordberg & Finer, 1990). Hygiene education on behaviour change has resulted in health benefits (MOH, 1999).

Only limited benefits will be achieved from well designed, well constructed and well maintained latrines unless people wash their hands after using them. Where water is used for anal cleaning, provision of hand washing should be an integral part of any sanitation program whether in form of simple clay water pot, a tap in the yard near the latrine or a wash basin. The hand-washing facility should be accessible to children (Cairncross & Feachem, 1996).
2.2 Technical options for water and sanitation

Many of the environmental sanitation and hygiene facilities are currently not being used. The reason for this state of affairs is the choice of wrong technology, which the user does not understand. The basic solution to the problem of choice of the technology lies in education teaching and access to information regarding the alternative technologies and their corresponding management needs (Cairncross & Feachem, 1996).

2.2.1 Water sources

Natural water sources include rainwater, surface water rivers, streams, ponds, lakes and seas. Technical options for water supply in a school include a well with hand-pump or a public tap. Where there is no water in the school the situation can be improved by the installation of a drum, as reservoir tip taps and by collecting rainwater (UNICEF, 1998).

2.2.2 Excreta disposal systems

Excreta disposal systems can be classified as follows:

**On-plot systems:** In which safe disposal of excreta takes place on or near the housing plot. Pit latrines and septic tanks fall into this category.

**Off-plot systems:** In which excreta are collected from individual houses and carried away from the plot to be disposed off, sewage is the most important in this category. The selection of the most appropriate sanitation system is influenced by technical, cultural and institutional factors (Julie, 2004). Three types of excreta disposal systems are
recommended for schools: pit-latrine, ventilated improved pit-latrine and water closet (UNICEF, 1998). Sanitation is effective when human faeces and urine are disposed of in such a way that organisms that cause diseases are prevented from contaminating food, the water supply and the general environment. Excreta are prevented from contaminating surface and the ground water, paths (Booth & Lankersier, 2001). Use of sanitary latrine bestows potential benefits not only to the household that uses it, but also to neighbours whose environment is protected from a degree of pollution (Cairncross, 1992). Most rural areas in developing countries do not have piped water, and where it exists the quantities may be inadequate. The situation necessitates the use of non-water systems commonly known as conservancy systems rather than the superior hygienic water carriage system. Excreta are returned directly to earth or are temporarily stored pending removal (Rukunga, 2001).

2.2.3 Solid waste disposal methods

The type and the amount of waste being produced basically determines the selection of garbage disposal system. In schools, waste bins placed in every classroom and around the school compound should be used to facilitate collection before treatment (UNICEF, 1998). Currently satisfactory waste disposal methods are sanitary landfills, or controlled tipping, composting and incineration (Cairncross & Feachem, 1996).

2.2.4 Waste water drainage

The type of drainage system selected depends on the level of filtration and evaporation taking place. Those in turn depend on the soil and the weather conditions and slope of the
terrain. For school compounds, unlined open drains may be considered. These are only advisable when the slope gradients are less than 1 percent. For slopes more than one percent grass will help to hold the topsoil. Closed drains should be avoided; open drains should be cleaned regularly (UNICEF, 1998). Liquid wastes from washing areas, water taps and rainwater can be drained to soak-away channels, evaporation pans, and drains and used for irrigation (WSP-AF, 2000).

2.2.5 Hygiene Education Methods

Different models of behavior change can be used:

2.2.5.1. Health Belief Model

This theory was originally developed by Rosenstock (1966) to explain preventive health behaviours and further developed by Becker (1974) (Robert et al., 1993). This theory states that, there are four types of beliefs that influence the likelihood of taking action that is relevant to a given disease or condition. These are: perceived susceptibility, perceived severity, perceived threat, perceived benefits of action which leads to likelihood of taking action (Robert et al., 1993).

2.2.5.2 The Theory of Reasoned Action

The theory was developed by social psychologists and was used to explain all human behavior. A major assumption is that people are usually rational and make predictable use of the information available to them. This theory states that intentions are the most immediate influences on behavior (Robert et al., 1993).
2.2.5.3 Communication Behavior Change model

Social psychologist and communication expert William McGuire (1981) developed it. This model provides people with the tools they need to change their own behavior, these are: self-monitoring, goal specification, self-reinforcement and behavior rehearsal (Robert et al., 1993).

2.2.5.4 Social Marketing model

It was developed to apply marketing principles and technique when the goal is not to sell a product but to create a social change. This model uses marketing approaches to match available resources with social needs. Four P’s define the basic characteristics: Product, Price, Place and Promotion (Robert et al., 1993). For sanitation products, provision of sanitation products such as improved water systems, latrines and household behavior such as proper use and maintenance of latrines, hand-washing, covered storage of water and proper waste disposal (Mayling & Herbert, 1998).

2.3 Water and Sanitation Situation Analysis

2.3.1 The global Picture

A concerted global effort in the 1990s resulted in over a billion people gaining access to safe water, hence eighty three percent (83%) of the world’s population now uses improved drinking water sources (WHO, 2000). Globally, some 1.1 billion people are currently without access to improved water supply. The lowest drinking water coverage rates are in sub-Saharan Africa (58%) and in Pacific (52%) but the largest numbers of un-served
people are in Asia, where the sanitation situation is worse (WHO, 2000). Only 58% of the world's population has access to improved sanitation facilities. A total of 2.4 billion people live without improved sanitation; less than half of all people live in developing countries (WHO, 2000).

The lowest sanitation coverage rate is in Sub-Saharan Africa (36%) and South Asia. In some countries like Afghanistan and Ethiopia, less than ten percent of the population has access to adequate sanitation facilities. In Africa, two out of five people lack improved water supply (WHO, 2000).

2.3.2 Water and sanitation situation analysis in Kenya

According to the National Development Plan (2002-2008), current estimates indicate that about 50 -75% of rural and urban populations have access to safe drinking water (GOK, 2002 a). In Kenya 31% of the population has piped water, (80% urban and 40% rural). Some rural areas in Kenya (28%) depend on lakes and rivers as their sources of water supply. This is regarded as unclean water because it is not subjected to any form of treatment and is exposed to pollutant materials (CBS, 2002 b). Although rivers are distributed throughout the country, many of them do not have sufficient flow throughout the year (JICA, 2002). Other sources of water include piped water, wells, bore hole, springs, dams and lakes. At the national level, 82.6% of the population have decent sanitation facilities, which is sewer while latrine coverage is 72%. Pit latrine is the most commonly used method of human waste disposal for both urban and rural areas in all the provinces. Nationally, 7.7% of the population is connected to the sewer, 72.1% use pit
latrines, and 16.4% use the bush (CBS, 2002 a). In Nyeri, 89.8% of the population has piped water while 24.6% have bore hole as their source of water. In Nyeri, 25.1% of the population are connected to the sewer and 74.9% use pit latrines (CBS, 2002 a). Most schools in Kenya (56%) however have access to safe water supply (UNICEF, 2003 c). The schools that have access to improved water and sanitation services are served as part of public systems that are operated by the Ministry of Water Resources, National Water Conservation Pipeline Cooperation; Non-governmental Organization, Local authorities and-self help groups (MOEST, 2003 a).

2.3.3 Water and sanitation situation analysis in Nyeri Municipality

Nyeri Water and Sewerage Company is a private firm owned by the Nyeri Municipal Council for providing water and sanitation services to the residents within the Municipality at a sustainable tariff. It sources its water from Chania, Nairobi and Amboni river. It operates and maintains two water treatment works. One conventional followed by stabilization ponds treatment works for Nyeri Town and sewerage stabilizing ponds for Kiganjo Township within the municipality. Other methods of sanitation are also in use such as septic tanks, VIP and normal pit latrines (NYEWASCO, 2003).

2.4 Effects of poor sanitation

2.4.1 Reduced health status

Health is one aspect of the burden of inadequate water supplies (Mcgranahan et al., 1996). Many infections of human beings are spread through inadequate sanitation. Viruses, bacteria, protozoa and worms may spread through direct contact, indirectly via
food, water and soil or via carriers and vectors (Winblad & Kilama, 1985). About 2 million deaths a year worldwide are attributed to unsafe water, sanitation and hygiene, mainly through infectious diarrhoea. Nine out of ten such deaths are in children and virtually all deaths are in developing countries (WHO, 2002a). A high percentage of diseases of poor people in developing countries are due to inadequate water supply, poor sanitation and hygiene (Clark & Gundry, 2004). In 1998, over 95% of deaths of children under 14 years of age occurred in developing countries (UNEP et al., 2002). Diarrhoea is estimated to have killed 2.2 million people worldwide in the year 2000 (90% of the deaths occurred in children: 85% in children 0-4 years and 5% in children 5-14 years) (WHO, 2002a). Schistosomiasis affects over 200 million people worldwide, of whom 88 million are under 15 years, with the heaviest infections being reported in the age group of 10-14 years in Africa and South America (UNEP et al., 2002).

Poor sanitation practices are the cause of bacterial, viral, protozoa, and helminthic infections (Feachem, 1977). Helminthic diseases are the common health problems among school children in developing countries. Depending on the severity of the infection, intestinal diseases can result in poor nutrition, anemia, retarded growth and death (UNEP et al., 2002). About 400 million school children are infected with roundworms, whipworm and hookworm, which affects about a quarter of the world's population (Akillu & Bundy, 1989). The effects of good sanitation practices on infections outweighs treating the whole community with anti-helminths (Charles, 1995). Cholera; a waterborne bacterial infection, infected 120,000 people in 2000 (WHO, 2000a). Twelve million people are infected with typhoid every year (WHO, 2000a). Six million people were
blind because of trachoma by 2000 (WHO, 2000a). In the same year there were 50,000
cases of guinea worm in thirteen African countries (WHO, 2000 a). In 1998, malaria
killed more than 1 million children under the age of 15, and was the second leading cause
of death in the world for the 5-14 age group (UNEP et al., 2002).

2.4.2 Socio-economic implications of poor sanitation

The impact of sanitation on health and the associated economic implications for national
and household economies are the primary reasons for developing sanitation policies
(Myles & Eledge, 2003). Poor health keeps families in a cycle of poverty and lost
income. The national cost on productivity, reduced educational potential and curative
health-care is substantial. Poor personal, water, sanitation and domestic hygiene accounts
for 5.7% of the total disease burden or 84 million life years lost per year expressed as
Disability Adjusted Life Years. Overall, environmental conditions are responsible for 33%
of the global burden of disease; 15.4% of those being borne by children under the age of
15 (UNEP et al., 2002).

The 1991 cholera epidemic cost Peru an estimated one billion dollars in lost tourism and
exports. The same amount would have been paid for all the water and sanitation systems
Peru needed to prevent such an outbreak from occurring (DFID, 1998).

2.4.3 Environmental costs

Human waste is a major polluter of rivers and ground water resources. Poor sanitation
leads to environmental degradation and pollution of water sources. This is largely by the
degradation of the environment by indiscriminate disposal of solid and liquid waste and by contamination of the lakes and rivers by untreated human wastes. Environmental damage discourages tourism and trade, reduces fish production and increases costs of clean-up activities (JICA, 2002).

If solid waste is not managed properly, there are many negative impacts that may result. Uncontrolled wastes often fill up the drains, causing blockages, which result in flooding and faecal contamination, flies breed in solid wastes and are very effective vectors that spread diseases (DFID, 1998).

Ineffective disposal of unwanted household materials, vegetable wastes, grass, cans, plastic bags and paper can be unsightly and can also encourage bad smell, attract rats, mosquitoes and flies and may cause cuts and injuries. There are several problems associated with inadequate solid disposal: flies breeding, contamination of ground water, rodents and wind blowing can be a source of surface water pollution. The solid waste emits foul odour and is unsightly. In poorly drained areas, run off mixes with sewage from overflowing latrines and sewers, causing pollution and waterborne diseases. Flooded septic tanks and leach pits provide breeding sites for mosquitoes, and faecal contaminated wet soil provides ideal conditions for the spread of intestinal worm infections, outbreak of diarrhoeal diseases and other intestinal illnesses (Jonathan, 2002). Lack of wastewater drainage causes disease, which can be transmitted by surface water contamination with excreta from sewers and overflowing septic tanks. These conditions favour the breeding of vectors and hence transmission of diseases (WASP-AF, 2000).
2.4.4 Effects of poor water supply on Education

Inadequate water and lack of sanitation facilities to cater for big numbers will have an effect on the health of school children (CBS, 2002 c). Illnesses account for a substantial loss of school time. These illnesses can result in impaired learning, poor school performance and absenteeism (UNEP et al., 2002). Where the environmental health conditions are poor, infections and diseases spread readily. Little or no knowledge on personal hygiene, poor water supply and sanitation leads to worm infections. Lack of sufficient latrines has been shown to correlate with girls’ drop-out from school. Additionally, illnesses among pupils result in absenteeism, which can lead to poor class performance, school dropout and grade retardation. Improving school environment becomes central to improving the health and the nutrition of the pupils (MOEST, 2003 a). Hunger has an immediate impact in that hungry children are unable to concentrate during the learning process (GOK., UNICEF, 2003 d).

2.5 Benefits of improved sanitation

Improved health is the principal economic and social benefit that governments and other agencies gain from improved sanitation (Cairncross, 1992). Interventions that include improvement in water supply, sanitation services and promotion of hygiene have the greatest impact on health (Clark & Gundry 2004). In Bangladesh, improved sanitation reduced mortality and illness (Pickford, 1995). In Costa Rica sanitation reduced incidences of worm diseases (Pickford, 1995). WHO diarrhea diseases control program reported a median reduction in diarrhoea morbidity of 22% with improved sanitation (Pickford, 1995). There is a growing recognition that the benefits of adequate sanitation
are not limited to public health. Poverty can be reduced and overall quality of life improved in the population that has this basic human right. Good sanitation inevitably improves the local environment and reduces threats to ground and surface waters (Myles & Eledge, 2003). The Peru, the cholera epidemic in the early 1990s provided information about the cost of not providing good sanitation and water supply. In the first ten weeks of the epidemic, loses in agriculture exports and revenues from tourism were more than three times the total amount Peru invested in sanitation and water supply in the whole of the 1980s (Pickford, 1995). The reduction of diseases when good sanitation is provided and properly used has economic benefits. The diseases that are common in situations with bad sanitation may result in reduced productivity. In addition economic loses may result from: time spent looking after sick children, wasted public expenditure in hospitals and health clinics (Pickford, 1995).

A clean water supply close to the home and a hygienic toilet are believed to be the cornerstone of those environmental and social changes that bring a dramatic decline in infectious diseases (Bourne, 1984). Diarrhoeal morbidity would be reduced by hand washing, improved excreta disposal and improved hygiene by 47% (WHO, 2002). Absenteeism from school due to sickness would also be reduced. Children would be able to exploit their full education potential (Edward & Michael, 2003). Children perform better when they function in a hygienic and clean environment (Wijk et al., 2003). A good school physical environment will undoubtedly affect the quality of teaching and learning (Torres et al., 2002).
2.6 School sanitation

2.6.1 Importance of school sanitation

After the family, schools are the most important places of learning for children and occupy a central place in the community (UNICEF, 1998). Schools are a stimulating learning environment for children and stimulate or initiate change. If sanitary facilities in schools are available, they can act as a model. Schools can also influence communities through outreach activities since through the students; schools are in touch with a large proportion of the households in a community (Pickford, 1995).

2.6.2 Sanitation standard requirements in public primary school

The quality of the physical environment of a school will undoubtedly affect the quality of teaching and learning in that school (MOEST, 2000). Research has revealed that for a school to be effective, minimum standards of sanitation must be met. It is the parents' responsibility to provide for building and maintenance of public primary schools (MOEST, 2000). Research evidence from the National Primary Baseline Survey suggested that many schools in Kenya do not have adequate toilet facilities (MOEST, 2000). Other research evidence by the population council also suggested that girls often drop out of school after they reach puberty because of their personal toilet needs (MOEST, 2000). When the basic elements of a health environment such as safe water, sanitary facilities and hygienic practices are strained, in schools this has led to low school enrollment, absenteeism and poor school performance (Vynckt & Nkinyangi, 1995). A study conducted on Kenyan schools showed that there were high rates of waterborne infections, diarrhoeal diseases and parasitic infections where hygienic practices were low (Vynckt & Nkinyangi, 1991).
CHAPTER 3: MATERIALS AND METHODS

3.1 Study Area

The study was conducted in Nyeri Municipality Division of Nyeri District, Kenya. Nyeri District is one of the seven districts in Central Province. The District forms part of Kenya’s Eastern highlands. It covers an area of 3.266 Km² and is situated between longitudes 36° and 38° East and latitude 0° 38 South. The district has a population of 661,156 (CBS, 2001). The district experiences equatorial type of climate. There are two rainfall maxima; long rains (March to May) and the short rains (October to December). The district borders Laikipia district to the North, Kirinyaga district to the East, Murang’a district to the South, Nyandarua district to the West and Meru district to the northeast (Appendix 4).

3.2 The Study Population

The study was carried out among public primary schools and involved pupils and head-teachers within public primary schools in Nyeri Municipality.

3.2.1 Inclusion criteria

Pupils from classes 5-8 were included because they were presumed to understand the research tools, the head-teachers who consented to the study.
3.2.2 MAP OF STUDY AREA

[MAP OF STUDY AREA]

**LEGEND**

- District boundary
- Division boundary
- TETU Division name
- A Nyeri Municipality
- Stud area

0 5 10 15km
3.2.3 Exclusion criteria

Pupils from classes 4 and below who did not understand the research tool and head-teachers of the schools, which were not part of the study population or who did not consent.

3.2.4 Ethical consideration

Ethical clearance was obtained from Kenyatta University, Ministry of Education Science and Technology, District Commissioner Nyeri, DMOH Nyeri, Nyeri Municipal Council, DEO Nyeri and the head teachers of randomized schools. Informed consent was also obtained from the respondents, after providing them with detailed information concerning the proposed study. Confidentiality of the data collected was maintained.

3.3 The Study Design

A descriptive cross-sectional study was carried out. The design was used because it was able to provide information concerning sanitation practices in schools.

3.4 Sampling Procedures

The two education zones Municipality North and Municipality South were purposively sampled. From each zone eleven schools were randomly selected using a table of random numbers. Probability proportion to size was used to get the actual respondents considering the gender in each school and class.
3.4.1 Sample Size Determination

The formula as used by Fisher et al. (1998) was used for sample size determination for population more than 10,000.

\[
n = \frac{Z^2 \cdot pqD}{d^2}
\]

\[
= \frac{1.96 \times 1.96 \times 0.5 \times 1}{0.05 \times 0.05} = \frac{3.84 \times 0.5 \times 0.5}{0.0025} = 384.16
\]

\(n\) = Desired sample size of the population valid only when the population is more than 10,000

\(Z\) = the standard deviate, usually 1.96 which corresponds to 95% confidence level.

\(P\) = Proportion of the target population estimated to have the particular characteristic

\(d\) = Degree of accuracy is (0.05)

\(D\) = Design effect usually 1 where there are no replications or comparisons.

The sample size was increased to 400.
3.5 Research Instruments

Data was collected using open and closed-ended questionnaires for pupils and head-teachers. An observation checklist was used to collect both quantitative and qualitative data concerning sanitation practices in schools.

3.5.1 Data collection methods

Several data collection methods were used either singly or in combination to obtain all the necessary primary data. Pre-testing of the research instrument was done in a private primary school within Nyeri municipality (Appendix 1-3).

3.5.2 Structured Questionnaires administration

Data was collected using structured questionnaires (appendix 1 and 2). The language used in the administration of the questionnaire was English.

3.5.3 Observation checklists

An observation checklist was used to record data. First the researcher had defined the sanitation components to be observed. During data collection the researcher checked off as it was. In this study the researcher was a complete observer and had structured schedule for observation (Appendix 3). This verified what the pupils and head-teachers had reported.
3.6 Data Management and Analysis

Data processing was done using the Statistical Package for Social Scientists (SPSS) version 11.0. Data was analyzed using descriptive and bi-variate analysis. Chi-square test was used to establish whether there was any statistical association between variables.
CHAPTER FOUR: RESULTS

4.1 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

4.1.1 Type of Primary School

A total of 22 schools were involved in the study. This included two (9%) girls boarding, one (5%) mixed day / boarding and nineteen (86%) mixed day Schools. A total of 400 pupils and 22 head-teachers were included in the study (Figure 4.1).

Figure 4.1: Primary schools involved in the study
4.1 2 School Management System

Two of the schools (9%) were managed by board of governors while nineteen schools (81%) were managed by school committees (Figure 4.2).

![Pie chart showing school management systems with 9% for board of governors and 91% for committees.]

Figure 4.2: School management systems

4.1.3: Gender of respondents

The respondents consisted of one hundred and eighty (45%) males and two hundred and twenty (55%) females (Figure 4.3).

![Pie chart showing gender distribution with 45% for males and 55% for females.]

Figure 4.3: Gender distribution of the respondents
4.1.4: Age of the Respondents

The mean age of the respondents was 12 years. Sixty (15%) respondents were 8-10 years, two hundred and thirty six (59%) were 11-13 years while one hundred and four (26%) were 14-16 yrs. Majority of the respondents (59%) were aged 11-13 years (Figure 4.4).

![Figure 4.4: Age distribution of respondents]

There was a statistically significant relationship between the age of the pupil and sex of the respondents (figure 4.5) \((\chi^2 = 12.7; \text{df}=2, \text{p}=0.0017)\).

![Figure 4.5: Age and the sex of respondents]
4.1.5: Absenteeism from school among the pupils

Illness of the children was responsible for absenteeism of pupils in eighteen (82%) schools. In three (14%) schools, lack of food was the main reason for absenteeism while in one school (4%) child labour was reported (Figure 4.6).

![Figure 4.6: Absenteeism from school among pupils](image)

4.1.6 Types of illnesses among pupils

Cough was reported in nine (40%) schools, intestinal worms in six (27%) malaria in five (28%), diarrhoea in one (5%) and others in one school (5%) (Figure 4.7)

![Figure 4.7: Type of illness among respondents](image)
4.2 Sanitation facilities among schools

4.2.1. Schools with piped water in the compound

Fifteen schools (68%) had water within the school compound, while seven (32%) had no water (Figure 4.8).

There was no significant relationship between water availability and type of school (Figure 4.9) ($\chi^2 = 5.36$, df = 2, p = 0.6860).

Figure 4.8: Schools with piped water in the compound

Figure 4.9: Water availability and the nature of school
There was no statistical relationship between water availability and the schools management system (Figure 4.10) \( (\chi^2 = 1.026, \text{df}=1, p=0.3173) \).

![Figure 4.10: Water availability and management system of school](image)

4.2.2 Schools' main source of water

In twelve (55%) mixed day schools, one mixed day / boarding (5%) and two girls' boarding (9%) schools, stand pipes were the main source of water. Seven (31%) mixed day schools used rivers as their water source. There was no statistical relationship between schools' main source of water and the nature of school (Figure 4.11) \( (\chi^2 = 5.32, \text{df}=2, p=0.0686) \).
4.2.3: Frequency of water among the schools

Thirteen (86%) of the schools with water had access to piped water throughout the day while two (14%) schools had water once a week which was made available to pupils at lunch hour and break time (Figure 4.12). Seven schools (32%) had no access to water.

There was a statistically significant relationship between water frequency and nature of school (Figure 4.13) ($\chi^2 = 22.46$, df=2, p=0.0001).
Figure 4.13: Water Frequency and nature of school

4.2.4: Water stands among schools

Of the schools visited, none met the requirements of the Ministry of Education of one hand-wash basin per thirty pupils (Table 1:).
Table 3.1: Ratio of water stands by pupils among schools

<table>
<thead>
<tr>
<th>School population</th>
<th>No of water stands</th>
<th>Ratio (stands: pupil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>624</td>
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</tr>
<tr>
<td>721</td>
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<td>1:685</td>
</tr>
<tr>
<td>928</td>
<td>2</td>
<td>1:464</td>
</tr>
<tr>
<td>701</td>
<td>1</td>
<td>1:701</td>
</tr>
<tr>
<td>753</td>
<td>1</td>
<td>1:753</td>
</tr>
</tbody>
</table>
4.2.5 Availability of water outside the toilet

Four schools (27%) had water for washing hands outside the toilets, while eleven (73%) schools had no water outside the toilets (Figure 4.14).

![Figure 4.14: Availability of water outside the toilet](image)

There was a statistically significant relationship between presence of water for washing hands and the nature of the school (Figure 4.15 ($\chi^2 = 6.63, \text{df}=2, p=0.0363$)).

![Figure 4.15: Water outside the toilet and nature of school](image)
There was no statistical relationship between availability of water outside the toilet and the school management system (Figure 16) ($\chi^2 = 1.475$, df=1, p=0.2246).

4.2.6 Type of toilet among schools

Nineteen schools (86%) used pit latrine while three schools (14%) had both pit latrines and water closet (Figure 4.17).
4.2.7 Toilet pupil ratio and type of school

In eleven (50 %) schools, one toilet was used by an average of 30 pupils and below. Three schools (14%) had one toilet used by forty pupils and below while in four schools (23%) one toilet was used by 50 pupils and below. In four schools (18%) one toilet was used by more than fifty pupils (Table 2).

Table 2: Toilet pupil ratio among schools

<table>
<thead>
<tr>
<th>Ratio of toilet: pupil ratio</th>
<th>Ratio of toilet: pupil ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:30</td>
<td>11</td>
</tr>
<tr>
<td>1:40</td>
<td>3</td>
</tr>
<tr>
<td>1:50</td>
<td>4</td>
</tr>
<tr>
<td>1:&gt;50</td>
<td>4</td>
</tr>
</tbody>
</table>

There was a statistically significant relationship between toilet pupil ratio and nature of school (Figure 4.18) \((\chi^2 = 15.324, \text{ df} = 6, p = 0.0179)\).
Figure 4.18: Toilet pupil ratio and the nature of school

There was no statistical relationship between toilet pupil ratio and the school management system (Figure 4.19) ($\chi^2=1.03$, df = 1, p=0.7940)

Figure 4.19: Toilet pupil ratio and school management system
4.2.8: Relationship between toilet boy ratio and the nature of school

Eight (44%) of mixed day schools had a toilet pupil ratio of 1:30, four (22%) of mixed day schools had a toilet pupil ratio of 1:40, three (17%) of mixed day schools had a toilet pupil ratio of 1:50, one (6%) mixed day/boarding had a toilet pupil ratio of 1:50 and two (11%) of mixed day school had a toilet pupil ratio of 1: >50. In majority of the schools (44%) there was a toilet boy ratio of 1:30. There was a statistically significant relationship between toilet boys ratio and the nature of school (Figure 4.20) \( \chi^2 = 11.6, \) df = 3, \( p=0.0089 \).
There was a statistically significant relationship between toilet boy ratio and school management system (Figure 4.21) ($\chi^2 = 20.988$, df = 1, p = 0.0001).

![](figure4.21.png)

**Figure 4.21: Toilet boy ratio and management system**

4.2.9: Relationship between toilet girl ratio and the nature of school

In ten (45%) of mixed day schools and two (9%) girls' boarding the toilet pupil ratio was 1:30. In four (18%) of the mixed day schools the toilet pupil ratio was 1:40. In one (5%) of the mixed day schools the toilet pupil ratio was 1:50. In four (18%) of the mixed day schools and one (5%) mixed day / boarding the toilet pupil ratio was 1: >50. There was a significant statistical relationship between toilet girl ratio and the nature of school (Figure 4.22) ($\chi^2 = 32.822$, df = 6, p = 0.0001).
There was a statistically significant relationship between girl toilet ratio and school management system (Figure 4.23) \( \chi^2 = 17.754, \text{ df}=1, p=0.0005 \).

### 4.2.10 Functional status of pit-latrines among schools

In seven schools (32%), all pit latrines were in use while in fifteen schools (68%) (Figure 4.24).
There was no statistical relationship between functional status of toilets and the nature of the school (Figure 4.25) \( (\chi^2 = 1) \).
4.2.11: Materials used to build toilets among schools

In three (14%) schools, the toilets were built of stone while in nineteen (86%) of the schools toilet superstructure was made of timber and the slab was made of stone (figure 4.26).

![Figure 4.26: Materials used to build toilet among the school](image)

4.2.12: Cleanliness of the toilets

One hundred and seventy six pupils (44%) said that the toilets were clean while two hundred and twenty four (56%) said the toilets were not (Figure 4.27).

![Figure 4.27: Cleanliness of the toilets](image)
4.2.13: Relationship between those who cleaned the toilets and nature of school

In mixed day schools two hundred and one (50%) pupils said pupils cleaned the toilets while one hundred and twenty four (31%) said workers cleaned the toilets. Forty-four (11%) pupils from mixed day/boarding and thirty-one (8%) from girls’ boarding said the toilets were cleaned by both pupils and workers. There was a statistically significant relationship between those who cleaned the toilet and nature of school (Figure 4.28) \( (\chi^2 = 48.05, \text{df}=1, p=0.0001) \).

![Figure 4.28: Relationship between who cleaned the toilet and nature of school](image)

4.2.14 Cleaning of the toilets

In eleven schools (50%), pupils cleaned the toilets while in five (23%) schools, the workers cleaned toilets. In six schools (27%) both the workers and pupils on punishment (Figure 4.29) cleaned toilets.

![Figure 4.29 Cleaning of school toilets](image)
4.2.15: Relationship between toilet cleanliness and those who did the cleaning

One hundred and thirteen (28%) pupils said that the toilets which were cleaned by pupils were clean while sixty-four (16%) pupils said the toilets which were cleaned by workers were clean. One hundred and three (26%) pupils said that the toilets which were cleaned by pupils were not clean while one hundred and twenty (30%) said that those toilets washed by workers were not clean. There was a statistically significant relationship between toilet cleaned by pupils and those cleaned by workers (Figure 4.30) \( \chi^2 = 23.89, \) df = 1, p = 0.0001).

![Figure 4.30: Relationship between toilet cleanliness and who did the cleaning](image)
4.2.16 Drainage system in schools

Five schools (23%) had wastewater drainage systems while eighteen (77%) had none (Figure 4.31).

![Pie chart showing 23% yes and 77% no for drainage system among schools]

Figure 4.31: Drainage system among schools

There was a statistically significant relationship between drainage system availability and the nature of the school (Figure 4.32.) \( \chi^2 = 25.5, \text{df} = 2, p = 0.0001 \).
There was a statistically significant relationship between drainage system availability and the school management system (Figure 4.33) \( (\chi^2 = 7.466, \text{df} = 1, p = 0.0065) \).

**Figure 4.32: Drainage system availability and the nature of school**

**Figure 4.33 Drainage system availability and school management system**

### 4.2.17. Refuse disposal in schools

In five (23%) schools, dustbin was provided in the classroom while in seventeen (77%) there were no dustbins provided at all (Figure 4.34).
There was a statistically significant relationship between dustbin availability and the nature of school (Figure 4.35 ($\chi^2 = 25.5$, df = 2, p = 0.0001).
There was a statistically significant relationship between dustbin availability in the classrooms and school management system (Figure 4.36) \( (\chi^2 = 7.4, \text{df } 1, p=0.0065) \).

Figure 4.36 Dustbin availability and school management system

### 4.2.18: Compost pits among schools

Fourteen (64%) schools had compost pits, which were regularly emptied. Eight schools (36%) had solid waste overflowing on the grass (Figure 4.37).

Figure 4.37: Availability of compost pit among schools
There was no significant relationship between compost pit availability and the nature of the school (Figure 4.38) \((\chi^2 = 2.015, \ df=2, \ p=0.3679)\).

![Figure 4.38: Availability of compost pit and type of school](image)

There was no significant relationship between compost pit availability and school management system (Figure 4.39) \((\chi^2 =3.69, \ df=1, \ p=0.0542)\).

![Figure 4.39: Compost pit availability and school management system](image)
4.2.19: Solid waste disposal among schools

The main method of solid waste disposal in eighteen (77%) schools was through burning. In four schools (18%) waste was disposed through burying while in one school (5%) waste was recycled and used as fertilizer for growing nappier-grass (Figure 4.40).

Figure 4.40: Solid waste disposal method among schools

4.2.20 Relationship between sanitation facilities and school performance

Fifteen (68%) of the schools with water had a mean-score of 263 in the national exam of 2003 while seven (32%) schools without water had a mean-score of 221. Five (23%) schools with waste water drainage system had a mean-score of 317.8 while seventeen (77%) schools without wastewater drainage system had a mean-score of 229.9. Fourteen (64% with compost pit had mean-score of 245.8 while eight (36%) schools without compost pit had a mean-score of 231.76 There was a statistical significant relationship between sanitation facilities and the examination mean-score (Figure 4.41) \( \chi^2 = 25.49, \) \( \text{df} = 3, p=0.0001 \).
Figure 4.41: Relationship between sanitation facilities and examination mean-score
4.3: HYGIENIC PRACTICES

4.3.1: Hand-washing by pupils before meals

Out of three hundred and forty three pupils who had water in the school compound a hundred and sixty (47%) washed hands before meals. One hundred and eighty three (53%) did not (Figure 4.42).

Figure 4.42: Practice of hand washing by pupils before meals
4.3.2: Hand-washing by pupils after visiting the toilet

Two hundred and eighty (70%) of the respondents washed hands after visiting the toilet while one hundred and twenty (30%) did not (Figure 4).

![Pie chart showing hand-washing habits of pupils after visiting the toilet. 70% washed hands, 30% did not.]

Figure 4.43: Practice of hand washing by pupils after visiting the toilet
4.3.3: Relationship between water availability for washing hands and those who wash hands after visiting the toilet

One hundred and twenty five (31%) pupils from schools with water washed their hands after visiting the toilet while fifteen (4%) did not. One hundred and fifty eight pupils (39%) from schools without water washed their hands with water carried from their homes while one hundred and two (26%) did not wash their hands. There was a statistically significant relationship between water availability and washing of hands after visiting the toilet (Figure 4.44) ($\chi^2 = 35.139, df = 1, p=0.0001$).

![Graph showing the relationship between water availability and washing hands](image)

Figure 4.44: Relationship between availability of water and washing hands after visiting the toilets

4.3.4 Relationship between age of pupils and washing of hands after visiting the toilet

Among children aged 8-10 years, twenty-seven (7%) pupils washed their hands while twenty-four (6%) did not. In ages 11-13 years eighty nine (22%) washed their hands while one hundred and forty two did not (35%). Among age group 14-16 years twenty
four (6%) washed their hands while ninety-four (24%) did not. There was a statistical
significant relationship between washing hands and age of the pupils (Figure 4.45) \((\chi^2 = 15.625, \text{df}=3, p=0.0001)\).

![Figure 4.45: Relationship between age and washing hands after visiting the toilet](image)

4.3.5: Relationship between sex of the pupil and washing hands after visiting the
toilet

Fifty-eight (15%) males washed their hands while eighty-two (20%) did not. One
hundred and nineteen (30%) females washed their hands while one hundred and forty one
(35%) did not There was no significant relationship between washing of hands and sex of
the pupil (Figure 4.46) \((\chi^2 = 0.684, \text{df}=1, p=0.4386)\)

![Figure 4.46: Relationship between sex of the pupil and washing of hands](image)
4.3.6: Relationship between washing of hands after visiting the toilet and nature of school

Two hundred and eighteen (54%) pupils from mixed day schools washed their hands while one hundred and nine (40%) did not. Forty (10%) from mixed day boarding washed their hands while four (1%) did not. Twenty-five (6%) from girls' boarding washed their hands while six (2%) did not. There was a statistically significant relationship between washing hands and nature of school (Figure 4.47) ($\chi^2 = 36.12$, df =2, p=0.0001).

![Figure 4.47: Relationship between washing hands after visiting the toilet and nature of school](image-url)
4.3.7: Overall cleanliness of the school

Two hundred and thirty six (59%) pupils opinion was that their school was clean while one hundred and fifty six (41%) pupils felt that their schools were not (Figure 4.48).

![Pie chart showing 59% clean and 41% not clean](image)

Figure 4.48 Overall cleanliness of the school

There was a statistically significant relationship between school cleanliness and type of school (Figure 4.49) ($\chi^2 = 76.495$, df = 2, p = 0.0001).

![Bar chart showing school cleanliness by type of school](image)

Figure 4.49: Relationship between school cleanliness and nature of School
4.3.8.: School feeding system

In four schools (18%), food was cooked in the school, in two (9%) food was either cooked at school or carried from home while in sixteen schools (73%) food was carried from home (Figure 4.50).

![Figure 4.50: School feeding systems](image)

There was a statistically significant relationship between school feeding system and nature of school (Figure 4.51) ($\chi^2 = 169.56$, df = 2, p=0.0001).

![Figure 4.51: Relationship between feeding system and type of school](image)
4.3.9: Feeding places among schools

In three schools (14%), pupils fed in the dining hall, one school (5%) had pupils feeding in the classroom while in eighteen schools (81%) pupils fed from outside (Figure 4.52)

Figure 4.52: Feeding places among schools
There was a statistically significant relationship between feeding places and nature of school (Figure 4.53) \( (\chi^2 = 277.6, \text{df}=2, p=0.0001) \).

**Figure 4.53: Relationship between feeding places and type of school**

### 4.3.10: Wearing of shoes among schools

In nine (40%) schools, wearing of shoes was part of school uniform while in thirteen (60%) schools wearing of shoes was not (Figure 4.54).
There was a statistically significant relationship between wearing of shoes and nature of school (Figure 4.55) \( (\chi^2 = 88.13, \text{df} = 2, p = 0.0001) \)

4.3.11: Health promotion activities among schools

Eight (36%) schools had health talks, five (23%) had school clean up days, four (18%) had school feeding programs, while four (18%) had no health promotion activity. In one school, there was regular de-worming among pupils (Table 3).
Table 3: Health promoting activities among schools

<table>
<thead>
<tr>
<th>Health promotion activities</th>
<th>Number of schools</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health talks</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>School clean up days</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>School feeding programs</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Regular de-worming</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>None</td>
<td>4</td>
<td>18</td>
</tr>
</tbody>
</table>
4.4 OCCURRENCE OF WATER AND POOR SANITATION RELATED DISEASES AMONG PUPILS

4.4.1 Diarrhoeal occurrences among pupils

One hundred and thirty pupils (33%) had suffered from diarrhoeal diseases in the last two months while two hundred and seventy (67%) pupils had not (Figure 4.56).

Figure 4.56: Occurrence of diarrhoeal diseases among pupils

4.4.2: Relationship between water availability and diarrhoeal disease

In the schools with water availability, one hundred and eight (31%) pupils had suffered from diarrhoeal while two hundred and thirty five (69%) had not. In the schools where there was no water twenty-six (46%) pupils had suffered from Diarrhoea while thirty one (54%) had not. There was a statistically significant relationship between water availability among schools and occurrence of diarrhoeal diseases among pupils (Figure 4.57) \( \chi^2 = 14.9, \text{ df} = 1, p=0.0001 \)
4.4.3: Relationship between occurrence of diarrhoeal and nature of school

In mixed day schools seventy-nine pupils (20%) had suffered from diarrhoea while two hundred and forty six (61%) had not. In mixed day / boarding nineteen pupils (5%) had suffered while twenty-five (6%) had not. In girls' boarding twenty-four pupils (6%) had suffered while seven (2 %) had not. There was a statistically significant relationship between occurrence of Diarrhoea and nature of school (Figure 4.58) \(\chi^2 = 41.1, \text{ df} = 2, p=0.0001\).
4.4.4: Relationship between occurrence of Diarrhoea and age of pupils

Among school children aged 8-10 years (2%) of the pupils had suffered from diarrhoea while forty (10%) pupils had not. In ages 11-13 eighty-four (21%) had suffered while one hundred and fifty one (38%) had not. In ages 14-16, twenty-eight (7%) pupils had suffered while eighty-six (22%) had not. There was a statistically significant relationship between age of the pupil and occurrence of diarrhoea (Figure 4.59) \(\chi^2 = 54.4, \text{df} 1, p=0.0001\).
4.4.5: Relationship between occurrence of diarrhoeal and sex of the pupils

Fifty males (13%) had incidences of diarrhoea while one hundred and twenty eight (32%) did not. Seventy-two (18%) females had diarrhoea incidences while one hundred and fifty (37%) had not. There was no statistical relationship between occurrence of diarrhoeal and sex of the pupils (Figure 4.60) \((\chi^2 = 0.84, \text{ df}=1, p=0.3594)\).

![Figure 4.60: Relationship between occurrence of Diarrhoea and sex of the pupil](image-url)
4.4.6 Occurrence of intestinal worms among pupils

One hundred and twenty five (31%) pupils had passed out an intestinal worm in the last two months before the study while two hundred and seventy five (69%) had not (Figure 4.61).

![Pie chart showing occurrence of intestinal worms among pupils](image)

Figure 4.61: Occurrence of intestinal worms among pupils

4.4.7 Relationship between water availability and intestinal worms

In the schools where water was available, one hundred and three (30%) pupils had suffered from intestinal worms while two hundred and forty (70%) had not. In the schools without water, twenty-two (39%) pupils had suffered from worms while thirty-five (61%) had not. There was no statistical relationship between water availability and intestinal worms (Figure 4.62) \( (\chi^2 = 4.85, \, df = 1, \, p = 0.2276) \).
Figure 4.62: Relationship between occurrence of intestinal worms and water availability

4.4.8: Relationship between occurrence of intestinal worms and nature of school

One hundred (25%) pupils from mixed day schools had passed intestinal worms while two hundred and twenty five (56%) had not. Ten (3%) from mixed day /boarding had intestinal worms while thirty-four (8%) had not. In girls boarding schools, fifteen pupils (4%) had suffered while sixteen (4%) had not. There was a statistically significant relationship between occurrence of intestinal worms and nature of school (Figure 4.63).

\( \chi^2 = 8.28, \text{ df}=2, p=0.0159 \)
Figure 4.63: Relationship between occurrence of intestinal worms and nature of school

4.4.9: Relationship between occurrence of intestinal worms and age of the pupils

In ages 8-10 years twelve (3%) pupils had passed intestinal worms while thirty nine (10%) had not. In ages 11-13, seventy-seven(19%) pupils had passed intestinal worms while one hundred and fifty eight (40%) had not. In ages 14-16 thirty-six (9%) pupils had passed intestinal worms while seventy-eight (20%) had not. There was no statistical relationship between occurrence of intestinal worm and age of the pupil (Figure 4.64) ($\chi^2= 2.98$, df=2, $p=0.2254$)

Figure 4.64: Relationship between occurrence of intestinal worms and age of the pupils
4.4.10 Relationship between occurrence of intestinal worms and sex of the pupil

Fifty-seven (14%) males had passed an intestinal worm while one hundred and twenty one (30%) had not. Sixty-eight (17%) females had passed intestinal worm while one hundred and fifty four (39%) had not. There was no statistical relationship between occurrence of intestinal worms and sex of the pupil (Figure 4.65) \(\chi^2 = 0.06, \text{df} = 1, p = 0.8065\).

Figure 4.65: Relationship between occurrence of intestinal worms and sex of the Pupils
4.4.11 Relationship between occurrence of intestinal worms and wearing of shoes among the pupils

Forty-four (11%) of the pupils where shoes were worn had intestinal worms occurrence while sixty (15%) pupils had not. Eighty one (20%) pupils in the schools where shoes were not worn had intestinal worms while two hundred and fifteen (54%) had not. There was a statistically significant relationship between those schools where shoes were worn and intestinal worms (Figure 4.66) ($\chi^2 = 7.84$, df =1, p=0.0051)

![Figure 4.66: Relationship between occurrence of intestinal worms and shoe wearing among schools](image-url)
CHAPTER 5: DISCUSSION

5.1 Sanitation facilities among school

5.1.1 Water availability among schools

The findings of this study showed that fifteen (68%) of the schools had piped water in the compound. Seven (32%) schools had no water in the school compound and obtained water from nearby rivers. Reliable and easily accessible water sources are a precondition for satisfactory personal, domestic and food hygiene. Lack of regular water supply in schools may have resulted in pupils not observing hygienic practices such as washing hands after visiting the toilet, before and after meals as required. The results of this study concur with the findings of McGranahan & Songsore (1996) who found that hygiene suffers most if water supply is not adequate. The absence and rationing of water in schools may have resulted in school committees not appreciating the importance of water for health and may account for the failure of the community to endeavor to have a good supply of piped water. This may result in poor enforcement of school sanitation. The results are in agreement with the findings of JICA (2002) who found that enforcement of regulations pertaining to sanitation among schools is generally weak. This makes it impossible to maintain the necessary sanitary conditions in school, which can lead to disease transmission. This is consistent with the findings of MOEST (2003) that most schools do not have adequate clean and safe water. This concurs with the findings of Ayeko (1990) who found that some areas within Nyeri Municipality did not get treated water and had to depend on river water for washing and domestic requirements which resulted in water-borne diseases.
5.1.2 Hand-washing facilities among schools

The results of this study showed that out of the twenty-two schools visited, none met the MOEST hand-washing basin requirements of 1 basin per 30 pupils (MOEST, 2001). This suggests that the hand-wash basins were not adequate. Only four (27%) schools had water for washing hands outside the toilet. These results suggest lack of supervision by the Public Health Officers to ensure that all buildings have sufficient hand-washing facilities (GOK, 1986). This finding may have resulted from failure of the government in implementing the Water Act (GOK, 2002). Sanitation has been given low priority status in the country. The findings of this study concur with the findings of WSP-AF (2000) that the Public health professionals are inadequately trained. As a result, they are ineffective in playing a coordination role and in persuading policy makers to give sanitation more attention and priority. There is evidence of failure of school inspectors and head-teachers to ensure that the Education Act (Cap 211) that states that 30 pupils should use one hand-wash basin (GOK, 1980) is enforced. Similar results were found by Vynckt & Nkinyang (1995) that some schools in Kenya lacked hand-washing facilities and that there was overcrowding at the school hand washing facilities. Wijk et al. (2003) found that schools had insufficient water supply and hand-washing facilities. The findings of this study however differ from recommendation by UNICEF, (1998) that hand-washing facilities should be placed close to latrines, since hand-washing is most important after defecation. The absence of enough hand-wash basins in schools did not enable pupils to put into practice what they had been taught. This could lead to rapid spread of disease causing organisms through contaminated hands (UNICEF, 1999).
5.1.3 Toilet facilities among schools

The results of this study showed that 86% of the schools used pit latrine as the main method of excreta disposal while 14% of the schools used both pit-latrine and water closet (figure 4.18). This is consistent with the findings of CBS (2002 b) that 72% of population used pit latrine as a method of excreta disposal. Installation of sanitary excreta disposal system and use helps to combat diarrheal diseases and intestinal geohelminths (UNICEF, 1999).

5.1.4 Toilet pupil ratio among schools

Fifty percent of the schools studied had a toilet pupil ratio of 1:30. The other fifty-percent had a toilet pupil ratio of 1: > 30. This may have resulted from other priorities among schools that were viewed as more pressing than latrines. The findings of this study are supported by WSP –AF, (2000) that there is little demand for sanitation among schools as there are other priorities that are viewed as more pressing than latrines. Public schools have not adhered to Public Health Act (GOK, 1986) which requires that all buildings must be provided with latrines for each sex nor the Education Act (GOK, 1980) which requires that one toilet be used by 30 pupils nor the Building Code (GOK, 1977) which requires that all buildings have latrines and adequate hand-washing facilities. Research evidence shows that, parental support for homework improves pupil’s education development. The parents should ask the pupils about the state of sanitary facilities in the schools and raise the concern with the parents teachers association. The findings of this study are in agreement with research evidence from the National Primary Baseline (MOEST, 2000) which found that many schools in Kenya did not have adequate toilet facilities. Similarly research by the Population Council found
that girls dropped out of school after they reached puberty due to lack of privacy for their hygiene needs (MOEST, 2000).

A study conducted in Vietnam found that latrines were used by more than the number of pupils that they were designed for and hand-washing facilities were lacking (UNICEF, 1998). Further to this study, in Zaire it was found that when pupils exceeded the required number per toilet, the basic standards of hygiene fell rapidly (UNICEF, 1998). The results of this study have supported the findings of a study in India that only one of ten schools had adequate toilets while safe water was available in only one of every two schools (Wijk et al., 2003).

5.1.5 Toilet maintenance among schools

This study revealed that some of the school toilets were not maintained and there was evidence of them being soiled. This suggests that sanitation in schools is not effective because the toilets are not kept clean. If toilets at school are not properly used and maintained they can become a health hazard and may have negative impact sanitation. Schools in this study were not safe for children due to neglect of the operation and maintenance of sanitation facilities. This might have resulted from lack of supervision by head-teachers. Lack of awareness among pupils on good hygiene is a health hazard.

In 2003 GOK&UNICEF found out that the most efficient way to ensure that latrines, hand-washing facilities and water points met the needs of both boys and girls was to ask them what their needs were and to fully involve them in planning, designing and implementation of sanitation facilities and educating pupils on their proper usage in schools. These results concur with Charles (1995) who found that lack of identification, ownership and responsibility of sanitation has led to poor usage and maintenance. There
is need for pupils to fully participate in sanitation issues. Older children’s failure to help in training younger children on proper usage of sanitation facilities and maintenance of school cleanliness may be due to poor knowledge on the need for good hygiene among pupils. The lack of adequate water and sanitation facilities reported in this study concurs with the findings of Vynckt & Nkinyangi, (1991) that in many developing countries lack of resources aggravates availability of sanitation facilities.

Similarly sanitation facilities among Nairobi municipal council primary schools have been shown to be poorly maintained thereby posing health hazards. This is in agreement with the findings of Winblad et al. (1997) who showed that toilet facilities that are not properly maintained could be harmful to the environment as they may increase the risk of disease. It is therefore important for school management and pupils to be committed to the proper use, care and maintenance of toilet facilities.

5.1.6 Waste water drainage system

The results of this study revealed that only a few schools (23%) had wastewater drainage. There was evidence of erosion in some schools. This suggests that during rainy seasons, water stagnated at the schools, which could serve as a breeding site for mosquitoes. These results contravene the Public Health Act Cap 242 which recommends that proper drainage system should be maintained in all the buildings. It was found by Caincross & Feachem (1996) that providing drainage was one of the methods of destroying the breeding sites for disease transmitting vectors such as mosquitoes. The results of this study concur with findings of (UNICEF, 1998) which found that schools in developing countries were built without following the established laws and policies. Vynckt & Nkinyangi (1991) found that the construction of schools by local builders often without
the pertinent expertise for the appropriate lay out of education space and in situation devoid of quality of statutory agency of the state may have resulted in many schools not providing an environment that is conducive to learning. Studies carried out in Brazil by DFID, (1998) found that the provision of drainage reduced the overall level of infection and failure to provide adequate drainage system caused the spread of diarrhea disease, damage to housing and property, disrupted communication and environmental degradation (Nordberg & Winblad, 1994).

5.1.7 Solid waste disposal methods

Based on the results of this study only five (23%) of the schools had dustbins in the classes. In some of the schools, compost pits were full. Most schools disposed their solid waste through burning. This may have resulted from lack of promoting the WHO global school initiative, which is designed to improve the health of pupils, school personnel, families and other members of the community. Similar results have been obtained by DFID (1998) that poor garbage disposal may lead to stagnant water due to blocked drains, fly breeding and vermin attraction. This may contribute to transmission of diseases causing organisms.

5.1.8 Effects of sanitation facilities on school performance

The results of this study found that the schools with good sanitation facilities had higher mean-score grades in the national examination. Provision of safe water and sanitation facilities promotes a healthy physical environment conducive for learning. This suggests that a good school physical environment will affect the quality of teaching and learning. Similar results have been obtained by Torres et al. (2002) who found that children
performed better when in a hygienic and clean environment (MOEST, 2000). Similarly, Pickford (1995) found that poor sanitation in schools reduced education performance due to absence from school and inability of sick children to learn properly.

5.2 Hygienic practices among public primary schools

5.2.1 Hand-washing practice among schools

The results of this present study showed that in the schools where there was water only 47% of pupils washed hands before meals while 53% did not. This suggests that the mere provision of facilities does not necessarily ensure usage. There is need for hygiene education that allows pupils to make appropriate decisions with regard to water and sanitation related behavior. The findings concur with (NETWAS, 2003) who found that even where schools had watering facilities, pupils did not wash their hands after latrine use. The health impact of water and sanitation interventions is mostly mediated through improvements with hygiene (UNICEF, 1999). Some pupils from schools without water washed hands. This suggests that pupils were able to practice what they were taught hence reducing disease transmission. These findings agree with a study done by NETWAS, (2003) which found that in schools where there were no hand-washing facilities pupils were encouraged to bring water from home in jerry cans which was kept near the toilets for easy access.

5.2.2 Hand-washing practices in relation to age and sex

The study has revealed that 35% of those pupils who did not practice hand washing after visiting the toilets were aged 11-13 years. This suggests that age was not influencing hand-washing practice. This was consistent with the findings of NETWAS (2003) which
showed that knowledge about hand washing appeared not related to the ability to practice good hand-washing practice. Thirty percent of females and fifteen-percent males washed hands. These findings agree with a study by UNICEF (1998) which found that availability of resources like safe-water supplies enabled pupils to transform newly acquired knowledge and practice into behavior.

5.2.3 School feeding practices

In the present study, it is evident that most of the mixed day school pupils (73%) carried food from home and in a few, food was cooked in the school and pupils fed in the field. In the boarding schools, pupils fed in dining halls. Food acts as an important vehicle in transmission of diarrhea and worm infections. This suggests that in most of the schools keeping of food at safe temperature in-order to reduce food borne diseases was not observed which led to rapid multiplication of bacteria (WHO, 2000). It was found by WHO (1985) that food acted as a vehicle in transmission of diarrhea and worm infections. Further to this in Vietnam, studies found that where food hygiene was poor, this was a cause of disease (Winblad, 1996).

5.2.4 Shoe wearing among pupils

In this study it was revealed that in most mixed day schools (60%), wearing of shoes was not part of school uniform. This could result to high rate of geohelminths among the pupils. A study by WHO (1985) found that wearing of shoes was effective in interrupting transmission of hookworms. The prevalence of hookworm among school children who wore shoes was significantly less than among children who did not (WHO, 1985).
5.3 Occurrence of diarrheal and intestinal worms among public primary schools

The results of the study showed that illness of the pupils was the main cause of school absenteeism. Among the illnesses (55%) were sanitation and hygiene related diseases such as diarrhea and intestinal worms. This may influence class performance. These results concur with the findings of MOEST (2003) that illnesses result in absenteeism, poor classroom performance, and school dropout and grade retardation. Similarly, UNICEF (1998) found that in many countries there exists a high prevalence of water and sanitation related diseases which keep children out of school. Further to these findings Akillu & Bundy (1989) found that absenteeism from school was more frequent among children infected with helminthes than in uninfected children. Lack of the most basic sanitation facilities was found to be a cause of intestinal worms and diarrheal diseases (Winblad et al., 1997).

5.3.1 Diarrheal disease among school pupils

The results of this study showed that (46%) of the pupils in the schools without water had occurrence of diarrhea compared with (31%) from the schools with water. These results suggest that pupils were not washing hands after going to the toilet which could lead to contamination of their food with consequences of diarrheal diseases. Hand washing with soap breaks the transmission cycle of diseases. A study in India found that half of the ailments found at school are related to unsanitary conditions and lack of personal hygiene (UNICEF, 1998). Similarly, studies by Said (1989) found that diarrheal diseases are a major cause of morbidity and mortality among children in developing countries. The findings of this study agree with studies by Wright who found that a number of excreta
related diseases could be controlled by providing sanitation facilities and promoting their usage (WHO, 1985). Wijk et al. (2003) found that three sanitation variables were associated with diarrheal diseases: lack of private excreta disposal facilities, lack of water in the houses and presence of excreta in the yard. Improved hygienic practices are essential if transmission of water and sanitation related diseases are to be reduced (Derslice et al., 1994).

### 5.3.2 Relationship between diarrhea occurrence and age of pupils

The results of this study showed that pupils aged 11-13 had the highest diarrhea occurrence (21%) compared with the other age groups. The results of this study suggest that majority of pupils were not practicing hand washing or there was no proper use of latrines. The results of this study are in agreement with Pickford (1995) who found that proper use of latrines by every one in a community reduces diarrhea. These findings concur with those of (Bourne, 1984) which showed diarrhea prevalence to be correlated with poor hygiene behavior. Further to this a classic study by Khan in Bangladesh showed that the simple practice of washing hands with soap after defecation was sufficient to reduce diarrhea disease (DFID, 1998). These findings are in agreement with another study done in Ghana WHO (2002) which revealed that hand washing with soap reduces diarrhea waterborne diseases by 47%. Similar results have been obtained in Bangladesh which showed that the practice of washing hands and good sanitation influenced the number of attacks by childhood diarrhea (AHRTAG, 1987).
5.3.3 Occurrence of Intestinal worms

This study has shown that 25% of the mixed day schools pupils had occurrence of intestinal worms compared with 4% from girls' boarding and 3% from mixed day / boarding. This suggests that pupils came into contact with soil that was contaminated with helminthic larvae or eggs. The results of this study showed that some of the school toilets were soiled. These finding concur with Pickford (1995) that toilets may have a negative health effects if they are not properly cleaned and used. Similarly Edward &Michael (2003) found that children were most likely to spread worm infections because they were less likely to use latrine and had generally poor hygienic practices.

The results of this study agree with the findings of UNEP et al. (2002), which found that intestinal worms found in the soil, and vegetables were the common health problems among school age children in developing countries. UNICEF (2003 d) found that 400 million school children worldwide were infected by intestinal worms which affects learning abilities leading to poor examination performance.

The result of this study showed that 15 % of pupils from the schools where shoes were not part of school uniform had intestinal worms compared with 11% of pupils where shoes were part of school uniforms. This suggests that shoes act as a preventive barrier. The findings from this study are in agreement with the findings of Vynckt and Nkinangi (1991) that there were higher incidences of diarrhea and intestinal worms where hygienic practices were low.
CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

1. In fifty percent of the public primary schools within Nyeri Municipality one toilet was used by more than 30 pupils.

2. Eighty percent of public primary schools within Nyeri Municipality did not have waste water drainage systems.

3. Eighty percent of public primary schools within Nyeri Municipality did not have dust bins in the classroom.

3. Sixty percent of pupils in Nyeri Municipality public primary schools did not wear shoes.
6.2 RECOMMENDATIONS

There is need for the government to formulate a national sanitation policy for schools

1. There is need for the Ministry of Health to ensure that the Public Health Act, Building Code and Education Act are adhered to in schools

2. The school committees, parents and head-teachers should see that schools are supplied with safe supply of drinking water, hand-washing facilities, waste water drainage systems, safe disposal facilities for excreta and solid wastes.

3. There is need for hygiene education to be incorporated in the school syllabus in all the classes, currently it is only covered in classes one and two

4. There is need for the Ministry of Health employees to promote sanitation inspection in schools

6. Sanitation is a growing concern in all urban centres in Kenya. This study has been able to give the true picture of some assumed practices in the schools.
6.3 Suggestions for future research

There is need for future research on:

1. The reason that lead to poor law enforcement in schools.

2. Hygiene promotion mechanisms among school, children, staff and parents.

3. To explore the possibility of excreta reuse among schools which would promote food security and also act as an income generating activity.

4. Sanitation practices in schools found within municipalities of Kenya.
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APPENDIXES

APPENDIX 1: PUPILS QUESTIONNAIRE

A STUDY ON SANITATION PRACTICES AMONG PUBLIC PRIMARY SCHOOLS WITHIN NYERI MUNICIPALITY, NYERI DISTRICT, KENYA

INTRODUCTION

To Whom It May Concern:

Hallo, my name is Nyaguthii Miriam Rukwaro of Kenyatta University Zoology Department. I wish to thank you for letting me talk to you and explain what I am doing. I am carrying out a study to determine sanitation practices, which comprises of water supply, wastewater disposal method, excreta disposal methods, solid waste disposal method and hygienic practices. With an aim of preventing diseases among public primary schools. I will pick some of you randomly and ask you to answer questions concerning sanitation practices. This information will be kept confidential. You will not write your name anywhere on the questionnaire. I will not share or disclose any of your answers to anyone. Your teacher will not know what you have said or the answer you will give me. The answers you will give regarding sanitation practices in your school will reveal gaps so that improvements can be made.

Signature .................................................
Do not write your name on these questionnaires. All answers given to this questionnaires will be kept confidential tic the correct answer or fill in the boxes provided where applicable.

A. Pupil’s Demography Data

Age: (years) 5-7 □ 8-10 □ 11-13 □ 14-16 □ other (specify) □

Male □ Female □

Name of your school

Your class: Std. □ Std. 6 □ Std. □ Std.8 □

B. Water supply

1. Is there water in the school compound? (a) Yes (b) No

2. If yes what is the main source of water?
   a) Piped water □
   b) Protected Spring/Borehole □
   c) Unprotected spring/Borehole □
   d) River/Stream □
   e) Rain water □

3. If piped how frequent?
   a) Through out the day □
   b) In the morning hours □
c) In the afternoon hours □

d) Once a week □

e) Other (specify) .........................................................

4 If rainwater is it available

(a) Throughout the year □

(b) Only on rainy season □

5. If there is no water within the school compound where do you get water?

a) Carry from home □

b) Borrow from the neighbours □

c) Buy from the water kiosk □

d) Other (specify) .........................................................

6. If the source of water is river/Stream is it free from germs? Yes □ No □

7. If yes how is the water made free from germs? Boiling □ chlorinating □

Others (specify) .........................................................

C. Sanitation

8. How many toilets are there in your school? Boys □ Girls □

9. Are all the toilet being used? Yes □ No □

10. If no what is the number? Boys □ Girls □

11. Are there Urinals? Yes □ No □ Numbers □
12. Are the toilets separate for different sexes? Yes [ ] No [ ]

13. What types of latrine/toilet are in your school?
   a) Pit latrines [ ]
   b) Ventilated improved pit latrines [ ]
   c) Water closet Asian [ ] Pedestal [ ]
   d) Others (Specify) ........................................

14. Materials which the toilet/latrine is build of? Stone [ ] Timber Mixed [ ]
    Iron sheet [ ] mud [ ]

15. Who cleans the toilet/latrine? Pupils [ ] School workers [ ]
    Others (specify) ........................................

16. Are the toilet/latrine clean all the time? Yes [ ] No [ ]

17. Is there Water for washing hands outside the toilets? Yes [ ] No [ ]
    D. Waste water drainage

18. Are their drains in your school? Yes [ ] No [ ]

19. Does Water stagnate in your school? Yes [ ] No [ ] I don’t know [ ]

20. Are the drains open?  a) Yes [ ]  b) No [ ]

21. What is the condition of the drainage system in your school?
   a) Blocked [ ]
b) Clear [ ]
c) Don’t Know [ ]

22. How often are the drains cleaned?
a) daily [ ]
(b) weekly [ ]

E. Solid waste disposal

23. Do you have a dustbin in your class?
   Yes [ ]    No [ ]

24. Is there a composite pit in your school compound?
   Yes [ ]    No [ ]

25. How do you dispose your solid waste in your school?
a) Burning in a refuse pit [ ]
b) Burying [ ]
c) Composting [ ]
d) Recycling [ ]
e) Collection by the local authority [ ]
f) Use them locally [ ]

F. Hygienic practices

26. When do you wash your hands?
a) After coming from the school [ ]
b) Before or after meals [ ]
c) After visiting Toilet/Latrine


d) After eating food


e) Others (Specify) ...........................................

What is the system of feeding in the school?

a) Cooked at school

b) Carry their food from home

Where do the children feed?

a) Dining

b) Classroom

Outside

How is the kitchen drains?

a) Blocked

b) Clear

Is your school clean all the time?

yes

No

Have you suffered from any of the following diseases?

a) Diarrhoea

b) Intestinal worms
APPENDIX 2: HEAD TEACHERS QUESTIONNAIRE

A STUDY ON SANITATION PRACTICES AMONG PUBLIC PRIMARY SCHOOLS WITHIN NYERI MUNICIPALITY, NYERI DISTRICT, KENYA.

INTRODUCTION

My name is Miriam Rukwaro I am a postgraduate student undertaking Masters in Public Health and Epidemiology at Kenyatta University, Zoology Department. I am carrying out a study on sanitation practices in public primary schools. Your school has randomly been selected to participate in the study. Any information given will be treated with utmost confidentiality. The findings will be useful in formulating school sanitation policy.

Signature......................................

A. School’s Demography

Name of your school............................ Division..............................

Zone...................... Type: Day □ Boarding □ Mixed □

: Boy□ Girls □ Mixed □

Number of teachers: Male ...... Female.......Total..............

Number of pupils: Boys .............. Girls ............ Total .............

Other workers: Male.......... Female ...............
Management structure of the school

Board of Governors

Committees

Other (Specify)

B. Academic Profile

1. What are the academic mean score of the school for the last three years?

<table>
<thead>
<tr>
<th>Year</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. a) Is there any dropout cases? Yes [ ] No [ ]

   b) If yes what’s the drop out rates for boys and girls for the last three years?

   .................................................................
3 What is the main cause of school drop out?

   a) Illness  
   b) Finances  
   c) Marriage  
   d) Transfers Schools  
   e) Others (Specify)  

4. If drop out is due to transfers to private institution State why.......................... 

5. Which is the most common ailment among pupils in the school?

   a) Malaria  
   b) Cough  
   c) Intestinal worm  
   d) Diarrhoea  
   e) Others (specify)  

6. Is there absenteeism of pupils? Yes  No  

7. If yes which is the main cause of absenteeism?

   a) Illness  
   b) Child labour  
c) Refusal by parents  

d) Financial  

e) Food  

f) Others (specify).................................

8 Does the school have any health promoting activity?

a) Feeding programme  

b) Deworming  

c) Health Education talks  

d) School clean-up activities  

e) Clubs  

C. Water supply

9 Is water available in your school compound?  Yes  No  

10 Is water adequate for the school a) Yes  b) No  

11 If the water supply is not adequate why? ............................................

12 What is the water source?

a) Piped water  

b) Protected Spring/Borehole  
13. If yes how often?
   a) Throughout the day
   b) In the morning hours
   c) In the afternoon hours
   d) Once a week
   e) Others (specify)

14. If there is no water in the school compounds what do the students do?
   a) Carry from home
   b) Borrow from neighbours
   c) Buy from the water kiosk
   d) Other (specify)

15. If the water is River/Stream is it treated? Yes No

16. If yes how is the water treated?
   a) Boiling
b) Chlorination □

c) Other (specify) ..............................................

D. Sanitation

17. How many Toilets/ Latrines are there in your school?  Boys □ Girls □

18. Are there Urinals?  Yes □ No □ Number □

19. Are the Toilet/Latrine separate for different sexes?  Yes □ No □

20. Are all the toilets in use  Yes □ No □

21. If no what is the number  Boys □ Girls □

22. What is the type of the latrine in your school?

   a) Pit latrines □

   b) Ventilated improved pit latrine □

   c) Water closet □

23. If water closet which type

   a) Asian type □

   b) Pedestal □

24. Material, which has built your Toilet/Latrine?

   a) Stone □ Timber □ mud □ Iron sheet □ mixed □
25. Who cleans the Toilet/Latrine? Pupils □  Workers □

26. Are the toilets clean throughout the day? Yes □  No □

27. Is there water for washing hands outside the Toilet/Latrines? Yes □  No □

E. Wastewater drainage

28. Are their drains in your school? Yes □  No □

29. Does water stagnate in your school? Yes □  No □

30. How are the Drainages in Your School?
   a) Blocked □  
   b) Unblocked □  
   c) I don't know □

F. Solid waste disposal

31. Is there dustbin in your classes? Yes □  No □

32. Is there composite pit in your school compound? Yes □  No □

33. How do you dispose your solid waste in your school?
   a) Burning □  
   b) Composting □  
   c) Recycling □
d) Burying  

e) Collection by Local authority  

f) Using the waste locally  

34. Has the school experienced any of the following diseases outbreaks and when?  

   a) Diarrhoea 

   b) Malaria  

   c) Cholera  

   d) Typhoid  

   e) Ameobiasis  

   f) None  
Appendix 3: Observation Checklist

1. Presence of latrines/Toilet in the school Yes □ No □

2. Their Numbers Boys □ Girls □

3. Whether in use Yes □ No □

4. Not in use Numbers Boys □ Girls □

5. Presence of water stands their numbers Yes □ No □ Numbers □

6. Presence of Wastewater drainage Yes □ No □

7. Presence of dustbin in the class Yes □ No □

8. Presence of composite pit in the school Yes □ No □

9. Presence of urinals? and the numbers yes □ No □ Number □

10. Are all the toilets in use Yes □ No □

11. Whether the pupils are wearing shoes? Yes □ No □