

**ASSESSMENT OF ENVIRONMENTAL RISK FACTORS EXPOSED TO
CHILDREN BELOW FIVE YEARS OF AGE IN NAIVASHA DAY
CARE CENTRES**

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**A Thesis Submitted to the Graduate School in Partial fulfilment for the requirements for
the award of the degree of Master of Science in Environmental Science of
Egerton University.**

EGERTON UNIVERSITY

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DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not, wholly or in part, been submitted or presented for examination for an award of a degree in any other university.

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DEDICATION

This work is dedicated to my parents Sophia Kalondu and Maurice Kitheka Mutumba and to my loving Husband Raymond Muindi; Son Devin Musyoka, daughter Sunshine Kalondu and the late Favour Muindi.

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ABSTRACT

Increase in maternal employment over the past 25 years has led to an increase in reliance on child care for young children from birth to 5 years of age. Non parental child care is now the norm for young children on a regular basis, with at least 44% of infants in child day care for more than 30 hours a week. Economic deprivation has led mothers especially in low income residential areas in Naivasha to return to work soon after delivery and since they do not have enough money to hire house helps they leave their children in substandard day care centres whose facilities may not be conducive for health. This move has raised questions on the environmental health risks associated with the care of the children. The broad objective of this study was to identify potential environmental risk factors exposed to children within day-care centres in Naivasha Municipality Kenya. The study entailed a cross sectional survey that comprised of 300 children in 10 day care centres. All the children's anthropometric measurements were taken. Ten children who had been in the day care for more than 2 months were randomly picked from each day care centre making a total of 100 children. Their mothers gave data about their socioeconomic status and the children's health status while childcare providers in the day care centres gave data on the daycares operation and activities. Primary data was collected using questionnaires and observation schedule. Secondary data from medical reports and demographic health surveys was used to obtain the prevalence of environmental related diseases among children under five in Naivasha area. Data was analysed using descriptive statistics and correlation. Results indicated that 50% of the daycares had an average of 20 children crowded in one room contrary to required standards. 80% of the sampled daycares did not have adequate lighting and ventilation of at least 50 lux of light at each floor level. 50% of the daycares managed their wastes appropriately. 90% used mobile phone for communication; none had a fire extinguisher and First Aid kit. 90% of the day care playgrounds had rubbish, sharp objects, and holes in the play area, 80% had animal and human waste, and 30% had water puddles, while 70% were on the road side and accessible to the driveway. Most (60%) of the children were reported to have had diarrhoea, 59% upper respiratory diseases, 5% malaria and 6% Ringworm. There was a significant correlation between the number of environmental risks in the daycare and the number of diseases experienced by the children. The daycares did not fully comply to required standards, diarrhoea was positively correlated to presence of soap and bowl for washing hands. There are no specific regulations to guide those who want to set up daycare centres. The state should provide laws and regulations to govern day care facilities.

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LIST OF ABBREVIATIONS AND ACCRONYMS

AAP	American Academy for paediatrics
AMREF	African Medical and Research Foundation
DFID	Department for International Development
EC	European Commission
EPA	Environment Protection Agency
GOK	Government of Kenya
URTIS	Upper Respiratory Tract Infections
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organisation
WSSD	World Summit on Sustainable Development
MOPHS -	Ministry of Public Health and Sanitation
MOMS -	Ministry of Medical Services

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Most countries have seen marked increase in maternal employment since the early 1970s. In fact most mothers return to work and remain in the work force, in their child's first 3-5 months of life (McCartney, 2004). In Kenya the number of women in the paid labour force has continued to grow, from 12.2 % in 1984 to 21% in 1987 (Kenya Development Plan 1989-1993). The number of female headed households has also continued to increase. It was estimated that 32.1 per cent (3 million) of the households were headed by females in 1979. Most of the women heading households are in their prime working and reproductive ages (25-29 years) therefore, the majority have children requiring care. Most of these women do not live with their parents and so extended family child support is not available. These women and mothers are responsible for caring and socializing their children, and are also the sole bread winners of their families. As a result, the households headed by women form one of the most vulnerable groups not only in Kenya but all over the world (Landers 1992, *etal* 2007).

The dramatic increase of women in the labour force has caused infants and young children to spend much of their early lives in child care arrangements that vary widely in type, setting, and quality. This dramatic shift in child rearing styles has prompted concerns as to whether child care poses any risks to healthy child development. Day care refers to childcare provided by someone else other than the parent which takes place in formal organized facilities. Day care is now an ordinary part of life for children in most western countries. More than half of infants are placed in some form of child care for at least ten hours per day during their first year of life, and more than three-quarters of families with young children depend on child care as a support for maternal employment (McCartney, 2004).

Grave concern has been raised over disadvantaged families whose children attend day care centres perceived to be of low quality. This is due to the alleged greater susceptibility of populations with lower social economic status to environmental threats. The joint report of the European Environment Agency and the WHO Regional Office for Europe (2002), pointed to the growing evidence that the most disadvantaged groups, and children and pregnant women among them, suffer from the worst environmental conditions. The cumulative risk of

exposure due to substandard housing and insufficient physical structure and infrastructure of the immediate environment can contribute both directly and indirectly to a variety of adverse health outcomes (Hornberg & Pauli, 2007).

It is estimated that 40% of world deaths can be attributed to various environmental factors (Pimentel et al, 1998). Most of these deaths occur mainly among the poor that live in developing countries (World Bank, 2003). Poor sanitary conditions contribute to approximately 4 million deaths, mostly among infants and young children, every year. Malnutrition, also a major cause of child morbidity and mortality, can be related to environmental degradation (Pimentel & Pimentel, 1996, Pimentel et al, 1998).

The complexity of day care-centres has been due to possible links between environmental pollutants, chemicals, to common infectious diseases, asthma, cancer, autism and other recurring cycles of illness in infants and preschoolers. In addition most child care centres do not conduct a site history, environmental site assessment, or environmental audit before being established. Such an investigation could help prevent a centre from being located on land or in a building that is contaminated (Tarah *et al* 2010).

Children's developmental stage and behaviours increase their exposure to environmental toxins as they spend a large portion of their time closer to the ground i.e. on the floor, carpet, grass, and playground surfaces as a result they have more exposure to toxins applied to or settled on these surfaces (Bearer, 1995) such as formaldehyde and volatile organic chemical vapours from carpets, lead-based paint dust, cleaning product residues, fertilizers, herbicides, and pesticides. Their breathing zones are closer to the ground, it is within these lower breathing zones that heavier chemicals such as mercury settle out and radon accumulates" (Bearer, 1995). Young children explore the world orally by putting things in their mouths. This developmentally appropriate behaviour significantly increases their opportunity for direct ingestion of pollutants in dirt or dust such as lead-based paint dust and pesticide residue. Children also breathe frequently through their mouths, bypassing nasal filtering. All of these characteristics make children more susceptible than adults to air pollutants. Children metabolic rate is higher than that of adults, they therefore breathe more rapidly take in proportionally more pollutants available in the air.

In Kenya, Infants from poor families are more likely to receive relatively low quality care. This is because the day-care centres which are available and economically friendly to them

are built in unhealthy communities where there is substantial traffic, lack of safe play areas, unsafe housing with poor indoor air quality. In the study area, where this study was carried out, inadequate data existed on the environmental risks factors in the day care centres and the prevalence of environmental related diseases among the children within these daycares.

1.2 Statement of the Problem

Economic deprivation has led mothers in their prime working and reproductive ages especially in low income residential areas in Naivasha Municipality to return to work soon after child delivery. In order to cope with the career and child care roles coped with meagre salaries, and with little money to hire house helps, they leave their children in cheap day care centres whose facilities may not be conducive for health. This move has raised questions on the environmental health risks that these children are exposed to in the day care centres. Little research has been conducted on environmental risks factors associated with day-care centres in low economic societies. This study sought to address this gap on environmental risk factors associated with day care centres that are exposed to children below five years of age in Naivasha Municipality Kenya.

1.3 Broad Objective

To identify environmental risk factors that children less than five years are exposed to within the day-care centres in Naivasha Municipality.

1.4 Specific Objectives

1. To investigate housing conditions, and facilities/infrastructure in the day-care centres and assess if they comply with the required standards.
2. To document the safety management used in the daycares.
3. To document environmentally related diseases and conditions of children brought to the day care centres.
4. To establish if there is a relationship between the environmental risks factors in the day care centres and the prevalence of environmentally related diseases among the children.

1.5 Research Questions

1. Do housing conditions and facilities/infrastructure in the day care centres comply with the required standards?

2. What are the safety management equipment/measures used in the daycare?
3. What are the environmental related diseases and conditions experienced by children brought to the day care centres?
4. Is there a relationship between the environmental risks factors and the prevalence of diseases in children in the day care centres?

1.6 Justification

Every year, over 5 million children 0–5years of age die, mainly in the developing world, from diseases related to the environment. An estimated 25% of all preventable illness is caused by environmental factors. In Africa, the environmental contribution is even higher, with approximately 35% of the burden of disease due to environmental factors (UNEP, WHO 2002). Prior the study, environmental risk factors exposed to children under five in day-care centres in Naivasha, were not documented and little information was available about the commonly suffered diseases by the children in day-care centres. The inadequate information is a hindrance towards the concerted efforts to achieve the Millennium Development Goal 4 on reducing childhood mortality, and Goal 6 on combating major diseases. Further this deters the effectiveness of environmental pillars which hinge on good health as stated in the 1992 UNCED Rio de Janeiro and WSSD that was the nexus between health, environment and poverty.

In Kenya high mortality rates due to environmentally related diseases have been recorded in children under age five. Pneumonia and diarrhoeal diseases are among the environmental related diseases that account for 60% of the mortality in this age-group (Nyamongo, 2004). Information generated on the environmental risk factors within daycares predisposed to children under five in the study area is necessary to establish whether there's a relationship between the environmental risks factors and the health of the children as an important step towards achieving MDG 4 & 6, and Vision 2030.

1.7 Limitations and Assumptions of Study

The major limitation of this study is that it did not investigate the living conditions of the homes from where the children came from. It was assumed that diseases that the children were suffering from were related to environmental conditions in the day care centres as this children spend the greater part of their time in the day cares.

1.8 Scope of Study

The subject of this study was confined to selected 0-5 year old children in day care centres, their mothers and child care providers in Naivasha Municipality. The study covered the socio economic status of the children's families, and environmental risk factors within day care settings which have a link to the children's health status. These included those in the buildings housing the day cares and outside where the children play or spend their time when not indoor. Data was collected in the afternoon and evening session to ensure convenience of the informants.

1.9 Definition of Terms

Anthropometric- Measurements of the human bodyweight, height, wrist and head circumference(Encyclopaedia*www.britannica.com*)

Autism - a disorder of neural development characterized by impaired social interaction and communication, and by restricted and repetitive behaviour. (AAP Glossary, 2003)

Daycare Centre - Daily care and/or supervision offered commercially to the public for any part of a twenty-four (24) hour day, to children away from their homes.

Environmental Risk Factor - Something unseen or not obvious to the child that may be detrimental to health/ result in injury.

Environmental tobacco smoke - Smoke given off by cigarettes, pipes, or cigars to which non-smokers can be exposed. (AAP Glossary, 2003)

Fall height: The distance a child could fall from play equipment to the ground beneath.(CAPFA, 2008)

Fall zone: The surface area that could be hit by a child falling from the play equipment. This zone is measured around play equipment, needs to be clear of other items.(CAPFA, 2008)

Risk - The potential that a chosen action or activity (including the choice of inaction) will lead to a loss or an undesirable outcome.(Free Merriam-Webster Dictionary)

Sick building syndrome – diagnosable illness attributed directly to airborne building

Pesticide - Substances or mixture thereof intended for preventing, destroying, repelling, or mitigating any pest.(AAP, 2003)

Potty- a seat of reduced size fitting over a toilet seat, for use by a small child (Dictionary.comdictionary.reference.com)

Undersurfacing: A certified material designed to absorb the impact of a fall that is installed within the fall zones of the playground.(CAPFA, 2008)

CHAPTER TWO

LITRATURE REVIEW

2.1 Introduction

Globally, the per capita number of healthy life lost to environmental risk factors is 5-times greater in children under five years of age than in the total population. Diarrhoea, malaria and respiratory infections all have very large fractions of disease attributable to environment, and also are among the biggest killers of children under five years old . In developing countries, the environmental fraction of these three diseases accounted for an average of 26% of all deaths in children under five years old. Prenatal conditions (e.g. prematurity and low birth weight); protein-energy malnutrition and unintentional injuries – other major childhood killers – also have a significant environmental component, particularly in developing countries (WHO, 2006).

2.2 Inter-relation of Children's Health to Environmental Risks

Scientists, policymakers, and the public have raised concerns about children's exposure to environmental contaminants such as lead, mercury, and synthetic chemicals like pesticides (Monks, 1997; Crain, 2000). There are also significant concerns about possible links between environmental exposures to common chemicals and asthma, cancer, autism, and other diseases that affect children (Greater Boston Physicians for Social Responsibility [GBPSR], 2000). What is most problematic is that while low levels of exposure to many chemicals are unavoidable, scientists know little about the risks of such exposures. Added to this is the problem that scientists are frequently unable to distinguish which chemicals might be dangerous because people are exposed to so many simultaneously. Moreover, chemicals in the environment may act synergistically, meaning that their combined effect is greater than the sum of the effects of the individual chemicals.

Increasing evidence suggests that environmental factors, such as exposure to toxic substances and pollution, may play an influential role in the emergence of new risks (Bearer, 1995; Mottet. *al*, 1997, Crain, 2000; GBPSR, 2000;). Since World War II, thousands of new chemicals have been introduced into the environment, yet only a fraction have received thorough testing for harm to human health, much less for toxicity to the child's developing brain. Research shows that children living in unhygienic environments as indicated by poor

drainage systems, inadequate or non-existent sanitation, and piles of uncollected refuse, suffer higher levels of morbidity and mortality. Because of their illegal status, residents of informal settlements do not receive government services such as water, drains, sewerage and rubbish collection (Caldwell, 2002).

Awareness of the importance of children's environmental health has been increasing during past years. This is attributed to non parental care arrangements on regular basis for under five for an average of 31 hours a week (Hofferth *et. al*, 1998). The study of the burden of disease attributable to environmental factors among children shows that large proportions of deaths are attributable to the selected environmental factors outdoor and indoor air pollution, inadequate water and sanitation, lead exposure, and injuries with pronounced differences between European sub regions (Vlent *et. al*, 2004).

2.3 Environment -related Diseases for Children under five

Despite technological advances in modern sciences, 12 million children under the age of five die every year in developing countries from preventable diseases. Of these deaths, over 70% can be attributed to just five primary causes: pneumonia, diarrhoea, malaria, measles and malnutrition. In many developing countries, 20 to 25% of the children die before reaching their fifth birthday resulting in an estimated 15 million deaths annually (AMREF, 1996). Infant and child death in developing countries constitute the largest age category of mortality. This is because children under the age of five years are the group most vulnerable to diseases caused by health risks and poor environmental conditions (UNICEF/GOK, 1998). Children under five years make up 14% of the population in Africa, but account for up to 50% of all deaths annually (Kessel, 2000).

Priority communicable diseases and conditions afflicting Kenyan children include diseases with the largest absolute burden attributable to modifiable environmental factors. These include malaria, lower respiratory infections, diarrhoea, intestinal worms, skin diseases, non communicable diseases and 'other' unintentional injuries. These may include injuries arising from environmental hazards or accidents, the majority of which are attributable to environmental factors (MOPHS, 2010).

In the sprawling megacities of developing countries, slum communities that stack neighbours closely together allow pathogens to spread rapidly, especially in combination with inadequate

ventilation, poor sanitation, and other toxic effects of poverty. Conditions within individual homes add further risk: A body of research has identified links to RTIs based on number of residents, number of siblings, and number of people who share a bed or a room. A study in São Paulo found that when four or more children shared a bedroom, they were 2.5 times more likely to have acute respiratory infections. Similar findings were reported in another Brazilian study, which correlated an increase in pneumonia with an increase in household size, and in Kenya, where children in households with more than five siblings were at greater risk of RTIs (World Lung Cancer Foundation, 2010).

Lower respiratory infections are associated with indoor air pollution related largely to the use of household solid fuel (biomass). Other contributory factors include second hand tobacco smoke as well as outdoor air pollution. An estimated 24.5 percent of such infections are attributable to environmental causes. Tuberculosis is also a priority respiratory disease in Kenya which is posing a serious public health threat due to the emergence of multiple drug resistance strains and also because it is usually a co infection with HIV/AIDS. Diarrhoea and intestinal worms are spread from contaminated water and soil and account for 4.7 and 4.3 percent of the outpatient morbidity respectively (MOPHS and MOMS, 2009).

2.4 Causes of Environmental risks in Day care Centres

2.4.1 Housing

Different residential locations lead to different levels of exposure and therefore different levels of risk. Studies around the world show that it is often the most vulnerable or disadvantaged located in areas with poorer environmental quality that suffer worst environmental threats (Evans *et.al* ,2002; Walker *et al.*, 2003; Kruize *et. al*, 2004) World Health Organisation data based on data collection in eight European cities further confirms that inadequate housing conditions are linked to lower levels of self-rated health for all income and socio economic status groups, but that the association is much stronger for poor households (WHO 1997; Braubach *et. al*, 2009). In addition, inadequate housing conditions are associated with risk factors such as mould, crowding, indoor pollution and noise especially for low income-households.

Other factors such as the efficiency of heating and ventilation systems and insulation and housing design features impact on the indoor microclimate. Extremes of hot and cold can

have marked impacts on children's health. Construction and design of buildings can also have a significant impact on noise levels in and around the home, which, at high levels, can lead to various health effects such as sleep disruption and psychological stress (WHO 1997).

2.4.2 Solid waste management

Unsustainable patterns of production and consumption have resulted in a considerable increase in both the quantity and variety of waste. Significant proportion of the urban population of Africa has poor access to refuse collection for proper solid waste management. Poorly managed waste presents a health risk to communities. This is primarily because untreated waste and waste that remains uncollected or improperly disposed of can be a source of contaminants and breeding sites. Such wastes contribute to diarrhoea, vector-borne disease, and the contamination of drinking water and other water resources. There are also examples where chemical contaminants released from dumping sites have caused direct harm to humans and, more commonly, destroyed environmental resources to the extent that they can no longer be used for human dwellings or activities (UNEP, 2007).

A study of one of Africa's largest waste dumpsites, the Dandora Municipal Dumpsite in Nairobi, found that half of the children tested in the area surrounding the dumpsite had concentrations of lead in their blood exceeding internationally accepted levels. Forty-two percent of soils samples from the dumpsite recorded lead levels almost 10 times higher than those found in unpolluted soil. The children had been exposed to pollutants such as heavy metals and other toxic substances through soil, water and air (smoke from burning of waste) leading to respiratory, gastrointestinal, and dermatological diseases. Almost half of the children tested had respiratory diseases, including chronic bronchitis and asthma (UNEP, 2007).

2.4.3 Indoor air pollution

Exposure to indoor air pollution may be responsible for nearly 2 million more deaths in developing countries and for some 4% of the global burden of disease (Bruce, 2000). In Kenya, it is among the factors linked to high morbidity, especially in children aged below five years. According to a survey that was conducted in Maucho Division Kenya by Moturi (2005) the state of housing and type of fuel used in households encourage indoor air pollution which in many studies has been associated with various diseases occurrence. Research by Kammen and Ezzati in the Laikipia district of Kenya demonstrated a relationship between higher particulate levels and higher rates of respiratory illnesses in poorly ventilated

dwellings, where indoor smoke exceeds acceptable levels. The Environmental Protection Agency and the U.S. Consumer Product Safety Commission (1995) warn that air within homes and other buildings is often more seriously polluted than the outdoor air in even the largest industrialized cities. This information, coupled with evidence that children spend as much as 90 percent of their time indoors, means that children's exposure to indoor air pollutants may be two to five times higher, and sometimes 100 times higher, than their exposure to outdoor air pollutants (Department of Health and Human Services U.S.A, 2000; EPA, 2002)

2.4.4 First Aid Kit and Fire extinguisher

According to the American Academy of paediatrics (2011), every twelve months, the child care facility should obtain written documentation to submit to the regulatory licensing authority that the facility complies with a state-approved or nationally recognized Fire Prevention Code. If available, this documentation should be obtained from a fire prevention official with jurisdiction where the facility is located. Where fire safety inspections or a Fire Prevention Code applicable to child care centers is not available from local authorities, the facility should arrange for a fire safety inspection by an inspector who is qualified to conduct such inspections using the National Fire Protection Association's.

2.4.5 Playgrounds

Most Kenyan playgrounds are not well defined with exemplary facilities as in the developed nations. Children play in any available grounds within the vicinity of childcare setting and use available playing materials. Some of this play grounds are dusty, and may have objects /that cause injury or may even be contaminated by human and animal wastes. Such poor sanitation and lack of access to clean playing grounds has been attributed to the global burden of diarrhoeal diseases that occurs in children. In developing countries it is estimated that approximately 90% of the diarrheal disease burden is related to the environmental factors. (Murray *et al* 1996).

Play grounds are sometimes located near main roads increasing the risks of exposure to by-products such as lead. Environmental risks also associated with accidents in play grounds with play facilities are also related to faulty design, poor maintenance of, and use of defective or improperly installed equipment and appliances. Falls frequently result from poorly sited or maintained, poor-quality floor coverings and surface in designed play ways (Othero *et al* 2010).

2.5 Required Housing and Building Standards

The safety of a baby is central to the provision of good and healthy development. While this is true at all levels of life, it is particularly critical for children at the critical early years in view of their relatively tender ages. Children of this early age are very vulnerable to environmental threats which can emanate from inappropriate facilities and infrastructure. These may include poorly constructed rooms and playing grounds, insufficient and broken---down faecal management facilities, bathroom facilities, and inadequate and inappropriate beds and other furniture (Safety standard manual of schools in Kenya, 2008)

2.5.1 Housing recommended Standards

Kenya building housing standards, statutes and regulations are scattered in various legal documents, including town planning, land and housing laws, the Public Health Act, EMCA 1999 and the Local Government Adoptive By-Laws. The main statutes governing building standards, design and materials today are; The Public Health Act Cap. 242, of 1972, The Housing Act, Cap.177 of 1953, of all these laws, the Public Health Act is, arguably, the most far-reaching in respect to the latitude it enjoys over building.

It is important to note that the Public Health Act Cap 242 is specific on, inter alia, areas such as; space around buildings, lighting and ventilation of buildings, and sizes of rooms to be used for human habitation; repairs or demolition of unsafe, dilapidated or dangerous buildings. The Occupational Safety and Health Act (2007) Cap 47-52 also gives the following provisions on housing. Every workplace shall be kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance, and, without prejudice. It is important to note despite the provisions of these laws there is none specific for the day cares in Kenya.

2.6 Required Playground Standards and Maintenance for Safe Play

Ensure that play equipment is strong, sturdy and securely anchored. Secure ropes top and bottom so they cannot form a noose. Ensure that footings are at least 200mm below ground level. Play equipment should not have sharp edges, splinters or protruding parts that could pierce skin, tangle clothing or remove cords out of clothing, Assess the condition of all play items for rust, detachments or weakening from sun exposure. Inspect all chains for rust, wear and tear. Locate play equipment in an area that is densely shaded and easily accessible, away from driveways, pools or other hazards, and that can be easily supervised. Check all play items for spiders and insects, animal contamination. Conduct regular checks for rubbish and litter in the play space (CAPFA 2008)Child Accident Prevention Foundation of Australia

2.6.1 Swings

Swing seats should be made of a soft, flexible plastic and have no more than two seats per frame. The connections of the swing at the seat should be checked regularly for sharp protruding parts. Ensure swing frames are well anchored into the ground and that under surfacing is provided beneath and around the swing frame (CAPFA (2008))

2.6.2 Under surfacing

Under surfacing is designed to minimise head injury and absorb the impact of a fall. Asphalt, concrete and grass are not considered under surfacing. Fall heights of 500mm or more above ground level require under surfacing options include: loose-fill materials such as pine bark, synthetic grass with an impact layer beneath a number of portable mat systems that offer impact absorption rubber surfaces (CAPFA 2008)

2.6.3 Height of equipment

Falls from play equipment constitute a large component of playground injuries. Standards restrict the height of play equipment to reduce the distance a child could fall from the equipment to the ground. Carers need to ensure that fall heights comply with the ages of the children that use their play space. The measurements for maximum fall heights are as follows: 0-3yrs: up to 1m, 3-5yrs: up to 1.5m (CAPFA, 2008)

2.6.4 Holes, wells, trenches and excavations

Any hole, well, trench or excavation that a young child could not easily climb out of without assistance, should be completely covered by a solid material capable of supporting the weight of an adult, and which is secured in position, or be completely closed by a barrier, such as a fence, wall or door.

2.6.5 Stairways

Stairways, corridors, hallways, external access balconies or bridges, with one or more sides 1m or more above the floor or ground should be bounded by a wall or balustrade. Walls or balustrade should: be at least 865mm above the front edge of stair treads, 1m above a level floor surface only have horizontal rails or footholds at the top and base. It is recommended that windows or other openings from which a young child could fall more than 1.75 metres should not open more than 100mm nor have permanent bars spaced at no greater than 100mm apart fixed (CAPFA, 2008)

2.7 Safety Standards in Schools

Windows should be easy to open to allow proper ventilation and light. The floors should be level and kept clean always, for cemented floors, any cracks should be repaired in good time. Similarly, mud walls and floors should be regularly smeared with fresh mud and floors smeared with cow dung to prevent the development of cracks and the generation of dust that can pose risks to the health of children. In all cases, efforts should be made to cement all the classroom floors. Each block should be fitted with serviced fire extinguishers. Regular inspections of the buildings, and stairway should be carried out and immediate measures taken to correct any problems noticed. The furniture in rooms should be arranged in a manner that facilitates easy and orderly movement of children in the room. The positioning of electrical sockets should be beyond the reach of young learners in order to avoid tampering. (Safety Standards Manual for Schools in Kenya, 2008). In recognition of the critical importance of school safety, in the provision of quality education, the Government, through the Ministry of Education, committed to institutionalising and mainstreaming school safety. However, it is critical to note that the given regulations are for schools and there is none specifically for daycares therefore this gap needs to be addressed.

2.8 Conceptual Framework

The conceptual framework (Figure 1) links the various concepts that underline the study and shows how the different variables relate to each other. The independent variables are represented by environmental risk factors that are associated with daycares centres and affect the health of the children. The risk factors are categorised into three: status of the play facilities, status of sanitation and housing status. The status of the play facilities can affect the health of the child in various ways. The surface of the playground may be rough or smooth, slippery, wet or littered with obstruction objects some of which might be sharp. All these may potentially cause unintentional injuries to the child. The sanitation status including faecal matter disposal, solid and liquid waste management can affect the health of the children. For instance when the environment is contaminated with faecal waste, pools of stagnant water and garbage dumped in the open the children may come into contact with it and suffer diarrhoea or other related diseases. Housing status including ventilation, presence of mould, floor type, lighting and safety management can affect children's health. The presence of mould has been known to increase the incidence of asthmatic attacks.

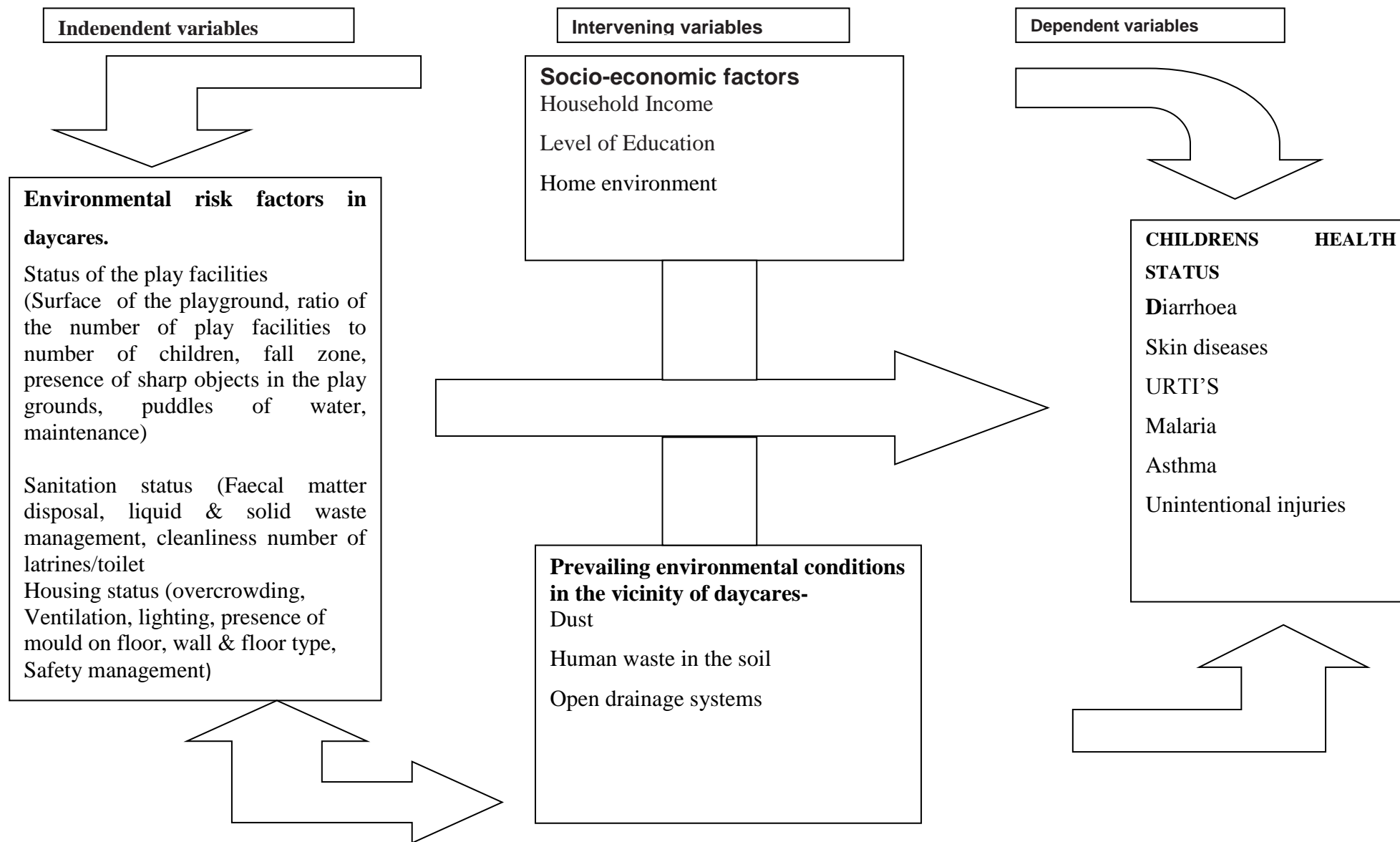


Figure 1: Conceptual framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Area

The study was carried out in Naivasha municipality in Naivasha District. It covered communities living in Naivasha town, Kihoto, Karagita , DCK and Kamere Centers. The covered area, lies northwest of Nairobi at a latitude 0⁰08' to 0⁰46'S longitude 36⁰14' to 36⁰43'E. It is located on the shore of Lake Naivasha and along the Nairobi - Nakuru highway and Uganda Railway. Naivasha is part of the Nakuru District with an urban population of 190,082 male and 186,161 female resulting to a total of 376,243 people (KNBS, 2009). With a total of 300 children in 10 day-care centres (District Officer Naivasha District, personal communication, 24/04/2012). The main industry in Naivasha is agriculture, especially floriculture. Naivasha Division has 365.6km² under flower production with 2,500 seasonal employees. (Nakuru District Development Plan, 2000-2005. Naivasha is an important resource to many stakeholders and has recently experienced massive influx of populations in the main industry despite the typically low wages indicated by low economic status of the casual workers.

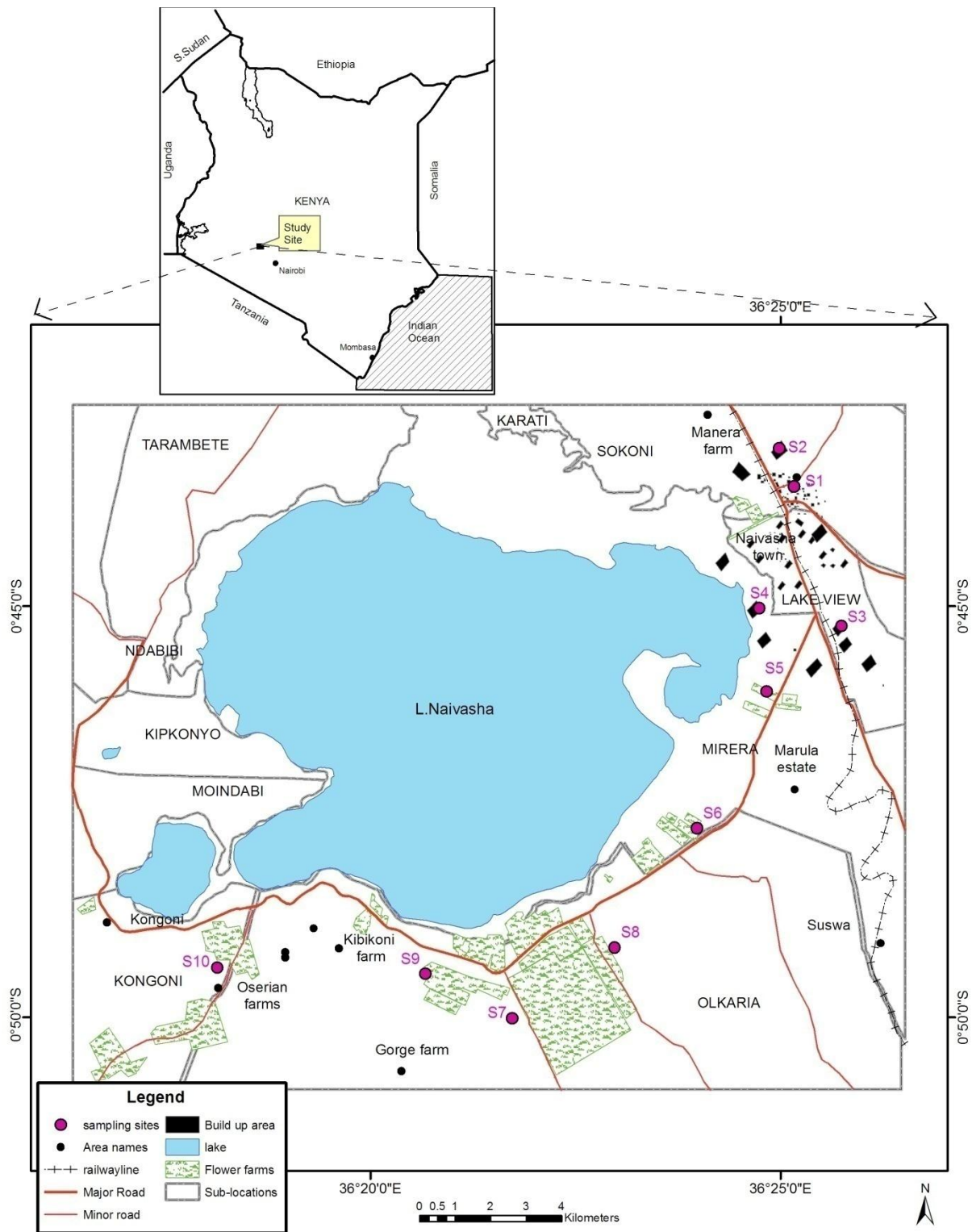


Figure 2: Study Site Naivasha

Source : Maina,2012

3.2 Research Design

The research design used was a cross section survey and the sampling frame comprised the population of Naivasha municipality and the neighbouring villages namely Kamere, Karagita, Sher Karuturi, Site and Kihoto.

3.2.1 Target Population and Sampling frame

The target population comprised of children up to five years of age, mothers of these children, and child care providers in daycares centres' situated in Naivasha and its environs. This comprised of an accessible population of 300 children in all day care centres which were available as shown in the table 1 below.

Table 1: Daycares

	DAYCARES	NUMBER OF CHILDREN
1.	Views	20
2.	Unity	60
3.	Kihoto	30
4.	Bashers	20
5.	Sher Karuturi	30
6.	Mathenge	40
7.	Panda daycare centre	50
8	Wambui daycare	25
9	Wa Carolyne	25
10	Kwa Jane	20
	Total	300

3.2.2 Sample size and sampling procedure

The sampling frame consisted of 300 children in 10 day care centres, in which the children's body weight and height was taken. Ten children who had been in the daycares for at least two months were randomly picked from each day care centre making a total of 100 children. The two month period was appropriate to enable precision in data collection as the diseases suffered were recurring. The mothers of the 100 selected children were then approached to give data on the children health status, and their demographic data. According to Adam & Schavaeveldt (1985), Cohen and Manion (1985) and Mungai (1995), there does not seem to be universally accepted sample size. Ary *et al* (1972) and Owen *et al* (1994) argue that a minimum sample size of 30 subjects is sufficient for comparison purposes in most studies. Kathuri and Pals (1993) states that a minimum sample size of 100 subjects in a major-group

and 20-50 subjects in a minor- subgroup could be sufficient. However, a sample should be large enough to be representative of the target population (Kathuri and Pals, 1993; Borg and Gall, 1996).

3.2.3 Data Collection

Primary data was collected by means of questionnaires and observation schedule. A total of 100 questionnaires were administered to the mothers with children aged up to 5 years that were selected from the 300 children whose anthropometric measurements were taken. The mother of each child filled questionnaires in order to provide information on the demographic data and the child's health status. Variables indicating the children's health status included recurrent disease suffered, presence or absence of injuries from play grounds, the degree and frequency of injury. Another set of questionnaires was administered to childcare providers in each day care centres to provide data on the centres time of operation and activities within the day care centres, risk mitigation measures put in place, and whether activities from adjacent areas cause interference to the day care centre. The observation schedule provided data on housing status which was indicated by the following variables ventilation, lighting, presence of mould on floor, wall & floor type, safety management. The status of play ground facilities was indicated through parameters as surface of the playground, ratio of the number of play facilities to number of children, fall zone, presence of sharp objects in the play grounds, puddles of water, maintenance. The sanitation status was indicated by the faecal matter disposal, liquid & solid waste management, cleanliness of the latrines/toilet and the materials used to build them. Secondary data on the trends of prevailing diseases among children under five from processed medical reports in the municipality was collected to validate findings from primary data collection.

3.2.4 Data Analysis

Data was analyzed by use of the Statistical Package for Social Sciences (SPSS) Version 17.A descriptive analysis was used to present the results as, percentages, measures of central tendency and frequencies. Pearson correlation was used to determine correlation significance of the influence of environmental risk on the health status of the children. The prevalence rate was calculated by taking the number of people in the population who have a disease of interest in a particular time period (Basic Statistics for Epidemiology, 2010)

[Number of cases of disease in given time period/total number in population in that time period]

Table 2: Data Analysis table

Research Question	Variables	Indicators	Data analysis methods
To investigate housing conditions and facilities/ infrastructure in the day-care centres and compare if the conditions comply with the required standard?	Housing status)	Ventilation, lighting, floor type, type of walls,	Descriptive statistics
	➤ Sanitation status	Faecal disposal, Liquid waste management, solid waste management,	
	➤ Status of the play facilities	playground surface, size, number of play facilities, height of the facilities from ground, presence of sharp objects in the play grounds, puddles of water	
What are the health conditions of children brought to the day care centres?	➤ Health status	Diarrhoea Skin diseases RTI'S Malaria Asthma Unintentional injuries	Descriptive statistics; calculation of prevalence rates for various diseases
Is there a relationship between the environmental risks and the health status of the children?	➤ Environmental Risks ➤ Health status	➤ Number of environmental risk factors ➤ Number of diseases	Pearson correlation

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Demographic Results

The mean age of the 100 sampled mothers is 28 years range (19-46). The mothers who had tertiary education was 3% secondary education were 50 % of the sample and those with upper primary were 39%, lower primary were 4%, whereas those with no formal education were 2%.The percentage of literate mothers with a minimum of primary education was 41.4 %. This was lower than the national average of adult literacy of 74% in Kenya (UNICEF, 2009) .This was an indicator to the view that low education status is linked to low socioeconomic status. Sixty nine percent of the women were married 24% single, 6% divorced and only 1% widowed. The mean income for all mothers per month was Ksh 9040. The minimum and maximum income was Ksh 3500 and Ksh 30,000 respectively. Seventy five percent of the sampled mothers were flower farm workers 12% were housewives, 8% were self employed, 3% government employees and 1% looking for a job.

Eighty five percent of the mothers rented houses while 15 % lived in company flower farm houses. The mean average rent paid was Ksh1483 while the highest rent at Ksh 3000 and minimum Ksh 400.Eighty eight percent used electricity as alighting source while 13% used kerosene lamps. Eighty eight percent lived in permanent houses, 9 % semi permanent houses and 3% in temporary houses. Forty nine percent use charcoal and kerosene as fuel, 44% charcoal only, 4% kerosene only, 2% gas, and 1% wood fuel.

4.2 Housing Status in the daycares

Most daycares 80% consisted of one room in which an average of twenty children were kept this was significantly a big number considering that this is where they carry out their activities, including cooking and sleeping. In general, the designated area for children's activities should contain a minimum of forty-two square feet of usable floor. (American Academy of Paediatrics, 2011). Children of different age brackets should be separated accordingly in order to incorporate specific activities based on their age and to minimise preventable risks. This is especially true if the older children are mixed with the infants. This was not the case in the daycares visited whereby only twenty percent of the daycares had more than one room which was detrimental to health. According to Harker (2006), the 'housing effect' is especially pronounced in relation to health. Children living in poor or overcrowded conditions are more likely to have respiratory problems, to be at risk of

infections, and have mental health problems. Children in overcrowded housing are up to 10 times more likely to contract meningitis. There is a direct link between childhood tuberculosis (TB) and overcrowding (Harker, 2006)

Twenty percent of the day cares were located near a dumpsite. It has been reported that persons who live near or on disposal sites, are prone to gastrointestinal parasites, skin disorders, respiratory abnormalities, ear & eye infections and headaches (UNEP, 2005). Ten percent were located near quarry, 50% near flower farm, and 80% near roadside. All daycares recorded foul smell dust, noise, eye irritation as an effect. Thirty percent recorded dust and noise, and insect 10% recorded eye irritation and foul smell as an effect.

4.2.1 Lighting and ventilation status in the daycares

Eighty percent of the day care visited had poor lighting with only twenty percent with enough light. The degree of lighting was such that the children could not see properly especially in the evenings (refer to plate 1). According to the Minimum Housing and Health Standards USA (1999), a housing premises shall be adequately lighted by natural or artificial light at all times, providing in all parts thereof at least 50 lux of light at each tread or floor level. This provision ensures that children in stable, long term day care arrangements are in a facility where they are exposed daily to natural light. The glass windows in a program that runs for six hours must have an area that is at least equivalent to 10 per cent of the floor area of the play activity room. According to Greiner (2008) the visual stimulation provided by a window is important to a young child's development; inadequate lighting has been linked to eyestrain, headache, and non-specific symptoms of illness. A study on school performance shows that elementary school children seem to learn better in classrooms with substantial daylight and the opportunity for natural ventilation (Heschong, 2002).



Plate 1: Captured in Kihoto day care showing lighting status.

4.2.2 Floor and walls status in the daycares

Forty percent of the day-care floors were clean and washable while 60% were not clean though washable. According to American Academy of Paediatrics (2011), day care facilities floors, walls, and ceilings should be in good repair, and easy to clean when soiled. Only smooth, nonporous surfaces should be permitted in areas that are likely to be contaminated by body fluids or in areas used for activities involving food. The hand contact and splash areas of doors and walls should be covered with a finish that is at least as cleanable as an epoxy finish or enamel paint. Messy play and activities that lead to soiling of floors and walls is developmentally inappropriate in all age groups, but especially among very young children, that are susceptible to infectious disease. This was not the case in most 60% of the daycares visited whereby most of the floors and walls were soiled and stained and hence did not comply to this requirement. Ninety percent of the daycares floors had rugs that were unsecure and could be a cause of tripping and falling. None of the daycares visited had mould on the floor or wall.

4.3 Facilities in daycares

4.3.1 Beddings

In 80% of the day cares children were kept and slept on one mattress that was placed on the floor. According to Family Day care Guidelines Australia (2008) each child who spends more than four hours a day at the facility should have an individual crib, cot, sleeping bag, bed, mat, or pad that has not been recalled for each. No child should simultaneously share a crib, bed, or bedding with any other child because respiratory infections are transmitted by large droplets of respiratory secretions, hence a minimum distance of three feet should be maintained between cots, cribs, sleeping bags, beds, mats, or pads used for resting or sleeping. Each child's pillow, blanket, sheet, and any special sleep item should be stored separately from those of other children. If the room used for sleeping cannot accommodate three feet of spacing between children, it is recommended for caregivers to space children as far as possible from one another and/or alternate children head to feet (American Academy of Paediatrics, 2011).

4.3.2 Utensils

In 50% of the daycares utensils and kitchen wares were within children's reach and could cause accidents. A study conducted by the Centre for Injury Research and Policy of The

Research Institute at Nationwide Children’s Hospital in the United States found that from 1990-2007 an average of nearly 15,000 children visited emergency departments annually for injuries received from furniture tip- over (Gottesman *et al*, 2009).This was not the case in this study as only 16% of the 100 sampled children recorded mild injuries in the day care facility.

4.4 Sanitation status in the daycares

4.4.1 Solid waste management in the daycares

Fifty percent of the daycares managed their wastes appropriately in which wastes were disposed on a daily basis, and immediately dustbins were full while another fifty percent disposed the refuse once a week and twice in a week (refer figure 4). Ideally wastes should be managed in a way that the surrounding environment is clean, because improperly disposed waste and waste that remains uncollected can be a source of contaminants and breeding sites. Such wastes contribute to diarrhoea, vector-borne disease, and the contamination of drinking water and other adverse effects to children (UNEP, 2005)

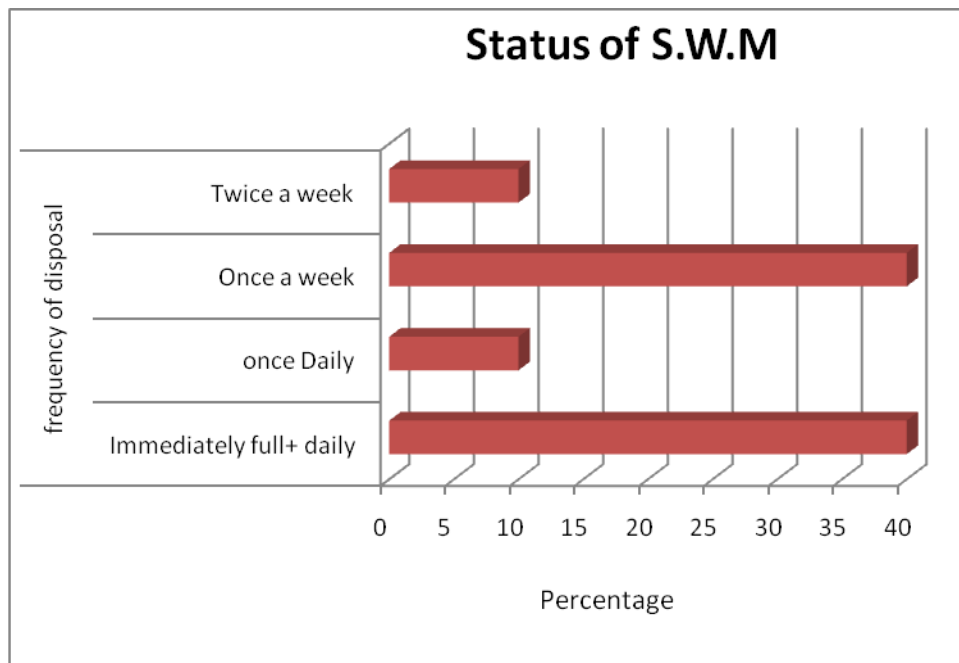


Figure 3: Solid waste management in day cares

In 80% of the daycares, waste pit location was appropriate while 20% recorded their waste bin to 5 meters away. Ideally waste bins should be designated and sited so that they are not prejudicial to health (refer plate 2) According to UNEP (2005) waste bins should be 10 metres away from houses or play vicinity. This is primarily because poorly managed waste presents a health risk to communities. Poor solid waste disposal, especially in urban areas continues to

threaten the environment and public health. This can be in the form of pollution of surface and underground water, presence of rats, cockroaches and flies and increased cases of diarrhoea diseases and intestinal parasites (Cointreau 2006; Bernado, 2008). This research work revealed that most (59%) of the children suffered from respiratory infections and diarrhoea.

The types of wastes collected from the day care were as follows: 40% food remains and sweepings, 30% pampers and sweepings, 20% were sweepings only, while 10% were food remains. UNEP (2005) asserts that the organic fraction of solid waste has potentially adverse impact upon public health and environmental quality as it attracts rodents and vector insects and affects environmental quality in the form of foul odours and unsightliness at disposal site, area surrounding the site and wherever the wastes are generated, spread, or accumulated.



Plate 2 : Solid waste strewn in the compost pit area & Entrance to a day care facility

4.4.2 Liquid waste management in the daycares

Twenty percent of daycares recorded liquid waste disposal via drainage while 80% recorded open disposal in which grey waters were poured just outside the day-care. Twenty percent had open drainages outside the facility 2 meters away. This caused the following: 60% recorded foul smell, 30% unsightliness and 40% pollution. All daycares recorded insect and vector attraction.

4.4.2 Faecal waste disposal in the daycares

The facility used to pass stool was a potty in all daycares, which was shared among the children in all the daycares. The highest sharing number recorded was ten, eight, and seven respectively. This was a significantly a big number considering that these children were still young and could contract diseases. Eighty percent of the daycares used water and soap powder in washing the potty's, 10% used water and bleaching detergent only and 10 % used

water only. This was contrary to the Standards and Guidelines for Health in Child Care Settings (Lambador, 2005), in which sanitizing routine is mandatory with freshly prepared bleach solution which should be applied/ sprayed on potty's and left for at least 30 seconds in order to kill germs. In all day care centres faecal waste was poured in pit latrines which were 5 meters away.

The latrines were shared with neighbouring houses and only 30 % had water and soap for washing hands after using the toilet (refer to figure 5). Seventy percent did not have water or soap. The absence of water around latrines was a pointer to the perception that the caregivers were not likely to wash their hands after visiting latrine. According to American Academy of Paediatrics (2011), gastrointestinal tract disease caused by bacteria, viruses, parasites, are spread from infected persons through faecal contamination of objects in the environment and hands of caregivers and children. This could contribute to health problems such, diarrhoea, cholera and typhoid fever which were common, due to faecal oral transmission. In 80% of the daycares latrine walls and floor were cemented, this was acceptable as its recommended surfaces that may come in contact with potentially infectious body fluids must be of a material that can be disinfected (American Academy of Paediatrics' 2011). Twenty percent were made of earthen floor and wooden walls and did not meet this standard.

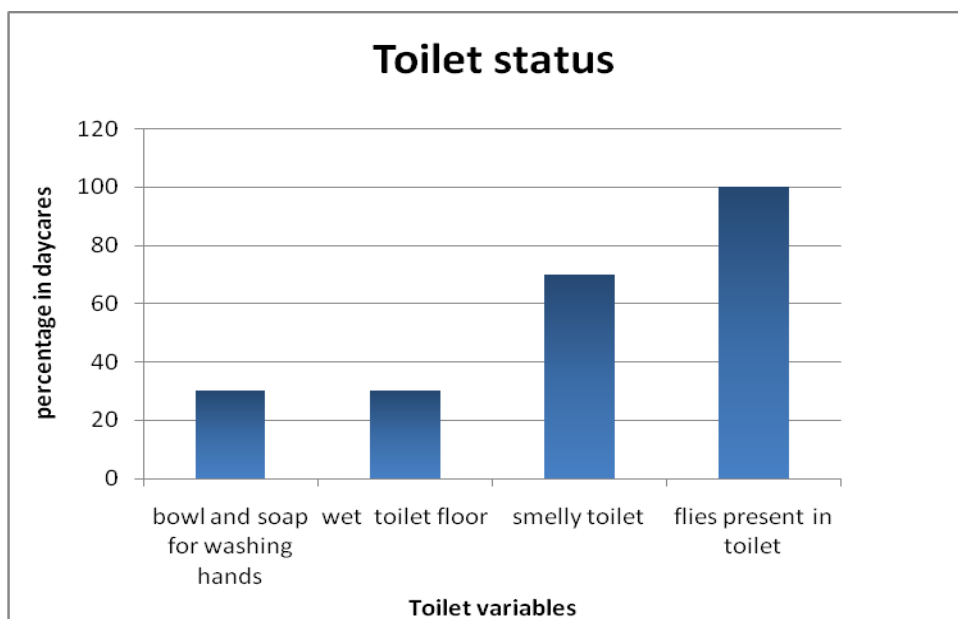


Figure 4: Toilet status in sampled daycares

4.5 Safety management

4.5.1 Communication

At least 90% of the daycares had a means of communication using mobile phone with parents contact kept by the day-care providers. Although this was a commendable aspect in communication, there was no emergency number for Ambulance, Fire Brigade, nearest hospital or alternate an effective means of emergency communication.

4.5.2 First aid kit

All daycares visited did not have a first Aid kit which is significant basic equipment in any institution. According to Fiene (2002) a facility should maintain first aid and emergency supplies in each location where children are cared for. The first aid kit or supplies should be kept in a closed container, cabinet, or drawer that is labelled and stored in a location known to all staff, accessible to staff at all times, but locked or otherwise inaccessible to children. Family Day Care Safety Guidelines Australia (2008), every home should contain a first aid kit with contents as outlined by an accredited first aid provider. In all daycares, no carer had a First Aid Certificate and none had a resuscitation chart displayed in a prominent position which is a crucial requirement in case of suffocation or choking.

4.5.3 Fire prevention and management

None of the day care visited had a fire extinguisher or kitchen blankets in case of intermittent fires (refer figure 3). All homes must have at least one working fire extinguisher installed in a reachable position. It is also vital for the day care providers to be educated about fire safety and more importantly what to do in case of a fire emergency. According to American Academy of Paediatrics (2011), every twelve months, the child care facility should obtain written documentation to submit to the regulatory licensing authority that the facility complies with a nationally recognized Fire Prevention Code. Further the facility should be subjected to continuous fire safety inspection by an inspector who is qualified to conduct such inspections.

4.6 Status of Playgrounds in the daycares

All playgrounds were open field and none of the daycares had a decent playground with play equipment as shown in plate 3 below. The areas designated for playing were an open field outside the day care facility and some on the roadside. All playgrounds did not have an under surfacing for fall heights of 500mm or more above ground level. According to Family Day Care Safety Guidelines Australia (2008) all daycares with play equipments should have under

surfacing of loose-fill material installed to a depth of at least 300mm and maintained at a depth of 250mm for fall heights of 500mm or more above ground level. These include loose-fill materials such as pine bark, synthetic covers-outs with an impact layer beneath, a number of portable mat systems that offer impact absorption. Under surfacing is designed to minimise head injury and absorb the impact of a fall. Some daycares had grass on the play area but it's important to note that concrete and grass are not considered under surfacing.

Eighty percent had rubbish, sharp objects and holes in the play area as shown in plate 3. According to child safety hand book Australia 2010 exposed concrete footings, abrupt changes in surface elevations, edging tree roots, stumps and rocks are all common trip hazards that are often found in the play environment. These pose a serious risk of injury if a child falls on them. These should be removed and an under surfacing clear of any obstacles maintained to ensure safe play. Protruding edges and components of equipment that can catch a child's clothing and potentially cause strangulation should be anchored securely at both ends so that they cannot form a loop or noose.

Eighty percent play ground had animal or human waste while 30% had water puddles (refer to figure 6). Human excreta have been implicated in the transmission of many infectious diseases including cholera, typhoid, infectious hepatitis and ascariasis. World Health Organisation (2004) estimates that about 1.8 million people die annually from diarrhoeal diseases where 90% are children under five, mostly in the developing countries.

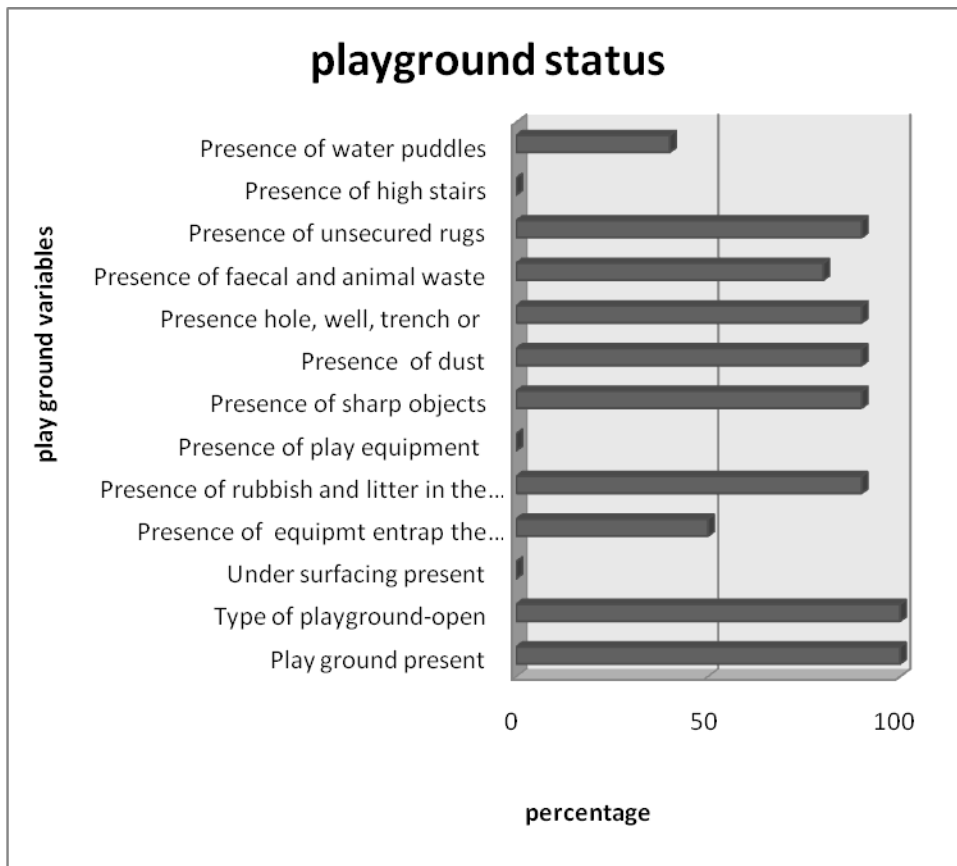


Figure 5: Summary of Playground status

Many daycares (70%) were on the road side and accessible to the driveway Research by Boothe & Shendell, (2008) indicate a relationship between outdoor air pollution and adverse respiratory effects on children. American Academy of Paediatrics, Committee on Environmental Health (2004) Suggest that exposure to air pollution is a function of proximity to roadways. Results from this study indicated that more than half (59%) of the sampled children suffered from upper Respiratory diseases which could be a contributing factor.



Plate 3: Play area and Playground surface without under surfacing

4.7 Prevalence of diseases among children in the day care centres

The average mean age of the 100 sampled children was 36 month with a range of 3-39 months. Forty five of the sampled children were male while 55 were female. Ninety eight percent were immunised and had a BCG scar as a confirmation, only 2% were not immunised. Mothers of the hundred children gave information on their health status. Results indicated that the diseases with highest prevalence rates per 100 were diarrhoea and URTIs at 60 and 59 respectively. The results are shown in table 3.

Table 3: Prevalence of diseases suffered

Diseases	Prevalence (per 100)
URTIS	59
Diarrhoea	60
Malaria	5
Ringworms skin disease	6
Ear infection	1
Meningitis	1
Measles	1

Naivasha is dusty especially in the low rainy season, the children played in dusty open ground. All day care playgrounds were open field and lack of access to clean playing grounds makes the children vulnerable to flu and coughs, and other respiratory tract infection. In addition in 80% of the daycares children were congested in one room which also makes the spread of flu and coughs spread easily. Living in close proximity to others, typically in

overcrowded urban housing, is associated with higher levels of acute respiratory infections. Young children sneeze, cough, drool, they hug, kiss, and touch everything and put objects in their mouths. According to World Lung Cancer Foundation (2010), respiratory tract infections may be spread in a variety of ways, such as by coughing, sneezing, direct skin-to-skin contact, or touching a contaminated object or surface. Respiratory tract secretions that can contain viruses (including respiratory syncytial virus and rhinovirus) contaminate surfaces and may present an opportunity for infection by contact.

In Kenya, acute respiratory infections are among the leading cause of mortality, contributing to over 70% of the deaths in children under five. In terms of lost healthy life years (measured as disability adjusted life years, DALYs), ARI is the chief cause of global ill health today because its biggest impact is in young children (Ministry of Health Kenya 2004).

Diarrhoea had the highest prevalence rate this could be attributed to low sanitation level from poor food hygiene, lack of hand washing at critical times, or even ingestion of faecal matter as children play in the grounds, which had human and animal waste. Low sanitation was indicated in eighty percent of the daycares whose liquid waste was inappropriate and caused foul smell attracting flies which are vectors of faecal oral diseases. Another aspect of low sanitation was using water only in washing pottee which were shared in 50% of the daycares by more than three children. This could be a possible cause of excreta transmission between the children by flies or fingers. In Africa, diarrhoea kills almost one in five children before their fifth birthday many childhood deaths in developing countries can be attributed to five main causes, or a combination of them: acute respiratory infections, diarrhoea, measles, malaria and malnutrition (UNICEF, 2000), which corroborates the findings of this research on most common illnesses in the day cares. A child in sub-Saharan Africa will on average have about 3-4 episodes of diarrhoea, 4-8 episodes of acute respiratory infections annually among many other health problems (Bern et al, 1992; Sikolia et al, 2002).

WHO (2004) estimates that about 1.8million people die annually from diarrhoeal diseases where 90% are children under five, mostly in developing countries. According to the 2008 Kenya Demographic and Health Survey, every child under five has an average of three episodes of diarrhoea annually. With 86 children dying every day, diarrhoea is the leading cause of death among under-fives in Kenya.

According to the Kenya Demographic and Health Survey (KDHS, 2003) Malaria accounts for one-third outpatient morbidity in Kenya, of all new cases reported. After malaria, the most common illnesses seen in outpatient clinics are diseases of the respiratory system, skin diseases, diarrhoea, and intestinal parasites. Other frequent health problems include accidental injuries, urinary tract infections, eye infections, rheumatism, and other infections. Results from this research indicated a high level of Upper Respiratory Tract infections, diarrhoea, and ringworms and malaria as highlighted by the Ministry of Health 2004. World health Organisation (2004) estimates 1.3 million people die of malaria each year, 90% of who are children under 5. There are 396 million episodes of malaria every year; most of the disease burden is in Africa south of the Sahara. Intensified irrigation, dams and other water related projects contribute importantly to this disease burden. Better management of water resources reduces transmission of malaria and other vector-borne diseases.

Kenya Demographic and Health Survey (KDHS) in 2003 expressed that 1 in every 9 children born dies before age five, mainly of acute respiratory infection, diarrhoea, measles, malaria, and malnutrition. WHO 2008 Global Burden of Disease estimates 0.94% mortality rate due to communicable diseases. Kenya Health Policy Framework 2010 estimates Infectious diseases including HIV/AIDS, Respiratory Tract Infections, diarrheal diseases and malaria accounted for over 50% of all deaths in Kenya.

In Kenya, the major causes of infant and child deaths are malaria, acute respiratory infections, diarrhoeal diseases, and several vaccine preventable diseases. These diseases are often accompanied by malnutrition. In general, acute respiratory infections cause most child deaths in Kenyan highland areas while diarrhoea, malaria and malnutrition are the major causes of death in the low lying areas of the Coast and around Lake Victoria in Nyanza province (UNICEF, 1992).

According to a report done in Naivasha by Jadili Afya (2013) The Ministry of Health raised concern about the rising cases of diarrhoea in the town. Hospital Statistics indicated that the region recorded over 57,000 cases of diarrhoea in 2012. The high numbers have been attributed to poor sanitation, lack of sewer systems and an increase of dumping sites. During the study, information from the office of the County Director of Public Health and Sanitation indicated that most affected were residents of slums. Seventy eight percent households had latrines in the county, but only seven per cent had hand-washing facilities. There were

concerns regarding rising cases of dumping, whereby eight tonnes of garbage were produced in Naivasha daily. Urban sanitation was a major challenge and stakeholders in the health docket were keen to ad- Poor sanitation blamed for rising cases of diarrhoea.

4.8 Relationship between the environmental risks factors in the day care centres and the number of environmentally related diseases among the children.

Sixty percent of the children suffered from diarrhoea, Fifty nine 59 % suffered URTIS, those who suffered from ring worms and malaria were 6% and 5% respectively. Other recorded diseases include ear infection, measles and meningitis as shown in Table 4.

Table 4 :Environmentally Related Diseases

Day care	Number of children with Diarrhoea	URTIS	Ringworm	Malaria	TOTAL
Vinecrest	6	3	0	1	10
kwa jane	7	7	0	0	14
Sher karuturi	7	5	3	0	15
Unity	8	4	0	0	12
Bashers	5	5	1	2	13
Views	6	7	0	1	14
Panda	5	5	0	0	10
Wambui	8	7	1	1	19
Mathenge	4	10	0	0	14
Mama Caro	4	6	1	0	11
TOTAL	60	59	6	5	

The total number of risk factors and the total number of environmentally related diseases per day care centre were then computed using SPSS and a bivariate correlation was done.

Table 5: Number of risks and number of children with diseases in each day care

Day care	Vine Crest	Kwa jane	Sher Karuturi	Unity	Bash Ers	Views	Panda	Wam Bui	Math enge	Mama Caro
Diarrhoea	6	7	7	8	5	6	5	10	4	4
URTIS	3	7	5	4	5	7	5	7	10	6
Ringworm	0	0	3	0	1	0	0	1	0	1
Malaria	1	0	0	0	2	1	0	1	0	0
Total diseases	10	14	15	12	13	14	10	19	14	11
Total Risk	20	21	22	20	18	22	15	31	23	22

Table 5 above shows the daycares visited the number of children suffering from various environmentally related diseases. The last column shows total number of risks in each daycare.

Table 6: Number of risks and number of children with diseases

Day care	Number of children suffering from environmentally related diseases	Number of risks
Vinecrest	10	20
kwa jane	14	21
Sher Karuturi	15	22
Unity	12	20
Bashers	13	18
Views	14	22
Panda	10	15
Wambui	19	31
Mathenge	14	23
Mama Caro	11	22

Pearson Correlation = 0.776, $p = 0.< 0.01$

The results indicated there was a significant correlation between the total number of risks to the total number of children suffering from environmentally related disease in each daycare. Table six above indicates that the day care with high risk factors recorded high number of children with environmentally related diseases and table 7 below indicates that the correlation was positive and significant $p = 0.01$ and Pearson correlation 0.776

Table 7: Correlation between the number of risks to the number of children suffering from environmentally related disease.

		RISK	DISEASE
RISK	Pearson Correlation		1
	Sig. (2-tailed)	.	0.77632211
	N		10
DISEASE	Pearson Correlation	0.776322	1
	Sig. (2-tailed)	0.008277	.
	N		10

** Correlation is significant at the 0.01 level (2-tailed).

4.8.1 Spearman's Rho Correlation between Each Risk Factor and each Environmental Disease

A correlation was done between each disease in each day care and each risk factor. The diseases considered for analysis of the correlation are as shown in table 4 and for the environmental risk factors considered in the day care centres refer appendix 5. The risk factor which was significant and positively correlated with the occurrence of diarrhoea was presence of bowl and soap for washing hands ($r=.667$, $p=0.035$). This could be attributed to presence of flies which contaminate the children's food and hence increase in diarrhoea despite washing hands. Or it could mean that despite the presence of bowl and soap, the daycare providers don't wash their hands.

The risk factor which was positively correlated and significant at 0.05 level with the occurrence of upper respiratory infections was flower farm near the day care ($r=.667$ and $p=0.035$). Flower farms are sprayed with pesticides these could have an impact due to the proximity to the children in the daycares and increase the rate of respiratory tract infections. Overcrowding was significant at 0.05 level and negatively correlated to URTIS ($r=.703$, $p=0.023$). The negative direction could be attributed to parental policing in which the day care with high number of children and better facilities did not necessarily record a big number of children with URTI. (Appendix 7).

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

The state of housing and facilities/infrastructure in the day-care centres did not wholly comply with the required standards. Those aspects which complied were solid waste disposal, location of latrines which were in most daycares ten meters away. The aspects that failed to comply with the standards were lighting status, the sharing of bedding unsafe playgrounds, and poor liquid waste disposal.

There were few safety management equipment/measures used in the daycares. All daycares visited did not have a first Aid kit which is significant basic equipment in any institution. Most daycares had a means of communication using mobile phone with parents contact kept by the day-care providers. None of the day care visited had a fire extinguisher or kitchen blankets in case of intermittent fires. They also had poor sanitizing routines

The environmentally related diseases and conditions experienced by children brought to the day care centres and their prevalence rates were as follows: Diarrhoea (60%), URTIs (59%), Ring worms (6%), Malaria (5%), Ear infections (1%), measles (1%) and meningitis (1%). The most prevalent diseases were Diarrhoea and URTIS. .

A positive correlation was established between the environmental risks factors and the prevalence of diseases in children in the day care centres. The day care with high risk factors recorded high number of children with environmentally related diseases. Diarrhoea was positively correlated with presence of faecal/animal waste in playgrounds and bowl and soap for washing hands in the latrines. URTI were positively correlated with nearness to driveway and negatively correlated with overcrowding, no significant correlations of the risk factors were established with Malaria and Ringworm.

5.2 Recommendations

In line with the research findings the following are recommendations in day care centers:

- The floors should be level and kept clean always. For cemented floors, any cracks should be repaired in good time. Similarly, for mud walls and floors daycare providers should ensure that they are regularly smeared with fresh mud and floors

smearred with cow dung to prevent the development of cracks and the generation of dust that can pose risks to the health of childcare providers and children. In all cases, efforts should be made to cement all the day care floors.

- Sharing of beds should be prohibited in day cares. Admissions should be tied to bed capacity.
- All sanitary facilities and equipment should be in the best state of serviceable and inspected regularly. Sanitisation routine with freshly prepared bleach solution applied on the surfaces for at least 30 seconds is mandatory. Potty sharing should be minimised to two children if possible.
- The access to the driveway from the house should be made difficult for a child, possibly using security doors, fencing or gates
- Pit latrines should be built at least 10 metres away from the day care facility and on the downwind side. A bowl of soap and water should be around the pit latrines to encourage hand washing.
- All daycares with play equipments should have under surfacing this include loose-fill materials such as pine bark, synthetic mats that offer impact absorption
- All daycares should have First aid kit with essentials as accredited by a first aid provider. Fire extinguishing equipment should be provided at easily accessible points and placed at each exit
- There are no specific regulations to guide those who want to set up daycare centres
The state should provide laws and regulations to govern day care facilities them.

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APPENDICES

APPENDIX 1: CONSENT LETTER

7/5/2012

Administrator of Centre

Address

RE: Permission to Conduct Research Study

Dear Sir/Madam

I am writing to request permission to conduct a research study at your institution. I am currently enrolled in Maser Environmental Science at Egerton University in Njoro, and am in the process of writing my i.e., Master's Thesis. The study is entitled Assessment of environmental risk, in Naivasha day-care- centres.

I hope that the day-care administration will allow me to recruit ten children; up to age of 5 from the Daycares centre. Due to the nature of the study, I hope to recruit guardian of these children to anonymously complete their own questionnaire

If approval is granted, participants will complete the survey in quiet setting in the daycare i.e. during recess time, lunch, after school and I kindly ask permission for use of this time. The survey process should take no longer than one hour. The survey results will be pooled for the thesis project and individual results of this study will remain absolutely confidential and anonymous. Should this study be published, only pooled results will be documented. No costs will be incurred by either your school/centre or the individual participants.

Your approval to conduct this study will be greatly appreciated. You may contact me at my email address: annkndi@Yahoo.com/ tel 0729467281

If you agree, kindly sign below to acknowledge your consent and permission for me to conduct this survey/study at your institution.

Sincerely,

Researcher: Kitheka Ann, Egerton University

Signature

Date

APPENDIX 2: QUESTIONNAIRE FOR THE SURVEY OF DAYCARE

1	Day care Name									
2	Monthly Cost per child									
3	Hour of Operation:									
4	How many children do you have in the centre									
5	Are the children kept in one room? 1. Yes 2. No									
6	If no why do you separate them_____									
7	Are babies regularly. <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 50%;">1.Played with</td> <td style="width: 50%;">1.Yes 2.No</td> </tr> <tr> <td>2.play on their own with toys</td> <td>1.Yes 2.No</td> </tr> <tr> <td>3.play with each other</td> <td>1.Yes 2.No</td> </tr> <tr> <td>4.Taken outdoors</td> <td>1.Yes 2.No</td> </tr> </table>	1.Played with	1.Yes 2.No	2.play on their own with toys	1.Yes 2.No	3.play with each other	1.Yes 2.No	4.Taken outdoors	1.Yes 2.No	
1.Played with	1.Yes 2.No									
2.play on their own with toys	1.Yes 2.No									
3.play with each other	1.Yes 2.No									
4.Taken outdoors	1.Yes 2.No									
8	What time are babies regularly taken outdoors_____									
9	Are parents encouraged, and able, to visit any time during the day? 1. Yes 2. No									
10	Do you have the rules regarding the handling of child illness 1. Yes 2. No									
11	If Yes list them									
12)	Do you feed the children 1. yes 2. No									
13)	If yes give schedule for the last 24 hours									

	Break fast	10 am Break	Lunch	4 pm break	
Day one					
Day two					

Prevailing environmental conditions in the vicinity of daycares

14)	What activities are near the Day-care facility? 1. Flower farms, 2. Garages, 3.Dumpsites 4 Roads 5. Other specify_____	
15	Do they interfere with the day care Environment? 1. Yes 2.No	
16	If yes how	

Solid waste management within the day care

17	What are the major types of solid waste from your place that have to be disposed? 1. Food remains [] 2. Grocery (vegetable) waste [] 3 Plastic paper wastes [4 Sweepings [] 6.Other (specify) _____	
18	What do you use for temporarily storing waste before disposal? Observe	
19	How often do you dispose your waste? (Tick one) 1. Immediately full [] 2. Daily [] 3.Twice a week []	

	4. Once a week []	
20	Is the SW disposal area (dumpsite/ waste pit) near the daycares housing facility? Yes [] 2) No [] (Observe)	
21	If yes, how close _____ (meters). Estimate	

Liquid waste management within the day care

22	Type of liquid waste	Disposal method (1. Open Disposal, 2. Drainage disposal)	Frequency of disposal	
	1.Kitchen liquid waste			
	2.Bathroom			
	3. Other			
23	Is the system for liquid waste disposal connected to sewer line 1.YES 2.NO			
24	Are there any drainages near the daycares housing facility? 1.Yes 2.No Observe			
25	If yes, how close _____ (meters). Estimate			
26	Observe environmental effects of liquid waste within the day-care?			
	1. Littering			
	2.Unsightliness			
	3. Foul odour			
	4. Water pollution			
	5.Encourage insects/disease Vectors			
	Other specify _____			

Faecal Matter Disposal

27	Is there provision for young children to pass stool 1. Yes [] 2. No []	
28	If yes what type of facility 1.Pottee 2. Flush toilet	

	3. Other													
29	Is this facility shared by the children . Yes [] 2. No													
30	If yes how many children_____													
31	What do you use to clean the facility _____													
32	How is the children's faecal matter disposed from the facility?													
33	Do you share your latrine/toilet with neighbours? 1 Yes 2 No													
34	Is there a bowl and soap for washing hands? 1.Yes 2.No Observe/comment_____													
35	Is the toilet/latrine cleaned 1.Yes 2.No													
36	ASK IF YOU COULD SEE IT AND RECORD HIS OR YOUR OWN DESCRIPTION NATURE OF THE TOILET IN TERMS OF <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Type of Toilet</th> <th style="width: 25%;">Location</th> <th style="width: 25%;">Wall material</th> <th style="width: 25%;">Floor material</th> </tr> </thead> <tbody> <tr> <td>1.Pit Latrine</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2.VIP latrine</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Type of Toilet	Location	Wall material	Floor material	1.Pit Latrine				2.VIP latrine				
Type of Toilet	Location	Wall material	Floor material											
1.Pit Latrine														
2.VIP latrine														
37.	How far away from the day care house is the pit latrine? _____ (APPROXIMATE DISTANCE IN METRES)													
38	Condition of the floor of toilet (please tick) <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 50%;">1.Dry</td> <td style="width: 50%;"></td> </tr> <tr> <td>2.Wet</td> <td></td> </tr> <tr> <td>3.smelly</td> <td></td> </tr> <tr> <td>4.Odourless</td> <td></td> </tr> </tbody> </table>	1.Dry		2.Wet		3.smelly		4.Odourless						
1.Dry														
2.Wet														
3.smelly														
4.Odourless														
39	Observe													

APPENDIX 3: OBSERVATION SCHEDULE

Playground status

		YES	NO
40	Is play equipment surrounded by surface material that is energy-absorbing	<input type="checkbox"/>	<input type="checkbox"/>
41	Does the equipment have any enclosed spaces that could entrap the head, fingers or limbs of a child?	<input type="checkbox"/>	<input type="checkbox"/>
42	Is there rubbish and litter in the play space?	<input type="checkbox"/>	<input type="checkbox"/>
43	Is the play equipment strong, sturdy and securely anchored?	<input type="checkbox"/>	<input type="checkbox"/>
44	Are there any sharp edges, splinters or protruding parts?	<input type="checkbox"/>	<input type="checkbox"/>
45	Presence of dust/ mud on the playground	<input type="checkbox"/>	<input type="checkbox"/>
46	Any hole, well, trench or excavation present	<input type="checkbox"/>	<input type="checkbox"/>
47	Presence of animal /people faecal waste in the playground	<input type="checkbox"/>	<input type="checkbox"/>
48	Presence of unsecured rugs	<input type="checkbox"/>	<input type="checkbox"/>
49	Presence of high stairs	<input type="checkbox"/>	<input type="checkbox"/>
50	Presence of water puddles in play ground	<input type="checkbox"/>	<input type="checkbox"/>

Housing Status & Safety management

51	Lighting	Window size	Are the windows glazed with glass to allow enough lighting and ventilation	YES <input type="checkbox"/>	NO <input type="checkbox"/>
52	Electric wiring system	Household wiring	Are all household wiring, plugs, cords and appliances in good order ? Are they guarded to prevent access by children	<input type="checkbox"/>	<input type="checkbox"/>
53	Tools, machinery and appliances	Accessibility	Are power tools, electrical appliances, machines, tools and appliances placed out of reach of children? Or are they guarded or made inoperable?	<input type="checkbox"/>	<input type="checkbox"/>
54	Floor		Is the floor smooth and clean without cracks and holes	<input type="checkbox"/>	<input type="checkbox"/>
55	Entrapments/ Strangulation	Blinds and curtains	Are blind and curtain cords secured out of reach of children	<input type="checkbox"/>	<input type="checkbox"/>

56	First aid First aid kit	Is there a first aid kit that's stocked with items as outlined by an accredited first aid provider?	<input type="checkbox"/>	<input type="checkbox"/>
57	Certification	Does the carer have a current first aid certificate?	<input type="checkbox"/>	<input type="checkbox"/>
58	Resuscitation	Is there a resuscitation chart on display in a prominent place	<input type="checkbox"/>	<input type="checkbox"/>
59	Storage	Are utensils, clean, and stored away from children to avoid accidents	<input type="checkbox"/>	<input type="checkbox"/>
60	Communications	Is there an operating telephone, or an alternate means of communication available	<input type="checkbox"/>	<input type="checkbox"/>
61	Fire prevention and management	Fire extinguisher Is there a fire extinguisher installed in the home? Have you had training in its use? Has it been maintained in compliance	<input type="checkbox"/>	<input type="checkbox"/>
62	Driveways Accessibility	Are driveways made inaccessible to children by security doors, fencing, and gates or by other means?	<input type="checkbox"/>	<input type="checkbox"/>
63	Walls	Material used for the walls is it smooth and washable without cracks and holes	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX 4: QUESTIONNAIRE FOR THE SURVEY OF MOTHERS

PART TWO DEMOGRAPHIC DATA		
71	Parent /guardian name	
72	Age of informer (years) _____	
73	Sex i) Male[] ii) Female []	
74	Highest level of education of guardian attained 1. No formal Education 2. Lower primary 3. Upper primary 4. Secondary 5. tertiary	
75	What is your occupation _____	
76	What is your house type? (please tick one) 1. Permanent 2. Semi-permanent 3. Temporary 4. other specify _____	
77	Is the house you are living in 1. Rented 2. Owned 3. caretaking 4. other _____	
78	Rent paid per month _____	
79	On average what is the family income monthly 1. Below 5000 2. 5000-10000 3. 10000- 150000 4. 20000 -30000 5. Above 50,000	
80	What is your main source of energy for heating? 1. Wood fuel 2. Electricity 3.Charcoal 4.Kerosene 5. Gas 6 Other specify	
81	What is your main source of lighting 1. Kerosene 2. Electricity 3. 4.solar 5. Other specify	

APPENDIX 5: QUESTIONNAIRE FOR CHILD ASSESMENT

82	Name of child																																		
83	Age of child																																		
84	Sex of child																																		
85	How long has the child stayed in the day care																																		
86	Current Weight																																		
87	Current Height																																		
88	Has the child ever suffered injuries from the playgrounds 1.yes 2.No																																		
89	How many times -----																																		
90	How would you degree of the injury? 1. Mild 2. Serious 3. Severe																																		
91	What are the diseases that the child suffered from in the last 2 months? Please provide details in the table below.																																		
	<table border="1"> <thead> <tr> <th>Disease suffered</th> <th>Number of times suffered in the last 2 months</th> <th>Total number of days suffered in the last 2 months</th> </tr> </thead> <tbody> <tr> <td>1. flu \$cough</td> <td></td> <td></td> </tr> <tr> <td>2.pneumonia</td> <td></td> <td></td> </tr> <tr> <td>3.diarrhoea</td> <td></td> <td></td> </tr> <tr> <td>4.malaria</td> <td></td> <td></td> </tr> <tr> <td>5.skindisease</td> <td></td> <td></td> </tr> <tr> <td>6.Asthma</td> <td></td> <td></td> </tr> <tr> <td>7.</td> <td></td> <td></td> </tr> <tr> <td>8.</td> <td></td> <td></td> </tr> <tr> <td>9.</td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> </tr> </tbody> </table>	Disease suffered	Number of times suffered in the last 2 months	Total number of days suffered in the last 2 months	1. flu \$cough			2.pneumonia			3.diarrhoea			4.malaria			5.skindisease			6.Asthma			7.			8.			9.			10			
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APPENDIX 6: ENVIROMENTAL RISK FACTORS IN DAYCARES

Risk Variables	DAYCARES									
	Vinecrest	kwa jane	Kasarani	unity	bashers	views	Panda	Wambui	Mathenge	Mama Caro
Do the children share bed	yes	Yes	Yes	Yes	Yes	no	no	yes	yes	Yes
Children kept in one room	yes	Yes	Yes	Yes	No	no	yes	yes	yes	Yes
Flower farm activities interfere with the Day-care	yes	No	Yes	Yes	No	no	no	yes	no	No
Garage activities are near the Day-care	No	No	No	no	No	no	no	no	no	No
Dumpsite near the Day-care	No	No	No	yes	No	no	no	no	no	Yes
Is waste pit near D.c	yes	No	Yes	no	No	yes	no	no	yes	No
Any drainages near the daycares	No	No	No	yes	No	no	no	yes	yes	No
Kitchen Lw disposal	yes	Yes	No	no	Yes	yes	yes	yes	yes	Yes
Effect: Encourage vectors	yes	No	Yes	yes	Yes	yes	yes	yes	yes	Yes
Effect: littering	yes	Yes	Yes	no	No	yes	yes	no	no	Yes
Distance of drainage	No	Yes	No	yes	No	no	no	yes	yes	No
Is this potty shared	yes	Yes	Yes	yes	Yes	yes	yes	yes	yes	Yes
Facility sanitised	yes	Yes	Yes	yes	Yes	no	no	yes	yes	Yes
Bowl and soap for washing hands	No	No	No	no	Yes	no	yes	yes	no	No
Distance of latrine from DC facility	No	No	No	yes	No	no	no	yes	no	No
Is the toilet clean	No	No	Yes	no	Yes	yes	yes	yes	yes	Yes
Nature of wall ok	No	Yes	No	no	No	no	no	yes	no	No
Nature of floor ok	No	Yes	No	no	No	no	no	yes	no	No
Floor wet	yes	Yes	Yes	no	No	yes	no	yes	yes	Yes
No cleaning provisions	No	Yes	No	no	No	no	no	yes	no	No
Presence of flies	yes	Yes	Yes	yes	Yes	yes	yes	yes	yes	Yes
Playground open	yes	Yes	Yes	yes	Yes	yes	yes	yes	yes	Yes
Under surfacing	yes	Yes	Yes	yes	yes	yes	yes	yes	yes	Yes

Entrap the head, finger	No	Yes	Yes	yes	No	no	no	yes	yes	Yes
Walls clean and washable	yes	No	No	no	Yes	yes	no	yes	no	No
Presence of rubbish and litter in the play space	yes	Yes	Yes	yes	Yes	yes	no	yes	yes	Yes
Presence of sharp objects	yes	Yes	Yes	yes	Yes	yes	no	yes	yes	Yes
Presence of dust mud	yes	Yes	Yes	yes	Yes	no	yes	yes	yes	Yes
Pole, well, trench or excavation present	yes	Yes	Yes	yes	Yes	yes	no	yes	yes	Yes
Presence of faecal animal waste	yes	Yes	Yes	yes	No	yes	no	yes	yes	Yes
Presence of unsecured rugs	yes	Yes	Yes	yes	Yes	yes	no	yes	yes	Yes
Presence of high stairs	yes	No	Yes	no	No	no	no	yes	yes	No
Presence of water puddles	No	Yes	No	no	No	yes	no	yes	no	Yes
Utensil	No	No	No	yes	Yes	no	yes	no	no	Yes
Lighting	No	No	No	no	Yes	yes	yes	no	no	No
Electric wiring system	No	No	No	no	No	yes	yes	no	no	No
Driveways accessible	No	No	Yes	no	Yes	yes	yes	yes	yes	Yes
Floors	No	No	Yes	yes	Yes	yes	yes	yes	yes	No
Total	20	21	22	20	18	22	15	31	23	22

**APPENDIX 7: SPEARMAN'S rho CORRELATION BETWEEN RISK FACTORS
AND ENVIROMENTAL DISEASES**

		DIARRHOE	URTI	MALARIA	RINGWRM
No. children in the centre	Correlation Coefficient	.100	-.703(*)	-.039	.067
	Sig. (2-tailed)	.783	.023	.915	.854
	N	10	10	10	10
Flower farm activities are near the Day-care	Correlation Coefficient	-.424	.667(*)	.279	.438
	Sig. (2-tailed)	.222	.035	.435	.205
	N	10	10	10	10
dumpsite activities are near the Day-care	Correlation Coefficient	.000	.268	-.050	.398
	Sig. (2-tailed)	1.000	.455	.891	.254
	N	10	10	10	10
quarry activities are near the Day-care	Correlation Coefficient	-.471		.266	.266
	Sig. (2-tailed)	.169	.231	.458	.458
	N	10	10	10	10
road activities are near the Day-care	Correlation Coefficient	-.177	.535	-.398	.050
	Sig. (2-tailed)	.625	.111	.254	.891
	N	10	10	10	10
is rubbish pit near D.c	Correlation Coefficient	.000	-.250	.279	.080
	Sig. (2-tailed)	1.000	.486	.435	.827
	N	10	10	10	10
Distance of dumpsite/ waste pit	Correlation Coefficient	.127	.156	-.004	.103
	Sig. (2-tailed)	.727	.666	.991	.777
	N	10	10	10	10
Distance of drainage	Correlation Coefficient	-.509	.117	-.500	-.522
	Sig. (2-tailed)	.126	.748	.141	.122
	N	10	10	10	10
Is this facility shared	Correlation Coefficient	-.236	-.178	-.266	-.266
	Sig. (2-tailed)	.512	.622	.458	.458
	N	10	10	10	10
bowl and soap for washing hands	Correlation Coefficient	.667(*)	.268	-.050	-.249
	Sig. (2-tailed)	.035	.455	.891	.488
	N	10	10	10	10
presence of rubbish and litter in the play space	Correlation Coefficient	-.236	-.178	-.266	-.266
	Sig. (2-tailed)	.512	.622	.458	.458
	N	10	10	10	10
presence of sharp objects	Correlation Coefficient	-.236	-.178	-.266	-.266
	Sig. (2-tailed)	.512	.622	.458	.458
	N	10	10	10	10
hole, well, trench or excavation present	Correlation Coefficient	-.236	-.178	-.266	-.266
	Sig. (2-tailed)	.512	.622	.458	.458
	N	10	10	10	10
Presence of fecal animal waste	Correlation Coefficient	-.534	-.268	-.050	.249

	Sig. (2-tailed)	.116	.455	.891	.488
	N	10	10	10	10
Presence of unsecured rugs	Correlation Coefficient	-.236	-.178	.332	.598
	Sig. (2-tailed)	.512	.622	.349	.068
	N	10	10	10	10
presence of high stairs	Correlation Coefficient	.177	-.268	-.249	.398
	Sig. (2-tailed)	.625	.455	.488	.254
	N	10	10	10	10
is floor clean and smooth	Correlation Coefficient	-.144	.073	.285	-.447
	Sig. (2-tailed)	.691	.841	.425	.195
	N	10	10	10	10
driveways made inaccessible to children by security doors	Correlation Coefficient	.463	-.522	-4.28	-.130
	Sig. (2-tailed)	.178	.122	.217	.720
	N	10	10	10	10

Correlations

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).