AN ASSESSMENT OF INJECTION SAFETY IN PUBLIC HEALTH FACILITIES IN NAIROBI

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BY

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DECLARATION

I declare that this thesis is my original work and that it has not been presented for a degree in any other university or for any other award.

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DEDICATION

I dedicate this work to: my father Eston Kaburi, my mother Beatrice Gathigia, my brothers Charles Mugo and Stephen Karimi and my sisters Winnie Nyaguthii, Mary Njeri, Esther Wanjiru and Judy Nyawira for the continuous encouragement throughout my academic life, and more so during the period of conducting this study.

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ACRONYMS AND ABBREVIATIONS

AD	Auto Disable
BBVs	Blood Borne Viruses
BCG	Bacillus Culmette Guerin
CDC	Center for Disease Control
GAVI	Global Alliance for Vaccines and Immunization
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HCW	Health Care Worker
Hib	Hemophilus influenza type B
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
KEPI	Kenya Expanded Program on Immunization
MMR	Measles Mumps-Rubella
MOH	Ministry of Health
NCC	Nairobi City Council
NGO	Non Governmental Organization
NSI	Needle Stick Injuries
PEP	Post Exposure Prophylaxis
PMO	Provincial Medical officer
SIGN	Safe Injection Global Network
TST	Time Steam Temperature
UN	United Nations
UNFPA	United Nations Population Fund
UNICEF	United Nations Children Fund
WHO	World Health Organization

DEFINITION OF TERMS

Safe injection: A safe injection does no harm to the recipient, does not expose the health worker to any risk, and does not result in waste that is dangerous to the community.

AD Syringes: These are single-use, self-locking, disposable syringes used to help increase injection safety. They are designed that way in order to prevent re-use.

Scavenging boys; this is a term used to refer to the boys who move from one dumpsite to another seeking for valuables for resale. They are also commonly referred to as "chokoras."

Injection related waste: this is waste that contains used syringes, needles, used contaminated cotton wool etc.

Sharps: any items that can cause cuts or puncture wounds; they include syringes with needles, scalpels and other blades, knives, infusion sets, among others.

Safety Boxes: Safety boxes (also known as "sharps containers") are puncture proof, impermeable containers for the safe and convenient disposal of used syringes and needles and other contaminated sharps.

ABSTRACT

Introduction and Background: Injections given in formal and informal health care settings are probably the most common percutaneous procedures worldwide. Unsafe injections are suspected to occur routinely in developing countries. World Health Organization estimates that at least 30% of the 12 billion injections administered each year are unsafe hence posing serious health risks to recipients, health workers and the public. These unsafe practices are associated with substantial morbidity and mortality, particularly hepatitis B and C and Human Immunodeficiency Virus (HIV). With the global increase in health use of injections for vaccination and therapeutic services, measures to reduce risks need to be put in place.

Objective: To determine injection safety practices in public health facilities in Nairobi.

Study design: This was a descriptive cross-sectional study conducted between November 2005 and February 2006 using a combination of quantitative and qualitative methodologies. Public health facilities within Ministry of Health or Nairobi City Council were randomly selected for the study.

Methodology: A total of 68 health facilities belonging to Nairobi City Council and Ministry of Health were randomly selected for the study. Data collection procedures included observation of available injection equipment and observation of injection administration practices. Injection providers and health cleaners who were randomly selected for the study were also interviewed for history of exposure to accidental prick injuries, vaccination status, knowledge and the kind of protective gear they were provided

with. Through focus group discussions with scavenging boys and private garbage collectors and observations of selected dumping sites, information regarding presence of inappropriately disposed injection related waste in the common dump sites was collected. This was augmented by a visit to the dumpsites.

Findings: All the facilities included in the study were using disposable syringes and auto disable syringes for therapeutic injections and immunization injections respectively. About 17.6 percent of the facilities lacked safety boxes in stock, 12.3 percent lacked safety boxes in the injection rooms, and 8.8 percent had expired syringes. Only one facility lacked syringes and needles. The most common method of sharp disposal was burning in a pit or in an enclosure which was being used by 38 percent of the facilities. Of all the facilities included in the study, 32 percent of the facilities were transporting the sharps for offsite treatment, 16.2 percent were burning sharps on an open ground while 1.5 percent reported throwing the sharps in a pit latrine. Only 11.8 percent of the facilities had an incinerator. Inappropriate disposal of sharps was evident in 58 percent of the health facilities. About 16 percent of the injection providers and 15.2 percent of health cleaners reported accidental prick injury in the year preceding the study. Of those who had needle stick injuries, only 2 out of 11 health workers and 2 out of 9 health facility cleaners went for HIV prophylaxis. Most of the scavenging boys and private garbage collectors recounted being pricked several times by used needles that were found disposed in common dumping sites.

Conclusion:

The study found that most of the health facilities were adequately supplied with necessary injection equipment; all the health facilities were using sterile equipment for injections. It was also found that facilities offering therapeutic injections were more likely to lack safety

boxes compared to facilities offering immunization injections. Health care workers were found to be at risk of blood borne infections resulting from unsafe injections. Inappropriate disposal of injection related waste from health facilities and consequently putting the community at risk of contracting blood borne infections was also noted to be widespread. These findings are an awakening call to the health authorities of the dire need of integrating modern intervention that have been proven to be effective across programs rather than implementing vertical programs such as immunization programmes

Recommendation:

Ministry of Health and NCC should put measures in place to ensure that there is continuous availability of sterile injection equipment including safety boxes in each health care facility including those not offering immunization. The occupational safety of health care workers should be adequately addressed to minimize the risk of blood borne infection. This is through appropriate training to increase the knowledge and practice of safe disposal; provision of post-exposure prophylaxis against HIV/AIDS, and vaccination against hepatitis B. Mechanisms to appropriately dispose off 'sharps' (i.e. needles and syringes) should be put in place so as to minimize the risk of accidental needle-stick injuries. This should include setting up a waste management system for the safe disposal of sharps and especially promoting strict compliance with waste segregation at the source. Facilities for safe handling and disposal of injection related waste should therefore be improved or created where they do not exist.

CHAPTER 1

1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

Injections given in formal and informal health care settings are probably the most common percutaneous procedures worldwide. World Health Organization (WHO) estimates that at least 12 billion syringes are sold each year for injection purposes, and that approximately one billion injections are given yearly in the course of childhood vaccination programs[1]. World Health Organization also estimates that at least 30% of the 12 billion injections administered each year are unsafe hence posing serious health risks to recipients, health workers and the public[2].

While the primary objective of therapeutic or vaccination injection is to prevent illness and deaths, the overriding concern of any public health intervention must be to "do no harm." If not properly administered, injections have the potential to transmit blood borne infections. World Health Organization (WHO) defines a safe injection as one that results in no harm to the recipient, no harm to the injection provider or other health personnel, and no harm to the surrounding community[3]. Review of available evidence from many developing countries shows that, injection overuse and unsafe injection practices account for a substantial proportion of the new infections with Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV)[4]. The highest numbers of infections from unsafe injections occur in Asia and Sub Saharan Africa, where the prevalence of pathogens is high and injection safety is poor. World Health Organization estimates that unsafe injections transmit 8-16 million Hepatitis B virus infections, 2.3-4.7 million Hepatitis C infections, and 80000-160000 HIV infections each year. Unsafe

injections also transmit parasitic infections such as malaria, fungal, bacterial and other types of infections[5].

Early last century, it became clear that in industrialized countries, unsafe injections, can lead to transmission of blood borne infections. Consequently, infection control policies, guidelines and practices to enhance the safety of patients, health workers and the community have been widely researched implemented and evaluated in high-income countries. As a result, the risk of nosocomial infections due to unsafe injection practices in these high-income countries is extremely low. On the contrary, in low-income countries, unsafe injection practices are comparatively common, placing the patients, health workers and the community at risk of infection with blood-borne viruses such as HBV, HCV and HIV.[6] Patients are at risk because both single-use disposables and re-usable needles and syringes are re-used, and the methods employed to clean and sterilize the equipment between patients are often sub optimal, if used at all. Improper disposal of used injection equipment presents a risk of infection and an environmental hazard to individuals and local communities. Poor management of health-care waste exposes health-care workers, waste handlers and the community to infections, toxic effects and injuries. In addition, it creates opportunities for the collection of disposable medical equipment (particularly syringes), its re-sale and potential re-use without sterilization.

Against this background, a health facility survey was conducted to determine the extent of unsafe injection practices in public health facilities in Nairobi. This study assessed the injection equipment supply, injection practices and disposal of injection related waste. It further assessed the risk of accidental needle stick injuries among the vulnerable groups such as the health facility cleaners, garbage collectors and scavenging boys who frequent disposal sites. This study was conducted in randomly selected public health care facilities in Nairobi using both quantitative and qualitative methods. Data was collected through

observation for availability of equipment and supplies, observation of injection practices, interviews with injection providers and health facility cleaners as well as focus group discussions with scavenging boys in various dumping sites in the city and garbage collectors from a private garbage disposal company.

Recommendations following the survey focus on interventions that promote injection safety. It is expected that the findings will help design, monitor and evaluate effective and efficient injection safety intervention programs.

Chapter 1 gives the introduction and background to the study. Chapter 2 examines the literature review of previous studies relevant to this study. Chapter 3 and 4 outlines the problem, justification and objectives of this study while chapter 5 outlines the methodological design and approach used for the study. Chapter 6 presents the findings from the health facilities observations, injection provider and health facility cleaners' interview and findings from the focus group discussion with scavenging boys and garbage collectors. Chapter 7, 8, and 9 outlines the discussion, conclusion and recommendations respectively.

1.2 Background

1.2.1 Historical Background

Early last century, it became clear that in industrialized countries, unsafe injection could lead to transmission of blood borne infections. In 1917 an outbreak of malaria among soldiers was linked to injections used for treatment of syphilis in Britain[7]. In 1945, a memorandum from the United Kingdom Ministry of Health concluded that viral hepatitis following injection was "communicated" by traces of blood transferred on syringes and needles from patient to patient. An outbreak of jaundice following injection campaigns in the 1940s and 1960s among Royal Air Force Service men who received multiple immunizations, clearly linked infections with injections for which syringes were re-used after changing the needle only[8].

Many studies have also linked HBV, hepatitis C, and HIV[9-15] outbreaks to unsafe injections. Other infections reportedly linked to unsafe injections include an outbreak of hemorrhagic fever in 1976 in Zaire caused by emerging Ebola virus[16]. This Ebola outbreak was linked to unsafe injections given at a hospital where the index patient had been treated for fever with injectable drugs.

1.2.2 Injections Demand and Magnitude of Unsafe Injections

WHO estimates that currently, over 12 billion injections are administered annually[1]. Widespread use of injections in low-income countries is promoted by the perception that they are more effective than oral medication. Health care workers are also influenced by the fact that compliance is better with injections than with oral medication. For these reasons, the use of injections in low-income countries is a common practice[17]. The estimated number of injections per person per year amongst samples in low-income

countries ranged between 1.2 (in Tanzania and India) and 8.5 (in Pakistan), with a median of 1.5 injections per person per year[9].

The formation of the Global Alliance for Vaccines and Immunization (GAVI), which supports immunization efforts worldwide with the purpose of helping countries to strengthen immunization services and introduce new and under-utilized vaccines, has greatly improved the vaccination coverage in many countries in Africa. However this initiative has increased the number of injections among children. In Kenya, for a child to be fully immunized he/she will have been injected five times (three pentavalent injections, one BCG and one measles injection). The vaccination coverage rate in Nairobi is over 63% and in the year 2004, there were over 90,000 children aged below one year who were on KEPI vaccination schedule[18]. In addition, hepatitis vaccine is now in use in half of the developing countries. Acceleration of special activities that aim at elimination of maternal and neonatal tetanus and better control of measles has also led to additional use of injections hence leading to a significant proportion of health care interventions given to children and pregnant mothers in form of injections.

Information from World Health Organization (WHO), United Nation Children Fund (UNICEF) and United Nations Population Fund (UNFPA) consistently highlights the widespread occurrence of un-sterile injection practices[3]. WHO also estimates that at least 30% of the 12 billion injections administered each year are unsafe, posing serious health risks to recipients, health workers and the public[2].

Although there is evidence that immunization injections are safer than curative injections, several reports from countries in Sub-Saharan region, Asia and the Middle East estimated that 31% to 90% of childhood vaccinations were unsafe[19]. Besides, during the mass

measles immunization campaigns that have become quite common in Kenya, many injections are given outside health facilities setup. In most setups there are no appropriate infrastructures for the disposal of used syringes and needles used during the mass vaccination campaigns.

1.2.3 Policies and Strategies towards Injection Safety

In March 1998, in recognition of the effects of unsafe injections, WHO developed a policy to promote safety for all types of injections [20]. The aim was to develop and implement policies and programmes in collaboration with countries and other partners, which would raise awareness on unsafe injection practices. This would ensure safe and rational use of injections, and reduce death and diseases spread by unsafe injection practices.

WHO convened a Safe Injection Global Network (SIGN) which aimed at promoting safe and appropriate injection use of injection worldwide by acting as a catalyst in the transition to safe injection practices. SIGN associates include UNICEF, UNFPA, CDC, USAID, NGOS, governments and industry groups. The culmination and deliberations of SIGN led to an Aide-Mémoire for a national strategy for the safe and appropriate use of injections[21]. Among the recommended activities in implementing the strategy are:

- Conduct an initial assessment
- Secure governments' commitment and support for the safe and appropriate use of injections
- Establish a national injection safety coalition, coordinated by the Ministry of Health
- Develop a national policy and plan

- Develop a systematic strategy for behavior change among patients and healthcare workers to decrease injection overuse and achieve injection safety
- Ensure the continuous availability of injection equipment and infection control supplies
- Set up a waste management system for the safe disposal of sharps
- Monitor the impact of activities on injection frequency, safety and injection-associated infections

As a follow-up to the Aide-Mémoire; WHO, UNICEF, UNFPA and the International Federation of the Red Cross and Red Crescent Societies (IFRC) called for the exclusive use of the auto disable (AD) syringes in immunization programmes by the end of 2003 as a strategy for eliminating the re-use of injecting equipment. Since AD syringes can only be used once, they prevent transmission of blood borne pathogens among clients. Their exclusive use in both mass campaigns and routine immunization services virtually eliminates the risk of infection between vaccine recipients. This approach to achieving injection safety was met with criticism that the exclusive use of AD syringes in immunization programmes in low-income countries was expensive in the long term in addition to having little impact on injection safety overall since 95% of injections were for curative services. Other factors such as the availability, affordability and quality of the supplied injecting equipment are also critical if injection safety in low-income countries is to be fully realized. Members were in agreement that the development of an appropriate technology (such as AD syringes) was only a small part of the response required[22]. However, they adopted the policy specifying that all supplies for immunization programs be "bundled" with AD syringes and safety boxes. The term "bundling" was chosen to define the concept of a theoretical "bundle," comprising of: high-quality vaccines, AD

syringes, and safety boxes[3]. The implication is that none of the component items can be considered alone but as part of the other two with all the three components included in the budget.

In 2004, Kenya developed a National Injection Safety and Health Care Waste Management Policy that aimed at ensuring safe injection practices and proper management of health care waste. The strategies to achieve these objectives included: advocacy and behavior change communication to the community, training of health care workers and communities, waste management, human capacity development, strengthening of the logistic management systems, appropriate financial mobilization and information systems strengthening for monitoring and evaluation[23]. Making Medical Injections Safer (MMIS) Kenya, a project funded by USAID to improve safety of medical injections in Kenya, is collaborating with EPI, the family planning program, National Sexually Transmitted Infections Control Program, TB and leprosy program, and the malaria program to ensure that essential drug programs supply syringes, needles, diluents, and safety boxes in quantities matching supplies of injectable medications.

MMIS through the MOH provides support for sustainable approaches for injection safety, including: training, support, and capacity building in order to ensure only safe and necessary injections are provided in health facilities. They also promote safe injection commodity management in order to improve the availability of safe injection equipment (syringes with re-use prevention and/or safety boxes), advocacy and behavior change, sharps waste management, and monitoring and evaluation toward the overall goal of preventing new infections of HIV and hepatitis B and C. MMIS initiated this support in a few selected districts outside Nairobi with a view of scaling up to the whole country.

1.2.5 Disposal of Sharps

While the use of AD syringes and safety boxes greatly reduce the risk of person-to-person transmission of blood borne pathogens for recipients and health care workers, they obviously increase the generation of injection waste[24]. The safe disposal of such waste is now widely recognized as a critical component of injection safety. However, finding an ideal method of disposing injection waste that suits every situation still remains a challenge.

Three methods commonly used in developing countries for the safe disposal of used injection equipment are burying, burning, and incineration. A major obstacle to finding appropriate injection waste disposal methods is often the lack of adequate financial resources for waste management in health programs. Given the high cost of incinerators, their use at the periphery levels remains suboptimal.

According to the Kenya Service Provision Assessment of 2004[25], only 64% of assessed facilities in Nairobi were found to have adequate health care waste disposal system. According to the survey, burning of waste in an incinerator was used by 51% of the facilities. This was followed by removal of waste for offsite treatment, which was used by 21% of the facilities, throwing in an open pit latrine and in an open trash was used by 13% and 14% of the health facilities respectively. However, the study had included private and NGO facilities, which were documented to have better waste disposal systems than government facilities.

Currently, Nairobi is among the cities experiencing problems of solid waste management. The fast population growth, lack of proper managerial inputs and misappropriation of funds are major contributing factors to the problem of waste management in the city[26].

Consequently, indiscriminate dumping and heaps of uncollected waste are rampant in the city. This solid waste often contains hospital waste including sharps which pose danger to the community especially human scavengers who frequent the dumping sites in search of valuable for resale. To make it worse, most of the dumping sites are located in the slum areas where most of the urban low-income earners live. In a setup where segregation of health care waste is not rigorously enforced, it is possible that contaminated needles and syringes find their way to the common dumpsites posing danger to the community[26].

1.2.6 Health Care Delivery

The health sector in Kenya is comprised of the public and private sector with major players being the MOH, parastatal organizations, local authorities, NGO and FBO. Overall, the public sector facilities account for about 51 percent of the health facilities in Kenya. Review of public health expenditure and budgets show that the Government's total spending on health constitutes about 8 percent of the total expenditure which is way below the commitment to spending 15 percent of the total revenue on health, as agreed in the Abuja declaration[27]. The under-financing thus reduces the ability to ensure an adequate level of service provision to the population.

Health service delivery is usually by MOH, Nairobi City Council (NCC), Non Governmental Organizations, mission and the private institutions. The MOH and Nairobi City Council facilities account for 40% of all health facilities in Nairobi[28]. There are 90 public health facilities that belong either to the Ministry of Health (MOH) or Nairobi City Council giving a concentration of 1.9 facilities per 10,000 people.

A Nairobi Health Management Board to oversee management of all public health facilities apart from Kenyatta National Hospital, Mathare Mental Hospital, Spinal Injury Hospital

and Pumwani Maternity hospitals was inaugurated in 2005. The board's mandate is to provide quality, accessible and affordable health care to an estimated 3.4 million Nairobi residents, while decongesting Kenyatta National Hospital and Pumwani Maternity Hospital by making the health care delivery system in the city functional. This is because the funding of health services in Nairobi depended on the ability of the Nairobi City Council to collect rates, rents and parking fees, amongst other revenue generating resources for the council, which was inadequate and thus jeopardizing the health of the city's over three million residents. Up to date, the board is still not autonomous and hence not able to mobilize the resources to manage the health facilities. However, NCC health facilities get their supplies from Kenya Medical Supplies Agency (KEMSA), which is under the Ministry of Health.

CHAPTER TWO

2.0 LITERATURE REVIEW

This section reviews the literature related to unsafe injection practices. The studies are reviewed systematically, beginning with a review of the prevalence of unsafe injections. This is followed by a critical review of studies on epidemiology, practices and prevention of sharp injuries among health care workers and, finally, a review of hospital waste management practices.

2.1 Prevalence of Un-Sterile Injections

The use of injections in low-income country health settings is a common practice. In many low-income countries there is a perception that injections are superior (more efficacious and faster acting) to oral medication[17, 19].

In Uganda, a trend by families to keep needles and syringes at home for use when a family member requires an injection was found to be common. This practice was found to be motivated by the belief that it is safer to share injecting equipment with family members and friends than it is to use the injecting equipment provided by public hospitals where strangers, who possibly have HIV infection, are treated[29].

Poor sterilization procedures and re-use of syringes and needles has been blamed for the transmission of infections. In Swaziland and Côte de'voir, there were reports of re-use of disposable syringes despite availability of injection equipment. In these countries none of the surveyed health centers used TST (Time Steam Temperature) indicators, and in many centers the injection equipment was boiled instead of being sterilized[2]. Similarly in a study conducted in health facilities to describe prevailing administration and sterilization

practices in Mwanza, Tanzania,[31] overall contaminated syringes and needles was found in 40% of health facilities. The lowest cadre of staff was found carrying out sterilization without any supervision. Improper sterilization was found in 61% of dispensaries, 30% of health centers and 33% of hospitals. The study also found out that syringes and needles were reportedly inadequate in a number of health facilities.

Studies conducted by WHO between 1989 and 1994 showed that unsafe injection practices were wide spread in West and East Africa. For example, in West Africa in 1989 the annual rate of injection-associated abscesses was 231 per 100,000 persons. This was attributed to poor sterilization practices where syringes and needles were occasionally boiled and sometimes only "sterilized" by placing in a disinfectant[30]. In East Africa in 1994, 37% of households had at least one member who had developed an abscess following an injection[4]. Similar surveys conducted between 1997 and 1998, found out that injection associated abscesses were reported in 40% of health centers in Swaziland (where only disposable syringes and needles were used) and 55% of health centers in Chad (where a mixture of disposable and sterilizable syringes were used)[2].

In Uganda, as a consequence of the popular concern with the spread of HIV, personal appropriation of needles and syringes was found to be common. In the study, 63% of the 360 households included in the study kept needles and syringes at home in Busoga. Use of the same equipment on multiple patients was observed in over 50% of the health facilities. Use of the same needle was common practice especially among siblings. A mother would present only one set of injection equipment for use on more than one of her children. This practice was most common among health seekers in government health centers. With respect to sterilization, the study found out that sterilization of equipment was not confined to institutions; instead the provider facilities required the users to sterilize their

equipment at home before and after visiting the facility. However, interviews with patients at the provider facilities indicated that boiling of the equipment was not actually done by many patients. The providers knew this fact but they continued using the same equipment without boiling. In the same study some providers especially those from the private facilities were in the habit of moistening the needle before injecting with the aid of water soaked cotton wool. They claimed that this assisted in removing dirt, which the wrapping material may have imparted on the needle[19].

According to the WHO report of the annual meeting of Safe Injection Global Network in the year 2001, the proportion of injections re-used in absence of sterilization globally was 40%. Also in the report, re-use of syringes and needles was high in Asia, which accounted for 92% of the 7.5 billion injections given annually with equipment re-used in absence of sterilization in the world. Similarly, sterilization was not regularly documented with Time, Steam and Temperature (TST) spots and only 55-88% of health facilities used sterile equipment for injections[32].

Lack of equipment coupled with poor maintenance of sterilization of the same has also been found to contribute to injections being unsafe. In a National injection safety assessment conducted in Nepal in 2001 using a WHO standardized tool, use of pressure sterilization was common but gaskets were found leaking and no timers were observed. Though the one syringe one needle and one-shot policy was observed, other safety procedures were not always implemented[33]. Another survey conducted by General Welfare Practisthan found almost the same results; the team discovered that though there was no problem with vaccine supplies, there was a major problem with regular supply of other required materials, especially replacement parts, syringes, needles, and fuel for sterilization. Almost every provider interviewed reported lack of sufficient kerosene and

this ubiquitous problem seriously compromised the safety and effectiveness of EPI throughout Nepal. Vast majority of immunizations were being given with sterilizable syringes and needles. Steam sterilizers were used extensively, though in many venues they had broken down with no spare parts. Health Care Workers would boil injection equipment for 20-30 minutes but even then, they had problems of lack of fuel[34].

2.2 Occupational Risk of Infections through Injections

Health care workers in developing countries are at serious risk of infection from blood-borne pathogens particularly HBV, hepatitis C virus (HCV) and HIV because of the high prevalence of such pathogens in most poor regions of the world[5, 6,9]. For more than a decade, the Center for Disease Control has recommended that used needles should not be recapped and should be placed in puncture proof containers[35,36]. Comparable recommendations were adopted in Canada by Laboratory Center for Disease Control[37]. In the United Kingdom, it has been recommended that a used needle should not be recapped unless there is a safe means of recapping[38].

Despite the above efforts studies, show that occupational needle stick injuries are prevalent. A study conducted by Centers for Disease Control (CDC) to describe the frequency of work related exposures to HIV infected blood and reporting of exposures among medical staff reported that 90% of respondents recalled accidental exposure to HIV blood. The study found that least 69% of the respondents recalled having at least one needle stick injury during their training[39].

A descriptive study on causes of needle stick injuries carried out at the university hospital of Virginia in 1986 found out that one third of injuries were related to poor disposal of used needles. Recapping of needles has been reported to be the most common mechanism

of injury from disposable syringes[40]. In a descriptive study to explore the frequency of exposure to needle stick injuries among HCW in Egypt, of the 1485 interviewed, 529 (35.6%) were exposed to at least one needle stick injury during the past three months with an estimated annual number of 4-9 needle prick per worker. The most common behavior associated with this kind of injuries was two-handed recapping. Overall, 64% of HCW disposed off needles unsafely in a non-puncture-proof container[41].

In a study conducted in Jordan between 1993 and 1995, 248 Hospital Care Workers had needle stick injuries and sharp injuries. In the study 11% of the injuries occurred during recapping, 10.5% during needle disposal, 12.5% during garbage collection and 5% were caused by neglected needles[42]. A similar study on epidemiology of needle stick injuries among HCWs in two German hospitals indicated that 500,000 needle stick injuries (NSI) occur annually in Germany. Most of these injuries occur during disposal of used needles and syringes and recapping[43].

According to a WHO report on immunization safety in the year 2002; needle stick injuries were reported in Ghana by 80% of health workers in the preceding 6 months; 60% of health workers were observed to be recapping needles; 60% of health facilities used safety boxes; and there was supervised burning at only 52% of health facilities. In a similar study in Mexico 28% of health workers had unintentionally pricked themselves with a needle[44].

In Kenya few studies have been published on injection safety. A study of 214 nurses in Nairobi found out that 61% needle stick injuries occurred among health workers in a 3 months period. Of the 61%, half of them were due to recapping and 12 % occurred during disposal[23].

Interventions to reduce incidences of needle stick injuries have been studied for their effectiveness. Teaching the one-handed, scooping-re-sheathing-recapping technique was effective in reducing the risk of recapping-related needle stick injuries in one study[45]. Studies have also estimated that unsafe collection of sharps causes between 5% and 28% of the injuries[45, 46]. The presence of sharps containers close to the point of use has been found to reduce the incidence of recapping and of recapping-related needle stick injuries[47].

2.3 Hospital Waste Disposal

The safe disposal of hazardous waste is now widely recognized as a critical component of injection safety. Unsafe collection of used syringes and needles poses danger to the health care workers and also the public. A WHO assessment of selected developing countries found that only 5% of facilities have a waste management policy. In Ghana supervised burning was found only in 52% of facilities[48]. Similarly in Tanzania, unsafe disposal of needles, syringes, and safety boxes and lack of awareness were noted. In Senegal and Côte d'Ivoire presence of used syringes and needles in the neighboring areas was observed in 10% and 70% of facilities respectively[32].

In a study conducted to evaluate the current status of hospital waste management in Bangladesh through observation and in-depth interviews of waste pickers and local residents, it was evident that satisfactory hospital waste management was severely lacking. There were no policies, laws or regulations present; waste was generally dumped in public places such as hospital surroundings, roadside or city corporation dust bins. Health care workers were noted not to perceive handling of medical waste as hazardous work[49].

Few studies have assessed the risk to the community from disposed needles and syringes. In a study done in Karachi, Pakistani to evaluate the risk to the community of infection

with blood borne pathogen all sweepers and scavenging boys who were interviewed said that used syringes are sold to dealers in a particular part of the city. Ten dealers of medical waste and eight dealers of used syringes confirmed buying syringes from sweepers of medical waste and scavenging boys reportedly sold them to industries for remolding. It was feared that some of the unclean syringes find their way into the hands of unsuspecting public[32].

In Nepal, disposal of contaminated medical waste, including disposable needles was found to be a serious problem. While providers were aware that they should handle and dispose of this waste carefully, it was rarely done. Instead, used equipment were tossed into a field or simply thrown out of the window of a clinic[33]. In Uganda, used needles and syringes were left littered on the floor and tables of the injection rooms. Only a few health units had waste bins. The urban provider facilities dumped this waste in communal skips where rubbish is scavenged. In semi-rural and remote facilities, final dumping was in the banana garden or a placenta pit where available. But in most instances, used needles and syringes were never disposed of and instead the providers gave them to the users to carry home for use in subsequent visits[29].

According to WHO, results of an injection safety assessment of 2001 showed that of all the African countries assessed, safety boxes were found in 60% of facilities while syringes were recapped using a two-handed technique in 54% of facilities. Contaminated sharps were found in the surrounding area in 50% of facilities and only 5% of facilities had a health care waste management policy[32].

The disposal of hospital waste takes different forms varying from one health institution to another with some having incinerators of their own, others burn hospital waste in their

compounds and others dump it in the city council dumping grounds. According to the Kenya Service Provision Assessment of 2004, only 64% of assessed facilities in Nairobi were found to have adequate hazardous waste disposal system.

2.4 Policy on Injection Safety

Implementation of injection safety has been associated with improvement of injection safety in some countries. An evaluation of the impact of National Drug Policy on injection safety in Burkina Faso found a dramatic improvement in injection safety. Compared to widespread re-use of injection equipment that was found in 50% of health facilities in 1995, re-use of equipment was found in only 4% of health facilities in 2000[50].

A survey of selected African countries in 1997 and 1998 showed that comprehensive injection policies were uncommon[2] with even those countries with injection safety policies not implementing them. In Cameroon, Chad and Uganda where the policy was to use only sterilizable syringes for routine immunization, different technologies were used in health centers. Although official policy in Senegal recommended the use of sterilizable syringes, many immunization injections were actually given with standard disposable syringes. In Burkina Faso where the official policy was to use a sterilizable syringe, assessments indicated that only 17% of health facilities used sterilizable injection equipment for EPI, while the majority (83%) used both sterilizable and disposable syringes. Even after the joint WHO/UNICEF bundling policy, Botswana, South Africa, and Zimbabwe did not adhere to the bundling policy and they used disposable syringes (locally produced in South Africa) for their measles campaign in 1998[51].

In conclusion, this review has highlighted the contribution of unsafe injection practices to blood-borne viral disease transmission in low-income countries, and the consequent need

for widespread promotion of injection safety messages amongst consumers and providers of health care services. Issues contributing to the problem are complex and include socio-cultural, economic and structural factors. The review has highlighted that the most prominent factors contributing to unsafe injections include: over prescription of injections, inadequate supply of injection materials leading to re-use of injection equipment without sterilization and lack of adequate facilities for collection and disposal of injection wastes.

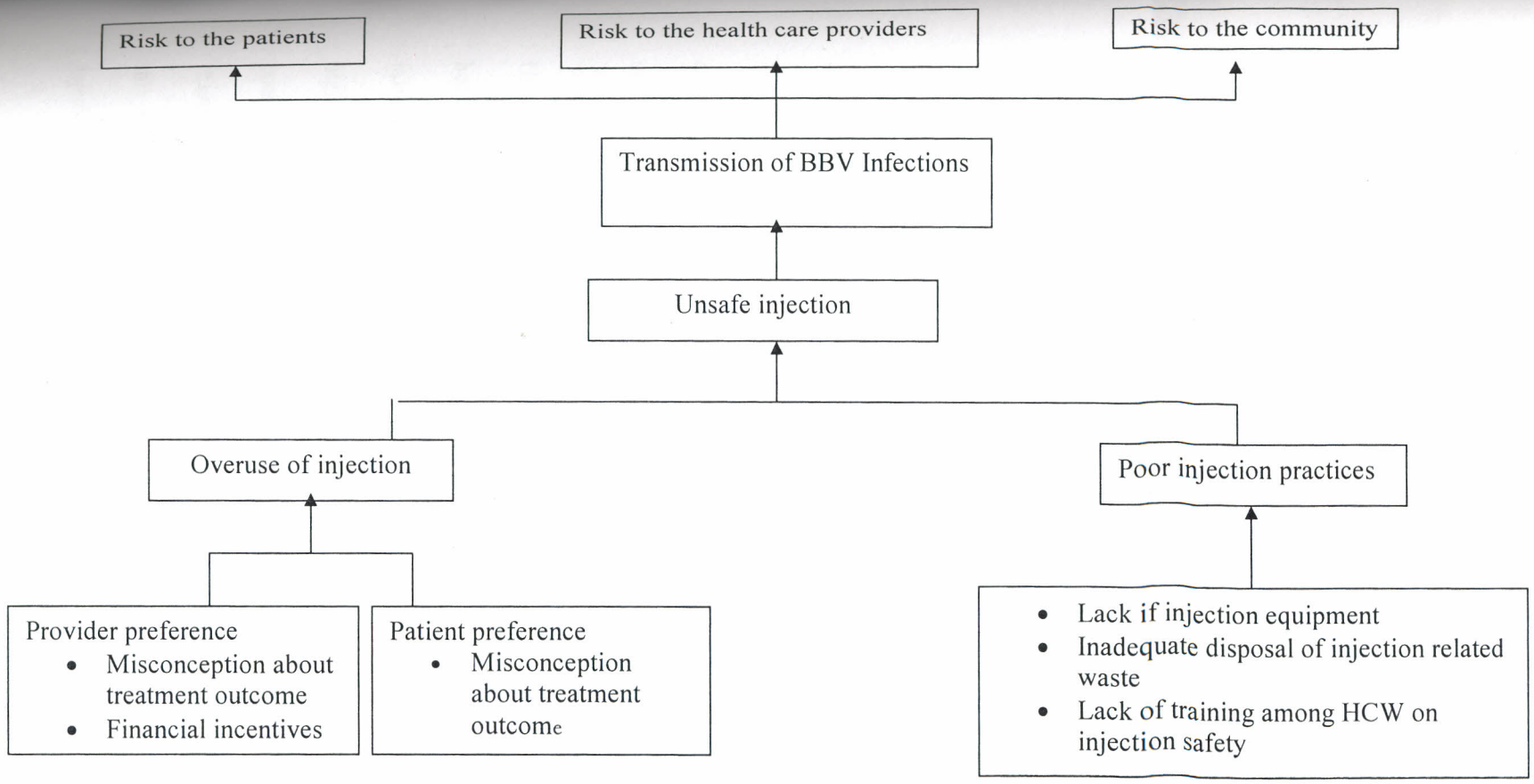

Figure 1: conceptual model for transmission of infections through unsafe injections

CHAPTER THREE

3.0 PROBLEM STATEMENT AND JUSTIFICATION

3.1 Problem Statement

Unsafe injection practices coupled with the popular and sometimes unnecessary use of injections in low-income countries is a complex public health problem that may be contributing to the burden of preventable blood-borne viral diseases including HIV infection. In low-income countries, unsafe injection practices are comparatively common; placing both patients and health workers at risk of infection with BBVs such as Hepatitis B (HBV), Hepatitis C (HCV) and Human Immuno-deficiency Virus (HIV)[9]. In many developing countries, the high demand for injections is derived from the belief that they are more effective than other forms of treatment. The limited availability of financial resources in the countries' health sectors affects their capacity to purchase and maintain an adequate supply of appropriate injection equipment. Coupled with poor distribution and stock management of injection equipment, this could usually result in unavailability of injection equipment in public health facilities.

Unsafe injection practices place not only patients at risk of infection with BBVs, but also health workers. Clearly, health care workers in developing countries are at serious risk of infection from blood-borne pathogens particularly HBV, HHCV, and HIV because of the high prevalence of such pathogens in many poorer regions of the world coupled with poor infection control standards. In low-income countries, access to educational resources and opportunities for ongoing professional development is often limited and this may eventually lead to inadequate awareness regarding risks and appropriate injection practices.

While the use of AD syringes and safety boxes has greatly reduced the infection risk within health facilities, their use has created another serious problem: the generation of large volumes of used needles and syringes that must be safely disposed off in order to prevent infection risk to the community. According to the Kenya service provision assessment of 2004, only 64% of assessed facilities in Nairobi were found to have adequate hazardous waste disposal system and the government-managed facilities were least likely to have adequate waste disposal system[25].

The fast growing population of Nairobi also appears to have over stretched the Nairobi City Council's resources allocated for social services including waste disposal. Consequently, heaps of uncollected waste and indiscriminate dumping is rampant. The city council has closed most of its solid waste disposal sites because they are full and others have been encroached upon by unplanned residential settlements. Currently the city council has only one disposal site in Dandora. Informal settlements have encroached on the dumping ground, which is also frequented by "*chokoras*" who spend most of their time collecting recyclables for sale[26]. This puts them in danger of having needle stick injuries as they scavenge the waste for valuables. The recyclables include used needles and syringes, which might eventually end up in the market being sold to the unsuspecting public.

Acknowledgement of the contribution made by unsafe injection practices to the transmission of diseases in low-income countries has been slow to emerge. This is partly due to lack of documentation of the extent of injection safety in the country.

3.2 Justification

The risk of nosocomial infection with blood-borne viruses (BBVs) as a consequence of unsafe injection practices was recognized in high-income countries in the middle of last century, and was brought into sharper focus by the advent of HIV/AIDS in the 1980s. In low-income countries, unsafe injection practices are comparatively common facing both the patients and health workers at risk of infection with BBVs such as hepatitis B, hepatitis C, and HIV. Potential gains attributable to interventions such as childhood immunization programmes are jeopardized by these practices. The large number of injections given to children in their first year of life mainly due to vaccinations and therapeutic injections may expose them to unsafe injections and consequent disease. Patients are at risk because both single-use disposable and re-usable needles and syringes are re-used, and the methods employed to clean and sterilize the equipment between patients are often sub-optimal. Potential health gains attributable to interventions such as childhood immunization programmes are jeopardized by these practices. Ensuring safe injection practices is essential for maintaining public confidence and extending the reach of health programmes. Participating rates in health programmes drop rapidly following negative publicity about adverse effects of injections[52].

Infection control policies, guidelines and practices to enhance the safety of patients and health workers have not been widely researched, implemented and evaluated in developing countries including Kenya. Key evidence and information to allow decision-making on safe and appropriate use of injections is lacking. Conducting an assessment of injection safety will provide the baseline data on the situation that can be used to monitor and evaluate injection safety and hence influence decision-makers. Public health facilities were selected on the basis that they provide services for more than twice the number of outpatients seen in the health facilities[53].

CHAPTER FOUR

4.0 OBJECTIVES OF THE STUDY

Main Objective

To determine safe injection practices in public health facilities in Nairobi and to explore the risk of occupational needle stick injuries among scavenging boys and garbage collectors.

Specific Objectives

1. *To establish if facilities where injections are given have the necessary equipment* and supplies for safe injections.
2. To determine the extent of unsafe injection administration practices in public health facilities in Nairobi.
3. To find out the current status of waste disposal in the health facilities in Nairobi.
4. To determine the prevalence of needle stick injuries among health care workers *and cleaners in public health facilities in Nairobi.*
5. To explore the knowledge, practice and risk of occupational needle stick injuries among scavenging boys and garbage collectors

4.1 Research Question

To what extent do injection practices in public health facilities in Nairobi conform to the recommended best practice?

4.2 Hypothesis

Injection practices in Nairobi health facilities conform to recommended best practices in terms of availability of injection supplies, administration of injections and availability of safe injection related waste disposal systems.

The garbage collectors and scavenging boys are not at risk of blood borne infections due to inappropriately disposed injection related waste.

CHAPTER FIVE

5.0 MATERIALS AND METHODS

5.1 Study Design

A descriptive cross-sectional study was conducted between November 2005 and February 2006 in public health facilities in Nairobi using a combination of quantitative and qualitative methods to assess injection safety. Health facilities run by Ministry of Health and Nairobi City Council were randomly selected for the survey. Injection providers and health cleaners in those facilities were also randomly selected as sources of information.

5.2 Study Area

The study was conducted in Nairobi province, the capital city of Kenya. The City is divided into eight divisions (Dagoretti, Embakasi, Kasarani, Central, Westlands, Kibera, Makadara, and Pumwani).

The population of Nairobi has been increasing consistently, rising from below 120,000 in 1948 to about 2.1 million people when the last census was conducted in 1999. Based on 1999 census, 4% of the population in Nairobi is children aged less than one year; 18% are children under five years and 45% of the population is below 15 years. Women of childbearing age, (15 to 49 years) constitute 22% of the total population[54]. Nairobi has a high concentration of health facilities with over 90 public health facilities: (appendix B) about 1.9 facilities per 10,000 people. Health service +delivery is by MOH, the Nairobi City Council and the private sector. The government and City Council facilities account for 40% of health facilities in Nairobi[53].

Like many urban centers in low-income countries, Nairobi has informal settlements commonly referred to as slums. It is estimated that 55 percent of the total population of Nairobi are housed in these informal settlements where the population density ranges between 23,000- 55,000 persons per square kilometer[55].

The high number of public health facilities, the high population density, and the current problems of garbage disposal made the area suitable for the study.

5.3 Study Population

The study population consisted of health facility cleaners and injection providers. Personnel who were usually involved in disposal of injection related wastes were also targeted for the study. For the assessment of availability of injection equipment and supplies the study population consisted of public health facilities. Health facility injection providers were observed and interviewed on administration of injections and safety practices while health facility cleaners were interviewed for injection disposal practices. For qualitative assessment, scavenging boys in the dumpsites, and private garbage collectors were targeted for focus group discussion and in-depth interviews. The sampling units consisted of primary health care facilities in the city of Nairobi that satisfied the inclusion criteria. Public hospitals that were offering primary maternal and child health care were also included. The fact that majority of outpatients seek health care services at public health facilities compared to mission and private facilities necessitated the selection of public health facilities

Inclusion Criteria and Exclusion Criteria

Inclusion Criteria

All public health care facilities in Nairobi.

Exclusion Criteria

Facilities that did not belong to either the Nairobi City Council or Government of Kenya and those outside Nairobi.

5.4 Sample Size

Sample size was determined using the following formula.[56]

$$n = \frac{Z^2Pq}{d^2}$$

Where

n= desired sample size

z= standard normal deviate

p= prevalence of unsafe injection 30% (WHO estimates)[2]

q= 1-p

d= degree of accuracy

$$\text{Thus} \quad n = \frac{(1.96)^2 x0.3x0.7}{0.5^2}$$

Calculated sample size =322

Since the facilities are less than 10,000 the sample size was corrected using finite correction formula. $n_c = \frac{n}{1+(n/N)}$

Where N is the number of health facilities in Nairobi that met the inclusion criteria

Where N_c = corrected samples size

Corrected sample size was therefore = $\frac{322}{1+(322/90)}$

$$n_c = 66$$

A sample size of 68 health facilities was included in the study.

5.5 Sampling Technique

A sample size of 68 health facilities was randomly selected. A list of all primary health facilities from the Ministry of Health was used to create a sampling frame. The facilities were listed according to the divisions and each health facility was assigned a number. In each division, health facilities proportional to the total number of health facilities in the division were randomly selected (using table of random numbers). From each health facility, the facility in-charge, one injection provider and one facility cleaner were randomly selected. The injection providers who happened to be giving injections at the time of the visit were automatically selected for the study and in cases where there was more than one provider; one was randomly selected for the study.

Selection of scavenging boys in the dumpsite was done through snowballing where after selecting an index, the person picked was asked to identify and recruit his colleagues for the focus group discussion. One focus group comprising of 8 scavenging boys was conducted during the study. Dandora dumpsite; the only major dumpsite in Nairobi and Kariobangi which is a holding dumpsite were purposively selected for the study.

One private garbage company was purposively selected for the focus group discussion, 12 members were selected for the discussion session. This selection was based on the company's wide coverage of garbage collection services in the city.

5.6 Study Variables

Independent Variables

The study's independent variable was the existence of safe injections practices that was *demonstrated by use of sterile syringes and needles for every patient, use of safe* injection administration practices and safe disposal of used syringes and needles in a manner that does not endanger members of the community.

Dependent Variables

The dependent variables included:

- Availability of equipment and supplies such as disposable needles, safety boxes
- Availability of safe injection waste disposal methods such as safety boxes, incinerators
- Status of disposal sites fence (well fenced)
- Injection provider training on injection safety
- Vaccination status against hepatitis B
- Availability of post exposure prophylaxis (PEP) services.

5.7 Data collection procedure

Data was collected between November 2005 and February 2006. Data was collected using structured observation and provider interviews. The principal investigator did data collection.

Observation of equipment and supplies

Part I of the instrument was a structured observation check list of equipment and supplies in the facility. The form was filled only on the basis of what was observed.

Observation of injection practices

Part II of the instrument was used for structured observation of injection practices during the visit. This targeted the injection providers who were found to be giving injection at the time of the visit

Interviews with injection providers and in-charge of health facility

The questionnaire (part III) was administered to injection providers while part IV was used to interview the in-charge of the facility. If there was more than one injection provider in the facility, one was randomly selected.

Interviews with health facility cleaners

A questionnaire was administered to the cleaner of the facilities; in cases where there was more than one cleaner in the facility, one was randomly selected for the interview.

Focus group discussion with scavenging boys in dumping grounds

A focus group discussion (FGD) guide was used during data collection from scavenging boys to gather information about the existence of hospital waste including syringes and needles. The FGD guide was used to establish if there were possible injuries resulting from used needles and the potential use of used needles and syringes by intravenous drug users.

Focus group discussion with private firm garbage collectors

Another FGD guide was used during the discussion with the private garbage collectors. One FGD was conducted with one private firm garbage collector. The discussion aimed

at assessing the possibility of occupational related needle stick injuries from injection related waste, which might be disposed off in the common garbage collection site. The participants were assured of confidentiality and members of the firm's management were not part of the discussion.

In-depth interviews with key informants

In depth interviews with selected health care workers, garbage collectors and other key informants were conducted using key informant checklists. The aim of key informant interviews was to get an understanding of attitudes and practices related to injection and disposal of injection related wastes.

5.8 Organization of Fieldwork

Pilot Testing

The health facility data collection instrument was tested in three purposely-selected health facilities to ensure suitability of the questionnaire. Health facilities selected for testing were excluded from the study following pilot testing.

Minimization of errors/bias

The investigator did all the data collection to eliminate any observation bias. The questionnaire was reviewed to ensure consistency, completeness of data collection and clarity of the notes. Facilities were randomly selected to remove selection bias.

Timing of Visits

The visits were impromptu/unannounced to eliminate bias (Hawthorne effect – observer induced changes in practices). To ensure observation of most injections, visits to health care facilities were carried out early in the morning when most injections are given.

Completion of Data Collection Instrument

After data collection, forms were checked for completeness, accuracy and clarity before leaving the facility.

5.9 Data Management and Analysis

All data emanating from this study was cleaned and entered into a computer based data file developed using Statistical Package for Social Sciences (SPSS) version 12. Unit of analysis was health facilities and health care workers interviewed. Results were summarized and presented in descriptive form using frequencies, percentages, tables, graphs and charts. Comparison of categorical data was done using Chi square or Fisher exact test where necessary. Level of significance was fixed at 0.05 ($p=0.05$)

5.10 Ethical Considerations

The study proposal was reviewed and approved by Kenyatta National Hospital (KNH) Ethics Review Committee. Permission to carry out the study was sought from the Nairobi City Council and Provincial Medical Officer Nairobi.

Health care workers in the facilities were made to feel comfortable with the assessment that was conducted voluntarily and they were informed of their right to decline participation. Respondents were informed that the personal information gathered through interviews and the questionnaires would be kept confidential. Informed consent was obtained from the respondents before the interviews were carried out. Where an injection practice that would expose the recipient to a potential risk was observed, the procedure was tactfully interrupted to protect the injection recipient.

Limitation of the Study

This study had a number of limitations first, due to the small number of injection providers interviewed there is a likelihood that the incidence of needle stick injuries was under or over estimated. However, this was in an attempt to include only the HCW who were currently handling injections. In that respect, this study should therefore be seen as indicative and not definitive. Secondly, observation induced modifications to behavior may have led to better practices due to Hawthorne effect, however the visit were made impromptu and the providers were assured that this was not an evaluation. Finally, although the risk of occupational needle stick injuries was assessed among the scavenging boys and garbage collectors, the related waste did not necessarily emanate from the public health facilities. Despite these limitations, this study provided a good indication of the situation on the ground.

CHAPTER SIX

6.0 FINDINGS

This chapter presents the study findings in three sections: the first section describes the health facility observations and interviews of injection providers and cleaners; the second section presents the findings of the focus group discussion with the scavenging boys and the third section reports the findings of focus group discussion with private garbage collectors. In the tables that follow, figures in parenthesis represent percentages

6.1 Distribution of Facilities Included in the Survey.

A total of 68 health facilities were included in the study. Forty-six (67%) of the facilities were affiliated to Nairobi City Council (NCC) while 22 (33%) belonged to Ministry of Health (MOH). Table 1 below summarizes the distribution of facilities according to the ownership, the type and location of the facilities.

Table 1 Distribution of Facilities by Ownership and Type

	Type of health facility (N-68)				Total
OWNERSHIP	Hospital	Health Centre	Dispensary	Clinic	
MOH	2	5	10	5	22 (33)
NCC	1	25	5	15	46 (67)
Total	3 (4.4)	30 (44.1)	15 (22.1)	20 (29.4)	68 (100)

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Total	**3 (4.4)**	**30 (44.1)**	**15 (22.1)**	**20 (29.4)**	**68 (100)**

Table 2 Distribution of Facilities by Division and Type

		FACILITY TYPE (N-68)				Total	Percentage
		Hospital	Health Centre	Dispensary	Clinic		
Division	Central	0	1	1	4	6	8.8
	Pumwani	0	2	1	5	8	11.8
	Makadara	0	5	6	6	17	25.0
	Langata	1	3	3	2	9	13.2
	Dagoretti	0	3	0	1	4	5.9
	Westlands	0	3	1	2	6	8.8
	Kasarani	1	7	3	0	11	16.2
	Embakasi	1	6	0	0	7	10.3
Total		**3**	**30**	**15**	**20**	**68**	**100**

Full list of visited health facilities is in appendix B

From Table 1 above, two thirds of the facilities are affiliated to the Nairobi City Council while a third is affiliated to the MOH. Of all the facilities, 30 (44.1 %) were health centers, 15 (22.1%) were dispensaries while 20 (29.4%) and 3 (4.4%) were clinics and hospitals respectively as is shown on Table 2.

Makadara division had the highest number of health facilities with 17 (25%) while Dagoretti had the lowest with 4 (5.9%). In general, the Eastern part of Nairobi had more health facilities compared with the rest of Nairobi.

6.1.1 Types of Injections Provided

In all the facilities, the number of immunization injections given in a week ranged from 7 to 600 injections with a median of 78 injections per week while therapeutic injections, ranged from 3 to 600 with a median of 75 injections per week. This is shown in the Table below.

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	Pumwani	0	2	1	5	8	11.8
	Makadara	0	5	6	6	17	25.0
	Langata	1	3	3	2	9	13.2
	Dagoretti	0	3	0	1	4	5.9
	Westlands	0	3	1	2	6	8.8
	Kasarani	1	7	3	0	11	16.2
	Embakasi	1	6	0	0	7	10.3
Total		**3**	**30**	**15**	**20**	**68**	**100**

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In all the facilities, the number of immunization injections given in a week ranged from 7 to 600 injections with a median of 78 injections per week while therapeutic injections, ranged from 3 to 600 with a median of 75 injections per week. This is shown in the Table below.

Table 3 Distribution of Injection Provided by Type and Ownership

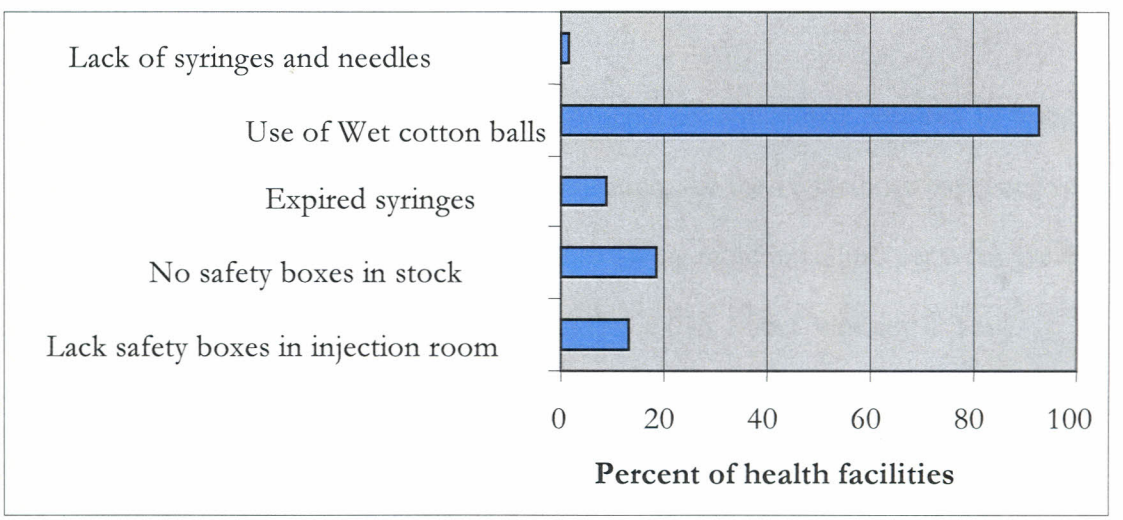
TYPE OF INJECTIONS	Range	Median	Ownership	Mean	Std. Deviation
Immunization injections	7-600	78	MOH	30	61.285
			NCC	100	125.204
Therapeutic injections	3-600	75	MOH	95	181.823
			NCC	60	98.414

There was no association between the number of injections given and ownership of the health facility (P> 0.076 for immunization and P> 0.749, Mann-Whitney U Test).

6.1.2 Availability of Injections Equipment

All the facilities included in the study were using disposable syringes and auto disable syringes for therapeutic injections and immunization injections respectively. Sterilization of injection equipment was not observed in any of the surveyed facilities. The availability of other injection equipment is summarized in the figure 2 below.

Figure 2: Availability of Injection Equipment (N=68)



From the figure 2 above, 17.6 % of the facilities lacked safety boxes in stock, 12.3 % lacked safety boxes in the injection rooms, and 8.8 % had expired syringes. Most of the facilities (93 %) were using wet swabs stored in a common container. Only one facility (1.5%) lacked syringes and needles hence patients were required to bring their own.

Injection providers in the facilities were asked whether patients were sometimes required to bring their own syringes and needles for either immunization injections or therapeutic injections. No facility reported that patients were required to bring their own syringes for immunization injections but this was reported for therapeutic injections. The responses are summarized in Table 4 below.

Table 4 Provider's Response on Whether Patients are required to Bring Syringes and Needles

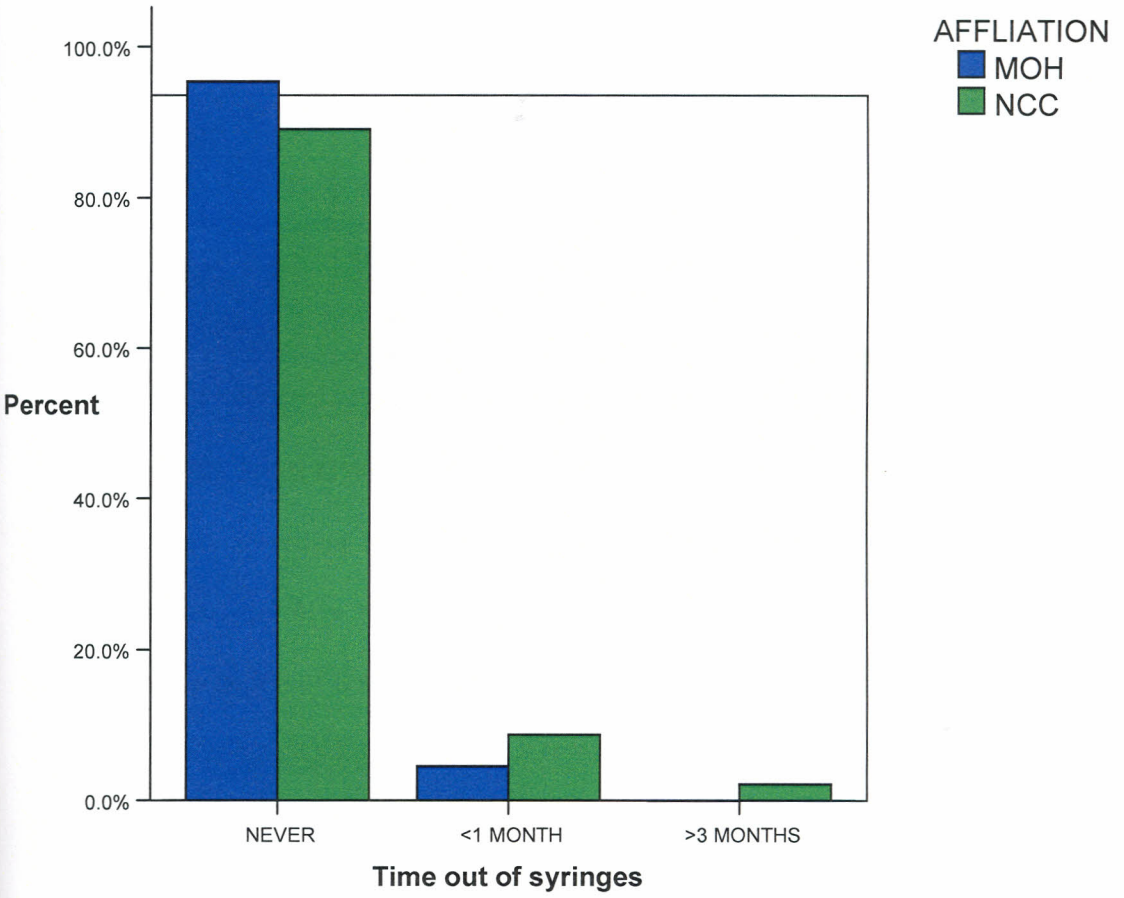
Response	Never	Sometimes	**TOTAL**
MOH	22 (100)	0 (0)	22(85.3)
NCC	36 (78.3)	10 (21.7)	46 (14.7)
Total	**58 (85.3)**	**10 (14.7)**	**68 (100)**

Chi-square 5.67, P-value 0.018

Of all the facilities, 10 (14.7%) reported that patients are sometimes required to bring their own syringes and needles for therapeutic injection. All the 10 facilities happened to be NCC health facilities (P value 0.018). Facilities giving more injections per week were more likely to ask patients to bring their syringes (P= 0.015, Mann-Whitney U Test).

The officers in-charge of the facilities were also asked the duration the facilities has been out of disposable syringes and needles in the last one year.

Figure 3 Duration of Syringe Stock outs. (n=68)



From the figure, 9 (13.5%) of the facilities reported lack of syringes for a period of less than a month in the last 12 months preceding the study, 1 (1.5%) reported lack of syringes for a period of more than 3 months and 58 (85.3%) reported that they have never had shortage of syringes.

The officers in charge of the facilities were also asked the duration they had had shortage of safety boxes in the last 12 months before the study. The findings are summarized in Table 5 below.

Table 5 Duration of Safety Boxes Stock Outs

AFFLIATION	Time out of safety boxes(N-68)				Total
	Never	<Month	1-3 Months	> 3 Months	
MOH	15(68.2)	0 (0)	1 (4.5)	6 (27.3)	22 (100.0)
NCC	36 (78.3)	5 (10.9)	4 (8.7)	1 (2.2)	46 (100.0)
Total	**51(75.0)**	**5 (7.4)**	**5 (7.4)**	**7 (10.3)**	**68 (100.0)**

From the Table 5, 51(75%) of the facilities reported no shortage of safety boxes in the last 12 months preceding the survey, 7(10.3)% reported shortage for a period of more than 3 months, 5(7.4)% reported for a period of 1-3 months and 5(7.4%) reported shortage for a period of less than a month. While 68.3% of MOH facilities reported that they have never had stock out of safety boxes, 78.3% of NCC facilities reported having a stock-out in the last 12 months. The difference was however not statistically significant (P= 0.36). All facilities reported that vaccines are always delivered with matching quantities of syringes and safety boxes.

The study sought to know whether lack of safety boxes in the injection rooms and in stock was related to the fact that some facilities were not offering immunizations. Facilities were therefore classified into two categories: those facilities offering immunization vaccines and those not offering the vaccines.

Table 6: Presence of Safety Boxes in the Injection Room by Services Offered

Facility characteristic		Presence of safety boxes where injections were being given. (N-68)		Total
		Yes	No	
MOH	Offering immunizations	13(100)	0 (0)	13
	Not offering immunizations	4(44)	5(56)	9
NCC	Offering immunizations	40(100)	0(0)	40
	Not offering immunizations	4(66.7)	2(33.3)	6
Total		61(89.7)	7(10.3)	68

From Table 6, while only 53.3% of facilities that were not offering immunizations had safety boxes in the injection room, all facilities offering immunizations had safety boxes in the injection room. The difference was statistically significant ($p<0.001$). NCC facilities were more likely to have safety boxes in the injection room compared to MOH facilities ($P=0.02$)

Similarly, as shown in Table 7, facilities not offering immunizations were more likely to lack safety boxes in stock compared to facilities offering immunizations. The difference was also statistically significant ($p<0.001$). Though 40 (87%) of NCC facilities had safety boxes in stock compared to 16 (72.7%) from MOH facilities the difference was not statistically significant ($P=0.15$)

Table 7 Presence of Safety Boxes in Stock by Services Offered

Facility characteristic		Presence of safety boxes in stock(N-68)		**Total**	
		Yes	No		
MOH		16 (72.7)	6 (27.3)	22	Chi square 2.17 df=1 p <0.15
NCC		40 (87)	6 (13)	46	
Offering Immunizations	MOH	12 (92.3)	1(7.7)	13	Chi square 27.57 df=1 p <0.001
	NCC	38 (95.0)	2 (5)	40	
	TOTAL	**50 (94.3)**	**3 (5.7)**	**53 (100)**	
Not offering Immunizations	MOH	4 (44)	5 (56)	9	
	NCC	2 (33.3)	4 (66.7)	6	
	TOTAL	**6 (40)**	**9 (60)**	**15**	
Total		**56 (82.4)**	**12 (17.6%)**	**68 (100.0)**	

6.1.3 Injection Practices

Injection administration practices were assessed through observation. The observations are summarized in the Table 6 below.

Table 8 Injection Administration Practices

Practice	Immunization injections N=53	Therapeutic injections N=65
Use of a sterile syringe and needle for each injection	100%	100%
Preparation of injections in a clean designated area	100%	96.4%
Patient bringing their own syringe and needle	0%	1.8%
Removal of needles from the vial	100%	89.3%
Removal of needles from the syringe after injection	0%	7.4%
Immediate disposal of needles and syringes after injection.	96%	82.6%
Two hands recapping	0%	4.4%

From Table 8 above, all facilities used single disposable syringe or auto disable syringe for immunization injection and they were all sealed in a tamper proof packet. No re-use of equipment was observed in any of the facilities included in the study. Preparation of injections was done in clean designated places in 96.4% of the facilities that were offering therapeutic injections while it was 100 % for those offering immunization injections. In one facility, it was observed that patients brought their own syringes and needles for therapeutic injections and there were no syringes in stock at the time of the visit.

It was observed that in seven (10.7%) facilities, needles were left in the vials after reconstitution of the drugs, which is not appropriate. The injection providers were however quick to remove them upon entry of the investigator in the injection room. Removal of the needles from the syringes was observed in 5(7.4 %) facilities while recapping was found in 3(4.4 %) facilities. Reasons for the practice were sought through in-depth interviews with the injection providers. One injection provider gave the following explanation during an in-depth interview. *"As you can see this is a very busy place, and if we placed the syringes and needles together in the safety box, the safety boxes would fill very fast and then we would be short of them".*

One injection provider explained that syringes are easy to burn while needles cannot be burnt hence they separate them for incineration. *"You know, we do not have an incinerator here and my fear is that the cleaners may get pricked as they collect the waste. Garbage collectors also frequent the dumping site and may get pricked in case the needles are not burnt fully. But I am very careful no to prick myself".*

Collection of Sharps

Disposal of injection wastes was assessed in the study through observation and interviewing the injection providers and health facility cleaners. Presence of overflowing or pierced safety boxes was observed during the assessment. The findings are summarized in the Table 9.

Table 9 Presence of Overflowing Injection Safety Boxes in Health Facilities

AFFLIATION	Presence of overflowing pierced or open boxes(N-68)		Total
	Yes	No	
MOH	7(31.8)	15(68.2)	22(100.0)
NCC	9 (19.6)	37 (80.4)	46 100.0
TOTAL	**16(23.5)**	**52(76.5)**	**68(100.0)**

Chi square 1.26 P value = 0.2

From Table 9 above, 16(23.5%) facilities had overflowing safety boxes in the area where injections were administered. There was no statistical difference between NCC and MOH facilities in this attribute (p value=0.2). Data was analyzed to find out whether facilities giving many injections were more likely to have overflowing safety boxes in the injection room. There was no association between the number of injection being given and the presence of overflowing safety boxes. (Mann-Whitney U test p=0.233).

During the visits to the health facility it was observed that some facilities were using open containers such as carton boxes and plastic containers. Table 10 summarizes the presence of open containers by facility type.

Table 10 Distribution of Presence of Open Containers by Type and Ownership

Facility type		Sharps in open containers exposing staff to injury(N-68)		Total
		Yes	No	
MOH		4(18.2)	18(81.8)	22(100.0)
NCC		6 (13.0)	40 (87.0)	46 (100.0)
Hospital	MOH	0 (0)	2 (100)	2
	NCC	0 (0)	1 (100)	1
	SUBTOTAL	0 (0)	**3(100)**	**3**
Health Center	MOH	0 (0)	5 (100)	5
	NCC	3 (12)	22 (88)	25
	SUBTOTAL	**3 (10)**	**27(90)**	**30**
Dispensary	MOH	4 (40)	6 (60)	10
	NCC	0 (0)	5 (100)	5
	SUBTOTAL	**4 (26.7)**	**11 (73.3)**	**15**
Clinic	MOH	0 (0)	5 (100)	5
	NCC	3 (20)	12 (80)	15
	TOTAL	**3 (15)**	**17 (85)**	**20**
Total		**10(14.7)**	**58 (85.3)**	**68 (100.0)**

Table 10 shows that 10(14.7%) facilities were using open containers to dispose syringes and needles. Though a higher percentage of dispensaries (26.7%) had open sharp containers compared to other type of facilities. However, the difference was not statistically significant (p=0.23 fisher exact test). There was also no statistical difference in presence of open containers between the MOH and NCC health facilities (p=0.15 fisher exact test).

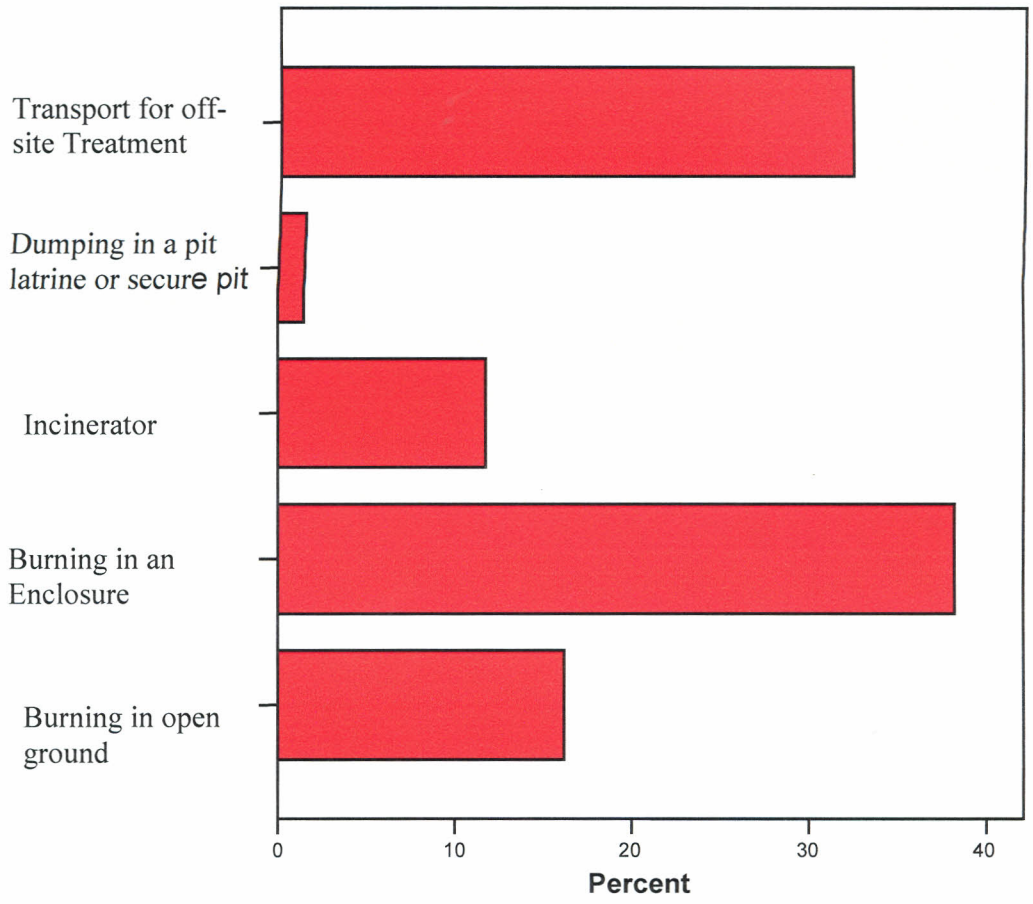
6.1.4 Disposal of Sharps

Various methods of waste disposal were observed in various facilities. The results are summarized in Table 11.

Table 11 Type of Sharps Waste Disposal Methods by Ownership

Type of waste disposal for sharps	Ownership(N-68)		Total
	MOH	NCC	
Burning in open ground	2 (9.1)	9 (19.6)	11(16.2)
Burning in a hole or enclosure	4 (18.2)	22(47.8)	26 (38.0)
Incinerator	4 (18.2)	4 (8.7)	8 (11.8)
Dumping in a pit latrine or secure pit	1 (4.5)	0 (0)	1 (1.5)
Transport for off-site treatment	11 (50.0)	11 (23.9)	22 (32)
Total	**22(32.4)**	**46 (67.6)**	**68 (100.0)**

Figure 4 Type of Sharps Waste Disposal Methods



From Table 11 and figure 4, the most common method of sharp disposal was burning in a hole or an in an enclosure as was reported by 26(38 %) facilities. Twenty-two (32%) facilities were transporting the sharps for offsite treatment, 11(16.2%) were burning sharps on an open ground while one (1.5%) reported throwing the sharps in a pit latrine. Only 8(11.8 %) facilities had an incinerator. Of the 8 facilities with incinerators, three were hospitals, four were health centers and only one was a clinic. Only three out of the eight incinerators were found to be in a good working condition.

Photographs showing the status of some of the incinerators

Note that the incinerators had the coverlid missing

The investigator observed that all facilities that transported safety boxes for offsite treatment had no means of transport of their own but depended on friendly institutions to provide transport and incineration. In the absence of any formal arrangement in the facilities, they were unsure of where and when they will dispose the used safety boxes. Consequently safety boxes were found stored in areas accessible to the members of the public such as toilet rooms and in the injection rooms. In one facility, more than 100 safety boxes containing used syringes and needles were found in the toilet room. On further enquiry about the safety of the toilet, the following explanation was given.

"There is usually no water in the toilet so it is rarely used and besides, there are no children who use the toilet. So we think it's a safe place".

Photograph showing used safety boxes stored in a toilet place awaiting collection for offsite treatment.

Presence of Sharps within the Compound

Through inspection of the surroundings of the facilities including the disposal sites, disposed sharps were observed in 58 % of the health facilities. They were disposed in a manner that is dangerous either to the members of the public or health care workers especially the facility cleaners during their routine disposal of garbage. The following Table shows the proportion of health facilities with sharps around the health facilities compound.

Table 12 Proportion of Health Facilities with Sharps within the Compound

Facility characteristic			Evidence of sharps around the facility or disposal sites(N-68)		Total	
			Yes	No		
AFFLIATION		MOH	10 (47.6)	11 (52.4)	21 (100.0)	P=0.235
		NCC	29 (63.0)	17 (37.0)	46 (100.0)	
Type	Hospital	MOH	1 (50)	1 (50)	2	P=0.95
		NCC	1 (100)	0 (0)	1	
		TOTAL	**2 (66.7)**	**1(33.3)**	**3 (100.0)**	
	Health Centre	MOH	2 (40)	3 (80)	5	
		NCC	16 (64)	9 (36)	25	
		TOTAL	**18 (60.0)**	**12 (40.0)**	**30 (100.0)**	
	Dispensary	MOH	4 (40)	6 (60)	10	
		NCC	4 (80)	1 (20)	5	
		TOTAL	**8(53.3)**	**7 (46.7)**	**15(100.0)**	
	Clinic	MOH	3 (75)	1 (25)	4	
		NCC	8 (53)	7 (47)	15	
		TOTAL	**11 (57.9)**	**8 (42.1)**	**19(100.0)**	
Total			**39 (58.2)**	**28 (41.8)**	**67(100.0)**	

In one facility inspection of the dumpsites and the surroundings was not possible because it was said to be a restricted area.

As shown in the Table, 39 (58.2%) facilities had sharps around the health facility though this was not statistically different between NCC and MOH facilities. (p=0.235). There was no association between the type of health facilities and presence of sharps within the health facility compound. (P =0.95). Further, for those facilities that were burning their injection related waste, it was observed that the contents were not completely destroyed as shown in photographs that are shown below.

The photographs below illustrate the state of the health facility disposal sites



Note the presence of incompletely burnt syringes and needles

From the photographs above it is evident that burning did not achieve complete destruction as expected therefore discarded syringes and needles could be seen around the disposal sites.

Health Facilities Disposal Site Fencing

In order to establish the risk posed by injection related waste to the community, especially to the children and scavenging boys, the status of the disposal sites fences was also assessed during the study. The status of fencing was categorized as either good or poor. Facilities with broken down fences and where evidence of a footpath to the facility other than the main gate was observed, such were categorized as poorly fenced.

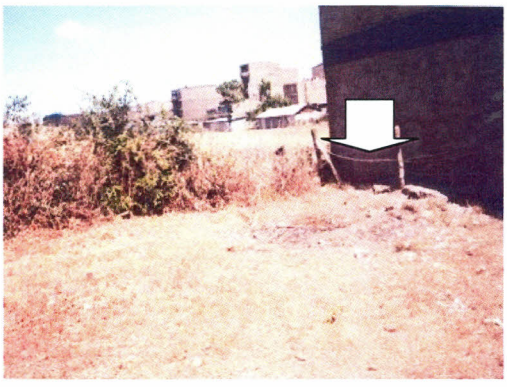
Table 13 Status of Disposal Site Fence by Type of Health Facility

Facility			Status of disposal sites fence(N-68)		Total	P VALUE
			Well fenced	Poorly fenced		
Affiliation		MOH	4(25.0)	12(75.0)	16	
		NCC	15(32.6)	31(67.4)	46	P=0.75
Type	Hospital	MOH	1 (100)	0 (0)	1	
		NCC	1 (50)	1 (50)	2	
		TOTAL	**2 (66.7)**	**1 (33.3)**	**3(100)**	
	Health Center	MOH	3 (60)	2 (40)	5	
		NCC	8 (32)	17 (68)	25	
		TOTAL	**11 (36.7)**	**19 (63.3)**	**30(100)**	
	Dispensary	MOH	0 (0)	6 (100)	6	P=0.235
		NCC	2 (40)	3 (60)	5	
		TOTAL	**2 (18.2)**	**9 (81.8)**	**11(100)**	
	Clinic	MOH	0 (0)	3 (100)	3	
		NCC	4 (26.7)	11 (73.3)	15	
		TOTAL	**4 (22.2)**	**14 (77.8)**	**18(100)**	
Total			**19(30.6)**	**43 (69.4)**	**62(100)**	

6 facilities didn't have a disposal sites

As shown in Table 13, 43(69.4%) of the facilities had poorly fenced disposal sites and only 19(30.6%) of the facilities had good fences. Above 75% of MOH facilities and 67.4% of NCC facilities were poorly fenced. There was no significant difference between the ownership of the health facility and the state of fencing (P=0.75).

The photographs below illustrate the status of fencing in some health facilities.



Note the state of fences around the health facilities (arrow)

During an interview with the health facility cleaners it emerged that scavenging boys frequently visited the disposal sites searching for valuables. At one facility one cleaner gave the following remarks;

"*There was a time we left some safety boxes here in the pit to collect a matchbox and spirit only to come back and find the boxes missing*".

At another site the investigator found a watchman who was mending a broken fence that according to him had been broken down by children from the neighborhood who frequented the disposal site. It was also established that "Chokoras" frequented the dumping sites too as one of the health facility cleaners reported often threatening any one they found 'destroying their valuables'.

The "chokoras" are not very happy with us when they see us burn the waste. At times they threaten us with crude weapons accusing us of burning the waste that they rely on for their livelihood. When they come we have to take cover. Most often, they do come and sleep in the hole. Our attempt to convince them of the danger is often unfruitful. We have tried to talk to our bosses to fence off the compound but they have not yet done so.

6.2 Training and Occupational Exposure to Accidental Needle Stick Injuries among Injection Providers

This section gives the findings of injection providers' interviews. The injection providers were all nurses who had been allocated duties in the injection room at the time of the study. In total 68 injection providers were interviewed.

6.2.1 Training on Injection Safety

The injection providers were asked whether they had attended any in-service course on injection safety. The Table below shows the distribution of staff trained on injection safety by type of health facility.

Table 14 Training on Injection Safety

FACILITY CHARACTERISTICS			Received training on injection safety (N-68)		Total
			Yes	No	
AFFILIATION	MOH		5 (22.7)	17 (77.3)	22
	NCC		11 (23.9)	35 (76.1)	46
Type	Hospital	MOH	1 (50)	1 (50)	2
		NCC	0 (0)	1 (100)	1
		TOTAL	1(33.3)	2 (66.7)	3
	Health Centre	MOH	1 (6.7)	14 (93.3)	15
		NCC	6 (40)	9 (60)	15
		TOTAL	7(23.3)	23 (76.7)	30
	Dispensary	MOH	3 (30)	7 (70)	10
		NCC	2 (40)	3 (60)	5
		TOTAL	5(33.3)	10 (66.7)	15
	Clinic	MOH	0 (0)	5 (100)	5
		NCC	3 (20)	12 (80)	15
		SUB TOTAL	3 (15)	17(85)	20
Total			**16 (23.5)**	**52 (76.5)**	**68 (100.0)**

Table 143 above illustrates that only 16 (23.5%) injection providers included in the study had attended any training on injection safety. There was no association between the ownership of health facility and having attended training on injection safety ($p>0.05$).

6.2.2 Hepatitis B Vaccination

The injection providers were also asked whether they had received a complete dose of hepatitis B vaccine within the last 10 years. Disappointingly only 2 (3%) had been vaccinated.

6.2.3 Occupational Exposure to Accidental Needle Pricks Injuries

The injection providers were asked whether they had had accidental needle stick injuries in the last 12 months preceding the study and if so, what could have led to the injuries. The action taken after the needle stick injury was also enquired from the injection providers. Table 15 shows the proportion of injection providers who reported an accidental needle stick injury within the 12 months preceding the study.

Table 15 Prevalence of Accidental Needle Pricks

	Had accidental needle pricks in the last one year(N-68)		Total
AFFLIATION	No	Yes	
MOH	17 (77.3)	5 (22.7)	22 (100.0)
NCC	40 (87.0)	6 (13.0)	46 (100.0)
Total	**57 (83.8)**	**11(16.2)**	**68 (100.0)**

Chi square 1.26 P value = 0.2

As shown in the Table above, 5 (22.7%) of the injection providers in MOH facilities and 6(13.0%) from NCC facilities reported an accidental prick injury in the year preceding

the study. The difference in incidence between the two categories was not statistically significant (P =0.2). Overall, 11 out of 68 (16.3% injection providers reported an accidental prick injury in the last one year preceding the study.

The injection providers who reported accidental needle stick injuries were asked what action led to the accidental needle stick injuries. The responses were as shown in Table 16.

Table 16 Causes of Needle Stick Injury

Practice	Frequency	Percentage
Recapping	3	27.3
Patients' movement	5	45.5
Sharps collection	3	27.3
Total	**11**	**100.0**

From the Table above, 5 (45%) of the accidental needle pricks were attributed to the abrupt movement of patients during the procedure while recapping and placing the syringe in the safety boxes contributed 3 (27%) incidences each.

Action Taken After Accidental Prick Injury

Majority of those who sustained needle stick injuries did not seek medical attention for possible Post Exposure Prophylaxis. Of those (11) who had accidental needle stick injuries, only two sought HIV post exposure prophylaxis. The results are shown in Table 17 below.

Table 17 Action Taken After Accidental Prick Injury

Action taken	Frequency	Percentage
HIV Post exposure prophylaxis	2	18.2
Disinfection of the injection site.	9	81.8
Total	**11**	**100**

One of the injection providers had this to say, a position that was taken by many of those who didn't go for prophylaxis.

When it happened, I just squeezed the wound, cleaned with spirit and prayed to God that I do not get infected.

One injection provider who had had an accidental prick injury reported that she immediately tested the patient and confirmed that the patient was HIV negative.

One of the two, who sought HIV post exposure prophylaxis, narrated how difficult it was for her to get the prophylaxis.

"I immediately went to a government hospital where I was told that they only have PEP kits for their members of staff. I then visited a private hospital where they told me that they only provide to victims of rape and not health workers. I had to go to a private hospital where I bought my own drugs and got treated."

Of all the facilities included in the study, only 2 had PEP services and both were hospitals.

6.2.4 Presence of Policy on Injection Safety and Sharps Waste Disposal

During the interview the officers' in-charge of the facilities were asked whether they had a copy of injection safety policy or guidelines on injection safety and sharps disposal in

the facility. In all the facilities, they reported that no such policies or guidelines existed and hence did not have a copy.

6.3 Knowledge Practice and Occupational Exposure among Health Facility Cleaners

The study also interviewed hospital cleaners to assess their knowledge, training, occupational exposure to accidental needle stick injuries and also the protective measures they take while working. A total of 59 health facility cleaners were interviewed during the study. In some facilities the health cleaners could not be reached for interview as they worked on casual basis or were prisoners who were allocated duty on unpredictable basis.

6.3.1 Trainings on Injection Safety

The respondents were asked whether they had received any training on injection safety. The responses are summarized in Table 16 below.

Table 18 Training on injection safety

	Received training on injection safety(N-59)		Total
AFFLIATION	Yes	No	
MOH	2 (15.4)	11 (84.6)	13 (100.0)
NCC	2 (4.3)	44 (95.7)	46 (100.0)
Total	**4 (6.8)**	**55 (93.2)**	**59 (100.0)**

Chi-Square = 1.96 P value = 0.162

Only 4 out of the 59 cleaners (6.8 %) reported having been trained on injection safety; 15.4% from MOH and 4.3% from NCC. However, the level of training between the two was not statistically significant. (P value = 0.162)

6.3.2 Occupational Needle Stick Injury among CHWs

The incidence of needle stick injuries within the 12 months preceding the study among the cleaners was enquired during the interviews. The responses were categorized by the category of health workers and are summarized in Table 17. Below

Table 19 Distribution of needle stick injuries by category of health worker

Category	Had needle stick injury		Total
	Yes	No	
Injection providers	11(16.2)	57(83.8)	68 (54)
Health facility cleaners	9 (15.5)	49 (84.5)	59 (46)
Total	**20 (15.9)**	**106 (84.1)**	**127 (100)**

Chi square 0.1 df=1, p=0.909

Of all the health workers included in the study 11(16.2 %) of injection providers reported having an accidental prick injury compared to 9(15.5 %) of the health facilities cleaners. However, the incidence of needle stick injury was not statistically different between the two categories of workers (P=0.9).

On being asked what activity led to the accidental needle stick injury, all health facility cleaners reported that they were picking the hospital waste. They reported that this happened when the injection providers did not place the needles appropriately in the safety boxes. One cleaner was of the opinion that the nurses are to blame because of carelessness

"*Though the safety boxes make it safe for us, you often find needles and syringes in the open containers that are not meant for needles.*"

In one facility a cleaner narrated how a fellow workmate who has now moved to another station had to be treated for a period of 3 months after developing a sore on the hand following a needle stick injury. (Attempts to trace the injured were not successful).

Similarly the cleaners were asked what action they took following the accidental prick injury. Only two cleaners out of the nine cleaners who had accidental needle stick injuries went for HIV post exposure prophylaxis.

6.3.3 Hepatitis B Vaccination

The facility cleaners were asked whether they had been vaccinated against hepatitis B in the 10 years preceding the study. The results are summarized in Table 18 below.

Table 20 Proportion of Cleaners Vaccinated For Hepatitis B

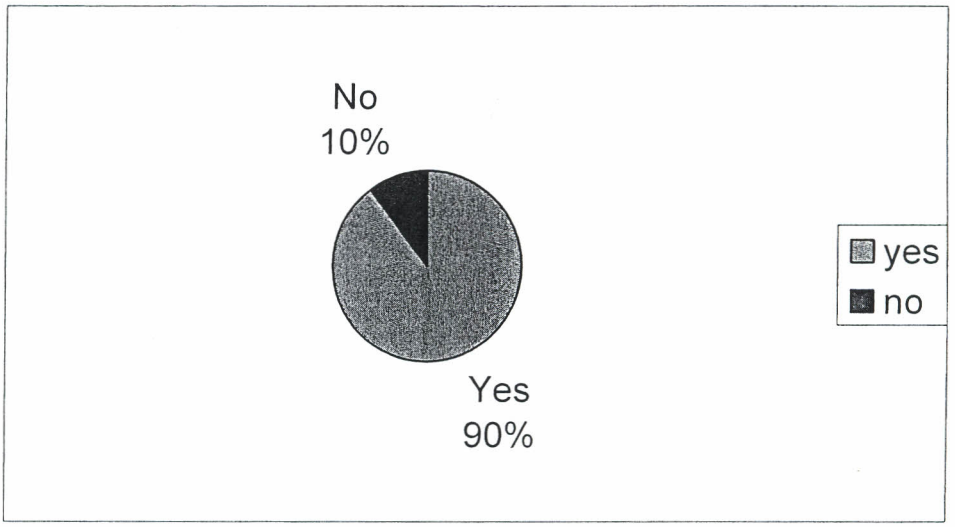
Category	Had Hepatitis B Vaccination.		Total
	Yes	No	
Injection providers	2 (3)	66 (97)	**68 (54)**
Health facility cleaners	4 (6.8)	55 (93.2)	**59 (46)**
Total	**6 (5)**	**121 (95)**	**127(100)**

From Table 20, only 4 (6.8 %) cleaners had hepatitis B vaccination in the 10 years preceding the study. When the cleaners were compared with the injection providers there was no statistical difference in proportion of those who had hepatitis B vaccine between injection providers and health facilities' cleaners (Fisher exact test, p =0.433).

6.3.4 Perceived Risk of infection

The health facility cleaners were also asked whether they considered themselves to be at risk of infection through injection related waste. The responses are as shown in figure 5.

Figure 5 Perception of Risk of Infection by Health Facilities Cleaners



The health facility cleaners were also asked which protective equipment they are provided with. The responses are as shown in Table 21 below.

Table 21 Protective Equipment Provided To Health Facility Cleaners

Equipment	AFFILIATION		Total
	MOH	NCC	
Light groves	11 (73.3)	41 (87.2)	52
Hard groves	2 (13.3)	5 (10.6)	7
Gumboots	2 (13.3	0 (.0)	2
Total	**15**	**47**	**62**

NB. This was a multiple response; percentages and totals are based on responses.*

The table illustrates that 52 out of 62 of the cleaners reported being provided with light medical examination groves and only 7 reported being provided with hard groves. Only 2 cleaners reported being provided with gumboots.

Respondents were also asked which diseases they can contract through the injection waste. Multiple responses were elicited without prompting. The responses are as summarized below.

Table 22 Diseases Likely to Be Contracted Through Injection Waste

DISEASES	AFFILIATION		Total
	MOH	NCC	
AIDS	11 (84.6)	37 (63.8)	48 (67)
TB	2 (15.4)	17 (29.3)	19 (27)
Tetanus	0 (0)	1 (1.7)	1 (0.4)
Cancer	0 (0)	1 (1.7)	1 (0.4)
Hepatitis B	0 (0)	1 (1.7)	1 (0.4)
Malaria	0 (0)	1 (1.7)	1 (0.4)
Total Responses	**13**	**58**	**71 (100)**

NB Percentages and totals are based on responses.

From the Table, the most identified risk was HIV/AIDS mentioned by 84.6 % of MOH and 63.8% of NCC health cleaners. TB followed and was mentioned by 15.4% from MOH and 29.3% from NCC. Tetanus, cancer, hepatitis B, and malaria had one response each.

Views were sought from the cleaners of how infections from injection waste can be minimized. The responses are as shown in Table 23 below. The most frequent response was provision of heavy duty gloves, which was mentioned by 32.9% of the responses. This was followed by provision of gumboots and aprons (30.7%, 12.1%) respectively

Table 23 Action Needed To Prevent Infection From Injection Related Waste.

Actions	AFFILIATION		Total
	MOH	NCC	
Provide heavy duty gloves	2 (16.7)	28 (35.4)	30 (32.9)
Provide gumboots	2 (16.7)	26 (32.9)	28 (30.7)
Provide aprons	2 (16.7)	9 (11.4)	11 (12.1)
Provide masks	4 (33.3)	3 (3.8)	7 (7.5)
Being careful	2 (8.3)	8 (8.9)	8 (8.7)
Build incinerators	0 (0)	2 (2.5)	2 (2.2)
Training	0 (0)	1 (1.3)	1 (1.1)
Hepatitis B vaccine	1(8.3)	2 (2.5)	3 (3)
Total Responses	**12**	**79**	**91**

Percentages and totals are based on responses.

6.4 Knowledge and Risk of Needle Prick Occupational Exposure among Scavenging Boys and Garbage Collectors

This section presents the findings of the focus group discussion with the scavenging boys and with private garbage collectors respectively. This qualitative phase was particularly useful in obtaining a variety of daily experiences on safety and disposal of used syringes and needles and also in seeking views or opinions about disposal of injection related waste in Nairobi.

6.4.1 Knowledge and Risk of Needle Pricks among Scavenging Boys

Nine participants were involved in the FGD. They were from Dandora (main dumping site) and Kariobangi collection dumping sites. Their ages ranged from 15 to 22 years.

Majority of them regularly visited the dumping sites to look for valuable items for sale. According to the scavenging boys, they preferred dumping sites despite the unpleasant smell and risk of contracting infections because it is their source of livelihood.

Presence of Used Syringes and Needles in the Common Dump Sites

When the participants were asked whether hospital sharps including needles are disposed in the dumpsites the response was unequivocal. They all agreed that used needles and syringes were often thrown in the dumpsites and they mentioned private health facilities as the most notorious with the practice. One participant remarked.

"The clinics/ hospitals do not burn the injection waste, they put them in boxes and polythene papers, dump them here especially at night and run away."

The participants gave names of the health facilities engaged in the practice of disposing syringes and needles in the dumpsites but they categorically exonerated city council and MOH facilities explaining that they have incinerators. They gave an example of a nearby health center. Though the health center in question had an incinerator it was observed that it was not functional.

The participants at this point invited us to go to the dumpsites to see where the syringes and needles were thrown but some respondents immediately said that the garbage collection trucks had just collected the garbage.

"*Were it not for the garbage collection trucks you would have found some needles and syringes at the site. The hospital waste is mostly dumped on Tuesday and Friday nights and can be found on Wednesday and Saturday mornings.*"

True to their word the investigator visited the site during the suggested days and confirmed the presence of injection waste as shown in the photographs below.

Photographs showing dumpsite boys in the dumpsite

Captions showing used injection syringes and needles in the dumpsite above.

Accidental Needle Stick Injuries

When the respondents were asked whether they had ever been pricked by inappropriately disposed needles, all participants unanimously agreed being pierced several times. On a lighter note one participant remarked that the needles even "know them" and sometimes do not pierce them. The participants pointed that they have been forced to be more innovative in handling the waste to minimize the chances of being pierced.

"*If you hold a dumped paper bag you get pierced – you have to open it using a stick.* One participant pointed at a sore on his foot where he was pierced and got infected (pus present) and reported that it itched even then. The participant narrated of a friend's ordeal after being pierced by a used needle.

The participants pointed out that the dumpsites were dangerous and said that they often discouraged children from visiting dumpsites to prevent them from getting pierced by used needles.

Knowledge of Diseases Transmitted Through Used Needles and Syringes

During the discussion the participants were asked what ailments can possibly be transmitted through the used syringes and needles. They mentioned syphilis, HIV/AIDS, and gonorrhea.It was clear from the participants that despite the perceived danger of contracting diseases through the injection related waste; they had not considered abandoning the occupation.

Resale of used syringes and needles

When the participants were asked about the resale of used needles and what they are used for, their views were divided. The participants indicated that they do not collect them but some of them reported that some people especially from the neighboring slums (Mathare) came to collect them at night. Participants were of the view that these are later sold to patients who cannot afford to buy them from chemists. Participants mentioned that there are some drug users who use the syringes and needles but they were quick to assert that they themselves do not use injectable drugs.

Suggested Solution to the Problem of Inappropriate Disposal

The participants were asked to give their views on what could be done to solve the problem of inappropriate sharps disposal. They all agreed that disposal of sharps is a major problem and pointed out that action should be taken especially on private clinics and hospitals. They suggested that a requirement be put in place for health facilities to prove how they dispose off their hospital waste. One member suggested "*The health*

facilities should be able to prove how they dispose off used needles and syringes to the government officials"

They all proposed that the government should take action in ensuring that health facilities adhere to the requirements by taking punitive actions against those who disposed used syringes and needles in the common dumping sites.

6.4.2 Knowledge and risk of needle pricks among garbage collectors

The twelve participants were from private garbage collection company that was purposively sampled because of its wide coverage of garbage collection services in the city. The company had a fleet of thirty-two garbage collection trucks and a workforce of 124 employees. The participants were between 22 to 45 years old.

The kind of waste collected by the garbage collection company included: household garbage, industrial waste, injection and hospital waste. The garbage collection company was also often contracted to dispose bio-hazardous waste by a number of health facilities.

Disposal of Injections and Needles in the Common Garbage

The participants were asked whether the injection related waste was properly sorted out or was mixed with other garbage. The participants reported that since they had an incinerator, their clients were always instructed to segregate injection related waste from the other types of waste. However, all were in agreement that not all clients separated hospital waste from the rest of the garbage. They said that they had problems especially from the buildings that were managed by caretakers because the clients are not willing to pay extra amount for hospital waste disposal.

"Since we charge extra for hospital waste, most of the clients urge that the landlords should take care of the disposal cost since it was included in the rent."

It was noted that most of the clinics operated consultant clinics hence rarely provided injections and were therefore unwilling to pay for extra charges for their waste.

During a visit to the garbage collection company, the investigator observed some of the syringes and needles that had been retrieved from a client's garbage the previous day and it was pointed out that this was a common practice.

Occupational Accidental Needle Stick Injuries

Most of the participants admitted that they had been pricked several times. One participant remarked. *"I was pricked yesterday when I was collecting garbage in town."* They also said that needle stick injuries were a common occurrence and for that reason they do not bother to report the injuries to their employer as required. The participants were also asked to state the protective gear usually given to them. They said that they are usually given gumboots, gloves, and aprons but they were quick to add that they are not usually very protective against injuries from the needles and broken glass. *"The gloves can only prevent against dirtying of hands; the needles pierce through gumboots and gloves. At times you just see yourself bleeding despite wearing them".*

The participants said that they had a medical cover and were expected to seek health services for all injuries. Though they also reported that they had been vaccinated against some diseases, they were not sure which diseases they are vaccinated against. It was confirmed from the administration that, normally they got periodic vaccinations against meningitis and typhoid. Some of the participants however reported not having received the vaccines.

When participants were asked whether they thought that they are at risk of infection from injection waste, they were quick to answer in the affirmative. All participants agreed that

despite protecting themselves, the kind of waste they handle is sometimes very infectious and that prolonged exposure to it puts them at high risk. All the participants felt that medical cover should also be extended to other members of the family because they were also at risk of infections that the workers may have gathered from the work places. When asked which diseases they were afraid of contracting in relation to the waste, participants mentioned the following diseases: HIV/AIDS, asthma, tuberculosis, eye infections and cancer.

Training on Occupational Safety

The participants were also asked whether they had received any training on handling waste and if yes, what the nature of the training was. Majority of the participants felt that most of the training was more on customer relations rather than on how to handle the waste. There was unanimous agreement that training was very important, as this would teach them about the diseases they can contract and how they can protect themselves.

Knowledge of HIV/AIDS Transmission

The participants were asked what action should be taken incase of accidental needle stick injury. Majority said that they just pray to God that they don't get HIV/AIDS for there is nothing they can do. They said that they wait and only seek treatment if there is a swelling. But one participant narrated how he sought treatment after the injury.

"*Immediately after the accident, I took the syringe and needle which pricked me and went to the hospital. I was then referred to the lab to take the syringe for a test since it contained some fluid. I was later treated but was not issued with the lab results*".

Though the participant could not tell the nature of the treatment given, he felt that one

should pick the syringe and needle for testing so that appropriate treatment could be given.

Opinions were divided on whether a used needle could transmit diseases especially HIV/AIDS after staying for sometime. A participant said, *"During a seminar we attended, we were told that HIV virus can only survive for six seconds after injection and after that it can't infect someone."*

Opinions were sought from the participants on what action should be taken to address the inappropriate disposal of injection waste. Respondents were quick to point out that the clients should be appropriately educated to segregate the waste at the source. They all agreed that appropriate training of garbage collectors on the potential hazards from the waste they deal with was also important.

CHAPTER SEVEN

7.0 DISCUSSION AND CONCLUSION

7.1 DISCUSSION

In this study, it was established that all facilities were using disposable syringes for therapeutic injections and auto disable syringes for immunization injections and hence there was no need to sterilize the injection equipment. There was also no re-use of syringes and needles in any of the facilities included in the study. This is indeed commendable as it contrasts with earlier findings that 20-80 % of health facilities in Africa were reusing syringes that were not sterilized[2]. Absence of disposable syringes was observed in only one facility (1.5%). The findings also differ from a WHO study in six countries in Africa that found out that only 55-88% of health facilities used sterile equipment for injections and that countries using AD syringes had them available in only 50-88% of the facilities conducted[33]. It is important to mention that the formation of Nairobi Health Management Board to oversee the management all the public health facilities in Nairobi combined with recent reforms in the Ministry of Health[28] could have contributed to availability of injection equipment and consequently contributed to improved injection practices.

The study also found out that most of health facilities had safety boxes in the injection rooms and only about 12 % lacked safety boxes in the injection rooms. The cause of this unavailability was due to logistics such as lack of transport to the facilities or failure of the facilities to order for them in time. After analysis it was observed that facilities not offering immunizations were more likely to lack safety boxes in the injection room compared to facilities offering immunizations. All facilities reported that vaccines are always packaged with matching quantities of syringes and safety boxes. This is a pointer

that while progress is being made to provide safe immunization injections, curative services are not accorded the same because facilities not offering immunization were not routinely supplied with safety boxes. These findings are an awakening call to the health authorities of the dire need of integrating modern intervention that have been proven to be effective across programs rather than implementing vertical programs.

The study found out that 23.5% of the facilities had overflowing safety boxes in the area where injections were administered. This was apparently due to failure of the injection providers to follow instructions of disposing off the safety boxes when they are three quarter full despite the instruction clearly shown on the safety boxes.

MOH facilities were more likely to have safety boxes in the injection room compared to NCC facilities (P=0.02) However, it is important to mention that though the facilities were affiliated to either MOH or NCC they were all receiving drugs and injection equipment for KEMSA which is under the Ministry of Health. The MOH was also deploying health workers in NCC facilities. It was therefore not surprising that there existed no differences between the two categories of health facilities in most injection safety attributes.

All the facilities were using disposable needles and syringes. The syringes were also stored in sealed tamper free packets. However, the presence of expired syringes (these were found to be exclusively BCG AD syringes) caught all injection providers unawares. This is a pointer that inspection for expired injection syringes is not routinely done. It was observed that in 10.7% of the facilities, needles were left in the vials after reconstitution of the drugs, which is not desirable. The injection providers were however

quick to remove them upon entry of the investigator in the injection room, meaning that they are aware of the correct practice.

The use of wet swabs stored as cotton balls in a common container was a common practice across board. It is important to note that this practice is discouraged because most swabs have been found to be un sterile in some studies and were blamed for injection related infections[7].

The findings of the study suggest that health care workers are at a higher risk of needle stick injury and blood borne pathogen infections in Kenya. Even if the study interviewed only 68 injection providers 16% of them reported an accidental needle stick injury in the 12 months preceding the survey. The incidence was low compared to those reported in a study done in Egypt that found the incidence of needle stick injuries to be 35.6%[47]. The incidence was also lower compared to a study in Ghana that reported that 80% of the health workers had reported an accidental needle stick injury[52] and also of a study in Mexico that reported an average needle stick injury rate of 3-4 times a year per HCW[54]. The low prevalence of needle stick injuries among the injection providers could be explained by the fact that recapping of needles after use was not common. Further the presence of safety boxes for disposal of sharps could have contributed to reduction of occupational needle stick injuries just as reported in some studies[43, 46].

The most common related behavior causing needle stick injuries was found to be patient movement, recapping and sharps collection. This compares with other studies that report recapping and unsafe collection of sharps as the greatest contributor to accidental needle stick injuries[52].

No known previous studies had set to establish the action taken after an accidental prick injury but the low number of HCW (only 2 injection providers and 2 cleaners) who went for post-exposure prophylaxis was disappointing. The recommended practice is that health workers should seek PEP services before 72 hours lapse after the incident. This means that most of the HCWs either do not consider transmission of HIV/AIDS through this route to be significant or are not aware of PEP. Another reason for not seeking PEP would be fear of knowing their HIV status after being tested. The fact that few facilities were offering PEP services could also explain the low proportion seeking PEP services.

Few studies have sought to establish the proportion of health care workers vaccinated against hepatitis B. In this study only 2% of the health care workers had been vaccinated for hepatitis B. A study done in Egypt also found that only 15.8% of HCWs reported vaccination with complete (3) dosage of hepatitis B Vaccine[47]. The low proportion of those who had hepatitis B vaccination is a clear indication that both the providers and the Ministry of Health do not consider prevention of hepatitis B through vaccination a priority. This is a paradox considering that hepatitis B vaccine is one of the components in pentavalent vaccine that was administered to children.

Disposal of injection related waste was found to be a major problem in this study. The methods of waste disposal varied from one health facility to another. This was not surprising since it was observed that there were no copies of injection safety and waste disposal policies and guidelines in the facilities. In our observation, the surroundings of more than half of the facilities were littered with vials, syringes and needles. This compares to studies in Ghana[33], Bangladesh[54], and Cote d'Ivore[33], which found that in most health facilities, used syringes and needles were observed in the facility compound.

In depth interviews with cleaners and residents near the health facilities found that children usually played with disposed injection equipment collected from the dumpsites. This problem was aggravated by the fact that most health facilities (69.4%) were not properly fenced. The study noted that fencing of health facilities is usually perceived by authorities more of physical security issue rather than a safety concern.

In-service training on injection safety is very important for every cadre of HCWs to maintain the levels of knowledge and technical competence they achieved during basic training. Health care workers should receive in-service training on current and new information on injection safety. This study found that only 23.5% of the injection providers and about 7% of cleaners had been trained on injection safety. The health facility cleaners were specifically neglected in matters of training. Considering that this cadre is not privileged with a lot of knowledge regarding the risk of injection waste, it means that they were more at risk of contracting blood borne diseases. In ensuring that there is adherence to the recommended guidelines the role of supportive supervision cannot be underscored. The supportive supervision will ensure effective monitoring of the laid down guidelines for effectiveness and those corrective measures are taken where adherence is found to be inadequate. In addition the supportive supervision will also act, as on job training for those who may not have been formally trained.

The facility cleaners were inadequately provided with protective equipment during their work. The studies found out that most of the cleaners are only provided with light examination gloves. Very few were provided with gumboots and aprons. This is very appalling considering the type of waste they handle on a daily basis. Therefore the employers in this case NCC and MOH were found not to take the occupation safety of the workers seriously.

Discussion with scavenging boys and garbage collectors found that some private health facilities disposed used needles and syringes in the common garbage sites. This was confirmed by the presence of used syringes and needles in the dumpsites. It is possible that either the health facilities were not aware of the correct practice or public health departments were not inspecting health facilities on a regular basis to ascertain the methods of injection waste disposal. All the scavenging boys and garbage collectors admitted having been pricked countless times by the used needles. In a country with a high HIV prevalence, inappropriately disposed needles and syringes could be a potential route of HIV transmission.

The role of city council in developing and ensuring adherence to council by-laws on safe disposal of injection related waste was not evident in the study. The fact that very few facilities had appropriate disposal methods was an indicator that city council is not adequately enforcing the safe disposal of injection related waste law. Moreover, most of the facilities were affiliated to the NCC and therefore enforcement of such regulation would be expected to be easy. This could also be a pointer that no matter how much the council tries to enforce the by-laws, as long as there is no commitment in terms of policy development, strategic planning on safety disposal and consequent resource allocation, adherence to the ideals may not be realized.

To guarantee injection safety, health programs that provide injections should have appropriate injection safety policies, strategies, and plans. This study found that there were no copies of guidelines on injection safety and safe disposal in all the facilities included in the study. This compares well with studies done in Cameroon, Chad,

Uganda and Switzerland[2] that showed that despite the existence of an injection safety policy, the policies were not subsequently implemented.

7.2 CONCLUSION

The health facilities that participated in the study were endeavoring to promote safe injection practices by implementing the widespread use of single-use disposable injection equipment. Most of the health facilities were adequately supplied with the necessary injection equipment. However, availability of safety boxes in facilities offering therapeutic injections was low compared to facilities offering immunization services.

There was a significant proportion (16%) of health care workers reporting an incidence of needle stick injury in the last one year preceding the study. There was also a low proportion of HCWs with training on injection safety, low hepatitis B coverage, and lack of post-exposure prophylaxis services in most of facilities. This therefore, puts the health care workers at risk of blood-borne infections.

Unsafe sharps collection and disposal was persistent. Consequently, health care workers were at risk of contracting blood-borne infections through accidental needle stick injuries and unsafe handling of injection waste. There was also inappropriate disposal of injection waste in the health facilities and as a result the community may be at risk of contracting blood borne infections.

Scavenging boys, children and garbage collectors were found to be at risk of blood borne infections through occupational needle stick injuries, which were found inappropriately, disposed of in the dumpsites. They all agreed that inappropriate disposal of injection

related waste in the common dumpsite is widespread and therefore exposing them to frequent needle stick injuries.

Most of the MOH and NCC public health facilities in Nairobi conform to the recommended best practice in terms of availability of injection equipment and injection administration practices. However, disposal of used syringes and needles is inadequate and more than half of health facilities had inappropriately disposed sharps within the compounds.

CHAPTER EIGHT

8.0 RECOMMENDATIONS

Measures should be put in place by the MOH and NCC to ensure that there are adequate supplies of clean injection equipment always including safety boxes in each health care facility. This is particularly so in NCC health facilities from which some injection equipment were lacking. The national health authorities should take measures to ensure that modern intervention that have been proven to be effective such as auto disable syringes and safety boxes are integrated across all health programs rather than implementing vertical programs as was the case for the immunization programmes.

Both MOH and NCC should ensure that the occupational safety of health care workers is adequately addressed to minimize the risk of blood borne infections. They should develop an educational program on the subject of safe injections in order to improve the knowledge level of HCWs and enhance the management and the quality of injection administration. Provision of post-exposure prophylaxis against HIV/AIDS, and vaccination against hepatitis B should be scaled up. Such efforts should also include the health facility cleaners who are in most cases neglected. To ensure that all providers have access to post-exposure prophylaxis (PEP), health care facilities should provide guidelines and referral services so that providers are aware of where to seek treatment. Health facility cleaners should also be provided with protective clothing.

Ministry of Health should ensure that mechanisms are put in place to ensure that "sharps" (i.e. needles and syringes) are disposed off appropriately to ensure that the risk of accidental needle-stick injuries is minimized. This should include setting up a waste

management system for the safe disposal of sharps and especially promoting strict compliance with waste segregation at the source. Facilities for safe handling and disposal of injection related waste should therefore be improved or created where they don't exist. The Ministry of Health and NCC should ensure that all injection related waste emanating from their facilities is disposed off in a safe manner.

The Ministry of Health and NCC should also implement public education emphasizing the possibility of infection by hepatitis B, HIV, hepatitis C, and abscesses from contaminated sharps. Messages on injection safety should be incorporated into existing HIV/AIDS awareness and prevention programmes. Effective dissemination of injection safety policy and accompanying guidelines in health facilities should be scaled up in all the health facilities.

Further research is recommended to assess the level of injection safety in all the provinces of Kenya in order to give a representative picture of injection safety in the whole country. More elaborate studies to ascertain the knowledge attitude and practices of injection safety among the health care workers including the prevalence of needle stick injuries among the health care workers should also be conducted.

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ANNEXES

INTRODUCTION AND CONSENT FORM

Introduction

[Greetings] My name is Dr. Patrick M. Kaburi, from University of Nairobi. We are conducting an assessment about injections and health care. To do this survey, we are asking a series of questions and observing supplies as well as injection practices. Your health care facility has been chosen at random to take part in this survey. The questions will take approximately 10 minutes to complete, but I will also observe your working conditions for about one hour. There is no risk associated in taking part in this survey. Taking part in this study is voluntary and you can choose not to answer any of the questions or you can tell us to stop at any time. Your name will not be written on the forms we use to write down your answers. If we write the results of the survey in a report, you will never be identified in the report. Please make sure any questions you have are answered before you agree to take part. If you have any questions about the survey you may ask them now.

Consent

I _____ of _____ health center/dispensary, certify that I have received detailed explanation of the study including the right to consent. I fully understand the nature of the study in helping improve injection safety. I fully understand that am free to withdraw from the study at any time without giving any explanation.

I understand that I can contact the principle investigator Dr. Patrick M. Kaburi on 0722-864580 in case of any problems or questions.
I hereby voluntarily agree to take place in the study.

Signed

*Participant*_____ *Date* _____

*Investigator*_____ *Date*_____

DATA COLLECTION INSTRUMENT TO ASSESS INJECTION SAFETY

Structured observations (part 1 and part 2)

Part 1 and part 2 should be used for structured observation (at the beginning of the visit, before questions in part 3 and part 4 are asked). Part 1 is a structured observation of equipment and supplies in the facility and part 2 covers the injections administered during the visit. For part 1 and part 2, you may ask the health care worker to show you the supplies you are looking for, but the form should be filled on the basis of what is observed only and not on the basis of answers that are given. Information from the health care worker was collected in part 3.

Questionnaire (part 3 and part 4)

The questionnaires in part 3 and part 4 should be used to interview the injection provider and the supervisor of the facility. If there is more than one injection provider in the facility one was randomly selected. Both questionnaires should be filled on the basis of answers to the questions and not on the basis of what you observed.

District (cluster) number: _____ Facility number: _____

Date and time of arrival: _____ Date and time of completion: _____

1. Structured observation of equipment and supplies available at the facility

I would like to start by observing some of the equipment and supplies available in this facility:
(*This section is based upon observation only*)

1.1	Re-use of syringes or needles in the facility, either for immunization or curative injections	1- Yes 2- No 3- Cannot be assessed
1.2	If yes, sterilization methods available (circle all that apply)	1- steam sterilizer 2- boiling 3- both 4- other (specify)--------
1.3	If pressure sterilizer used in this facility Absence of leaks in routinely used sterilizers	1- Yes 2- No 3- Cannot be assessed
1.4	Presence of a complete, updated register for logging TST spot indicators.	1- Yes 2- No 3- Cannot be assessed
1.5	Presence of service manual	1- Yes 2- No
1.7	Storage of syringes and needles on a clean designated area where blood or body fluid contamination is unlikely	1- Yes 2- No 3- Cannot be assessed
1.8	Syringes and needles packed in sealed tamper free packages	1- Yes 2- No 3- Cannot be assessed
1.9	Presence of expiry dates on the injection equipment (syringes and needles)	1- Yes 2- No 3- Cannot be assessed
1.10	Presence of expired injection equipment	1- Yes 2- No 3- Cannot be assessed
1.11	Presence of swabs used for skin preparation that are dirty, bloodstained or kept wet	1- Yes 2- No
1.12	Number of puncture-proof safety containers (safety boxes) in stock	_____Containers
1.13	Presence of safety boxes in areas where injections are	1- Yes

	being given	2- No 3- Cannot be assessed
1.14	Presence of overflowing, pierced or open box (es)	1- Yes 2- No 3- Cannot be assessed
1.15	Number of full sharps boxes waiting disposal/incineration stored safely (not in the injection area)	Number present --------- Cannot be assessed.
1.16	Number of full sharps boxes waiting disposal/incineration stored in unsupervised fashion (areas accessible to the members of public)	Number present --------- Cannot be assessed.
1.17	Sharps in plastic bottles or open containers exposing staff to needle-stick injuries	1- Yes 2- No 3- Cannot be assessed.
1.18	Evidence of used sharps around health center and/or the disposal site	1- Yes 2- No 3- Cannot be assessed.
1.19	Type of waste disposal method used for the disposal of the majority of sharps (circle only one)	1- open burning on the ground 2- open burning in a hole or an enclosure 3- incinerator 4- burial 5- dumping in pit latrine or other secure pit 6- dumping in a supervised area 7- transport for off-site treatment
1.2	Status of disposal sites fence	1. well fenced 2. Poorly fenced.

2. Structured observation of all injections given during the visit

I would now like to see you perform injections.

	Type of injection	VACCINE	CURATIVE
		1= yes 2 = no	
2.1	Preparation of injection on a clean designated table or tray, where blood or body fluid contamination is unlikely		
2.1	Type of syringe used (1=AD, 2= disposable, 3= sterilizable.		
2.3	Did the patient bring his or her own syringe needle for injection		
2.4	For each injection, use of syringe from sterile packet or use of syringe taken from a sterilizer using a sterile technique (sterilizable syringes)		
2.5	For each injection, use of needle from sterile packet or use of needle taken from a sterilizer using a sterile technique (sterilizable syringes)		
2.6	Removal of all needles from the vaccine/medication vial between injections		
2.8	For each reconstitution, use of a sterile syringe and needle		
2.9	For heat sensitive vaccines vial kept between 2°c and 8°c		
2.10	Two-hands re-capping of the needle after the injection		
2.11	Disposable or AD syringes collection in a puncture proof safety container immediately after the injection		
2.12	(Sterilizable syringes) Flushing, dissembling and dropping of syringes and needles immediately after use into bowl containing enough water to cover them		

3. Interview of injection provider

I would like to ask you a few questions about how to give injections:

3.1	How many injections are given per week on average in this facility?	Immunizations/week----- - Other injections/week----- -
3.2	Do patients provide their own injection equipment for immunizations?	1- always 2- sometimes 3- never 4- don't know
3.3	Do patients provide their own injection equipment for therapeutic injections?	1- always 2- sometimes 3- never 4- don't know
3.4	Do you use needle cutters or needle removers before disposing of injection equipment?	1- Yes 2- No 3- don't know
3.5	How many needle-stick injuries have you had in the last 12 months?	---------- accidental pricks in the last year
3.6	Cause of needle stick injury	1. Recapping 2. Abrupt patient movement 3. During sharps collection
3.7	If you have had a needle stick injury what action did you take.	.....
3.8	Have you ever had any training or attended continuous medical education on injection safety?	1- Yes 2- No 3- don't know
3.9	If yes, when was the last time you attended?	1- 3 months ago 2- 6 months ago 3- 12 months ago 4- More than a year ago
4.0	Have you been vaccinated against hepatitis B.	1- Yes 2- No
4.1	When the steam sterilizer was last serviced?	1- < 1 month

		2- <6 month 3- <1 year 4- >1 year 5- don't know 6- N/A
4.2	Are you provided with sufficient kerosene, other energy source, or sufficient funds to purchase it through your health services?	1- Yes 2- No

4. Interview of injection health facility in charge

I would like to ask you a few questions about your policy and your supplies

4.1	Do you have a copy of the injection safety policy/recommendations issued by your health services?	1- Yes 2- No 3- don't know
4.2	Do you have a copy of the safe sharps and health care waste disposal policy issued by your health services?	1- Yes 2- No 3- don't know
4.3	In the last year, how long in total have you been out of kerosene or energy source for sterilization	1- Never 2- <1 month 3- <3 month 4- >3 months 5- don't know
4.4	In the last year, how long in total have you been out of new, disposable or AD syringes?	1- Never 2- <1 month 3- <3 month 4- >3 months 5- don't know
4.5	In the last year, how long in total have you been out of puncture-proof, sharps containers?	1- Never 2- <1 month 3- <3 month 4- >3 months 5- don't know
4.6	Are stocks of vaccines always delivered with matching quantities of injection equipment?	1- Never 2- <1 month 3- <3 month 4- >3 months 5- don't know
4.7	Are stocks of vaccines always delivered with matching quantities of puncture-proof sharps containers?	1- Never 2- <1 month 3- <3 month 4- >3 months 5- don't know

Thank you very much for you time. Your participation in this survey was useful in improving injection practices in public health facilities.

5.0 Interview with hospital waste pickers

5.1	Sex	1. Male 2. Female
5.2	Number of years in the facility as a waste picker	_____ years
5.3	Have you received any training on injection safety	1 yes 2 no
5.4	Are you provided with protective equipment for handling hospital waste?	1 yes 2 no
5.4a	If yes which protective equipment are you provided with.	
5.5	How many needle-stick injuries have you had in the:	Last 12 months? ---------- Last 3 months? ----------
5.6	Have you had a hepatitis B vaccination?	1 yes 2 no
5.7	If yes when	____ Years ago
5.8	Which Diseases do you fear most contacting through needle stick injuries?	----------
5.9	What actions are needed to prevent you from infections through injection waste?	----------

Thank you very much for you time. Your participation in this survey was useful in improving injection practices in public health facilities

Interview Guide for Scavenger Boys in Dumping Sites

1- Are used hospital sharps commonly disposed in the dumping sites?

2- Do used needles and sharps in the dumping sites often pierce you?

3- Do you think they are dangerous to you?

4- What ailments can possibly be transmitted through the used injections

5- Do you collect the used needles and syringes for resale?

6- If you resale them, to whom do you sell them and for what purpose are they later used.

7- Do intravenous drug users often use used syringes and needles?

8- If the used syringes are resold, how much do they sell them?

9- Is disposal of used needles and syringes a problem and if it is problem, how can the problem be solved?

Focus group discussion guide for garbage collectors

1. What kind of waste that you deal with on routine basis.
2. Is injection waste properly disposed or is mixed together with other garbage
3. Do you sometimes get hurt by inappropriately disposed syringes and needles during their routine work of garbage collection?
4. What protective gear is usually given to you?
5. Do you think that you are at risk of infection from injection waste?
6. Have you received any training on how to handle waste and if yes what kind of training?
7. What action should be taken incase of accidental needle stick injury
8. What action should be taken to address the inappropriate disposal of injection waste in Nairobi?

THE END

Appendix B List of Public Health Facilities in Nairobi

Health Facility Name	District	Type	Ownership	Division	Included/not Included
Starehe Boys Centre	Central	Clinic	MOH	Starehe	DECLINED
Pumwani Staff	Central	Clinic	NCC	Kamukunji	DECLINED
Pumwani Maternity	Central	Hospital	NCC	Kamukunji	DECLINED
GSU Hq. Ruaraka	Kasarani	Clinic	MOH	Ruaraka	INCLUDED
Ministry Of Works	Makadara	Clinic	MOH	Industrial Area	INCLUDED
NYS Public Health	Kasarani	Clinic	MOH	Mathare	INCLUDED
Special Std	Central	Clinic	MOH	Starehe	INCLUDED
Uhuru Camp	Langata	Clinic	MOH	Langata	INCLUDED
Wilson Airport	Langata	Clinic	MOH	Langata	INCLUDED
Shauri Moyo	Central	Clinic	NCC	Kamukunji	INCLUDED
State House Road	Langata	Clinic	NCC	State Road	INCLUDED
NYS Engineering	Kasarani	Dispensary	MOH	Mathare	INCLUDED
Industrial Area Lunga	Kasarani	Dispensary	NCC	Mathare	INCLUDED
Karura	Westlands	Dispensary	NCC	Westlands	INCLUDED
APTC Embakasi	Embakasi	Health Centre	MOH	Embakasi	INCLUDED
Kamiti GK Max.Prison	Kasarani	Health Centre	MOH	Kasarani	INCLUDED
Langata GK Women Prison	Langata	Health Centre	MOH	Langata	INCLUDED
GSU Hq. Thika Road	Kasarani	Health Centre	MOH	Ruaraka	INCLUDED
JKIA Port Health	Embakasi	Clinic	MOH	Embakasi	INCLUDED
Kamiti	Kasarani	Health Centre	MOH	Kamiti	INCLUDED
Loco	Makadara	Health Centre	MOH	Makadara	INCLUDED
NYS Nairobi	Kasarani	Health Centre	MOH	Mathare	INCLUDED
Nairobi West Prison	Langata	Dispensary	MOH	Langata	INCLUDED
Railway Training School	Embakasi	Dispensary	MOH	Embakasi	INCLUDED
Railways Headquarters	Central	Health Centre	MOH	Starehe	INCLUDED
South B Police Line	Makadara	Dispensary	MOH	South B	INCLUDED
Baba Dogo	Kasarani	Health Centre	NCC	Mathare	INCLUDED
Bahati	Makadara	Health Centre	NCC	Makandara	INCLUDED
Biafra	Central	Dispensary	NCC	Kamukunji	INCLUDED
Chest Ngaiwa	Central	Clinic	NCC	Starehe	INCLUDED
Dandora I	Kasarani	Health Centre	NCC	Mathare	INCLUDED
Dandora II	Embakasi	Health Centre	NCC	Embakasi	INCLUDED
Eastleigh	Central	Dispensary	NCC	Starehe	INCLUDED
Embakasi	Embakasi	Health Centre	NCC	Embakasi	INCLUDED
Highridge	Westlands	Health Centre	NCC	Parklands	INCLUDED
Hono Crescent	Makadara	Clinic	NCC	Makadara	INCLUDED
Jericho	Makadara	Health Centre	NCC	Makadara	INCLUDED
Jinnah Avenue	Langata	Clinic	NCC	Langata	INCLUDED
Kahawa	Kasarani	Health Centre	NCC	Kasarani	INCLUDED
Kaloleni Sub	Makadara	Clinic	NCC	Makadara	INCLUDED
Kangemi	Dagoretti	Health Centre	NCC	Dagoreti	INCLUDED
Karen	Langata	Health Centre	NCC	Langata	INCLUDED
Kariobangi	Kasarani	Health Centre	NCC	Mathare	INCLUDED
Kariokor	Central	Dispensary	NCC	Starehe	INCLUDED
Kasarani Sub	Kasarani	Health Centre	NCC	Kasarani	INCLUDED
Kawangware	Dagoretti	Health Centre	NCC	Dagoretti	INCLUDED
Kayole I	Embakasi	Hospital	NCC	Embakasi	INCLUDED
Kayole II	Embakasi	Health Centre	NCC	Embakasi	INCLUDED
Lang'ata	Langata	Health Centre	NCC	Lang'ata	INCLUDED
Lunga Lunga	Embakasi	Health Centre	NCC	Embakasi	INCLUDED
Makadara	Makadara	Health Centre	NCC	Makadara	INCLUDED
Makongeni	Makadara	Health Centre	NCC	Makadara	INCLUDED