FACTORS ACTING AS BARRIERS TO ROUTINE MEASLES IMMUNIZATION ON CHILDREN MORBIDITY IN HOMA BAY DISTRICT, KENYA

BY

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(HIGHER DIPLOMA IN CLINICAL MEDICINE AND SURGERY-PAEDIATRICS)
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SEPTEMBER, 2003
DECLARATION

I, Odanga Aluoch Josephine do hereby declare that, the thesis is my original work and has not been presented for a degree in any University or any other award.

Signature  
Date 18.09.2003

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DEDICATION

This thesis is dedicated to my late father Titus Jaleny Ombim and Mother Lucia Adhiambo, for instilling academic inspiration in my life. I also wish to dedicate it to my husband Bartholomew and children: Wycliff, Carolyne, Mercy, Antoinette and Ian
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<th>Full Form</th>
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<tr>
<td>BCG</td>
<td>Bacilli Calmette Guerrin</td>
</tr>
<tr>
<td>CBOs</td>
<td>Community Based Organizations</td>
</tr>
<tr>
<td>CBS</td>
<td>Central Bureau of Statistics</td>
</tr>
<tr>
<td>CDR</td>
<td>Crude Death Rate</td>
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<td>CFR</td>
<td>Case Fatality Rate</td>
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<tr>
<td>DHMT</td>
<td>District Health Management Team</td>
</tr>
<tr>
<td>DMOH</td>
<td>District Medical Officer of Health</td>
</tr>
<tr>
<td>Et al.</td>
<td>Et Alia</td>
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<tr>
<td>HMIS</td>
<td>Health Management and Information System</td>
</tr>
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<td>HRID</td>
<td>Health Records and Information Department</td>
</tr>
<tr>
<td>FGD</td>
<td>Focused Group Discussion</td>
</tr>
<tr>
<td>IDS</td>
<td>Integrated Disease Surveillance</td>
</tr>
<tr>
<td>IMCI</td>
<td>Integrated Management of Childhood Initiative</td>
</tr>
<tr>
<td>IMR</td>
<td>Infant Mortality Rate</td>
</tr>
<tr>
<td>KEPI</td>
<td>Kenya Expanded Programme on Immunization</td>
</tr>
<tr>
<td>PAHO</td>
<td>Pan American Health Organization</td>
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<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>WHO/ EPI</td>
<td>World Health Organization/Expanded Programme on Immunization</td>
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<td>WHO/EPI/GEN</td>
<td>World Health Organization/Expanded Programme on Immunization/Geneva</td>
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ABSTRACT

Measles remains a major cause of vaccine-preventable illness and death; it is therefore a major public health problem in developing countries, due to low trends of immunization coverage.

A descriptive cross sectional survey was conducted in Nyarongi and Asego Divisions of Homa Bay District, Kenya, between October and December 2002. The survey determined the trends of routine measles immunization on measles epidemiology, with an aim of identifying the factors that were possible barriers to the immunization strategy and ways of strengthening it. Trends of routine measles immunization coverage and morbidity were determined through review of records of children with previous measles infection. Socio-cultural, economic, operational factors impeding routine measles immunization and intervention measures for strengthening measles immunization were also established through systematic interview of mothers who visited health facilities with their children. Focused group discussions were held with members of CBOs, while key Informant Interviews were also held with DHMT members who were selected purposively.

Nyarongi Division recorded immunization coverage (1999-2002) of 20.3% compared to 35.05% of Asego ($\chi^2=61.899$, $p<0.001$ and O.R .9932, $p>0.05$), thus the coverage considered to be low in both Divisions. The female to male ratio of measles occurrence by sex was 1.1:1. The measles age-specific morbidity rate was high in the 0-4 years age cohort, than in the 10-14 years age cohorts, more in Nyarongi than Asego ($\chi^2=4.085$, $p<0.05$ and O.R 396.6624, $p>0.05$). This reflected the low trends of routine measles immunization in both Divisions. Majority of the children from both Divisions had their immunization status ($\chi^2=3.059$, $p>0.05$ and O.R 7791.9708, $p>0.05$), reflecting a weak system of reporting in both Divisions, leading to an incomplete evaluation of measles epidemiology.
Lack of money emerged more of a barrier to routine measles immunization ($\chi^2=16.721$, $p<0.001$ and O.R 2.4702, $p<0.05$) than other socio-economic related factors cited. More mothers from Nyarongi than Asego walked to the health facilities for immunization services ($\chi^2=16.658$, $p<0.001$ and O.R 138.5384, $p>0.05$). The higher the charges on travel and other expenses reduced mothers' chances of presenting children for immunization in Nyarongi than Asego ($\chi^2=11.706$, $p<0.001$ and O.R 17.5793, $p<0.05$). The Socio-cultural factors that impeded routine measles immunization had less chances of increasing immunization coverage in both Divisions ($\chi^2=14.149$, $p<0.001$ and O.R 0.0242, $p<0.001$). Attitude of health workers as an operational factor was more likely to bar mothers from taking their children for immunization services in Asego than Nyarongi ($\chi^2=12.354$, $p<0.001$ and O.R 5.9394, $p<0.001$). Provision of additional health care staff in Asego was more likely to strengthen routine measles immunization than other factors cited ($\chi^2=38.152$, $p<0.001$ and O.R 5.6685, $p<0.001$). There is therefore need to strengthen routine measles immunization strategy by elimination of the obstacles through; vigorous advocacy with policy makers, health managers and health care providers at all levels; and in addition intersectoral collaboration and partnership with members of the provincial administration, community based organizations, opinion leaders and Non Governmental organizations in the District.
CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

1.1 GENERAL INTRODUCTION

Measles is a serious viral infection, especially in the developing world, where routine measles immunization coverage is low. In 1995, 44 million cases and one million deaths occurred worldwide. In the developing countries, it is estimated that measles account for 9.5% of the estimated 12.2 million deaths among the children aged below five years. Over 40 million cases occur worldwide annually contributing to approximately one million deaths, of which half occur in Africa (WHO, 1996; PAHO, 1999). Measles mostly affect children, with the younger age groups (< 5 years) being more vulnerable to severe morbidity and mortality than the older ones (Burstrom et al., 1995).

In Kenya measles is endemic in all parts and is listed as one of the 15 priority diseases for integrated disease surveillance (Republic of Kenya, 2001; WHO, 2001). The areas that record low routine immunization coverage have frequent outbreaks and high disease burden than those that record high coverage (Republic of Kenya, 2000). With the level of under reporting in the country as high as 50%, many cases of measles are not reported and this may not reflect the real magnitude of the disease in the country. Measles is one of the diseases targeted by the integrated management of childhood illness strategy of the Division of Child Health, Ministry of Health (pneumonia, diarrhoea, malaria, measles and malnutrition), because they cause 70% of mortality of children aged below five years (Republic of Kenya, 2000). With the level of under reporting between the health facility to the district, and the district to the national documented at 30% and 50% respectively, many cases and deaths resulting from measles reported are likely not to have been accurate. WHO developed strategies
for reduction of measles in addition to routine measles immunization. Different countries in Africa adopted different sets of strategies, depending on countries characteristics on measles control/elimination programme which included routine measles immunization coverage, presumed mortality and polio eradication status by 1998 (WHO, 1999c). Kenya is in the same block with other East African Countries, whose routine measles immunization coverage are considered medium (50%-75%), with a presumed low to medium mortality (case fatality rate: 0.5%-4%) and very low to near zero wild polio virus circulation since 1997. These group of countries are targeted for Accelerated measles control and the strategies for achieving their goal include: strengthening routine measles immunization coverage; strengthening measles surveillance; conducting supplemental immunization and strengthening measles case management. Strengthening routine measles immunization is a strategy that has not been successful in achieving the desired goal in parts of this country, and it is crucial for policy makers to seek to identify and solve such obstacles.
1.2 LITERATURE REVIEW

1.2.1 EPIDEMIOLOGY OF MEASLES

Measles is a member of the genus *Morbili* virus, of the Paramyxoviridae Family. The virus appears to be antigenically stable, with no evidence adduced on change of the viral antigens. The virus is sensitive to ultraviolet light, heat and drying (PAHO, 1999). Man is the sole reservoir for measles viral infection. Although monkeys may become infected, transmission among them to the wild is not an important mechanism for the virus to persist in nature (Cook, 1996; PAHO, 1999). Measles occurs worldwide and is seasonal. In temperate climates, outbreaks generally occur in late winter and early spring. In tropical climates, it is one of the most prevalent infectious diseases and certainly the most serious of the acute childhood illnesses, whose transmission increases after the rainy season (Cook, 1996). In developing countries with low vaccination coverage, epidemics often occur every 2-3 years and usually last 2-3 months. Duration of outbreaks however vary, depending on the population size, crowding, and the population's immune status (PAHO, 1999). In the absence of measles vaccination, virtually all children are infected with the measles virus, except for isolated communities (Feacham and Jamison, 1991; PAHO, 1999). Countries with relatively high immunization coverage usually have five to seven year periods, of when case numbers remain small. As the number of susceptible children increase to outbreak threshold levels, explosive outbreaks are expected to occur after 5 years (Republic of Kenya, 2000; WHO, 2001).

Measles transmission is primarily by respiratory droplet or airborne spray to mucous membranes in the upper respiratory tract or the conjunctiva (Cook, 1996; PAHO, 1999; Feacham and Jamisson, 1991). Cases are only infectious in the early stages when the virus can be isolated from the throat. Measles is one of the communicable
diseases in man with a basic reproductive rate of 17-20 (Cook, 1996; WHO, 1999a). Measles is a highly contagious virus and most communicable 1-3 days before the onset of fever and cough. The average incubation period is approximately 10 days (8-13 days) from the time of exposure to the onset of fever, and about 14 days from the exposure to the appearance of the rash. Immunity to measles is both antibody and cell mediated, and is life long following an acute attack of the disease. Passive immunity transferred from mother to foetus transplacentally lasts for the first six months of infant life. Measles depresses cell-mediated immunity, which can also be reduced by malnutrition; this accounts for the severity of the disease in many tropical countries (Cook, 1996). Vaccination with measles vaccine has been shown to be protective for at least 20 years.

The incidence of measles worldwide is diminishing in developed countries since the introduction of measles vaccine during the 1960s. Periodic measles epidemics have however continued to occur especially in the large urban areas (Ekanem et al., 2000; Cook, 1996; PAHO, 1999). The outbreaks have occurred primarily among unvaccinated pre-school-aged children and also among fully immunized school-aged children. In developing countries measles virus continues to circulate with unvaccinated infants and pre-school-aged children being at greater risk for measles infection. Outbreaks are also reported among older children, and usually involve those children who have previously escaped natural measles infection because of low measles incidence (PAHO, 1999; Thakur et al., 2002; Feacham and Jamison, 1991).

In Kenya measles is endemic in all the regions. Approximately 3,800 – 11,500 measles cases are reported annually, in the context of considerable under reporting (WHO, 1999c). In the Pre-Immunization era, nearly every child in the country contracted
measles before the age of 2 years. The advent of Kenya Expanded Program on Immunization (KEPI) and the subsequent immunization over the years led to a dramatic decline in measles morbidity and mortality (Republic of Kenya, 2000).

1.2.2 PATHOGENESIS AND CLINICAL MANIFESTATIONS

Prodromal fever, conjunctivitis, coryza, cough and the presence of white (Koplik) spots on the buccal mucosa characterize the disease. A maculopapular rash appears on the third to seventh day, beginning on the face, becoming generalized and lasting 4-7 days. The rash is caused by an allergic response due to the union of sensitized lymphoid cells and the measles antibody with the virus in the skin (WHO, 1999a).

A similar reaction occurs in the epithelium leading to conjunctivitis, stomatitis, pneumonitis and acute inflammation of the gastrointestinal tract. The frequency of complications varies in different parts of the world. General complications include pneumonia, diarrhoea, croup, malnutrition, otitis media and encephalitis. The three major causes contributing to high case fatality are pneumonia diarrhoea and croup. Life long disabilities like blindness, brain damage and deafness have also been associated with measles infection. Most measles deaths (98%) occur in developing countries (WHO, 1999b) where vitamin A deficiency is common. Through synergy with measles infection, vitamin A deficiency contributes to an estimated one million childhood deaths from measles every year.

1.2.3 TREATMENT, PREVENTION AND CONTROL

There is no chemotherapeutic agent that influences the course of viraemia during the course of measles infection. Conservative management is recommended, where food and fluids are encouraged. Administration of clinical vitamin A has been shown to
reduce severity of measles morbidity and mortality (PAHO, 1999). Use of antibiotics in case of bacterial complications is also recommended (WHO, 1999a; Cook, 1996).

Since measles has no specific treatment, prevention and control of the virus is very crucial in its eradication/elimination. There are three consequential phases for measles immunization programmes namely: measles control phase, measles outbreak prevention phase and measles elimination phase (WHO, 1999a). The measles control phase is defined as a significant reduction in measles incidence and mortality. This is achieved when high levels of vaccine coverage are attained (coverage >80%), the incidence decreases and intervals between outbreaks are lengthened (for example, 4-8 years) when compared to those observed during the pre-vaccine era (e.g. 2-4 years). As high levels of vaccine coverage is maintained, an increasing proportion of cases will occur among individuals in older age groups. As vaccine coverage improves, the proportion of cases with a vaccine history increases (PAHO, 1999; WHO, 1999a).

Routine measles immunization to infants has for long been one of the strategies for reducing the disease morbidity and mortality. Routine measles immunization alone as a strategy however is not sufficient, since the measles vaccine is not 100% effective (WHO, 1999c). In outbreak prevention phase, implementation of strategies aimed at prevention of periodic measles outbreaks may be embarked on. These strategies include improved routine measles surveillance in order to understand the changing epidemiology of the disease (such as changes in the age distribution of cases and their immunization status). This can assist countries in predicting outbreaks and thereby preventing them by timely immunization of susceptible individuals in the populations at higher risk and by improving overall levels of immunization coverage in the population. Both developing and developed countries have begun to implement
innovative measles immunization and surveillance strategies in an effort to eliminate the indigenous transmission of virus. The development of these strategies has been prompted by the persistence in these countries of low-level transmission and intermittent outbreaks, despite high coverage either with one-dose or two dose immunization schedules (WHO, 1999a).

In the absence of measles vaccine, virtually every one is vulnerable to measles infection. Routine measles immunization to each birth cohort is therefore fundamental in the control of the viral infection. The measles strategies include maintaining the build-up of susceptible individuals at very low levels by immunizing a large proportion (>95%) of each birth cohort. The recommended age for measles immunization is 9-15 months, when maternal measles antibody levels in infants are low. The measles vaccine efficacy when administered at 9-15 months is 85% - 95% (WHO, 1999a). Thus even if a high vaccine coverage is achieved among each birth cohort, susceptible individuals still accumulate. This may be gradual to reach an outbreak threshold, hence older age groups involved (Bhaskaram et al., 1999; Marufu et al., 1998). When routine measles vaccine coverage is low among each birth cohort, accumulation of susceptible population is quite rapid and outbreaks occur quite frequently. The severity of morbidity and mortality rates is also high since the younger age groups are often involved and they are vulnerable to the viral infection. Vulnerability is partly due to their underdeveloped immune system (Feacham and Jamison, 1991; Burstrom et al., 1995; Cutts et al., 1999).

High routine measles immunization coverage for each birth cohort, above 80% ("keeping-up") is recommended for reduction of morbidity and mortality. The high coverage should also be continuous for each birth cohort in order to sustain a reduction
in morbidity and mortality. High measles vaccination coverage in every birth cohort through routine services is absolutely necessary if the interruption of measles virus circulation is to be maintained over time. Various approaches are used to ensure that at least 90% of each birth cohort receives measles containing-vaccine. These include: improving access to immunization services; integrating immunization services with routine health services; reducing missed vaccination opportunities; and conducting special mobile/outreach services among other approaches. With a vaccine efficacy of 85% - 95%, this leads to a gradual accumulation of susceptible individuals to reach an outbreak threshold (PAHO, 1999, WHO, 1999a). The number of accumulated susceptible population over time could be drastically and speedily reduced by vaccination in a more aggressive measles strategy of a supplemental immunization called a measles "catch-up" mass campaign. This is a one-time-only vaccination activity conducted over a short period of time across a wide age cohort of children. The goal is to rapidly interrupt chains of measles transmission in a geographic area by the achievement of levels of population immunity. The other strategy entails additional vaccination activities, to periodically protect susceptible individuals who have accumulated (follow-up). This follows the catch-up campaign, four years later and involves the 1-4 years of age. This can only be achieved where routine measles immunization coverage is high, such that the accumulation of susceptible children is gradual.

1.3 RATIONALE FOR THE STUDY

1.3.1 Statement of the problem

Despite acceleration of routine immunization in Kenya with the launch of the Kenya Expanded Programme on Immunization (KEPI) in 1980 to-date, higher rates of measles outbreaks are still reported in the country involving a wide range of age groups, ranging
from 9 months–14 years (Republic of Kenya, 2000). Routine measles immunization coverage in Homa Bay District is reported to be still quite low, notably in Nyarongi and of moderate levels in Asego Divisions respectively (Republic of Kenya, 1997). Efforts were made in the year 2001 to accelerate routine infant immunization, using the GAVI funding but with little improvement. It is in this context that review of routine measles immunization versus morbidity and mortality of measles is necessary to estimate the impact of immunization and establish the socio-economic and cultural determining factors. The burden of the disease is felt by the country that has to mobilize resources in response to measles outbreaks in terms of: supplemental measles immunization to communities surrounding the outbreak areas; management of cases of measles; and the complications that may arise. In a country where there are often other competing public health and medical priorities like HIV infection/AIDS and malaria among others, in such circumstances, budgetary allocation for the many public health problems is diverted to curative services like responding to measles outbreaks instead of preventive and promotive health services. The essence of routine measles immunization is to confer immunity to each birth cohort, hence reducing the incidence of the disease outbreaks and it is also expected to be cheaper, compared to responding to outbreaks. This study is therefore geared towards addressing: immunization versus morbidity and mortality trends of measles and the socio-economic; cultural and operational factors that hinder improvement in routine measles immunization coverage; and the intervention measures that can strengthen routine measles immunization coverage in Homa Bay District, Kenya. The results of this study, if implemented could actually also lengthen the duration of impact of the measles catch-up campaign in this District with low coverage, through efforts to improve coverage to above 80%.
1.3.2 RESEARCH QUESTIONS

a) Do the two Divisions differ in their trend of routine measles immunization coverage?

b) Do the two Divisions differ in their trend of measles occurrence by age, sex, immunization status

c) Do the two Divisions differ in socio-economic, cultural and operational factors that influence routine measles immunization?

d) Do the two Divisions differ in their desired intervention measures for strengthening routine measles immunization?

1.3.3 JUSTIFICATION

Homa Bay District was proposed for the research study because it recorded low trends of routine measles immunization (Republic of Kenya, 1999b). Despite the review of KEPI activities in the year 2000 and acceleration of routine infant immunization in Kenya using the Global Alliance on Vaccine Initiative (GAVI) funds in the year 2001, no improvement was documented on routine measles immunization coverage. The district also recorded an averagely low trend of routine immunization of 45%, of the fully immunized birth cohorts (Republic of Kenya, 1999c).

The District also had one of the highest morbidity rates in the country, where measles is rated high as one of the diseases that contribute to high morbidity. The District also had a high poverty level and low utilization of health services (District Development Plan, 1997 – 2001), which were some of the factors that contributed to high mortality rates. Infant mortality rates in the divisions of the district; in their order of intensity were as follows; Nyarongi, Ndhiwa, Riana, Rangwe, and Asego respectively. The main causes of such high mortality were listed as malaria, respiratory infections, measles, home deliveries, HIV infection/AIDS, diarrhoea, and malnutrition among others
Measles together with other integrated management of childhood illness (IMCI) targeted diseases (pneumonia, diarrhea, malaria, measles and malnutrition) cause more than 70% of the deaths of children aged five years and below. The study is important in the evaluation of the measles catch-up campaign conducted in the year 2002. Results of this study, if implemented could actually lengthen the duration of impact of the measles catch-up campaign in the District, which has recorded low coverage trends over the years. The study could assist both at the District and the National levels respectively, in planning for measles activities and on developing and revising policies on measles control in the country.

1.4 NULL HYPOTHESES

a) There is no significant relationship between the Divisions in trends of routine measles immunization coverage.

b) There is no significant relationship between the Divisions in measles morbidity trends by age, sex, immunization status.

c) There is no significant relationship between the Divisions in socio-cultural, socio-economic and operational factors impeding routine measles immunization.

d) There is no significant relationship between the Divisions in intervention measures that strengthen routine measles immunization.
1.5 OBJECTIVES OF THE STUDY

1.5.1 GENERAL OBJECTIVE

The general objective was to estimate, and compare the impact of routine measles immunization coverage on morbidity trends of measles (1999 –2002), and establish the effect of socio-economic, cultural and operational factors on routine measles immunization strategy in two Divisions of Homa Bay District, Kenya.

1.5.2 SPECIFIC OBJECTIVES

a) To determine and compare the trends of routine measles immunization coverage in the study area.

b) To identify and compare trends of measles occurrence in the study subjects by age, sex and immunization status in the study area.

c) To establish and compare socio-cultural, economic, operational determinants and intervention measures of routine measles immunization in the study area.
CHAPTER 2: MATERIALS AND METHODS

2.1 THE STUDY AREA

The research study was conducted in Nyarongi and Asego divisions of Homa Bay District. The former division has recorded low trends of routine measles immunization coverage while the latter moderate trends (Republic of Kenya, 1999b), for comparison of results of the objectives. The district is located in the South Western Kenya along Lake Victoria, and is one of the twelve Districts of Nyanza Province. The District borders Rachuonyo District to the north, Kisii to the east, Migori to the south, and Suba to the west. Homa Bay is located between longitudes 34°12' and 34°40' E and latitudes 0°28' and 0°40' S. The district has a total area of 1155.5 km² (Kenya population census, 1999). Nyarongi Division covers an area of 238.1 km², while Asego covers a total area of 181.4 km² (Republic of Kenya 1999a). The District can be divided into two main relief regions, namely the lakeshore lowland and the upland plateau, with an inland equatorial type of climate modulated by altitude and proximity to lake Victoria. The district receives an annual rainfall of 700-800 mm. Heavy rains are received in Rangwe division, while areas of Ndhiwa, Nyarongi, parts of Rangwe and Asego receive less rainfall (Map of Homa Bay- Appendix vi).

2.2 THE STUDY POPULATION

The population size of the district, in the 1999 census was 288,540, indicating a growth rate of 2.9% per annum. The proposed population for the year 2002 was therefore estimated at 314,377 (Republic of Kenya, 1999a). The population size for the children aged 9 months to 14 years was estimated to be 141,470 and they account for 45% of the total population. The District has the following health indices: crude death rate 168/1000 (National 112/1000; crude birth rate 441/1000 (National 467/1000); infant
mortality rate 102/1000 (National 62/1000); immunization coverage 35% (National 78%) among other indices. The study population retrospectively and prospectively included: Children aged 9 months-14 years who suffered from measles through review of their records of; and all birth cohorts expected for immunization and those immunized against measles through review of their data. Prospectively, mothers/caretakers, opinion leaders, representatives of community based organizations (CBOs), Clinical Officers, Public Health Officers and Technicians, Nurses in-charge of health facilities, the District Public Health Nurse and the Medical Officer of Health were also be part of the study population.

2.2.1 INCLUSION CRITERIA

The study included the following in the two divisions:

Retrospectively and prospectively for review of records:

a) Records of children (male and female) aged nine months to fourteen years, who had previously suffered from measles infection.

b) Data of all birth cohorts expected for immunization and those immunized against measles were also reviewed.

Prospectively for interview on the socio-cultural, economic, operational that are a barrier to routine measles immunization and intervention measures for strengthening routine measles immunization strategy:

a) Mothers and caretakers who accompanied their children aged 0-23 months for immunization services.

b) Members of the District Health Management Team (DHMT), other health workers stationed at the immunizing health facilities of the two divisions.

c) Representatives of community based organizations (CBOs) and opinion leaders were also interviewed.
2.2.2 EXCLUSION CRITERIA

The study excluded in the two divisions the following:

a) Records of any child aged less than 14 years or those above fourteen years who did not present with the signs and symptoms of measles.

b) Data of birth cohorts immunized with other antigens other than measles vaccine.

c) Mothers and caretakers who accompanied their children aged more than 23 months.

d) All the respondents and interviewees who declined to participate in the study.

2.2.3 ETHICAL CONSIDERATIONS

Clearance to carry out the proposed research study was sought from the following institutions: Kenyatta University Senate, through the Dean of School of Pure and Applied Sciences, and the National Ethical Review Committee, under the Ministry of Education, Science and Technology based at Jogoo House, Nairobi. For legal purposes, informed consent was also obtained from the respondents, after providing them with detailed information concerning the proposed research study, to enable them participate in the project. There was also a high sense of privacy and confidentiality during period of data collection and entry, where data was entered into the computer, using coded numbers and not names. The subjects included in the study could at any time, during the course of data collection revoke their consent and withdraw from the study without any penalty.
2.3 STUDY DESIGN

A descriptive, cross-sectional study design, retrospective and prospective in nature was used to determine the impact of routine measles immunization on measles morbidity and mortality in the district. Both retrospective and prospective aspects featured in review of records, and gathering data from respondents and interviewees was entirely prospective.

2.4 SAMPLING AND SAMPLE SIZE DETERMINATION

For review of records:

Records of all measles cases (9 months–14 years) in the two divisions selected for the study and also data of all birth cohorts expected for immunization and those immunized against measles were reviewed. Purposive sampling method was used in selecting study subjects for key informant interviews, while the use of systematic sampling method was instituted in selecting mothers/caretakers for interview.

The formula, as used by Fisher et al., (1998) was used to determine the sample size for those targeted for the one to one in-depth exit interview, where:

\[ n = \frac{Z^2pqD}{d^2} \Rightarrow n = \text{sample size} \]

\[
Z = 1.96
\]

\[
P = \text{proportion in target population (0.5 where there is no estimate)},
\]

\[
Q = 1 - p = 1 - 0.5 = 0.5
\]

\[
d = \text{degree of accuracy usually is } 0.05
\]

\[
D = 2
\]

\[
(b) \quad n = (1.96^2)(0.5)(0.5)2 = 768.152, \text{ but the population sampled was } 400
\]

\[
(0.05)^2
\]
2.5 DATA COLLECTION METHODS AND RESEARCH INSTRUMENTS

A Pilot study to standardize research instruments was done in the District in September. The actual data collection was done over a period of two months, from 14th October through to 10th December 2002.

2.5.1 QUESTIONNAIRES

Checklist questionnaires were used to collect data on trends of routine measles immunization, and trends of measles morbidity and mortality, using the health facility reporting forms for immunization profile and for morbidity and mortality.

2.5.2 EXIT INTERVIEW FORMS

Structured questionnaires were used for the one to one in-depth exit interview, to generate information from mothers/caretakers on the possible socio-cultural, economic and operational factors that hinder routine measles immunization. The District Public Health Nurse (DPHN), the District Medical Officer of Health, Clinical Officers, Public Health Officers and Technicians and Nurses in the health centres participated in Key Informant interviews using the structured questionnaires, on the factors that affect immunization coverage trends in the District.

2.5.3 FOCUS GROUP DISCUSSIONS

Six focused Group discussions, three from each Division were also held with opinion leaders, mothers/caretakers, representatives of community based organizations (CBOs), and health workers to clarify on the factors that were mentioned during the one to one in-depth interview.

2.6 DATA MANAGEMENT AND ANALYSIS

Data was coded before entry and captured using the Integrated Micro-computer Processing System (IMPS) version 3.1; because it has few outliers, since data editing is
done on the screen during entry. Data was converted to the SPSS programme through a written programme. Data analysis was done using the Statistical Package for Social Scientists (SPSS) version 8.0

2.6.1 Quantitative Data

Descriptive statistics was used for editing the data, showing the distribution of the data and also for presentation of the preliminary results of the thesis. The results were then presented in descriptive form using frequency tables, cross tabulation tables and bar charts.

Measures of central tendency and dispersion (mean, median, mode and standard deviation, range, minimum and maximum) respectively were also used where necessary. The following analytical procedures were used:

a) Comparison and difference of variables between the Divisions (chi-square) statistical tests of association and significance are given where applicable. Level of significance given at 0.05 (p=0.05).

b) Comparing strength of relationship between the variables (multivariate multiple regression). Odds Ratio estimations with 95% confidence interval for every model.

2.5.2 Qualitative Data

Qualitative data from each FGD was transcribed, coded and descriptive analysis done according to the objectives of the study. Summary of the analysis provided necessary explanation for the quantitative data. Similarities and disparities have been described in the text.
CHAPTER 3: RESULTS

This includes presentation of the study findings both quantitative and qualitative. The quantitative results were from the trends of routine measles immunization coverage, trends of measles occurrence by age, sex, and immunization status and trends of measles mortality. There were also 400 responses on socio-cultural, economic and operational factors that hinder routine measles immunization and the intervention measures for strengthening it. The qualitative results were from the six (6) focus group discussions (FGD) and 8 key informant interviews.

3.1 Distribution of demographic characteristics of the study population by Divisions

The demographic characteristics of the study population as shown in figure 1 and 2 are for the secondary data on trends of measles immunization coverage and trends of measles occurrence by sex, year, age and immunization status against measles. Figure 3 has demographic characteristics of the respondents who participated in the one to one in-depth exit interview, to establish the effect of the possible socio-cultural, economic, and operational determinants of routine measles immunization

3.1.1 Trends of routine measles immunization coverage

In 1999, there were 296 (14.3%) children from Nyarongi who were vaccinated against measles, out of a total of 2065 children expected for immunization, compared to 999 (26.0%) who were immunized against measles, out of a total of 3839 from Asego Division. In the year 2000, there were 676 (32.0%) who were immunized out of 2125 who were expected for immunization, compared to 1893 (50.0%) from Asego out of 3950 expected for immunization, indicating an improvement in both Divisions.
(17.7%) of children born in the year 2001 from Nyarongi were immunized, out of a total of 2187, compared to 1789 (44.0%) out of a total of 4065 expected for immunization in Asego Division. There was reduction in the number of children immunized against measles that year from both Divisions. In the year 2002, there were 387 (17.1%) vaccinated out of a total of 2250 who were expected for immunization in Nyarongi, compared to 859 (20.0%) from Asego out of 4183 expected to be immunized against measles, still reflecting a reduction in routine measles immunization coverage as shown in figure 1.
Figure 1: Distribution of trends of routine measles immunisation coverage by Division

<table>
<thead>
<tr>
<th>Years</th>
<th>Asego</th>
<th>Nyarongi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.1.2 Selected demographic characteristics of trends of measles morbidity and Division

Three hundred and fifteen records of children who suffered measles (1999-2002) were reviewed, 190 (60.3%) were from Nyarongi and 125 (39.7%) from Asego. The mean age of this study group (children from the two Divisions included in the survey) was 46.29 ± 41.70 (SD) months (median=30.00 months, range 9 to 168 months). One hundred and fifty one (47.9%) of the records, of which Nyarongi had 90 (47.4%) compared to 61 (48.8%) from Asego were males, while females were 164 (52.1%) of which Nyarongi had 100 (52.6%) compared to 64 (51.2%) from Asego. In the year’s category, the trend of occurrence was as follows: 1999 there were a total of 65 (20.6%) cases, with Nyarongi having had 37 (19.5%) and Asego 28 (22.4) of the total cases. The year 2000 recorded forty-nine (15.6%) cases, where Nyarongi had 6 (3.2%) and Asego 43 (34.4%) cases. The year 2001 recorded thirty-five (11.1%) cases, with Nyarongi having 20 (10.5%) and Asego 15 (12.0%) of the total cases. Year 2002 had one hundred and sixty six (52.2%) cases, with Nyarongi recording 127 (66.8%) and Asego 39 (31.2%) of the total cases that year.

The age category of the same study group had frequency of measles trend of occurrence by age as follows: The 0-4 years age cohort had a total of 216 (68.6%) with Nyarongi recording 143 (75.3%) and Asego 73 (58.4%) of the cases. The 5 to 9 years age cohort recorded a total of 67 (21.3%) with Nyarongi recording 33 (17.4%) and Asego 34 (27.2%) of the cases. The age cohort 10 to 14 years recorded a total 33 (10.1%) cases, with Nyarongi recording 14 (7.9%) while Asego 18 (14.4%) of these cases respectively.
The trend of measles occurrence by immunization status showed the following frequency by Division: Those immunized against measles were 34 (10.8%), with Nyarongi recording no (0%) case and Asego 34 (27.2%) cases, whose immunization status against measles was indicated. The children not immunized against measles were 2 (0.6%) from Asego and Nyarongi recorded none (0%). The children whose immunization status against measles was not known (not indicated) were 279 (88.6%) with Nyarongi leading with a high proportion of 190 (100%) compared to Asego 89 (71.2%) cases occurred respectively, as shown in Figure 2.
Figure 2: The distribution of trend of measles occurrence by age cohorts, immunization status and Division

Years of record review, Division and age cohorts

- 0 - 4 yrs immunized
- 0 - 4 yrs not immunized
- 0 - 4 yrs unknown
- 5 - 9 yrs immunized
- 5 - 9 yrs unknown
- 10 -14 yrs immunized
- 10 -14 yrs unknown
3.1.3 Selected demographic characteristics of the respondents and other socio-economic related variables and the Divisions

Four hundred respondents (100%) were interviewed to establish the socio-cultural, economic and operational factors that lead to low routine measles immunization. Nyarongi had 200 (50%) and Asego 200 (50%) respondents, who participated in the one to one in depth exit interview. Three hundred and ninety eight (99.5%) of the respondents were females of which, Nyarongi had 200 (100%) and Asego 198 (99.0%) females respectively. Two of the respondents (0.5%) were males, who were from Asego 2 (1.0%) Division.

The mean age of the respondents in the study group was $22.67 \pm 5.80$ (SD) years (median=21 years, mode=20 years, range 12- 59 years). One hundred and fifteen (28.8%) of the total number of the respondents indicated they were housewives, with Nyarongi having 73 (36.5%) compared to 42 (21.0%) respondents from Asego. A total of one hundred and seventy three (43.3%) of the respondents indicated they were farmers, with Nyarongi having 81 (40.5%) and Asego 92 (46.0%). Ninety-two (23.0%) of the respondents said they were businesswomen, with Nyarongi having 33 (16.5%) and Asego 59 (29.5%) respectively. Nineteen (4.8%) indicated they were students where Nyarongi had 12 (6.0%) and Asego 7 (3.5%), only one respondent (0.5%) from Nyarongi Division was in formal employment, as shown in Figure 3.
Figure 3: The distribution of Divisions and respondents' occupations

Proportion respondents' occupations (%)

- 100.0
- 90.0
- 80.0
- 70.0
- 60.0
- 50.0
- 40.0
- 30.0
- 20.0
- 10.0
- 0.0

Housewife  Farmer  Business woman  Formal employment  Student

Nyarongi  Asego  Respondents' occupation
Figure 4: The distribution of age and occupations of respondents
3.2 The modes of transport used by mothers while taking their children for immunization and the cost per Division

Two hundred and eighty three (70.8%) of the respondents of which 160 (80%) were from Nyarongi compared to 123 (61.5%) from Asego indicated having walked while taking their children for immunization services, while another 95 (23.8%) of them, 36 (18.0%) from Nyarongi and 59 (29.5%) from Asego used matatus. Bicycles were used by twenty-one (5.3%) of the respondents with Nyarongi having had 3 (1.5%) and Asego 18 (9.0%), while only one respondent (0.3%) from Nyarongi Division used a private vehicle as shown in Figure 5.

While traveling to the health facilities for immunization, the respondents used varied amounts of money depending on the mode of transport. This ranged between ten (10.00) to thirty (30.00) Kenya shillings and those who used ten shillings were 63 (15.8%) of which 29 (14.5%) were from Nyarongi and 34 (17.0%) from Asego. Forty (10.0%) of the respondents used twenty shillings, out of which 13 (6.5%) were from Nyarongi and 27 (13.5%) from Asego. The respondents who paid thirty (30.00) Kenya shillings for traveling were 15 (3.7%) of which only one (0.5%) was from Nyarongi and 14 (7.0%) from Asego. The remaining 282 (70.5) never paid any money since they walked to the health facilities, with Nyarongi having 157 (78.5%) and Asego 125 (62.5%) of the respondents as shown in Figure 6.
Figure 5: The distribution of Divisions and modes of transport used by respondents to immunization facilities

Proportion of respondents (%)

Walking on foot   Using a matatu   Bicycle   Private vehicle
Modes of Transport

Nyarongi
Asego
Figure 5: The distribution of Divisions and modes of transport used by respondents to immunization facilities

<table>
<thead>
<tr>
<th>Modes of Transport</th>
<th>Nyarongi</th>
<th>Asego</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking on foot</td>
<td>80.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Using a matatu</td>
<td>20.0</td>
<td>30.0</td>
</tr>
<tr>
<td>Bicycle</td>
<td>0.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Private vehicle</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Proportion of respondents (%)
Figure 7: The distribution of the Divisions and amount of money paid for transport by respondents to immunization facilities.

Proportion of respondents (%)

Amount of money paid for travel (Kshs.)

- Nyarongi
- Asego
3.3 The items purchased by mothers at the health facilities and cost in the Divisions

While taking their children for immunization services, mothers paid money for some necessary items to enable their children receive the required services at the health facilities. These included cards, needle and syringe and security to the health facilities as shown in Figure 8. Three hundred and fifteen (78.8%) of the respondents purchased needle and syringe, of which 157 (78.5%) were from Nyarongi and 158 (79.0%) from Asego Divisions respectively. A further 46 (11.5%) of the respondents purchased cards, thirty-three (16.8%) from Nyarongi and 13 (6.5%) from Asego. Security of the facilities was also catered for, where fifteen (3.8%) of the respondents paid for watchman's fee services, with Nyarongi having had nine (4.5%) and Asego six (3.0%) of the respondents respectively. There were however a few respondents who never committed themselves to having paid for any of the above items and services, whose number stood at 24 (6.0%), with Nyarongi having had only one (0.5%) and Asego the remaining 23 (11.5%) of the respondents. Costing for the items ranged between five (Kshs. 5.00) and fifty (35.00) Kenya shillings. The total number of the respondents who paid five (Kshs. 5.00) Kenya shillings was 13 (3.2%) of which Nyarongi had 11 (5.5%) and Asego 2 (1.0%) of the respondents. Those who indicated having paid ten (Kshs.10.00) were 201 (50.3%) of whom, 29 (14.5%) were from Nyarongi and 172 (86.0%) from Asego. A total number of 186 (46.5%) respondents paid between Kshs.20.00 to 50.00, of which hundred and sixty of the respondents (80.0%) came from Nyarongi and the remaining 26 (13.0%) from Asego. Majority of the respondents paid for the purchase of needle and syringe, while the age cohort 10-39 years also purchased child welfare cards as illustrated in Figure 9. The mean amount of money paid for immunization services ranged between 10.00 and 2.00 Kenya Shillings (Figure 10)
Figure 8: The distribution of the Divisions and items purchased by respondents during immunization services
Figure 9: The distribution of age of the respondents and items purchased for immunization services
Figure 9: The distribution of age of the respondents and items purchased for immunization services

<table>
<thead>
<tr>
<th>Items purchased for immunization services</th>
<th>Card</th>
<th>Needle and Syringe</th>
<th>Security services</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 - 14 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<tr>
<td>20 - 24 yrs</td>
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<tr>
<td>25 - 29 yrs</td>
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<tr>
<td>30 - 34 yrs</td>
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<tr>
<td>35 - 39 yrs</td>
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<tr>
<td>40 - 44 yrs</td>
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<tr>
<td>45 - 49 yrs</td>
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<td>50 - 59 yrs</td>
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<tr>
<td>55 - 59 yrs</td>
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</tbody>
</table>
3.3.4 Distribution of socio-cultural factors acting as barriers to routine measles immunization in the respective Divisions

Respondents also gave their views on socio-cultural factors that were a barrier to routine measles immunization as shown in Figure 11. A hundred and fifteen (28.8%) of the respondents, Nyarongi 61 (30.8) and Asego 54 (31.0%) confided that they were busy with other work at home. Those who cited culture as a hindrance were 69 (17.3%) of who 33 (16.7%) were from Nyarongi and 36 (20.7%) from Asego. Laziness was also mentioned by 46 (11.5) of the respondents, who 35 (17.7%) were from Nyarongi and 11 (6.3%) from Asego. Thirty-seven (9.3%) of the respondents said they feared the side effects of the vaccine, with Nyarongi having had 20 (10.1%) and Asego 17 (9.8%) of the respondents. Inconvenient days for immunization were also cited by 25 (6.3%) of the respondents, 14 (7.1%) from Nyarongi and 11 (6.0) from Asego. Fuelling of rumour about the vaccine was mentioned by 23 (5.8%) of the respondents, who 8 (4.0) were from Nyarongi and 15 (8.6%) from Asego. The child having been sick, thereby preventing a mother from presenting her child for immunization was also mentioned by 20 (5.0%) of them, 7 (3.5%) of who were from Nyarongi and 13 (7.5%) from Asego. Ten of the respondents conceded to not having had of the existence of immunization services, 10 (5.0%) of these who came from Nyarongi and 5 (2.5%) from Asego. Thirteen (3.3%) of the respondents cited long waiting time before arrival of the health facility staff as a hindrance, with 4 (2.0%) of them from Nyarongi and 9 (4.5%) from Asego. Five of the respondents cited lack of faith in vaccine as a hindrance, 3 (1.5%) of who came from Nyarongi and two (1.0%) from Asego. There were however 28 (14.0%) respondents who never gave their views on any of the above factors, 2 (1.0) of them from Nyarongi and 26 (13.0%) from Asego.
Figure 11: The distribution of the Divisions and socio-cultural barriers to routine measles immunization

- Culture prohibits
- No knowledge of measles immunization
- Child sick
- Fear of side effects
- Long waiting time
- Laziness
- Busy at home
- Religion restricts
- Inconvenient immunization Days
- No faith in immunization
- Rumours
3.5 Socio-economic factors acting as barriers to routine measles immunization in the respective Divisions

The socio-economic factors mentioned were four, namely mothers paying for services, long distances to the facilities and money not being available as shown in Figure 12. Majority of the respondents 153 (38.3%) felt that the issue of mothers paying for services was a factor restraining them from taking their children for routine measles immunization, with Nyarongi having a higher proportion of 92 (47.7%) compared to 61 (37.2%) from Asego. The other factors cited for their impediment to routine measles immunization in their order of proportion were; Long distance to the immunization facility, which had a total of 118 (29.5%) respondents, where Nyarongi had 61 (31.6%) and Asego with a close range of 57 (34.8%) of the respondents. Unavailability of money followed with a less proportion 59 (14.8%) with Nyarongi having fewer respondents 15 (7.8%), compared to Asego 44 (26.8%). The proportion of respondents who never gave their views on the above factors were considerable, with 32 (16.0%) from Nyarongi compared to 38 (19.0%) from Asego showing close range proportions. Most of the respondents mainly cited lack of money and long distances to immunizing facilities as possible barriers to routine measles immunization, as shown by the age distribution in Figure 13.
Figure 12: The distribution of socio-economic barriers to routine measles immunization shown according to Divisions

Socio-economic barriers to routine measles immunization

- Payment for immunization services
- Long distances to the immunizing facility
- No money available
- No Response

Proportion of respondents (%)
Figure 13: The distribution of socio-economic barriers to routine measles immunization shown according to age of respondents
3.6 Distribution of factors related to operations of health facilities acting as barriers of routine measles immunization in the Divisions

Attributes of possible operational obstacles of routine measles immunization were also looked into, with respondents giving different views as shown in figure 14. The attributes included staff shortage, which had higher respondents 87 (21.8%), with 29 (15.7) respondents from Nyarongi compared to 58 (43.3%) from Asego. Respondents who cited attitude of health care staff as a hindrance were 55 (13.8%), where by Nyarongi had 12 (6.5%) compared to 43 (32.1%) from Asego. Shortage of vaccines was also a concern and 45 (11.3%) of the respondents cited it, with a comparatively marginal range of proportion between Nyarongi with 28 (15.1%) respondents compared to 17 (12.7) from Asego. Respondents noted with concern the hours of operation of the health facilities, with 19 (4.8%) of them citing facilities as being opened late and closed early as a hindrance, where Nyarongi had 10 (5.0%) respondents compared to 9 (4.5%) from Asego reflecting minimal proportionate range between the Divisions. The largest proportion of 194 (48.5%) of the respondents had no commitment in citing any operational related attributes to low routine measles immunization. Nyarongi had a higher proportion of 121 (60.5%) respondents compared to Asego’s 73 (36.5%) respondents. All Age cohorts who participated in the study reflected their views on operational factors, as shown in Figure 15.
Figure 14: The distribution of factors that are a barrier to operations of immunizing health facilities by Division

Factors that are a barrier to routine measles immunization

- attitude of health workers
- lack of staff
- lack of vaccines
- opening late and closing early
- No response

<table>
<thead>
<tr>
<th>attitude of health workers</th>
<th>lack of staff</th>
<th>lack of vaccines</th>
<th>opening late and closing early</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nyarongi</td>
<td>Asegò</td>
<td>Nyarongi</td>
<td>Asegò</td>
<td>Nyarongi</td>
</tr>
</tbody>
</table>

Proportion of respondents (%)
Figure 15: The distribution of barriers related to operations of immunizing facilities by Age Cohorts
3.7 Distribution of factors for strengthening (intervention measures) routine measles immunization in the Divisions

An attempt was made to address the constraints to routine measles immunization, based on the factors that were highlighted by the respondents, as shown in Figure 16. Proportionally the measures included: Long distances to facilities, with a strong feeling among the 113 (28.3%) respondents that mobile/outreach services should be intensified, with Nyarongi having 65 (32.5%) respondents compared to 48 (26.2%) from Asego. Ninety-two (23.0%) of the respondents felt that intensifying health education and social mobilization was a priority. There was a wider range between Nyarongi having had 64 (32.0%) respondents compared to 28 (15.3%) from Asego. Sixty-nine (17.3%) of the respondents had a desire for immunization services to be offered free off charge, where Nyarongi had 33 (16.5%) compared to Asego’s 36 (18.0%) respondents. Asego Division had more respondents who felt that more staff were required, with 54 (29.5%) respondents compared to 10 (5.0%) from Nyarongi. Both Divisions had a comparable range in their desire for the facilities to be opened early, with Asego having had 12 (6.0%) respondents compared to 4 (2.0%) Nyarongi. Improvement of road infrastructure was given little thought by the respondents with 3 (1.5%) respondents from Nyarongi compared to 2 (1.0%) from Asego. There were a comparable proportion of the respondents who never gave any response towards the above factors, with 21 (10.5%) respondents from Nyarongi compared to 20 (10.0%) Asego. The Age cohort 15-39 years highly cited most of the factors for strengthening routine measles immunization than the other age cohorts as shown in Figure 17.
Figure 16: The distribution of factors that can strengthen routine measles immunization (intervention measures) by Division

Factors (intervention measures)

- Nyarongi
- Asego
Figure 17: The distribution of factors for strengthening routine measles immunization as shown according to age of respondents.
3.8 BIVARIATE ANALYSIS

In order to compare and determine the factors that had significant relationship among the Divisions, cross tabulation was done between the Divisions and each of the various factors.

3.8.1 Relationship between the Divisions and trends of routine measles immunization over the years (1999-2002)

The years under review for routine measles immunization were cross-tabulated against the Divisions. The years (occurrence) were dichotomized into the children who were immunized against measles (actual) and those that were expected for immunization (Expected) while for the two Divisions, Nyarongi and Asego. All the years under review for routine measles immunization coverage (Table 1) had negative (significant) relationship with the divisions (1999: \( \chi^2 = 70.773, p<0.001 \); 2000: \( \chi^2 = 61.899, p<0.001 \), 2001: \( \chi^2 = 225.004, p<0.001 \) and 2002: \( \chi^2 = 7.101, p<0.001 \)). The divisions differed in their trends of routine measles immunization coverage over the four-year period with overall low trends.
Table 1: Relationships between the Divisions and trends of routine measles occurrence over the years

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Divisions</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nyarongi</td>
<td>Asegò</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Actual</td>
<td>Expected</td>
<td>Actual</td>
<td>Expected</td>
<td></td>
</tr>
<tr>
<td>Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>296(14.3)</td>
<td>2065</td>
<td>999(26.0)</td>
<td>3839</td>
<td>$\chi^2=70.773, P&lt;0.001^{***}$</td>
</tr>
<tr>
<td>2000</td>
<td>676(32.0)</td>
<td>2125</td>
<td>1893(50.0)</td>
<td>3950</td>
<td>$\chi^2=61.899, P&lt;0.001^{***}$</td>
</tr>
<tr>
<td>2001</td>
<td>387(17.7)</td>
<td>2187</td>
<td>1789(40.0)</td>
<td>4065</td>
<td>$\chi^2=225.004, P&lt;0.001^{***}$</td>
</tr>
<tr>
<td>2002</td>
<td>387(17.2)</td>
<td>2250</td>
<td>859(20.2)</td>
<td>4183</td>
<td>$\chi^2=7.101, P&lt;0.001^{***}$</td>
</tr>
</tbody>
</table>

*** denotes a strong significant relationship, df=1

EXPECTED FIGURES: Frequency of the children expected for routine measles immunization each year and the proportions are each 100%

ACTUAL FIGURES: Frequency and proportions of the children who were immunized against measles each year out of the total number expected for immunization
3.8.2 Trends of measles occurrence by age, sex, years and immunization status against measles.

There was a positive (insignificant) relationship between the sexual status of the children whose records were reviewed for measles trend of occurrence (Table 2) and the Divisions ($\chi^2=0.062$, $p>0.05$).

In the measles trend of occurrence by age category, the age cohort 0-4 years was most affected by measles. Nyarongi Division recorded 143 (75.3%) compared to 73 (58.4%) cases from Asego, out of a total of 216 (68.6%) cases that occurred, there was a negative (significant) relationship with the divisions ($\chi^2=4.085$, $p<0.05$). The age cohort 5-9 years, with Nyarongi 33 (16.5%) and Asego 14 (7.0%) had a similar relationship with the Divisions ($\chi^2=4.352$, $p<0.05$). There was however an positive (insignificant) relationship between the age cohort 10-14 years, where Nyarongi had 14 (7.0%) and Asego 18 (9.0%) and the Divisions ($\chi^2=3.300$, $p>0.05$).

In year 1999 there were 37 (19.5%) cases of measles reported in Nyarongi and 28 (22.4%) in Asego.
In year 2000, there were 43 (34.4%) cases reported in Asego compared to Nyarongi 6 (3.2%) cases.
Year 2001 had Nyarongi with more, 20 (10.5%) compared to Asego 15 (12.0%) cases respectively.
Similarly in year 2002, Nyarongi recorded more cases 127 (66.8%) compared to 39 (31.2%) in Asego.
The wide range in recorded cases of measles between the Divisions shows a strong negative (significant) relationship over the years ($\chi^2=85.945$, $p<0.001$).

In the immunization status against measles, Nyarongi had no child whose immunization status were indicated, (0%) while Asego had 34 (27.2%) children thus showing a strong negative (significant) relationship between the Divisions ($\chi^2=57.5933$, $P<0.001$). The children who were not immunized against measles were 2 (1.6%) in Asego, while Nyarongi never recorded any such case (0%) reflecting an positive (insignificant) relationship between the Divisions and the children whose immunization
status against measles was indicated ($\chi^2=3.059$, p>0.05). Nyarongi had all the 190 (100.0%) cases reviewed for measles trend of occurrence by immunization status, whose immunization status were not known (not indicated), while Asego had 89 (71.2%) thereby showing a strong negative (significant) relationship between the Divisions, in reporting cases with no immunization status against measles ($\chi^2=61.781$, P<0.001***).
Table 2: Relationship between the Divisions and trends of measles occurrence by sex, age, year and immunization status

<table>
<thead>
<tr>
<th>Variables</th>
<th>Nyarongi</th>
<th>Asego</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>100 (52.6)</td>
<td>64 (51.2)</td>
<td>$\chi^2 = 0.62, P &gt; 0.05$</td>
</tr>
<tr>
<td>Male</td>
<td>90 (47.4)</td>
<td>61 (48.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>37 (19.5%)</td>
<td>28 (22.4%)</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>6 (3.2%)</td>
<td>43 (34.4%)</td>
<td>$\chi^2 = 85.945, P &lt; 0.001^{***}$</td>
</tr>
<tr>
<td>2001</td>
<td>20 (10.5%)</td>
<td>15 (12.0%)</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>127 (66.8%)</td>
<td>39 (31.2%)</td>
<td></td>
</tr>
<tr>
<td><strong>Age Group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4 Years</td>
<td>143 (75.3)</td>
<td>73 (58.4%)</td>
<td>$\chi^2 = 4.085, P &lt; 0.05^*$</td>
</tr>
<tr>
<td>5-9 Years</td>
<td>33 (17.4)</td>
<td>14 (7.0)</td>
<td>$\chi^2 = 4.352, P &lt; 0.05^*$</td>
</tr>
<tr>
<td>10-14 Years</td>
<td>14 (7.4)</td>
<td>18 (14.4)</td>
<td>$\chi^2 = 3.300, P &gt; 0.05$</td>
</tr>
<tr>
<td><strong>Immunization Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immunized</td>
<td>0</td>
<td>34 (27.2)</td>
<td>$\chi^2 = 57.933, P &lt; 0.001^{***}$</td>
</tr>
<tr>
<td>Not Immunized</td>
<td>0</td>
<td>2 (1.6)</td>
<td>$\chi^2 = 3.059, P &gt; 0.05$</td>
</tr>
<tr>
<td>Not Known</td>
<td>190 (100.0)</td>
<td>89 (71.2)</td>
<td>$\chi^2 = 61.781, P &lt; 0.001^{***}$</td>
</tr>
</tbody>
</table>

***- denotes a strong relationship, n=190 (Nyarongi), n=125 (Asego), df=1
3.8.3 Relationship between the Divisions and the respondents' sex, age distribution and occupation

All study independent variables were cross tabulated against the Divisions and Table 3 shows the results of selected respondents' selected characteristics and the Divisions.

Nyarongi Division had all (100.0%) female respondents compared to Asego which had 198 (99.0%) females and two (1.0%) males, showing a positive (insignificant) relationship between the Divisions ($\chi^2=2.010, p>0.05$). The age distribution of the respondents was similar in both Divisions (Table 3) with minimal range difference between age cohorts in the Divisions. The 10-14 years age cohort had 3 (1.5%) respondents from Nyarongi and 1 (1.0%) from Asego. The 15-19 years age cohort had 63 (31.5%) from Nyarongi with Asego having had 64 (32.0%) respondents. The 20-24 years age cohort had the highest number with Asego recording 83 (41.5%) and Nyarongi 66 (33.0%) respondents. The 25-29 years age cohort had a higher number of 38 (19.0%) respondents from Nyarongi compared to 27 (13.5%) from Asego. Nyarongi Division had 19 (9.5%) compared to 14 (7.0%) respondents from Asego in the 30-34 years age cohort. There were 9 (4.5%) respondents and Asego 7 (3.5%) in the 35-39 years age cohort respectively. The age cohort 40-44 years had similar number of 2 (1.0%) respondents from each Division. Nyarongi had no (0%) respondent, while Asego had 1 (0.5%) in the 45-49 years age cohort. There were no respondents in the 50-54 years age cohort from both Divisions, while Nyarongi had no respondent in 55-59 years age cohort and Asego had 1 (0.5%) respondent. There was positive (insignificant) relationship between the Divisions in their age distribution as shown in Table 3.

There were 81 (40.5%) respondents from Nyarongi Division who indicated that they were farmers compared to 92 (46.0%) from Asego. Narongi had 73 (36.5%) respondents who indicated they were housewives compared to 42 from Asego. Thirty-three respondents from Nyarongi indicated that they
were engaged in business, compared to 59 (29.5%) from Asego. One respondent (0.5%) from Nyarongi indicated that she was in formal employment (any other) and none (0%) from Asego, while there were 12 (6.0%) students from Nyarongi and 7 (3.5%) from Asego. There was a strong negative (significant) relationship between the Divisions, housewife, and business-woman ($\chi^2=11.728, p<0.001$ and $\chi^2=9.543, p<0.05$) as occupations for the respondents respectively. There was however Positive (insignificant) relationship between the Divisions and farming; formal employment (any other) and student ($\chi^2=1.232, p>0.05$; $\chi^2=1.003, p>0.05$; and $\chi^2=1.381, p>0.05$) respectively, as forms of occupation (roles) for the respondents as reflected on Table 3.
Table 3: Relationships between the Divisions and age distribution of respondents and occupation (socio-cultural related factors)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nyarongi</th>
<th>Asego</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0 (0%)</td>
<td>2 (1.0%)</td>
<td>( \chi^2=2.010, P&gt;0.05 )</td>
</tr>
<tr>
<td>Female</td>
<td>200 (100.0%)</td>
<td>198 (99.0%)</td>
<td></td>
</tr>
<tr>
<td>Age Distribution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-14 Years</td>
<td>3 (1.5%)</td>
<td>1 (0.5%)</td>
<td>( \chi^2=1.010, P&gt;0.05 )</td>
</tr>
<tr>
<td>15-19 Years</td>
<td>63 (31.5%)</td>
<td>64 (32.0%)</td>
<td>( \chi^2=0.012, P&gt;0.05 )</td>
</tr>
<tr>
<td>20-24 Years</td>
<td>66 (33%)</td>
<td>83 (41.5%)</td>
<td>( \chi^2=3.091, P&gt;0.05 )</td>
</tr>
<tr>
<td>25-29 Years</td>
<td>38 (19.0%)</td>
<td>27 (13.5%)</td>
<td>( \chi^2=2.223, P&gt;0.05 )</td>
</tr>
<tr>
<td>30-34 Years</td>
<td>19 (9.5%)</td>
<td>14 (7.0%)</td>
<td>( \chi^2=0.826, P&gt;0.05 )</td>
</tr>
<tr>
<td>35-39 Years</td>
<td>9 (4.5%)</td>
<td>7 (3.5%)</td>
<td>( \chi^2=0.260, P&gt;0.05 )</td>
</tr>
<tr>
<td>40-44 Years</td>
<td>2 (1.0%)</td>
<td>2 (1.0%)</td>
<td>( \chi^2=0.000, P&gt;0.05 )</td>
</tr>
<tr>
<td>45-49 Years</td>
<td>0 (0.0%)</td>
<td>1 (0.5%)</td>
<td>( \chi^2=1.003, P&gt;0.05 )</td>
</tr>
<tr>
<td>50-54 Years</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
<tr>
<td>55-59 Years</td>
<td>0 (0.0%)</td>
<td>1 (0.5%)</td>
<td>( \chi^2=1.003, P&gt;0.05 )</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House wife</td>
<td>73 (36.5%)</td>
<td>42 (21.0%)</td>
<td>( \chi^2=11.728, p&lt;0.001^{***} )</td>
</tr>
<tr>
<td>Farmer</td>
<td>81 (40.5%)</td>
<td>92 (46.0%)</td>
<td>( \chi^2=1.232, P&gt;0.05 )</td>
</tr>
<tr>
<td>Business Woman</td>
<td>33 (16.5%)</td>
<td>59 (29.5%)</td>
<td>( \chi^2=9.543, P&lt;.05^{*} )</td>
</tr>
<tr>
<td>Any Other</td>
<td>1 (.5%)</td>
<td>0 (0%)</td>
<td>( \chi^2=1.003, P&gt;0.05 )</td>
</tr>
<tr>
<td>Student</td>
<td>12 (6.0%)</td>
<td>7 (3.5%)</td>
<td>( \chi^2=1.381, P&gt;0.05 )</td>
</tr>
</tbody>
</table>

***- denotes a strong relationship; 0 denotes no relationship computed; n=400; df=1
3.8.4 Modes of transport to health facility by mothers while taking child for immunization services

All the travel related variables were cross-tabulated against the Divisions, and the results are shown in Table 4. Majority of the respondents took their children for immunization services while walking, with one hundred and sixty (80.0%) of the respondents coming from Nyarongi compared to hundred and twenty three (61.5%) from Asego. Nyarongi Division had 36 (18.0%) respondents who used matatu as a mode of traveling to reach the health facility, compared to Asego, which had 59 (29.5%) respondents. Bicycles were used by 18 (9.0%) respondents from Asego to reach the health facility, compared to three (1.5%) from Nyarongi. Only one (0.5%) respondent from Nyarongi Division used a private vehicle to reach the health facility, with Asego having none (0%). There was a negative (significant) relationship between the divisions and the mode of travel variables walking, matatu and bicycle respectively ($\chi^2=16.658$, $p<0.001$; $\chi^2=7.303$, $p<0.05$; $\chi^2=11.308$, $p<0.001$), except private vehicle ($\chi^2=1.003$, $p>0.05$) as shown in the Table 3.

While taking children for immunization services, the respondents indicated having paid varied amounts of money as matatu/bicycle charges. The amount of money paid ranged between 10.00 and 30.00 Kenya shillings depending on the distance and the Division. Majority of the respondents did not pay any money since they walked to the health facilities, with Nyarongi Division having a higher number of respondents 157 (78.5%) compared to 125 (62.5%) respondents from Asego. The respondents who indicated having paid 10.00 Kenya Shillings for travel were 34 (17.0%) in Asego compared to Nyarongi 29 (14.5%). An average amount of twenty Kenya Shillings was paid by 27 (13.5%) respondents from Asego compared to 13 (6.5%) from Nyarongi. Similarly Asego had a higher number (14 (7.0%) of respondents who paid 30.00 Kenya Shillings, compared to Nyarong which had only one (0.5%) respondent. There was a positive (insignificant) relationship between the divisions
and paying 10.00 Kenya Shillings for travel ($\chi^2=0.471, p>0.05$). There was however a positive influence on the Divisions and the cost related variables, with a rising strong (significant) relationship between the Divisions and 20.00, 30.00 Kenya Shillings and non-payment ($\chi^2=5.444, p<0.05$; $\chi^2=11.707, p<0.001$ and $\chi^2=12.309, p<0.001$) respectively.

Table 4: Relationships between the Divisions and the variables related to mode of transport (socio-economic)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nyarongi</th>
<th>Asego</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of travel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>160(80%)</td>
<td>123(61.5%)</td>
<td>$\chi^2=16.658, P&lt;0.000^{***}$</td>
</tr>
<tr>
<td>Using Matatu</td>
<td>36(18.0%)</td>
<td>59(29.5%)</td>
<td>$\chi^2=7.303, P&lt;0.05^{**}$</td>
</tr>
<tr>
<td>Bicycle</td>
<td>3(1.5%)</td>
<td>18(9.0%)</td>
<td>$\chi^2=11.308, P&lt;0.001^{**}$</td>
</tr>
<tr>
<td>Private vehicle</td>
<td>1(0.5%)</td>
<td>0(0%)</td>
<td>$\chi^2=1.003, P&gt;0.05$</td>
</tr>
<tr>
<td>Amount paid for travel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Ksh.</td>
<td>29(14.5%)</td>
<td>34(17.0%)</td>
<td>$\chi^2=0.471, P&gt;0.05$</td>
</tr>
<tr>
<td>20 Ksh.</td>
<td>13(6.5%)</td>
<td>27(13.5%)</td>
<td>$\chi^2=5.444, p&lt;0.05^{*}$</td>
</tr>
<tr>
<td>30 Ksh.</td>
<td>1(0.5%)</td>
<td>14(7.0%)</td>
<td>$\chi^2=11.706, P&lt;0.001^{**}$</td>
</tr>
<tr>
<td>None</td>
<td>157(78.5%)</td>
<td>125(62.5%)</td>
<td>$\chi^2=12.309, P&lt;0.000^{***}$</td>
</tr>
</tbody>
</table>

$^{***}$- denotes strong relationship, $n=400$, df=1
3.8.5 Items purchased at the health facility to facilitate immunization services and cost

Health facilities charge a user fee for sustainability of the services. Mothers while taking their children for immunization services paid for certain items and services. These included card, needle and syringe, and other services like security (watchman) services. Services related variables were cross-tabulated against the Divisions and the results are as shown in Table 4. Majority of the respondents from both Divisions purchased needle and syringe, with Asego having 158 (79.0%) compared to Nyarongi 157 (78.5%). Child welfare card was also purchased by a number of respondents where Nyarongi had 33 (16.8%) compared to Asego with 13 (6.5%) respondents. Nine (4.5%) respondents paid for security services from Nyarongi, compared to 6 (3.0%) from Asego. Twenty-three (12.5%) respondents from Asego compared to 1 (0.5%) from Nyarongi did not pay for any of the items/services. There was a negative (significant) relationship between the Divisions and purchasing a card and not purchasing any (none) item/services ($\chi^2=9.826$, p<0.05; and $\chi^2=21.454$, p<0.001) respectively. Conversely, there was an positive relationship between the Divisions and purchasing needle and syringe, and paying for a watchman's services ($\chi^2=0.015$, p>0.05; and $\chi^2=0.623$, p>0.05) respectively as shown in Table 4. Cost of the items/services also received varied responses where increasing strong negative relationship between the Divisions and cost related variables was noted in the following order 5.00 Kenya, 10.00 and the range of 20.00-50.00 Shillings ($\chi^2=6.440$, p<0.05; $\chi^2=204.445$, p<0.001; and $\chi^2=180.444$, p<0.001) respectively.
### Table 5: Relationships between the Divisions and items/services related variables (socio-economic)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nyarongi</th>
<th>Asego</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items Paid for at MCH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Card</td>
<td>33(16.8%)</td>
<td>13(6.5%)</td>
<td>$\chi^2$=9.826, $p&lt;0.05^*$</td>
</tr>
<tr>
<td>Needle and Syringe</td>
<td>157(78.5%)</td>
<td>158(79.0%)</td>
<td>$\chi^2$=.015, $P&gt;0.05$</td>
</tr>
<tr>
<td>Others (. e.g. Watchman)</td>
<td>9(4.5%)</td>
<td>6(3.0%)</td>
<td>$\chi^2$=.623, $P&gt;0.05$</td>
</tr>
<tr>
<td>None</td>
<td>1(0.5%)</td>
<td>23(11.5%)</td>
<td>$\chi^2$=21.454, $P&lt;0.000^{***}$</td>
</tr>
<tr>
<td><strong>Cost of Items</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Kshs.</td>
<td>11(5.5%)</td>
<td>2(1.0%)</td>
<td>$\chi^2$=6.440, $P&lt;0.05^*$</td>
</tr>
<tr>
<td>10 Kshs.</td>
<td>29(14.5%)</td>
<td>172(86.0%)</td>
<td>$\chi^2$=204.495, $P&lt;0.000^{***}$</td>
</tr>
<tr>
<td>20-30 Kshs.</td>
<td>160(80.0%)</td>
<td>26(13.0%)</td>
<td>$\chi^2$=180.444, $P&lt;0.000^{***}$</td>
</tr>
</tbody>
</table>

***- denotes a strong relationship, $n=400$, df=1
3.8.6 Relationship between the Divisions and socio-cultural related variables

Socio-cultural related variables were each cross-tabulated against the Divisions, to determine their effect on routine measles immunization and the result is as shown in Table 5. Majority of respondents who were interviewed on socio-cultural factors that affect routine measles immunization coverage cited engagement with other work at home as a major hindrance. Nyarongi Division had 61 (30.5%), while Asego had 54 (27.0%) of respondents who were engaged with other work at home, but the Divisions were positively related to the variable ($\chi^2=0.598$, $p>0.05$). Culture was also cited as a hindrance, where Asego Division had 36 (18.0%) compared to 33 (16.5%) of the respondents from Nyarongi, and similarly the relationship between the Divisions is positive ($\chi^2=0.158$, $p>0.05$). Laziness as a barrier, was cited by 35 (17.5%) respondents from Nyarongi, compared to 11 (5.5%) from Asego, reflecting a strong negative relationship ($\chi^2=14.149$, $p<0.001$) between the Divisions. A number of the respondents mentioned fear of side effects of the vaccine as a factor that makes mothers shy off from presenting their children for routine measles immunization. The Divisions had minimal difference in their number of respondents, where Nyarongi had 20 (10.0%) compared to Asego with 17 (8.5%) respondents, consequently reflecting a positive relationship between them ($\chi^2=0.268$, $p>0.05$). The two Divisions shared respondents marginally with Nyarongi having 14 (7.0%) who cited inconvenient immunization days compared to Asego 11 (5.5%), there by reflecting a positive relationship between the two Divisions ($\chi^2=0.385$, $p>0.05$). Rumours about the vaccine, was mentioned as a hindrance to the immunization strategy, with Asego having 15 (7.5%) respondents compared to 8 (4.0%) from Nyarongi, this reflected a positive relationship between the Divisions ($\chi^2=2.260$, $p>0.05$). Some of the respondents felt that when a child was sick they should not be taken for immunization, thereby resulting in a missed opportunity for immunization for the child. Asego had 13 (6.5%) compared to Nyarongi that had 7 (3.5%) respondents with such feelings, which showed an
insignificant relationship between these Divisions ($\chi^2 = 1.985, p > 0.05$). A significant number of respondents conceded to lack of awareness on the existence of immunization services, with Nyarongi having 10 (5.0%) respondents compared to Asego having 5 (2.5%), similarly reflecting a positive relationship between the Divisions ($\chi^2 = 1.732, p > 0.05$). Mothers also gave their views on the long time; they take to wait for the health facilities to open. Asego Division had 9 (4.5%) respondents for this variable compared to 4 (2.0%) from Nyarongi. The relationship between the Divisions and this variable was also positive ($\chi^2 = 1.988, p > 0.05$). A section of the respondents conceded to not having faith in the immunization as a hindrance to measles immunization, with Nyarongi having had 3 (1.5%) compared to 2 (1.0%) respondents from Asego. There was still a positive relationship between the Divisions and the variable. Religious sects that prohibit their followers from presenting their children for immunization was also cited by a few respondents, 3 (1.5%) of who came from Nyarongi compared to 1 (0.5%) from Asego. This similarly elicited a positive relationship between the Divisions and the variable ($\chi^2 = 1.010, p > 0.05$). A considerable number of respondents declined to give their views on any of the socio-cultural related issues, and 26 (13.0%) were from Asego while only 2 (1.0%) were from Nyarongi. This reflected a negative relationship between the Divisions and the response ($\chi^2 = 22.120, p < 0.001$)
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nyarongi</th>
<th>Asego</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socio-Cultural Factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Busy with work at home</td>
<td>61(30.8%)</td>
<td>54(27.0%)</td>
<td>$\chi^2=.598, P&gt;0.05$</td>
</tr>
<tr>
<td>Culture doesn’t allow</td>
<td>33(16.7%)</td>
<td>36(18.0%)</td>
<td>$\chi^2=.158, P&gt;0.05$</td>
</tr>
<tr>
<td>Laziness</td>
<td>35(17.5%)</td>
<td>11(5.5%)</td>
<td>$\chi^2=14.149, P&lt;0.001$* *</td>
</tr>
<tr>
<td>Fear of Side effects</td>
<td>20(10.0%)</td>
<td>17(8.5%)</td>
<td>$\chi^2=.268, P&gt;0.05$</td>
</tr>
<tr>
<td>Days of immunization inconvenient</td>
<td>14(7.0%)</td>
<td>11(5.5%)</td>
<td>$\chi^2=.385, P&gt;0.05$</td>
</tr>
<tr>
<td>Rumours about vaccine</td>
<td>8(4.0%)</td>
<td>15(7.5%)</td>
<td>$\chi^2=2.260, P&gt;0.05$</td>
</tr>
<tr>
<td>Child sick</td>
<td>7(3.5%)</td>
<td>13(6.5%)</td>
<td>$\chi^2=1.895, P&gt;0.05$</td>
</tr>
<tr>
<td>Never had of of Immunization services</td>
<td>10(5.0%)</td>
<td>5(2.5%)</td>
<td>$\chi^2=1.732, P&gt;0.05$</td>
</tr>
<tr>
<td>Long waiting time at clinic</td>
<td>4(2.0%)</td>
<td>9(4.5%)</td>
<td>$\chi^2=1.988, P&gt;0.05$</td>
</tr>
<tr>
<td>No faith in immunization</td>
<td>3(1.5%)</td>
<td>2(1.0%)</td>
<td>$\chi^2=.203, P&gt;0.05$</td>
</tr>
<tr>
<td>Religion does not allow</td>
<td>3(1.5%)</td>
<td>1(0.5%)</td>
<td>$\chi^2=1.010, P&gt;0.05$</td>
</tr>
<tr>
<td>No response</td>
<td>2(1.0%)</td>
<td>26(13.0%)</td>
<td>$\chi^2=22.120, P&lt;0.001$</td>
</tr>
</tbody>
</table>

***- denotes a strong relationship, n=400, df=1
3.8.7 Socio-economic related variables

Each socio-economic related variable was cross-tabulated against the divisions to compare the relationships and the results are computed in Table 6. Majority of respondents indicated that paying for services at the health facility while taking children for immunization was a hindrance to measles immunization. Nyarongi had 92 (46%) while Asego had 61 (30.5%) of the respondents. This generated a strong negative relationship ($\chi^2=10.172$, $p<0.001$) between the Divisions. A considerable number of respondents cited long distance to the health facilities, as a hindrance with 61 (30.5%) respondents from Nyarongi compared to 57 (28.5%) from Asego. A positive relationship was reflected between the Divisions ($\chi^2=0.192$, $p>0.05$). Asego Division had 44 (22.0%) respondents who complained about lack of money as a hindrance, compared to 15 (7.5%) from Nyarongi. This reflected a negative relationship between the Divisions ($\chi^2=16.721$, $p<0.001$). A considerable number of respondents did not consider socio-economic related factors as a hindrance to measles immunization by declining to respond when interviewed. Asego had 38 (19.0%) compared to 32 (16.0%) respondents from Nyarongi, eliciting a positive relationship between the Divisions ($\chi^2=0.623$, $p>0.05$)

Table 7: Relationships between the Divisions and socio-economic related

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nyarongi</th>
<th>Asego</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-economic factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers/ care takers paying for services</td>
<td>92 (46.0%)</td>
<td>61 (30.5%)</td>
<td>$\chi^2=10.172$, $p&lt;.001$**</td>
</tr>
<tr>
<td>Long distance immunizing facility</td>
<td>61 (31.5%)</td>
<td>57 (27.0%)</td>
<td>$\chi^2=.192$, $p&gt;0.05$</td>
</tr>
<tr>
<td>No money available</td>
<td>15 (7.5%)</td>
<td>44 (22.0%)</td>
<td>$\chi^2=16.721$, $p&lt;.001$***</td>
</tr>
<tr>
<td>No response</td>
<td>32 (16.0%)</td>
<td>38 (19.0%)</td>
<td>$\chi^2=.623$, $p&gt;0.05$</td>
</tr>
</tbody>
</table>

***- denotes a strong relationship, n=400, df=1
3.8.8 Relationship between the Divisions and variables related to operations of health facilities

Cross tabulation between the operational related variables against the Divisions is shown in Table 8. Lack of adequate health care staff was cited by majority of the respondents as a hindrance to routine measles immunization, where Asego had 58 (29.0%) compared to 29 (14.5%) respondents from Nyarongi. Asego had a higher number of respondents than Nyarongi resulting in a strong negative relationship between the divisions ($\chi^2=20.258$, $p<0.001$). The attitude of health workers to mothers when they visit the health facilities was mentioned as an impeding factor to measles immunization. The influence of this particular variable was high in Asego represented by 43 (21.5%) respondents compared to 12 (6.0%) from Nyarongi, there by reflecting a negative relationship between the Divisions. Lack of vaccines was cited more in Nyarongi with 28 (14.0%) respondents compared with 17 (8.5%) in Asego, conversely reflecting a positive relationship between the Divisions ($\chi^2=3.030$, $p>0.05$). There was no (0%) respondent who cited reminder about the return date by the health care staff for immunization as a hindrance from both Divisions. Both Divisions had respondents’ views on late opening and early closure of the health facilities, with Nyarongi having 10 (5.0%) compared to Asego 9 (4.5%) respondents. This showed a positive relationship between the Divisions ($\chi^2=0.55$, $p>0.05$). The number of respondents who never gave their views on these variables was considerable, with majority 73 (36.5%) of the respondents in Asego compared to 12 (6.0%) in Nyarongi. The relationship between the Divisions in this scenario was a strong negative one ($\chi^2=23.061$, $p<0.001$).
Table 8: Relationships between the Divisions and variables related to operations of health facilities

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nyarongi</th>
<th>Asego</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of staff</td>
<td>29(14.5%)</td>
<td>58(29.0%)</td>
<td>$\chi^2=20.258, P&lt;0.001^{***}$</td>
</tr>
<tr>
<td>Attitude of health workers</td>
<td>12(6.0%)</td>
<td>43(21.5%)</td>
<td>$\chi^2=12.354, P&lt;0.001^{***}$</td>
</tr>
<tr>
<td>Lack of vaccines</td>
<td>28(14.0%)</td>
<td>17(8.5%)</td>
<td>$\chi^2=3.030, P&gt;0.05$</td>
</tr>
<tr>
<td>Not reminded of return date</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td>$\chi^2=0.055, P&gt;0.05$</td>
</tr>
<tr>
<td>Opening late and closing early</td>
<td>10(5.0%)</td>
<td>9(4.5%)</td>
<td>$\chi^2=23.061, P&lt;0.001^{***}$</td>
</tr>
<tr>
<td>No response</td>
<td>121(60.5%)</td>
<td>73(36.5%)</td>
<td></td>
</tr>
</tbody>
</table>

***- denotes a strong relationship, n=400, df=1
3.8.9 Relationship between the Divisions and variables related to intervention measures for strengthening routine measles immunization

The Divisions due to the numerous factors that hinder routine measles immunization, could benefit from measures that could strengthen routine measles immunization. Variables that are related to intervention measures were each cross-tabulated against the Divisions to compare and test for relationship between the Divisions and the results are shown in Table 9. Majority of respondents felt that intensifying outreach /mobile clinics would be beneficial, with 65 (32.5%) of the respondents from Nyarongi compared to 48 (24.0%) from Asego citing this factor. This variable had a comparable response resulting in an insignificant relationship between the Divisions ($\chi^2=3.564, P>0.05$). Nyarongi Division was highly influenced by intensifying health education on routine measles immunization, with 64 (22.0%) compared to 28 (14.0%) respondents from Asego showing a strong negative relationship between the Divisions ($\chi^2=18.295, P<.001$). A considerable number of respondents from both Divisions felt that immunization services should be offered free of charge. Nyarongi had 33 (16.5%) compared to 36 respondents from Asego reflecting a positive relationship between the Divisions ($\chi^2=3.030, P>0.05$). There was a negative relationship on recommendation for more staff where Asego had 54 (27.0%) respondents compared to 10 (5.0%) from Nyarongi, as reflected here ($\chi^2=38.152, P<0.001$). Respondents in Asego felt health facilities should be opened early 12 (6.0%) compared to 4 (2.0%) in Nyarongi. This variable had a reflected a negative relationship between the Divisions ($\chi^2=4.167, P<0.05$). There was positive relationship between Asego 2 (1.0%) and Nyarongi 3 (1.5%) in their quest for improvement of infrastructure ($\chi^2=0.203, P>0.05$). There was a similar relationship (positive) between the respondents from Nyarongi 21 (10.5%) and Asego 20 (10.0%) in declining to give their views on the desired intervention measures for strengthening routine measles immunization ($\chi^2=0.027, P>0.05$).
Table 9: Relationships between the Divisions and intervention measures related variables

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Nyarongi</th>
<th>Asego</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrective Measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensify mobile/outreach clinics</td>
<td>65(32.5%)</td>
<td>48(24.0%)</td>
<td>$\chi^2=3.564, P&lt;0.05*$</td>
</tr>
<tr>
<td>Intensify health education</td>
<td>64(32.0%)</td>
<td>28(14.0%)</td>
<td>$\chi^2=18.295, P&lt;0.001***$</td>
</tr>
<tr>
<td>Free MCH services</td>
<td>33(16.5%)</td>
<td>36(18.0%)</td>
<td>$\chi^2=.158, P&gt;0.05$</td>
</tr>
<tr>
<td>More staff</td>
<td>10(5.0%)</td>
<td>54(27.0%)</td>
<td>$\chi^2=38.152, P&lt;0.001***$</td>
</tr>
<tr>
<td>Open health facility early</td>
<td>4(2.0%)</td>
<td>12(6.0%)</td>
<td>$\chi^2=4.167, P&lt;0.05*$</td>
</tr>
<tr>
<td>Improve infrastructure</td>
<td>3(1.5%)</td>
<td>2(1.0%)</td>
<td>$\chi^2=.203, P&gt;0.05$</td>
</tr>
<tr>
<td>No response</td>
<td>21(10.5%)</td>
<td>20(10.0%)</td>
<td>$\chi^2=.027, P&gt;0.05$</td>
</tr>
</tbody>
</table>

***- denotes a strong relationship, n=400, df=1
3.9 Multivariate Analysis (Logistic Regression)

In order to determine whether the various factors (variables) had effect on the Divisions, enter stepwise Logistic regression methodology was used to assess critical predictors to the Divisions. All the possible predictors, including those with significant relationship were entered in the 8 models.

The first model compared the Divisions and trends of routine measles immunization. There was a negative relationship between the Divisions in their trends of routine measles immunization coverage (OR 0.5862, p<0.001). There was, however positive relationship between the Divisions in measles immunization coverage over the years, as shown in Table 10 (OR 0.9932, p>0.05). There was also a 0.68% less chances of increase in measles immunization coverage in the Divisions over the years under review, as shown in Table 10.

Table 10, Model 1: Comparing the strength of relationships between the divisions, the years and occurrence of routine measles immunization

<table>
<thead>
<tr>
<th>Variable</th>
<th>ODDS RATIO</th>
<th>P Value</th>
<th>95% C.I for Exp(B) Lower-Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years</td>
<td>0.9932</td>
<td>0.5328</td>
<td>0.9720-1.0148</td>
</tr>
<tr>
<td>Occurrence</td>
<td>0.5862</td>
<td>0.0000***</td>
<td>0.5521-.6223</td>
</tr>
</tbody>
</table>

***- denotes a strong relationship
3.9.1 Trends of measles occurrence by age, years, sex and immunization status

There was positive relationship between the Divisions and trends of measles occurrence by sexual status and the years (O.R 0.9443, p>0.05; and O.R 0.5860, p<0.001) respectively as shown in Table 11. The 0-4 years age cohort was 990 and also 287 times (O.R 396.6624, p>0.05; O.R .4006, p<0.05 and O.R 149.8895, p>0.05) more likely to suffer from measles infection than the 5-9 years age cohort and 10-14 years age cohort respectively. Only the age cohort 5-9 years maintained the positive relationship on multivariate analysis (O.R .4006, p<0.05)

There was a likelihood that children who suffered measles may have their immunization status against measles indicated or not indicated on the health facility reports for both Divisions, as shown in Table 11 (immunized- O.R 7791.9708, p>0.05; and those not immunized- O.R 7791.9708, p>0.05).
Table 11, Model 2: Comparing the strength of relationship between the divisions and trend of measles occurrence by sex, years, age and immunization status.

<table>
<thead>
<tr>
<th>Variable</th>
<th>ODDS RATIO</th>
<th>P VALUE</th>
<th>95 C.I FOR EXP(B) LOWER-UPPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>.9443</td>
<td>.8035</td>
<td>.6010-.1.4835</td>
</tr>
<tr>
<td>Years</td>
<td>.5860</td>
<td>.0000***</td>
<td>.4809-.7141</td>
</tr>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4 years</td>
<td>396.6624</td>
<td>.6576</td>
<td>.0000-.1.229E+14</td>
</tr>
<tr>
<td>5-9 Years</td>
<td>.4006</td>
<td>.0024**</td>
<td>.2217-.7236</td>
</tr>
<tr>
<td>10-14 Years</td>
<td>149.8895</td>
<td>.7106</td>
<td>.0000-4.682E+13</td>
</tr>
<tr>
<td>Immunization Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Against Measles)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immunized</td>
<td>7791.9708</td>
<td>.3873</td>
<td>.0000-5.177E+12</td>
</tr>
<tr>
<td>Not Immunized</td>
<td>7791.9708</td>
<td>.8339</td>
<td>.0000-1.840E+40</td>
</tr>
<tr>
<td>Not Known</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

***- denotes a strong relationship
3.9.2 Respondents' age distribution and occupation

There was no significant relationship between the Divisions in the distribution of mothers by age and their probable chance to taking children for immunization services, as shown in Table 12. All age cohorts (O.Rs <1.000, p>0.05) had less chances of taking their children for routine measles immunization in both Divisions, as reflected in Table 12.

The respondents who were farmers were 2 times more likely to take their children for routine measles immunization than the mothers who were house wives (O.R 1.1358, p>0.05; O.R .5753). Mothers who were business women were 325 times more likely to take their children for routine measles immunization than those who were in formal employment (O.R 1.7879, p<0.05; O.R .0055, p>0.05). They were still three times more likely to take their children for routine measles immunization than those who were students (O.R 1.7879, p<0.05; O.R .0055, p>0.05). The variables that reflected significant relationship between the Divisions during bivariate analysis still maintained the relationship during multivariate analysis.
Table 12, Model 3: Comparing the strength of relationships between the Divisions and respondents’ age and occupation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>P Value</th>
<th>ODDS RATIO</th>
<th>95% C.I for Exp(B) Lower -Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-14</td>
<td>.6423</td>
<td>.0018</td>
<td>629898737</td>
</tr>
<tr>
<td>15-19</td>
<td>.7013</td>
<td>.0056</td>
<td>1.747E+09</td>
</tr>
<tr>
<td>20-24</td>
<td>.7130</td>
<td>.0070</td>
<td>2.162E+09</td>
</tr>
<tr>
<td>25-29</td>
<td>.6818</td>
<td>.0039</td>
<td>1.225E+09</td>
</tr>
<tr>
<td>30-34</td>
<td>.6838</td>
<td>.0041</td>
<td>1.276E+09</td>
</tr>
<tr>
<td>35-39</td>
<td>.6869</td>
<td>.0043</td>
<td>1.359E+09</td>
</tr>
<tr>
<td>40-44</td>
<td>.7012</td>
<td>.0055</td>
<td>1.845E+09</td>
</tr>
<tr>
<td>45-49</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.777E+16</td>
</tr>
<tr>
<td>55-59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House Wife</td>
<td>.0001***</td>
<td>.5753</td>
<td>.3936-.8410</td>
</tr>
<tr>
<td>Farmer</td>
<td>.0874</td>
<td>1.1358</td>
<td>.8426-1.5311</td>
</tr>
<tr>
<td>Business Woman</td>
<td>.0075**</td>
<td>1.7879</td>
<td>1.1676-2.7376</td>
</tr>
<tr>
<td>Any Other</td>
<td>.7004</td>
<td>.0055</td>
<td>.0000-1.716E+09</td>
</tr>
<tr>
<td>Student</td>
<td>.2571</td>
<td>.5833</td>
<td>.2297-1.4816</td>
</tr>
</tbody>
</table>
3.9.3 Respondents mode of travel to health facility and items/services purchased at the health facility

The model has shown no significant relationship between the Divisions and various mode of travel related variables unlike in bivariate analysis, where all the variables except, private vehicle and 10.00 Kenya Shillings that were not significant. Mothers who used bicycles were 8 and 3.7 times more likely to take their children for routine measles immunization, than those who walked or used matatu to reach the health facilities (O.R 1081.2752, p>0.05; O.R 138.5384, p>0.05 and O.R 295.3484) respectively. The cost of travel related variables still maintained a significant relationship between the Divisions, except for those who paid 10.00 Kenya Shillings as shown in Table 13. The respondents who paid 30.00 Kenya Shillings for travel were 12 and 6.7 times more likely not to take their children for routine measles immunization than those who paid 10.00 and 20.00 Kenya Shillings (O.R 17.5793, p<0.05; O.R 1.4726, p<0.001 and O.R 2.6086, p<0.05) respectively.

The variables related to purchase of items were all significant on the model, even those that were previously not significant. The respondents who paid for the purchase of needle and syringe were 2.5 and 1.5 times more likely not to take their children for routine measles immunization, than those who purchased cards, or paid for watchman’s services (O.R .0759, p<0.001; O.R .0263, p<0.001 and O.R 3.6375, p<0.001) respectively. Mothers who paid 10.00 Kenya Shillings to purchase items required for immunization services were 36.3 times more likely not to take their children for routine measles immunization than those who paid 5.00 Kenya Shillings for purchase of the items (O.R 104.8971, p<0.001; O.R 2.8888, p>0.05). They were also 238.7 times more likely not to take their children for routine measles immunization than those who paid between 20.00-50.00 Kenya Shillings to purchase the items (O.R 104.8971, p<0.001; O.R .3698, p<0.05). There was a significant relationship between the Divisions in the purchase of items related variables. The more amount of money that was required
for purchase of items/services increased the chances of a mother not taking a child for immunization, as shown in Table 13.

Table 13, Model 4: Comparing the strength of relationships between the Divisions, mode of travel by the respondents to immunizing health facilities and cost of items at the facilities

<table>
<thead>
<tr>
<th>Variable</th>
<th>P Value</th>
<th>ODDS RATIO</th>
<th>95% C.I for Exp (B) Lower -Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Means of travel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>.7149</td>
<td>138.5384</td>
<td>.0000 - 4.288E+13</td>
</tr>
<tr>
<td>Using Matatu</td>
<td>.6735</td>
<td>295.3484</td>
<td>.0000 - 9.161E+13</td>
</tr>
<tr>
<td>Bicycle</td>
<td>.6052</td>
<td>1081.2752</td>
<td>.0000 3.439E+14</td>
</tr>
<tr>
<td>Private vehicle</td>
<td>.7004</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Amount paid for travel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Ksh.</td>
<td>.1666</td>
<td>1.4726</td>
<td>.8510 - 2.5480</td>
</tr>
<tr>
<td>20 Ksh.</td>
<td>.0074**</td>
<td>2.6086</td>
<td>1.2927 - 5.2643</td>
</tr>
<tr>
<td>30 Ksh.</td>
<td>.0059**</td>
<td>17.5793</td>
<td>2.2811 - 135.4776</td>
</tr>
<tr>
<td>None</td>
<td>.0572*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Items Paid for at the Immunizing Health facilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Card</td>
<td>.0000***</td>
<td>.00172</td>
<td>.0068 - 1024</td>
</tr>
<tr>
<td>Needle and syringe</td>
<td>.0000***</td>
<td>.00439</td>
<td>.0229 - .2511</td>
</tr>
<tr>
<td>Others .e.g. Watchman</td>
<td>.0000***</td>
<td>.0291</td>
<td>.0045 - .1526</td>
</tr>
<tr>
<td>None</td>
<td>.5671</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cost of items</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Kshs.</td>
<td>.2252</td>
<td>2.8888</td>
<td>.5203 - 16.0397</td>
</tr>
<tr>
<td>10Kshs.</td>
<td>.0000***</td>
<td>104.8971</td>
<td>44.5788 246.8303</td>
</tr>
<tr>
<td>20-50Kshs</td>
<td>.0181*</td>
<td>.3698</td>
<td>.1621  .8439</td>
</tr>
</tbody>
</table>
3.9.4 Comparing the strength of relationship between the divisions and the socio-cultural related variables

This model compared the strength of relationship between the Divisions and each of the socio-cultural related variables and the results are shown in Table 14. All the socio-cultural related variables had insignificant relationships with the Divisions during bivariate analysis. In this model the Divisions have strong positive significant relationship with all the variables except, with long waiting time at the clinic. All the variables were 83%-97% likely to be a hindrance to routine measles immunization as shown in Table 14
Table 14, Model 5: Comparing the strength of relationships between the divisions and the socio-cultural related variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>P Value</th>
<th>ODDS RATIO</th>
<th>95% C.I for Exp(B) Lower - Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socio-Cultural</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culture doesn’t allow</td>
<td>.0013**</td>
<td>.0839</td>
<td>.0185 - .3813</td>
</tr>
<tr>
<td>Busy with other work at home</td>
<td>.0004***</td>
<td>.0681</td>
<td>.0154 - .3004</td>
</tr>
<tr>
<td>Has never had of existence of immunization services</td>
<td>.0004***</td>
<td>.0385</td>
<td>.0064 - .2315</td>
</tr>
<tr>
<td>Religion does not allow</td>
<td>.0074**</td>
<td>.0256</td>
<td>.0018 - .3746</td>
</tr>
<tr>
<td>Child sick</td>
<td>.0254*</td>
<td>.1429</td>
<td>.0259 - .7873</td>
</tr>
<tr>
<td>Days of immunization inconvenient</td>
<td>.0008***</td>
<td>.0604</td>
<td>.0117 - .3118</td>
</tr>
<tr>
<td>Fear of Side effects</td>
<td>.0007***</td>
<td>.0654</td>
<td>.0135 - .3165</td>
</tr>
<tr>
<td>No faith in immunization</td>
<td>.0112*</td>
<td>.0513</td>
<td>.0052 - .5093</td>
</tr>
<tr>
<td>Long waiting time at clinic</td>
<td>.0644</td>
<td>.1731</td>
<td>.0270 - 1.1107</td>
</tr>
<tr>
<td>Rumours about vaccine</td>
<td>.0234*</td>
<td>.1443</td>
<td>.0270 - .7699</td>
</tr>
<tr>
<td>Laziness</td>
<td>.0000***</td>
<td>.0242</td>
<td>.0049 - .1185</td>
</tr>
<tr>
<td>No response</td>
<td>.0005***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.9.5 Comparing the strength of relationship between the divisions and socio-economic related variables.

The socio-economic variables that showed significant relationship between the Divisions during bivariate analysis, are still reflecting a significant relationship between the Divisions during multivariate analysis. The mothers who mentioned lack of money as a barrier to routine measles immunization were 4.4 times more likely not to take their children for routine measles immunization, than those who cited cost sharing at the facilities (O.R 2.4702, p<0.05; O.R .584, p<0.05). They were also 3.1, times more likely not to take their children for routine measles immunization, than those who cited long distances to immunization facilities, as hindrances and (O.R 2.4702, p<0.05; O.R .7869, p >0.05), as shown in Table 15

Table 15, Model 6: Comparing the strength of relationships between the divisions and the socio-economic related variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>P Value</th>
<th>ODDS RATIO</th>
<th>95% C.I for Exp(B) Lower -Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-economic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mothers/ care takers paying for services</td>
<td>.0454*</td>
<td>.5584</td>
<td>.0539 -.3083</td>
</tr>
<tr>
<td>Long distance to immunizing facility</td>
<td>.4282</td>
<td>.7869</td>
<td>.0749 -.4409</td>
</tr>
<tr>
<td>No money available</td>
<td>.0183</td>
<td>2.4702</td>
<td>.2099 -.1.5496</td>
</tr>
<tr>
<td>No response</td>
<td>.4738</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.9.6 Comparing the strength of relationship between the divisions and variables related to operations of immunizing health facilities.

In this model, the variables that were not significant during bivariate analysis are now significant and attitude of health workers that was strongly significant between the Divisions is not significant in this model. Attitude of health workers was 6 times more likely to make mothers not take their children for routine measles immunization than lack of vaccines (O.R 5.9393, p<0.001; O.R 1.0064, p>0.05). Lack of health care staff was 2.2 times more likely to make mothers not take their children for routine measles immunization than operation hours of the health facilities (O.R 3.3151, p<0.001; O.R 1.4918, p>0.05), as shown in Table 16.

Table 16, Model 7: Comparing the strength of relationships between the divisions and operational related variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>P Value</th>
<th>ODDS RATIO</th>
<th>95% C.I for Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of staff</td>
<td>.0000***</td>
<td>3.3151</td>
<td>.2221-.9303</td>
</tr>
<tr>
<td>Attitude of health workers</td>
<td>.0000***</td>
<td>5.9394</td>
<td>.3478-.19068</td>
</tr>
<tr>
<td>Lack of vaccines</td>
<td>.9852</td>
<td>1.0064</td>
<td>.0606-.3143</td>
</tr>
<tr>
<td>Opening late and closing early</td>
<td>.4070*</td>
<td>1.4918</td>
<td>.0708-.5909</td>
</tr>
<tr>
<td>No response</td>
<td>.0007***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.9.7 Comparing the strength of relationship between the divisions and intervention measures related variables.

The variables that showed significant relationship between the Divisions on bivariate analysis have also shown significant relationship on multivariate analysis, except the variable "open health facility early". Adding more staff to the health facilities as an intervention measure may 6 times more likely strengthen routine measles immunization, than intensifying health education/social mobilization in both Divisions O.R 5.6684, p<0.05; O.R .4594, p<0.05). Providing free immunization services to health consumers as a strategy is 1.5 times more likely to strengthen routine measles immunization than intensifying mobile/outreach services in both divisions (O.R 1.1455, p>0.05; O.R .7754, p>0.05). Regulating operation hours of the health facilities in the Divisions is 4.5 times more likely to improve routine measles immunization coverage than improving the infrastructure as an intervention measure (O.R 3.1, p>0.05; O.R .7000, p>0.05), as shown in Table 17.
Table 17, Model 8: Comparing the strength of relationships between the divisions and intervention measures related variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>P Value</th>
<th>ODDS RATIO</th>
<th>95% C.I for Exp (B) Lower -Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrective Measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensify mobile /outreach clinics</td>
<td>.4868</td>
<td>.7754</td>
<td>.0000-20422.198</td>
</tr>
<tr>
<td>Intensify health education</td>
<td>.0439</td>
<td>.4594</td>
<td>.0000-12119.267</td>
</tr>
<tr>
<td>Free MCH services</td>
<td>.7307</td>
<td>1.1455</td>
<td>.0000-30241.926</td>
</tr>
<tr>
<td>More staff</td>
<td>.0002***</td>
<td>5.6684</td>
<td>.0000-85723.999</td>
</tr>
<tr>
<td>Open health facility early</td>
<td>.0805</td>
<td>3.1500</td>
<td>.000085723.999</td>
</tr>
<tr>
<td>Improve infrastructure</td>
<td>.7116</td>
<td>.7000</td>
<td>.000020125.074</td>
</tr>
<tr>
<td>No response</td>
<td>.8759</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 4: DISCUSSION

The study had three sets of data: data of routine measles immunization coverage, measles trend of occurrence by age, sex, year and immunization status against measles. There was also data of respondents on socio-cultural, economic, operational factors impeding routine measles immunization and intervention measures to routine measles immunization.

4.1 Trend of routine measles immunization coverage in the study area
The study compared and evaluated the trend of routine measles immunization coverage between two Divisions, namely Nyarongi and Asego. The Divisions have had low trends of routine measles immunization coverage over the years, with Nyarongi having had a lower coverage of 20.3% (1999-2002) compared to 35.05% in Asego over the same period (O.R .9932, p>0.05). This is considered a lower coverage and compares well with the KEPI report (Republic of Kenya, 2000). Nyarongi Division has only one health facility in a vast area covering 254 Km\(^2\). The Division has poor infrastructure compared to Asego and is more rural compared to the latter Division, in which the District head quarter of Homa Bay District is located therefore part of the Division is within an urban setting. Communities in the two Divisions engage in peasant farming, small scale businesses and fishing, which is mainly in Asego Division.

4.2 Trend of measles occurrence by sex, years, age and immunization status.
In this study category, female to male ratio was 1.1:1, showing no difference in the sexual ratio of measles occurrence, which compares well with a study aimed at improving measles vaccination and surveillance in India, where there was no variation in measles occurrence by sex (Thakur et al., 2002). The age distribution of the records of children infected by measles showed that 75.3% of the 0-4 years age cohort were affected by measles in Nyarongi Division compared to 58.4% in Asego. The 5-9 years
age cohort had 17.4% in Nyarongi and 27.2% in Asego while the 10-14 years age cohort had 7.4% from Nyarongi and 14.4% from Asego. This compares well with a study conducted in Peru (PAHO, 1999; Jamisson, 1991), where measles age-specific attack rate was higher in the 1-4 years age cohort. This trend is also associated with regions where routine measles immunization coverage is low.

In Asego Division 27.2% of the children who got measles infection were immunized compared to Nyarongi where the immunization status against measles was not indicated. Only 1.6% of the records of children reviewed for measles infection from Asego Division were documented not to have been immunized against measles, while there was none in Nyarongi. Nyarongi Division had all the 190 (100.0%) cases with their state of immunization against measles not indicated, compared to 71.2% from Asego. Multivariate analysis showed that in both divisions, the ratio (likely hood) of children reportedly be immunized against measles before they suffered from measles to those who were not vaccinated was 1:1 (O.R 7791.9708, p>0.05; O.R 7791.9708). This shows that the health facilities relied more on the use of a less reliable tool “outpatient morbidity register” in reporting measles cases, than the use of a more elaborate W.H.O designed tool “measles outbreak investigation form” which has more information on the variables that were included in the study.

The high morbidity rates are a reflection of low routine measles immunization coverage, as is also the case in Homa Bay District. The findings reflect poorly on the measles (mass) catch-up campaigns that were conducted in the Country in the year 2002, in terms of the duration of impact of the campaign on measles morbidity in the Districts of the country that still record low routine vaccine coverage. The nation-wide catch-up campaign recorded an average coverage of 97%, but with low routine coverage trends, the proportion of susceptible cohorts are high. The higher the proportion of the chain of susceptible, the rapid an outbreak threshold is achieved, thereby resulting in frequent outbreaks of measles, in the younger age group who are liable to severe morbidity.
4.3 Socio-cultural factors determining routine measles immunization

In order to establish the socio-cultural factors responsible for low routine measles immunization; the age, sex occupation of the respondents and also other socio-cultural related factors were considered as possible obstacles, which included issues like acceptability; affordability and accessibility of services. Majority of the respondents interviewed on factors hindering measles immunization were females 100.0% from Nyaongi compared to 99.0% from Asego, where 1.0% of the respondents were males. The 15-29 years age cohort were 85.4% of the study respondents, with no considerable variation in the two divisions, were housewives (36.5%-Nyarongi and 21.0%-Asego) in this age category. Farming was also an engagement for most respondents, with 40.5% from Nyarongi compared to 46.0% from Asego. The respondents who engaged in business were 16.5% from Nyarongi, compared to 29.5% from Asego. Multivariate (logistic Regression) analysis indicated that respondents who engaged in business were 3 times more likely to take their children for routine measles immunization, than those of them who were housewives or students. This category of mothers were still 1.7 and 325 times more likely to take their children for immunization than those who engaged in farming or formal employment respectively. The fact that most mothers were housewives therefore confirms their low health facility attendance, considering that those of them who are in formal employment had higher chances of taking their children for immunization.

Further results on socio-cultural determinants to routine measles immunization indicated that, 30.5% of the mothers from Nyarongi compared to 27.0% from Asego could not take their children for immunization because they were busy with other work at home. The Key informant interview rated the concern at 50%, while FGD members from both Divisions did not think of it as a concern. Bivariate analysis indicated a positive relationship between the Divisions ($\chi^2=0.598$, p>0.05). Multivariate analysis showed the concern was 91.64% less likely to prevent mothers from presenting their children for measles immunization, with negative relationship between the divisions. Mothers are charged with
more responsibilities than their spouses, as revealed during the FGD sessions, which interferes with their noble roles of child-care. Majority of mothers in the 15-39 years age range felt they could not get time to take their children for measles immunization and this is the productive age range, who are expected to frequent the immunization facilities with their children.

Mothers who cited culture as a concern (barrier) to routine measles immunization were 16.5% from Nyarongi compared to 18.0% from Asego, with all age categories of the respondents sharing the same opinion. There were 63.6% of the FGD members from Nyarongi compared to 36.4% from Asego who shared the same feeling. Key informant interview with the District health supervisors showed that 37.5% of them shared the same opinion with the mothers and 63.6% of the FGD members from Nyarongi compared to 36.4% from Asego had the same opinion. The deep cultural practice among these communities included in the study made ladies to be married off at a young age as shown by the age distribution of the respondents. This scenario complicates matters for mothers as they cannot freely make any meaningful decision without the intervention of their spouses. The FGD sessions indicated that husbands actually refused their wives from presenting their children for immunization because to them it served no purpose. They felt, they (husbands) were alive despite missing immunization opportunities in their lifetime. The youthful mothers were also liable to forgetfulness, making their children miss immunization sessions. The young age actually contributes to ignorance, which is the source of most of the concerns related to culture and was rated quite high 61.3% by FGD members from Nyarongi compared to 38.7% from Asego. The cultural myths surrounding measles infection included strong restrictions to mothers to keep their children infected with measles indoors lets a “bad air” would befall the sick child. Such restrictions are likely to prevent a mother from seeking any intervention measures should their children fall sick. Other issues included the use of herbal concoctions by the communities for treatment of measles, such that mothers would not regard
vaccination against measles as important. Bivariate analysis showed positive relationship between the Divisions ($\chi^2=0.158$, $p>0.05$). Mothers were 91.61% less likely to take their children for routine measles immunization because of cultural practices in the communities under study, as shown by multivariate analysis (O.R .0839, $p<0.001$) with a negative relationship between the Divisions and emphasis of the difference in Nyarongi Division.

Laziness as a negative factor to routine measles immunization was a concern to mothers, 17.5% of them from Nyarongi compared to 5.5% from Asego. FGD members from Asego Division never felt it was a concern compared to 100.0% of those from Nyarongi. Key informant interviewees thought it was not a priority problem in the District. The 10-39 years age range felt this was a concern amongst them, considering this is the reproductive age group with children for immunization. Bivariate analysis indicated a strong negative relationship between the Divisions ($\chi^2=14.149$, $p<0.001$). Multivariate analysis showed a negative relationship between the Divisions (O.R .0242, $p<0.001$), however the factor was 97.6% likely to prevent mothers from taking their children for routine measles immunization.

Fear of side effects of the vaccines was a concern during the study with 10.0% of the respondents from Nyarongi and 8.0% from Asego citing it. The 15-39 years age range of the respondents mentioned this factor, a fact revealing they still have young children and can remember the problems they encounter with immunization on their children. This is however a false perception that needs addressing, since the measles vaccine does not have the side effects mentioned by the mothers. This factor was not highlighted during the FGD sessions, while during the key informant interviews, it was rated at 25%. A positive relationship between the Divisions was reflected ($\chi^2=0.268$, $p>0.05$), while multivariate analysis showed a strong negative relationship between the Divisions (O.R .0654, $p<0.001$). The
concern, on multivariate analysis, indicated that it was 93.4% likely to prevent mothers from taking their children for routine measles immunization.

Health facilities had immunization days for BCG (tuesdays), which was wrongly interpreted by the mothers to be immunization days for all antigens. The other antigens were given on daily basis, from Monday to Friday of every week. This false perception made mothers not present their children for immunization as required. 7.0% of the mothers from Nyarongi compared to 5.5% from Asego felt this was a concern. This was not prioritized as a concern during the FGD sessions, while on key informant interview it was rated at 12.5%. Bivariate analysis reflected a positive relationship between the Divisions ($\chi^2=0.385$, $p>0.05$), while multivariate analysis showed a negative relationship between the Divisions (O.R .0604, $p<0.001$). Inconvenient days of immunization as a concern, was 93.7% less likely to prevent mothers from taking their children for routine measles immunization.

Asego Division had 7.5% compared to 4.0% of the mothers from Nyarongi who cited rumour about measles vaccine as a hindrance for mothers to present their children for immunization. 85.7% of members of the FGD from Nyarongi had the same feeling compared to 14.3% from Asego. Those who participated in the key informant interview rated it at 50.0%. Mothers in the 15-59 years age range cited rumour as a factor that interfered with their plans to immunize their children. Rumour that was spread about the vaccine included fears of the vaccine laced with the HIV causing virus and family planning regime. The communities also alleged that the vaccine causes delayed milestones in their infants, while others also claim that if their first-born child who was vaccinated against measles died then the vaccine was claimed to be lethal. Some members of these communities also believe that conventional medicine actually makes a child with measles more sick or die all together. Bivariate analysis reflected a positive relationship between the Divisions ($\chi^2=2.260$, $p>0.05$), while multivariate
analysis showed a negative relationship between the divisions (O.R .1443, p<0.05). Rumour as a factor was 85.6% likely to prevent mothers from presenting their children from immunization. Some mothers felt that when their children are sick, immunization should not be administered to them, with 6.5% of such mothers from Asego compared to 3.5% from Nyarongi. The 15-34 years age range of the mothers had such feelings, which does not augur well for infant immunization, since this is the age range of mothers with young children who require immunization services most. Members of the FGD did not approve of the concern, while those who participated in key informant interview rated the concern at 37.5%. Bivariate analysis yielded a positive relationship between the Divisions, while multivariate analysis showed a negative relationship between the Divisions (O.R .1429, p<0.05). When mothers have such situations, they were 85.7% less likely to take their children for routine measles immunization.

Ignorance as mentioned in focus group discussion sessions, can also be perceived as other factors such as lack of knowledge, where mothers conceded to not to have heard of existence of immunization services as a concern. The young age limits the mothers on knowledge, which is further attributed to ignorance. 5.0% of the mothers from Nyarongi compared to 2.5% mothers from Asego cited this as a concern; most of them within the 15-39 years age range. Bivariate analysis showed a positive relationship (χ²=1.732, p>0.05). Multivariate analysis showed a negative relationship (O.R .0385, p<0.001), with the concern 97% likely to influence mothers not take their children for immunization services. The other factors mentioned by a few mothers included long waiting time at the clinic, no faith in immunization and prohibitive religion also reflect on multivariate analysis a like lihood that they can influence the mothers’ decision on immunization. The concerns discussed under socio-cultural determinants compare well with findings of a study conducted in Cambodia and American Academy of Paediatrics (Barbara et al., 2001; Zahner, 1999). Culture as a hindrance to routine measles immunization is also a major set back to measles case management, which is also a strategy in
strengthening accelerated measles control in the country. The restrictions that are imposed on mothers make many children who suffer from measles end up with serious complications and either suffer permanent disabilities or die from measles complications because they are prohibited by tradition from immunization or seeking medical intervention when they have measles. Culture is also an impediment as has already been mentioned, mothers married off at a comparatively younger age are not capable of making decisions, without influence from their spouses, neither are they empowered with the knowledge, nor financially to meet the challenges that go with motherhood like child care.

4.4 Socio-economic factors that are a barrier to routine measles immunization

Mothers gave their views on mode of transport and cost, items purchased at the health facilities their cost and other factors discussed in the text as the possible socio-economic factors that pose a barrier to taking children for routine measles immunization.

Most mothers walked while taking their children for immunization (O.R 138.5384, p>0.05). Nyarongi Division had majority, 80.0% of the respondents compared to 61.5% from Asego. Some of the mothers used matatu to reach the health facilities, with Asego having 29.5% of the respondents compared to 18.0% from Nyarongi. Asego had 9.0% of the respondents using bicycles compared to 1.5% from Nyarongi. Only one respondent from Nyarongi used a private vehicle. All the age cohorts had no comparison while walking to the facilities for measles immunization. Nyarongi had more respondents walk to the health facility because of poor infrastructure in the Division compared to Asego which has a better road network, this compares well with a study on measles epidemiology conducted in Sudan (de Swart et al., 2001). Asego had potentials for income generation compared to Nyarongi. Mothers were 3.7 times more likely to use bicycles to the health facilities than vehicles (O.R 1081.2752, p>0.05; O.R 295.3484, p>0.05), with no significant relationship between the Divisions. Most mothers live in rural areas, where accessibility is better by use of bicycle compared to matatus, and also due to
the fact that most of the communities living in the two Divisions are mainly peasant farmers or are engaged in small scale businesses with little income. Mothers who used bicycles were more likely to take their children for immunization services, than those who either walked or used matatu in both Divisions (O.R 1081.2752, p>0.05; O.R 138.5384, p>0.05; and O.R 295.3484, p>0.05)

The mothers who paid for transport expenses to the health facilities were 37.5% in Asego Division, compared to 21.5% from Nyarongi. Those who indicated not to have paid money for travel, meaning they walked to the health facilities were 78.5% from Nyarongi compared with 62.5% from Asego. There was a strong negative relationship between the Divisions in their mode of travel as has already been shown ($\chi^2=11.706$, p<0.001). This finding confirms the state of infrastructure in Nyarongi compared to Asego, and the socio-economic state of the communities living in Asego, compared to those in Nyarongi. The finding has also shown that the mothers who may have to pay more money for travel may have high chances of not taking their children for routine measles immunization.

Majority of the respondents paid money for the purchase of needle and syringe, with 78.5% mothers from Nyarongi compared to 79.0% of the mothers from Asego. This shows that the mothers with children who visit the health facilities let their children to be vaccinated. Mothers who purchased needle and syringe were 2.5 and 1.5 times less likely to have their children vaccinated against measles than those who purchased cards or paid for security services (O.R .0439, p<0.001; O.R .0172, p<0.001 and O.R .0291, p<0.001), with a negative relationship between the Divisions. This implies that the high amounts of money a mother may be required for purchase of items/services reduced their chances of taking children for routine measles immunization. This compares well with the American Academy of Paediatrics, which cited financial factors as a barrier to immunization (Zahner, 1999). The mothers from Nyarongi who bought cards were 16.8% compared to 6.5% from Asego. The 10-34 years age
range bought cards more than any other age, this is attributed to the fact that this age range is the peak for child bearing, therefore the need to acquire cards for their infants. All the age cohorts included in the survey purchased needle and syringe, which reflects positively on infant immunization.

The cost of the items that were required before a child was immunized showed a significant relationship between the Divisions. Asego Division had 86.0% of the mothers who paid 10.00 Kenya Shillings for purchase of the items compared to 14.5% from Nyarongi. Charges in the facilities differ with the class of the facility. The health facility in Asego is a dispensary, while the facility in Nyarongi was a health centre, thereby attracting higher charges. Nyarongi Division also had mobile clinics organized by a Non Governmental Organization (NGO), Catholic Relief Services that had a child survival project in the Division and their charges were higher than the Government run health facilities. Nyarongi had 80.0% of the mothers who paid between twenty (20.00) to fifty (50.00) Kenya Shillings compared to 13.0% from Asego. The mean amount of money that was paid for purchase of items in Nyarongi Division was 23.00 compared to 11.80 Kenya Shillings in Asego. The high amount paid in Nyarongi could be an impediment to strengthening routine measles immunization in this Division. The age cohorts' mean amount ranged between 10.00 (paid by the 40-59 years age cohort) and 20.00 Kenya Shillings (paid mostly by the 10-14 years age cohort). The mothers who paid 10.00 Kenya shillings for the purchase of the immunization related items were 36.3 times more likely not to have their children immunized than those who paid 5.00 Kenya shillings (O.R 104.8971, p<0.001; O.R 2.8888, p>0.05), with a negative relationship between the Divisions. Those mothers who paid between 20.00 and 50.00 Kenya shillings were 239 times less likely to have their children immunized against measles than those who paid 10.00 Kenya Shillings.

Further findings from the study on socio-economic determinants indicated that 46.0% of the mothers from Nyarongi compared to 30.5% from Homa Bay felt the payment they made for immunization
items and services was a hindrance to taking their children for immunization. The mothers in the age range 25-34 years had this concern and were 2.3% to 6.3% of the respondents. 30.0% of the mothers from Nyarongi complained about long distances traveled to reach health facilities compared to 28.5% from Asego. The mothers who cited this factor were mainly in the 15-39 years age range, were between 43.6%-47.7% of the respondents and within the reproductive age range. Mothers who felt lack of money was a barrier were 7.5% and 22.0% from Nyarongi and Asego respectively. 100.0% of the mothers in the age range 10-14 and 55-59 years shared the same feeling, while those in the age range 15-39 years were rated 50.0%-56.0% in their feeling towards lack of money for immunization services at the health facilities. Both bivariate and multivariate analyses reflected significant relationship between the Divisions, except for long distance to facilities and the respondents who declined to respond on interview ($\chi^2=0.192$, $p>0.05$; $\chi^2=0.623$, $p>0.05$ and O.R .7869, $p>0.05$; $p>0.05$). Mothers who indicated lack of money as a barrier were 4.4 times more likely not to take their children for immunization than those whose concern was cost sharing for immunization services. Those citing lack of money were also 3.1 times more likely to fail to present their children for immunization than those who cited long distance to the facilities as a barrier. These findings compare well with the study conducted in Cambodia except, in the Cambodia study, the mothers living far away from health facilities had more of their children immunized because of enhanced mobile services unlike in this study (Barbara et al., 2001). Information gathered from key informant interviews indicated that communities living in the study area are mainly engaged either: in peasant farming and small scale businesses (100.0%) respectively or are in formal employment (50.0%), and fishing (37.5%), which is mainly in Asego. Considering these facts, it then reflects positively on issues raised by the respondents about lack of money and the factors that are related to money and immunization, like the purchase of items and payment for certain services which require money. Nyarongi Division was disadvantaged by the long distances to the only health facility, coupled with high charges for
services, considering the facility is a health centre demanding higher charges than the facility in Asego. Catholic relief Services is also striving to strengthen child survival initiative in Nyarongi at high costs for services offered, but in a Division with high rates of poverty due to limited resources.

4.5 Operational determinants of routine measles immunization

Findings in the study indicate that 43.3% of mothers from Asego complained of lack of staff as a barrier to routine measles immunization compared to 14.5% from Nyarongi. This concern was common among all the mothers interviewed, their feelings rated between 14.3% for the 10-14 years age range to 100.0% with the older mothers. All members of the FGD in Asego shared this concern, with 50.0% of those who participated in the key informant interviews also sharing the same concern. 21.5% of mothers from Asego were not happy with negative attitude of health workers towards them compared to 6.0% from Nyarongi. Most of the mothers were in the 10-49 years age range, who numbered 11.1%-100.0%, with 85.7% of the FGD members from Nyarongi with the same concern compared to 14.3% from Asego. The same concern was also raised by 62.5% of the health supervisors during the key informant interviews. Lack of vaccines as a hindrance to routine measles immunization was also cited by 14.0% of mothers from Nyarongi compared to 8.5% from Asego. Majority of the mothers were in the 15-44 years age range, and were 7.9%-26.6% of the respondents. 37.5% of the health supervisors also raised the same concern. Mothers complained of the late opening of the health facilities as a barrier to their effort in having their children immunized. Since most of the mothers have double roles, any delay at the health facilities may make them change priorities, making their children miss immunizations or discourage them from taking their children. 8.0% to 25.0% of the mothers in the 15-39 years age range cited this concern. Asego Division had 4.5% of mothers, with this concern compared to 5.0% from Nyarongi. 66.7% of FGD members from Asego compared to 33.3% from Nyarongi and 50.0% of the health supervisors shared the same concern. A considerable proportion of
the mothers, of who 36.5% were from Asego compared to 60.5% from Nyarongi declined to give their views on operational related factors that could be barriers to routine measles immunization. Most of these mothers were in the 10-39 years age range and they were 28.6% to 50.0% of the respondents. This reflects negatively to routine measles immunization, because of the considerable proportion and the potential reproductive age of these mothers. There was a strong negative relationship between the Divisions and the factors cited except for lack of vaccines and operation hours of the facilities. Multivariate analysis reflected the same relationships. Mothers are 6 times more likely not to take their children for immunization services, due to attitude of health workers than lack of vaccines in the facilities. They were also 2.2 times more likely to miss immunization sessions for their children due to lack of health staff than when they have no reason for not attending the sessions. An efficient system requires an adequate number of skilled personnel and availability of logistics that are required for better performance. The study area lacks adequate staff (Asego) and their attitude undesirable to the consumers of the services that they offer. The results compares well with the American Academy of Paediatrics report, which gave barriers to immunization as fragmented health care, financial barriers and missed opportunities for immunization (Zahner and Susan, 1999)

4.6 Proposed intervention measures for strengthening routine measles immunization

The study findings indicated that in order to improve routine measles immunization coverage in the study area, based on the problems that were identified to be barriers to mothers in attending immunization sessions, solutions had to be sought. 32.5% of mothers from Nyarongi compared to 24.0% from Asego felt that intensifying mobile/outreach services within the study area, more in Nyarongi would help them. FGD members from both Divisions had equal feeling (50.0%), with 100.0% of the health supervisors sharing the same. Bivariate analysis showed a significant relationship between the Divisions ($\chi^2=3.564$, $p<0.05$). Multivariate analysis did not reflect a significant
relationship between the Divisions (O.R \( .7754, p>0.05 \)). 18.0% of mothers from Asego compared to 16.5% from Nyarongi felt immunization sessions should be offered free to the consumers. 100.0% of the FGD members from Nyarongi supported this, with none from Asego and the health supervisors, supporting this initiative. Bivariate analysis showed no significant relationship between the Divisions \( (\chi^2=.158, p>0.05) \), similarly multivariate analysis reflected no significant relationship (O.R 1.1455, \( p>0.05 \)). Offering immunization services free to consumers was 1.5 times more likely to improve routine measles immunization coverage than intensifying mobile/outreach services (O.R 1.1455, \( p>0.05 \) and O.R \( .7754, p>0.05 \)). 32.0% of mothers from Nyarongi compared to 14.0% from Asego also thought intensifying health education/social mobilization is key to improvement of routine measles immunization. Members of the FGD from both Divisions equally (50.0%) shared the same feeling and 100.0% of the health supervisors. Bivariate analysis indicated a strong negative relationship between the Divisions \( (\chi^2=18.295, p<0.001) \) and multivariate analysis also reflected a negative relationship (O.R \( .4594, p<0.05 \)). A section of the mothers felt that additional health care staff to the facilities would strengthen routine measles immunization services, 27.0% from Asego compared to 5.0% from Nyarongi. 100.0% of the FGD members from Asego supported this measure and 62.5% of the health supervisors felt additional skilled staff were required in the District to improve immunization services. Bivariate analysis showed a strong significant relationship between the Divisions \( (\chi^2=38.152, p<0.001) \) and a similar relationship with multivariate analysis (O.R 5.6684, \( p<0.001 \)). Adding more staff was 12.3 times more likely to strengthen routine measles immunization than intensifying health education/social mobilization. Mothers felt that the operation hours of the health facilities was not satisfactory, whereby the facilities opened late (around 10:00 A.M) and closed early (3:00-4:00 P.M). 6.0% the Mothers were from Asego compared to 2.0% from Nyarongi. The members of the FGD and the key informant interviews had other priorities other than this. 0.5% other
mothers from Nyarongi compared to 1.0% from Asego felt improvement of infrastructure was ideal for strengthening routine measles immunization. 33.3% of the FGD members from Nyarongi compared to 66.7% from Asego shared the same concern. Bivariate analysis showed positive relationship between the Divisions, while multivariate analysis indicated the same (O.R 3.1500, p>0.05 and O.R .7000, p>0.05) respectively. Opening health facility early and closing at the appropriate time was 4.5 times more likely to strengthen routine measles immunization than improving infrastructure. Other measures that were highlighted on FGD and key informant interviews included embracing intersectoral collaboration, where by involvement of opinion leaders in implementation of immunization services (FGD), with 66.7% of the members from Nyarongi compared to 33.3% from Asego; Training of members of the community based organizations (traditional birth attendants, community health workers and community based distributors among others); Conducting research on herbal concoctions alleged to be used in treating measles cases; motivation of staff and tracking immunization defaulters were also highlighted during the sessions. These findings compared well with the Cambodia study where intervention measures were three fold, including management support and training and training and supervision management of traditional birth attendants (Barbara et al., 2001).

Strengthening routine measles immunization is crucial in measles control and possible eradication. The strategy is also of importance in determining the duration of impact of the measles catch-up campaign that was conducted in the country last year. High routine vaccination coverage if achieved will result in longer periods (years) between outbreaks and high morbidity rates in the older age group, who often suffer a mild illness. Considering the resources that were used to make the catch-up campaign successful, it is therefore a priority of the Government to sustain the reduction in morbidity, addressing the various factors that are possible barriers to achieving desirable (>80%) immunization coverage.
CHAPTER 5: A SUMMARY OF CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS FOR FUTURE WORK

5.1 Conclusions

a) Low routine measles immunization coverage trends in the District (Nyarongi-20.3%; Asego-35.05%) have resulted in high morbidity rates among the younger age group than the older age groups (Nyarongi-75.3%; Asego-58.4%), with no information on immunization status against the Disease.

b) Cultural-related factors are a source of barrier, making immunization services to be unaccepted by mothers from both Divisions ($A^2=.598, p>0.05, df=1$).

c) Factors related to financial obligations during immunization services make mothers shy away from taking children for routine measles immunization due limited resources against many competing priorities in Nyarongi more than Asego ($A^2=10.172, p<0.001, df=1$).

d) Logistical inadequacies related to operations of immunizing health facilities made immunization services inaccessible to mothers, more in Asego than Nyarongi ($A^2=20, p<0.001$).

e) Strengthening of routine measles immunization strategy is feasible, when a collaborative effort is put and a combination of strategies implemented concurrently in Nyarongi than Asego ($A^2=3.564, p<0.05$).
5.2 RECOMMENDATIONS

a) There is need to strengthen and improve routine measles immunization coverage >80%, through strategies evaluated in the study, by providing logistical inadequacies.

c) Periodic evaluation of measles epidemiology through intensified use of appropriate reporting tools should be encouraged to monitor the progress of the immunization strategy and disease burden.

e) Provision of skilled health care staff and enforcement of support supervision in health facilities, in order to enhance effective and quality services to health consumers.

f) There is need to strengthen Primary Health Care concept and sustainability through:

(i) Training and motivation for members of community based organizations (CBOs)

(ii) Intersectoral collaboration and bottom-up planning approach should be adopted, by involving the locally based Non Governmental Organizations; community based organizations; all Government departments and other stakeholders in the health sector for desired outcome.

(iii) Harmonizing culture and modern medicine, to strengthen the strengths between them and tackling the weak areas that may be a source of barrier to improvement of quality life through infant immunization.

(vi) A vigorous health promotion/ advocacy initiative at all levels of the Government, civil society and other sectors should be embarked on, for strengthening routine measles immunization strategy. Majority of the communities lack the proper knowledge on immunizations and their timing, hence the essence of marketing these services.
5.3 SUGGESTIONS FOR FUTURE RESEARCH WORK

b) Consider conducting research on herbal concoctions allegedly effective in the treatment of measles to establish their therapeutic properties.

c) Assessing cost effectiveness of routine measles immunization strategy versus the catch-up campaign in relationship to morbidity reduction.

d) Comparing cost of outreach and static routine measles immunization strategies, with the aim of identifying the strategy that best suits the Districts that have recorded low trends of vaccine coverage, for improving measles immunization coverage.
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World Health Organization- Global Programme on immunization. (1999c). Using surveillance data and outbreak investigations to strengthen measles immunization Programme

APPENDICES

APPENDIX I

OPERATIONAL DEFINED TERMS

Infants – The age period between birth to one year

Child- Variable age, depending on the region but it is accepted from birth up to the age of 14 years

Vaccine – preventable illness and death
Illnesses and deaths that are caused by diseases that can be prevented through vaccination during the period of infancy. The traditional ones in Kenya are Tuberculosis, Poliomyelitis, Diphtheria, Whooping Cough, Tetanus and Measles.

Low routine immunization coverage
When among the targeted birth cohort for immunization, only < 50% are reached by immunization.

Moderate routine immunization coverage
When 50-75% of the expected birth cohort for immunization is reached.

High routine immunization coverage
A situation where more than 75% of the expected birth cohort are immunized.

Outbreak
When the number of cases observed in a locality is greater than that number normally expected in the same geographic area for the same period of time

Outbreak threshold
It is a pre-determined number of reported measles cases or a reported incidence rate above which the situation is defined as an outbreak
Vaccine Efficacy
Defined as how well a vaccine performs under idealized conditions of a pre-marketing evaluation or controlled trial

Vaccine Effectiveness
The ability of a vaccine to provide protection under the normal conditions of public health vaccination program

Age specific attack rate
Proportion of the children within a specific age cohort that are infected by measles infection

Case fatality rate
Proportion of measles patients who die from the disease

Cohort
A group of people who share characteristics (basis of some event)

Birth cohort
A group of infants born during same period of time, hence legible for infant immunization during a specified period of time

“Keep up” coverage
Sustaining high routine measles coverage (>80%) in each infant cohort to reduce the rate at which new individuals enter the susceptible population

Susceptible population
Portion of the targeted population for immunization, who were never reached by immunization or who received the vaccine, but did not take up immunity

Catch-up Campaign
This is a one time mass campaign, which targets to reach 95% of the target population (9 months to 14 years), to reduce measles transmission to the barest minimum possible.
APPENDIX II

OPERATIONAL DEFINED VARIABLES

Trend of routine measles immunization coverage
Routine measles immunization coverage over a period of time, for this study five-year period from June 1999–July 2002

Trend of measles occurrence by Sex, year, age and immunization status
Documentation over a period of time of measles cases according to sex, year of occurrence, age groups and their immunization status

Case fatality rate:
Proportion of the population dying from measles compared to the population suffering from measles.

Socio-economic, cultural and operational factors contributing to disproportion in routine measles immunization coverage
Possible socio-cultural, economic and operational related issues that may hinder desired routine measles immunization coverage in the district.
APPENDIX III

Consent form for the mothers/caretakers who accompany their children to the immunizing health facilities for immunization services.

I __________________________ agree to participate in this research study, after a detailed explanation of what the study involves and my role in the study. My participation is entirely voluntary and I am free to refuse to take part or withdraw at any time of the study. I am assured of privacy and confidentiality of the information that I may provide.

Signature of informant: _______________________

Date: _________________

Signature of Research Assistant: _______________________

Date: _________________

Signature of Investigator: _______________________

Date: _________________
APPENDIX IV

Consent form for the District Medical Officer of Health/DPHN/ EPI Nurses/ Clinical Officers and Mothers/ Caretakers who accompany their children for immunization.

I __________________________ agree to participate in this research study, after a detailed explanation of what the study involves and my role in the study. My participation is entirely voluntary and I am free to refuse to take part or withdraw at any time of the study. I am assured of privacy and confidentiality of the information that I may provide.

Signature of informant: __________________________

Date: __________________________

Signature of Research Assistant: __________________________

Date: __________________________

Signature of Investigator: __________________________

Date: __________________________
HELLO,

MY NAME IS JOSEPHINE ALUOCH ODANGA, I AM INTERESTED IN KNOWING THE SITUATION OF ROUTINE MEASLES IMMUNIZATION COVERAGE, DISEASE BURDEN AND THE SOCIO-ECONOMIC, CULTURAL DETERMINANTS. PLEASE ALLOW ME TO USE YOUR FACILITY AND ALSO GIVE ACCURATE INFORMATION CONCERNING THE ABOVE, WHICH WILL BE TREATED WITH CONFIDENCE.

RESEARCH TITLE:

THE IMPACT OF ROUTINE MEASLES IMMUNIZATION ON MORBIDITY AND MORTALITY OF MEASLES IN HOMA BAY DISTRICT, KENYA.

Checklist Questionnaire for Data collection

Section A:

Checklist questionnaire for trends of measles occurrence by age, sex, immunization status and trends of fatality: for the year 1999.

*Please indicate the value in the column boxes below as appropriate, by indicating the age (as specified in column 2) or choosing the appropriate number (as in columns 3, 4 & 5)*

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<th>Name</th>
<th>Age: in yrs and months/ Date of Birth</th>
<th>Sex:</th>
<th>Immunization status:</th>
<th>Outcome of illness:</th>
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<td>1-Alive 2-Dead 3-Unknown</td>
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RESEARCH TITLE:

THE IMPACT OF ROUTINE MEASLES IMMUNIZATION ON MORBIDITY AND MORTALITY OF MEASLES IN HOMA BAY DISTRICT, KENYA

Checklist Questionnaire for Data collection

Section A:

Checklist questionnaire trends of measles occurrence by age, sex, immunization status and trends of mortality: for the year 2000.

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<th>Outcome of illness: 1-Alive 2-Dead 3-Unknown</th>
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The Impact of Routine Measles Immunization on Morbidity and Mortality of Measles in Homa Bay District, Kenya

Checklist Questionnaire for Data Collection

Section A:

Checklist questionnaire trends of measles occurrence by age, sex, immunization status and trends of mortality: for the year 2001

(Please indicate the value in the column boxes below as appropriate, by indicating the age (as specified in column 2) or choosing the appropriate number (as in columns 3, 4 & 5))

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<th>(2) Age: In yrs and months/ Date of Birth</th>
<th>(3) Sex: 1- Female 2-Male</th>
<th>(4) Immunization status: 1-Immunized 2-not immunized 3-Unknown</th>
<th>(5) Outcome of illness: 1-Alive 2-Dead 3-Unknown</th>
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Checklist Questionnaire for Data collection

Section A:

Checklist questionnaire trends of measles occurrence by age, sex, immunization status and trends of fatality: for the year 2002.

*(Please indicate the value in the column boxes below as appropriate, by indicating the age (as specified in column 2) or choosing the appropriate number (as in columns 3, 4 & 5)*

<table>
<thead>
<tr>
<th>Division</th>
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<tbody>
<tr>
<td>Name</td>
<td>Age: yrs and months/ Date of Birth</td>
<td>Sex: 1- Female 2-Male</td>
<td>Immunization status: 1-Immunized 2-not immunized 3-Unknown</td>
<td>Outcome of illness: 1-Alive 2-Dead 3-Unknown</td>
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SECTION B:

CHECKLIST QUESTIONNAIRE TRENDS OF ROUTINE MEASLES IMMUNIZATION COVERAGE. *(Please insert in the boxes below the figures as specified)*

1(a) Number of birth cohorts reached by routine measles vaccination per division in the year 1999.

- Asego
- Nyarongi

(b) Total number of birth cohort expected for routine measles immunization in the year 1999

- Asego
- Nyarongi

2(a) Number of birth cohorts reached by routine measles vaccination per division in the year 2000

- Asego
- Nyarongi

(b) Total number of birth cohort expected for routine measles immunization in the year 2000

- Asego
- Nyarongi

3(a) Number of birth cohorts reached by routine measles immunization per division in the year 2001

- Asego
- Nyarongi

(b) Total number of birth cohort expected for routine measles immunization in the year 2001

- Asego
- Nyarongi

4(a) Number of birth cohorts reached by routine measles immunization per division in the year 2002 (January-June)

- Asego
- Nyarongi

(b) Total number of birth cohorts expected for routine measles immunization in the year 2002

- Asego
- Nyarongi
HELLO,

MY NAME IS JOSEPHINE ALUOCH ODANGA, I AM INTERESTED IN KNOWING THE SITUATION OF ROUTINE MEASLES IMMUNIZATION COVERAGE, DISEASE BURDEN AND THE SOCIO-ECONOMIC, CULTURAL DETERMINANTS. PLEASE ALLOW ME TO USE YOUR FACILITY AND ALSO GIVE ACCURATE INFORMATION CONCERNING THE ABOVE, WHICH WILL BE TREATED WITH CONFIDENCE.

RESEARCH TITLE:

THE IMPACT OF ROUTINE MEASLES IMMUNIZATION ON MEASLES MORBIDITY AND MORTALITY IN HOMA BAY DISTRICT, KENYA.

SECTION C

(A) QUESTIONNAIRE (ONE TO ONE IN DEPTH INTERVIEW FORM) FOR MOTHERS/CARETAKERS WHO ARE ACCOMPANYING THEIR CHILDREN FOR IMMUNIZATION ON SOCIO- CULTURAL, ECONOMIC AND OPERATIONAL DETERMINANTS OF ROUTINE MEASLES IMMUNIZATION TRENDS.

One to one in-depth Interview with mothers/caretakers. (Please tick as appropriate in th spaces and boxes provided below)

1.Division

2.Age 3.Sex (1-Female, 2-Male) 1 □ 2 □

4. Residence (Rural-1, Urban-2) 1 □ 2 □

5. What is your occupation/source of income (Tick as appropriate)

1 □ Housewife
2 □ Farmer
3 □ Business Woman
4 □ Any Other (e.g. teacher)
5 □ Student

6. How do you travel to the health facility while taking your child for immunization? (Tick as appropriate)

1 □ Walking on foot
2 □ Using a Matatu
3 □ Bicycle
4 □ Private Vehicle

7. If using a Matatu or a bicycle how much money do you pay to reach the health facility for immunization? (Tick as appropriate)
1. 10 Ksh.  
2. 20 Ksh.  
3. 30 Ksh.  
4. No money paid

8. Do you pay for services offered at the immunizing health facility (when you take child for immunization)? (Tick as appropriate)

1. Yes  
2. No

9. If yes, for what services? (tick as appropriate)

1. Card  
2. Needles and syringe  
3. Watchman’s fee  
4. No Money paid

10. How much do you pay?

1. 5 Ksh.  
2. 10 Ksh.  
3. 20-30 Ksh.

11. What problems probably prevent you from presenting your child for measles immunization? (Tick as appropriate for the responses in the following questions—a tick for a ‘YES’ response and a blank for a ‘NO’ response, where there is no response—tick in the ‘no response’ box)

Socio-cultural

1. Culture does not allow.  
2. Busy with other work at home.  
3. Has never had of existence of measles immunization.  
4. Religion does not allow  
5. Child sick hence not taken for immunization  
6. Days of immunization inconvenient  
7. Fear of side effects  
8. No faith in immunization  
9. Long waiting time at the clinic  
10. Rumours about the vaccine  
11. No response

12. Socio-economic

1. Mothers/caretakers paying for services offered  
2. Long distances to the immunizing facility  
3. No money available  
4. No response
13. Operational
   1 □ Attitude of health workers
   2 □ Lack of staff
   3 □ Lack of vaccines
   4 □ Not reminded by the health care staff when to return
   5 □ No response

14. Corrective measures (what in your opinion do you think can be done to improve your attendance for immunization)
   1 □ 
   2 □ 
   3 □ 
HELLO,

MY NAME IS JOSEPHINE ALUOCH ODANGA, I AM INTERESTED IN KNOWING THE SITUATION OF ROUTINE MEASLES IMMUNIZATION COVERAGE, DISEASE BURDEN AND THE SOCIO-ECONOMIC, CULTURAL DETERMINANTS. PLEASE ALLOW ME TO USE YOUR FACILITY AND ALSO GIVE ACCURATE INFORMATION CONCERNING THE ABOVE, WHICH WILL BE TREATED WITH CONFIDENCE.

RESEARCH TITLE:

THE IMPACT OF ROUTINE MEASLES IMMUNIZATION ON MEASLES MORBIDITY AND MORTALITY IN HOMA BAY DISTRICT, KENYA.

SECTION C
(B) QUESTIONNAIRE (KEY INFORMANT INTERVIEW) FOR HEALTH WORKERS (CLINICAL OFFICERS IN-CHARGE OF HEALTH CENTRES, NURSES IN-CHARGE OF HEALTH CENTRES, DIVISIONAL PHOS, DPHN AND THE DMOH)

Division_________________ Name_____________________

1. Age __________  2. Sex: (Female-1, Male-2) □ ☐

3. Designation__________________________

4. What is the main source of income for the communities in this division?

1 ☐ __________________________
2 ☐ __________________________
3 ☐ __________________________
4 ☐ __________________________

5. What do you consider as the social, economic, cultural factors that probably lead to low routine measles immunization in Homa Bay district? (tick as appropriate for the responses in the following questions-a tick for a ‘YES’ response and a blank for a ‘NO’ response, where there is no response-tick in the ‘no response’ box)

(5) Socio-cultural
1 ☐ Busy with other work at home.
2 ☐ Has never had of existence of measles immunization.
3 ☐ Culture does not allow
4 ☐ Child sick hence not taken for immunization
5 ☐ Days of immunization inconvenient
6 ☐ Fear of side effects
7 ☐ No faith in immunization
8 ☐ Long waiting time at the clinic
9 ☐ Rumours about the vaccine
10 ☐ No response
(6) Socio-economic
1  □ Mothers/caretakers paying for services offered
2  □ Long distances to the immunizing facility
3  □ No money available
4  □ No response

(7) Operational
1  □ Attitude of health workers
2  □ Lack of staff
3  □ Lack of vaccines
4  □ Not reminded by the health care staff when to return
5  □ No response

(8) Corrective measures (what in your opinion do you think can be done to improve mothers’ attendance for routine measles immunization)
1 □ 
2 □ 
3 □ 

□ Children does not like
□ Busy with other work at the time
□ Not reminded by the health care staff
□ Same day had to go to the edge
□ Not available
□ Not reminded by the health care staff
□ Others
SECTION C
(C) QUESTIONNAIRE (KEY INFORMANT INTERVIEW) FOR OPINION LEADERS

1. Division____________________

Name________________________ 2. Age ________________

3. Sex: (Female-1, Male-2) 1 ☐  2 ☐ -(tick as appropriate)

3. Occupation _________________

4. Residence (Rural-1, Urban-2) 1 ☐  2 ☐ - (tick as appropriate)

5. What is the main source of income for the communities in this division? (tick as appropriate)

   1 ☐ __________________________
   2 ☐ __________________________
   3 ☐ __________________________
   4 ☐ __________________________

6. What do you consider as the social, economic, cultural factors that probably lead to low routine measles immunization in Homa Bay district? (tick as appropriate)

   1 ☐ Culture does not allow.
   1 ☐ Busy with other work at home.
   2 ☐ Not reminded by the health care staff when to return
   3 ☐ Has never had of existence of measles immunization.
   4 ☐ Religion does not allow
   5 ☐ Child sick hence not taken for immunization
   6 ☐ Days of immunization inconvenient
   7 ☐ Fear of side effects
   8 ☐ No faith in immunization
   9 ☐ Long waiting time at the clinic
 10 ☐ Rumours about the vaccine
 11 ☐ No response

(b) Socio-economic

  1 ☐ Mothers/caretakers paying for service
  2 ☐ Long distances to the immunizing facility
  3 ☐ No response

(c) Operational

  1 ☐ Lack of vaccines
  2 ☐ Lack of staff
  3 ☐ Attitude of health workers
  4 ☐ Not reminded by the health care staff of return date
  5 ☐ No response
7. Corrective measures (what in your opinion do you think can be done to improve mothers’ attendance for routine measles immunization)

1 □ 
2 □ 
3 □ 
4 □
HELLO,

MY NAME IS JOSEPHINE ALUOCH ODANGA, I AM INTERESTED IN KNOWING THE SITUATION OF ROUTINE MEASLES IMMUNIZATION COVERAGE, DISEASE BURDEN AND THE SOCIO-ECONOMIC, CULTURAL DETERMINANTS. PLEASE ALLOW ME TO USE YOUR FACILITY AND ALSO GIVE ACCURATE INFORMATION CONCERNING THE ABOVE, WHICH WILL BE TREATED WITH CONFIDENCE.

RESEARCH TITLE:

THE IMPACT OF ROUTINE MEASLES IMMUNIZATION ON MEASLES MORBIDITY AND MORTALITY OF MEASLES IN HOMA BAY DISTRICT, KENYA.

FOCUSED GROUP DISCUSSION WITH OPINION LEADERS, MOTIVATORS, MOTHERS/CARETAKERS AND HEALTH WORKERS

FOCUSED GROUP DISCUSSION WITH MOTIVATORS

Guidelines
Welcome the whole group
Introducing the focused members and the research team
Explain the purpose of the discussion
Explain the process to be followed

Number invited for focused group discussion

Number in attendance

Time Session begins:

General questions

• What do you do for a living?
• What does your work involve?
• What causes measles?
• At what age is measles immunization administered?
• What messages do you give about routine measles immunization?

1. What factors impede routine measles immunization in the Division (In terms of social, economic, cultural and operational aspects)?

a) What demotivates them in relation to socio-economic issues? (e.g.)

Explore-
Cost of bus
Cost of services
Other priorities (e.g. food, treating other siblings)

b) What demotivates them in relation to socio-cultural issues?

Explore-
- Distance-time factor
- Walking or taking a vehicle
- Other siblings sick
- Culture does not allow
- Mother sick
- Belief in protection from ancestors
- Religion does not allow
- No belief in western type of medicine
- Busy with other work at home. e.t.c

2. What can you say about operational problems?

Explore-
- Shortage of staff
- Attitude of health workers
- Lack of vaccines
- Opening late and early

3. What is the communities’ response towards routine measles immunization in the division?

4. What intervention measures do you think can be put in place?

Time Session Ends: ____________________
FOCUSED GROUP DISCUSSIONS WITH OPINION LEADERS

Guidelines
Welcome the whole group
Introducing the focused members and the research team
Explain the purpose of the discussion
Explain the process to be followed

Number invited for focused group discussion

Number in attendance

Time Session begins:

1. General questions

- What do you do for a living?
- What does your work involve?
- What is measles and what causes it?
- Have you ever heard of measles immunization, what have you heard about it?
- What is your experience with a child immunized against measles?
- At what age is measles immunization administered?

2. What messages are you given concerning routine measles immunization?

3. What aspects of your social, economic and cultural life is a problem to you, thereby interfering with your schedule of taking your child/children for measles immunization?

4. Social/cultural
   Explore-
   - Distance-time factor
   - Walking or taking a vehicle
   - Others-child sick
   - Other siblings sick
   - Mother sick
   - Culture does not allow
   - Mother sick
   - Belief in protection from ancestors
   - Religion does not allow
   - No belief in western type of medicine
   - Busy with other work at home.

   - Belief in protection from ancestors
   - Religion does not allow. e.t.c
   - No belief in western type of medicine
5. Economic
Explore-
Cost of bus
Cost of services
Other priorities (e.g. food, treating other siblings)

1. What can you say about operational problems?

   Explore-
   - Shortage of staff
   - Attitude of health workers
   - Lack of vaccines
   - Opening late and early

2. What is the communities' response towards routine measles immunization in the division?

3. What intervention measures do you think can be put in place?

Time Session Ends: _____________________
FOCUSSED GROUP DISCUSSION WITH HEALTH WORKERS (SUPERVISORS)

Guidelines
Welcome the whole group
Introducing the focused members and the research team
Explain the purpose of the discussion
Explain the process to be followed

Number invited for focused group discussion

Number in attendance

Time Session begins:

General Questions

• What do your responsibilities include?

Immunization

1. What messages do you give to mothers in the subsequent visits for immunization?
2. How do you ensure that mothers bring their children for measles immunization?
3. What factors from your experience makes mothers not bring their children for immunization in terms of

• Social
  Explore-
  e.g
  1. Family problem
  2. Mothers unaware of need for measles immunization
  3. Immunizations scheduled on certain days of the week
  4. Mothers have no faith in measles immunization

• Economic
  Explore-
  1. Cost of cards
  2. Cost of transport
  3. Other costs

• Culture
  Explore-
  1. Beliefs
  2. Cultural practices
  3. Any other

• What can you say about operational problems?
  Explore-
  1. Shortage of staff
  2. Attitude of health workers
3. Lack of vaccines
4. Opening late and early

What is the communities' response towards routine measles immunization in the division?

What intervention measures do you think can be put in place?

Time Session Ends: __________________________
APPENDIX VI

LOCATION OF HOMA BAY

NYARONGI

ASEGO

LOCATION OF THE DISTRICT
Our Ref. 157/164/01

Your Ref. ...

Date 24/9/2002

The Permanent Secretary,
P.O. BOX 30040,
NAIROBI.

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION:

I write to introduce Josephine Aluoch Odanga who is a Postgraduate Student of this University. She is registered for a (M.P.H.E) degree programme in the Department of Zoology.

Mrs Odanga intends to conduct research for a project entitled, "The Impact of Routine Measles Immunization on Measles Morbidity and Mortality in Homa Bay District, Kenya", as a partial fulfilment of the requirement of her degree programme.

Any assistance given to her will be highly appreciated.

Yours faithfully,

The Office of the Director

Registrar (Acad.)
Director, BPS - to see on file
Dean, School of Pure & Applied Sciences
Chairman, Zoology Dept.
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

Josephine Aluoch Odanga
P.O. BOX 43844
NAIROBI

Dear Madam

RE: RESEARCH AUTHORISATION

Following your application for authority to conduct research on the impact of Routine Measles Immunization on Measles Morbidity and Mortality in Homabay District, I am pleased to inform you that you have been authorised to conduct research in Homa Bay District for a period ending 30th September, 2003.

You are advised to report to the District Commissioner the District Education Officer Homa Bay District and the District Medical Officer of Health Homa Bay District before embarking on your research.

You are further advised to avail two copies of your research findings to this Office upon completion of your research project.

Yours faithfully

A. G. KAARIA
FOR: PERMANENT SECRETARY/EDUCATION

CC
The District Commissioner
Homa Bay

The District Education Officer
Homa Bay

The Medical Officer of Health
Homa Bay
APPENDIX VIII: ABSTRACT FOR CONFERENCE

Odanga, J. A; Okelo R. O; Orago S. A. A

First Zoological Annual Conference held from 4th to 8th August 2003 at the Science Complex, Kenyatta University

Measles remains a major cause of vaccine-preventable illness and death; it is therefore a major public health problem in developing countries, due to low trends of immunization coverage.

A descriptive cross sectional survey was conducted in Nyagongi and Asego Divisions of Homa Bay District, Kenya, between October and December 2002. The survey determined the trends of routine measles immunization on measles epidemiology, with an aim of identifying the factors that were possible barriers to the immunization strategy and ways of strengthening it. Trends of routine measles immunization coverage and morbidity were determined through review of records of children with previous measles infection. Socio-cultural, economic, operational factors impeding routine measles immunization and intervention measures for strengthening measles immunization were also established through systematic interview of mothers who visited health facilities with their children. Focused group discussions were held with members of CBOs, while key Informant Interviews were also held with DHMT members who were selected purposively.

Nyarongi Division recorded immunization coverage (1999-2002) of 20.3% compared to 35.05% of Asego ($\chi^2=61.899$, $p<0.001$ and O.R .9932, $p>0.05$), thus the coverage considered to be low in both Divisions. The female to male ratio of measles occurrence by sex was 1.1:1. The measles age-specific morbidity rate was high in the 0-4 years age cohort, than in the 10-14 years age cohorts, more in Nyarongi than Asego ($\chi^2=4.085$, $p<0.05$ and O.R 396.6624, $p>0.05$). This reflected the low trends of routine measles
immunization in both Divisions. Majority of the children from both Divisions had their immunization status ($\chi^2=3.059$, $p>0.05$ and O.R 7791.9708, $p>0.05$), reflecting a weak system of reporting in both Divisions, leading to an incomplete evaluation of measles epidemiology.

Lack of money emerged more of a barrier to routine measles immunization ($\chi^2=16.721$, $p<0.001$ and O.R 2.4702, $p<0.05$) than other socio-economic related factors cited. More mothers from Nyarongi than Asego walked to the health facilities for immunization services ($\chi^2=16.658$, $p<0.001$ and O.R 138.5384, $p>0.05$). The higher the charges on travel and other expenses reduced mothers’ chances of presenting children for immunization in Nyarongi than Asego ($\chi^2=11.706$, $p<0.001$ and O.R 17.5793, $p<0.05$). The Socio-cultural factors that impeded routine measles immunization had less chances of increasing immunization coverage in both Divisions ($\chi^2=14.149$, $p<0.001$ and O.R .0242, $p<0.001$). Attitude of health workers as an operational factor was more likely to bar mothers from taking their children for immunization services in Asego than Nyarongi ($\chi^2=12.354$, $p<0.001$ and O.R 5.9394, $p<0.001$). Provision of additional health care staff in Asego was more likely to strengthen routine measles immunization than other factors cited ($\chi^2=38.152$, $p<0.001$ and O.R 5.6685, $p<0.001$). There is therefore need to strengthen routine measles immunization strategy by elimination of the obstacles through; vigorous advocacy with policy makers, health managers and health care providers at all levels; and in addition intersectoral collaboration and partnership with members of the provincial administration, community based organizations, opinion leaders and Non Governmental organizations in the District.