FACTORS INFLUENCING ROUTINE IMMUNIZATION COVERAGE AMONG CHILDREN IN NYERI DISTRICT, KENYA

BY

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DECLARATION

I, Sammy Kagoiyo Njeru, do hereby declare that this thesis is my original work and has not been presented for a degree in any University or for any other award.

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Date: 7th June 2007

We, the supervisors of the above named candidate do confirm that the work reported in this thesis was carried out by the candidate under our supervision.

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DEDICATION

I dedicate this thesis to my parents, father Mr. Benjamin Njeru Murage and Mother Mrs. Monica Wangeci Njeru for their encouragement and prayers which have inspired my academic performance upto this far. I also wish to dedicate the same to my wife Mrs. Sabina Wanjeri Kagoiyo for her total and unwavering support during the study period I was at the Kenyatta University. To my three children Benjamin Njeru, Monica Wangeci and Peter Macharia whose continued good performance in Secondary Education and their closeness to me during my study was a source of encouragement. It instilled in me more vigor to set an example for them to emulate, I dedicate to them this thesis.
ACKNOWLEDGEMENT

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Lastly I thank my research assistants who dedicated themselves to assist as much as they could, and for any other support offered to me during the study period.
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ABBREVIATIONS

Ag – antigen

BCG – Bacillus Calmette Guerrin

CBOs – Community Based organizations

CBS – Central Bureau of statistics

CDR – Crude Death Rate

CPR – Case Fatality Rate

CMI – Cell Mediated Immunity

CO – Clinical Officer

CWC – Child Welfare Clinic

DHMB – District Health Management Board

DMOH – District Medical Officer of Health

DOMU – Disease Outbreak Management Unit

EPI – Expanded Programme on immunization

et al – Et Alia / and others

FGD – Focus Group Discussion

GAVI – Global Alliance for Vaccine Initiative

G.O.K – Government of Kenya

HMIS – Health Management Information Systems

HRIO – Health Records and Information Office / r

IDS – Integrated Disease Surveillance and Response

IMCI – Integrated Management of Childhood Illnesses

IgM – Immunoglobulin M.

IMR – Infant Mortality Rate
KDHS – Kenya Demographic Health Survey
KEMRI – Kenya Medical Research Institute
KEPI – Kenya Expanded Programme on Immunization
MMR – Measles, Mumps, Rubella.
MOH – Ministry of Health
MSIAS – Measles Supplemental Immunization Activities
NGOs – Non Governmental Organizations
NIDS – National Immunization Days
PAHO – Pan American Health Organization
PHO – Public Health Officer
R.O.K – Republic of Kenya
UNICEF – United Nations Children Education Fund
WHO – World Health Organization
DEFINITIONS OF OPERATIONAL TERMS

Age specific attack: Specific age cohort, in a given proportion of children that are infected by the vaccine preventable diseases.

Birth cohort: Infants born within the same period of time and who are eligible for immunizations during a specified period.

Case fatality rate: A proportion of patients who die from routine vaccine preventable diseases.

Catch-up campaign: This is a mass immunization activity for any of the immunizable diseases targeting children below 15 years so as to reach above 80% of all children for immunizations at a given area.

Child: Any person below 5 years of age and eligible for immunization.

Infants: Children below one year of age from the time of birth.

Cohort: People with the same characteristics exposed to the same event.

High routine immunization coverage: When above 80% of the birth cohort is immunized in the same place and time.

Keep-up coverage: Maintenance of above 80% routine immunizations achievement in the birth cohort as a measure to reduce child susceptibility to routine vaccine preventable infections.

Low routine immunization coverage: Reaching below 50% of routine immunization from among the targeted birth cohort.

Moderate routine immunization coverage: Any immunization activity with an achievement of between 50% - 80% of the expected birth cohort in a given area.

Outbreak: When cases of the disease exceed those that are normally within the same area and at the same time.
Outbreaks threshold: An incidence rate reported as beyond the predetermined number.

Susceptible population: Population which was never reached for routine immunization or which received the immunization but were not conferred with immunity from among the targeted population.

Vaccine effectiveness: Ability of a vaccine which under normal conditions of cold chain confers immunity to protect the subject from vaccine preventable diseases.

Vaccine efficacy: Performance of a vaccine after controlled trials by the manufacturers.

Vaccine preventable deaths: Deaths occurring due to lack of immunization for vaccine preventable diseases.

Vaccine preventable illness: Any disease which occur due to lack of immunization for the vaccine preventable disease.
ABSTRACT

This study was conducted in Nyeri District of the Republic of Kenya on factors influencing routine immunization coverage among children. The study took place between August, 2004 and covered Mukurweini and Tetu Divisions. Routine immunization coverage in the developing world is low at 60% compared to the developed world, above 80%. Due to the low coverage many children have died from lack of immunization while others have been disabled. In Kenya the Infant Mortality Rate is currently estimated to be 77 per 1,000 live births while the under five mortality rate is 115 per 1,000 live births. A descriptive cross sectional survey which determined trends of routine immunization coverage in two divisions of Nyeri District was undertaken to find factors that were possible hindrances to the routine immunization and the corrective measures that can be instituted. Information was received from mothers/caretakers who brought their children to the immunizing health facilities and also from health workers and opinion leaders who filled in the questionnaires respondents. The other information was received from the desk reviews in the permanent Register for immunized children. Focus Group Discussion were also done for back up information. The study compared determinants of the social, cultural, economic and operational impacts on the routine immunization in Mukurweini and Tetu divisions to strengthen the mechanisms employed in the routine immunization. Mukurweini division recorded an immunization coverage of 72.06% (1999-2003) compared to 83.93% in Tetu ($\chi^2 = 27.030$, P<0.05, df1, O.R. 4938). Thus there was a moderate coverage in Mukurweini and a high coverage in Tetu Division. The ratio in male to female of the children immunized was 1:1.2. The higher number of immunized children in both divisions was in the age bracket of 1-4 months (88.7%) depicting a high immunization coverage in the start of the children's lives. This coverage reduced to 0.05% at 12 months of children's age. This indicates that few children appeared for immunizations as they advance in age. Majority of mothers/caretaker (20.9%) expressed fear of side effects associated with vaccines such as fever. They also feared that immunization would cause impotence in their children (17.07%) in both divisions. Only 2.4% indicated that their religious sect did not allow their children to be taken for immunizations or conventional medical treatments. These socio-cultural factors impacted negatively in routine immunizations coverage in both divisions. Poor economic status exemplified by lack of funds for routine purposes, and more so for transport to the immunizing health facilities was also noted as a hindrance to routine immunization. The most affected division was Mukurweini ($\chi^2 = 10.295$, P<0.001, df 1 OR 2.6963, P<0.05). The negative attitude of some health workers was cited in both divisions as an operational factor impeding routine immunizations ($\chi^2 = 2.2836$, P<0.001, OR.651). This factor was more likely to weaken immunizations by preventing mothers from bringing their children for routine immunizations. The most likely measure cited in countering the factors which can hinder routine immunizations was recruitment of more health centers staff with 222 (24.8%) responses. To effectively strengthen the routine immunization, elimination of obstacles by policy makers, and radical but careful implementation of the recommendations given should be done. The findings of this study will be important to the policy makers, the GOK and NGO'S in improving and strengthening routine immunizations with a view to achieving a high coverage (80% and above) in Nyeri District. The same information can be replicated to other Districts with low to moderate coverage's to assist them achieve a high coverage.
CHAPTER 1: INTRODUCTION

1.1 Background information

Routine immunization coverage among children in developing countries is below the WHO and UNICEF target of 80% which leads to many children suffering from infectious parasitic and immunisable diseases which are by far the leading causes of morbidity and mortality in the developing countries (WHO, 1999). There are many variations reported in developing countries in infant mortality and life expectancy due to lack of immunization (Tolba, 1992; WHO, 1998). It has been estimated that globally 5 million children die due to lack of immunization of vaccine preventable diseases (WHO, 1999). Many other children are disabled by complications of immunizable diseases, thus, raising child morbidity. The immunizable diseases among children are tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus, viral hepatitis, haemophilus influenza, and measles. These diseases are divided into 3 categories for their effective management. There are those diseases targeted for elimination, others for eradication and those that are for control (AMREF, 1993). The vaccines are preparations which contain antigens that when administered for specific diseases provide a lifelong immunity by triggering an immune reaction (Anderson, 1985).

In Kenya, the expanded programme on immunization (EPI) launched in June 1980 helped to raise the immunization coverage from 30% at initiation to 80% by 1993 (KEPI / MOH, 2001). But later in 1998 the Kenya Demographic Health Survey (KDHS) showed a decline in coverage from the 80% in 1993 to 65.4% in 1998 (KDHS, 1998). This decline was due to poverty and poor socio-cultural determinants. Some of the immunizable diseases have since been listed as among the 18 diseases of priority in the integrated disease surveillance and response for ease of management during their outbreaks. These same diseases have been captured for efficient management in the IMCI strategy, an initiative of the division of child Health, Ministry of Health, Kenya (ROK, 1999b). Some strategies have also been put in place in both western and
eastern blocks of the world. Kenya being in the Eastern block with other East African countries had adopted the Measles Supplemental Immunization Activities (MSIAs) which took place in 2002 with a view for elimination of measles. The measles immunization coverage is considered to be medium (50% -70%) and measles is responsible for a presumed low to medium mortality (CFR 0.5% - 4%). Also in place is the strategy for eradication of poliomyelitis by the year 2005 (WHO, 1999b). The countries of the East African block recommended that to meet their strategies and achieve their goals in the control, eradication and elimination of the immunizable the following measures should be put in place: (a). High routine immunization coverage of above 80%, (b). Conduct supplemental immunization activities (SIAs) with above 80% coverage for each round, (c). Conduct supplemental National Immunization Days (NIDS) in selected high risk districts using appropriate strategy while strengthening case management, and an effective system for integrated disease surveillance and response for prompt and timely epidemic management (KEPI, 2001).

1.2 Rationale For The Study

1.2.1. Statement of the problem

With the launch of KEPI in 1980 for the acceleration of routine immunization in Kenya, tremendous progress has been achieved in the protection of children against the immunizable diseases. At its initiation, KEPI noted that immunization coverage in Kenya was at 30% and by 1993 it had raised to 80% (MOH/KEPI, 2001). This achievement was not maintained and in 1998, KDHS showed a decline in the routine immunization coverage from 80% in 1993 to 65% in 1998. This decline has caused an increase in immunizable or vaccine preventable diseases affecting children below 5 years (ROK, 2001). Nyeri district reported areas with low immunization coverage notably in Mukurweini Division (KEPI/MOH, 2001). Despite the
National Immunization Days (NIDs) for measles campaign known as the MSIAs in 2002 where the coverage in Nyeri District was 82%, there were suspected cases of measles reported in Mukurweini. Blood samples from the cases were drawn and the specimens taken to KEMRI for laboratory analysis and results were received as measles IgM positive (KEPI, 2003). Despite the availability of Global Alliance for Vaccine Initiative (GAVI) funds which have strengthened and enabled improvement in immunization in many areas, the routine immunization coverage for the under fives is still below 80%. No studies have been carried out to determine the factors responsible for the low immunization coverage within this division. This thesis project therefore addressed factors responsible for low routine immunization coverage, the associated morbidity and mortality trends among children, the social, economic, cultural and operational factors that impede strengthening of immunizations to achieve and maintain a high coverage of above 80% in Nyeri. The results of this study and recommendations will help Nyeri District achieve the above 80% coverage in routine immunizations and maintain it at the same level.

1.2.2 Research Questions
The research study answers the following questions:

i) What is the routine immunization coverage in Nyeri District?

ii) What factors influence routine immunization practices?

1.2.3 Null Hypotheses

a) There was no comparative determinant in the factors impacting on routine immunization practices in the two divisions of Mukurweini and Tetu in Nyeri District, Kenya.

b) There were no differences in the trends of routine immunization coverage in Mukurweini and Tetu divisions of Nyeri District, Kenya.
1.3 Study Objectives

1.3.1 General objective

The main objective of this study was to determine routine immunization coverage among children in Nyeri District, Kenya.

1.3.2 Specific objectives

1. To determine the immunization coverage in Mukurweini and Tetu Divisions of Nyeri District.
2. To establish factors that impact on the routine immunization in the two divisions.

1.4 Justification of the Study

Due to its vastness, and the nature of its high and scattered population (ROK, 1999a), Nyeri District was targeted for the study. In the year 2003, measles cases were detected among children and their serum contained measles specific IgM despite the MSIA of year 2002 (ROK, 1999b), Though the routine immunization coverage in Nyeri District had been below the targeted WHO indicator of 80%, no known cause had been attributed to such a low achievement. Despite the GAVI funds of the year 2001, no much improvement was realized on routine immunization coverage. Cases of morbidity and mortality among children had been reported from the vaccine preventable diseases. No studies have been carried out within Nyeri District due to lack of funding for such an undertaking despite the low immunization trends. The findings of this study will therefore assist the GOK / MOH, WHO, UNICEF, DHMT and other development partners in planning for intervention and in developing policies that reflect on Nyeri district’s performance while revisiting the already existing policies governing routine immunization for under fives with an aim of improving immunization services.

This study determined the routine immunization coverage and factors influencing the immunization among children below 5 years in the two divisions of Mukurweini and Tetu in Nyeri District, Kenya.
CHAPTER TWO: LITERATURE REVIEW

2.1 Immunization Coverage

Routine immunization coverage in the developing world is low at 60% (WHO, 1998) compared to the developed world. Many factors among them poverty have been associated with the low immunization coverage. The low immunization coverage in resource strained countries has resulted to increased childhood mortality from immunizable diseases. In the year 1995, it was estimated that 44 million children were not immunised leading to the death of one million of them (PAHO, 1999). The immunizable childhood diseases include tuberculosis, polio, diphtheria, pertussis, tetanus, viral hepatitis, influenza and measles (KEPI/MOH, 2001). Globally, over 40 million cases of measles occur annually with one million deaths due to lack of routine immunization half of these deaths occurring in Africa (WHO, 1998; PAHO, 1999). Lack of routine immunization is mostly observed in the youngest age group less than 1 year who are vulnerable to severe morbidity and mortality (Burstrum et al., 1995). In developing countries, about 5 million children die each year from the vaccine preventable diseases, most of them being in Africa (WHO, 1998).

It is estimated that out of the 15 million African children born annually, one million die from EPI-target diseases and in addition 400,000 are disabled (ROK, 2001). As such, for promotion of EPI programme and immunization acceleration in the African region, more efforts should be geared towards research, policy review, planning and management of immunizable diseases.

In Kenya, the three most common EPI immunizable diseases (polio, measles and tetanus) are included in the 18 selected communicable diseases of priority for integrated disease surveillance (ROK, 2001; WHO, 1999). Frequent disease outbreaks have been reported in areas with low routine immunization coverage which has led to a high disease burden than in areas that have recorded a high coverage (ROK, 2001). In some areas which have reported above 10
percent drop out rates in a given population, immunization coverage for these areas have been lower than expected. Success of immunization in Africa is dependent upon the policies and practice of the immunizations at the health service delivery points either in the Health Centers, District Hospitals or at the National level (WHO, 1998).

### 2.2 Immunization

Immunization is a process of stimulating immune responses in the body by use of a vaccine. A vaccine is a preparation which consists of antigen or components of antigen that exhibit an immune response (e.g., antibody production) which protects the body from infection (Anderson, 1985). The vaccines which are routinely used for specific disease prevention in children are BCG, Oral Polio, Pentavalent (a combination of diphtheria, pertussis, tetanus, haemophilus influenza type 'B'), hepatitis B and measles vaccines (WHO, 1998). The measles vaccine is used to give a correct immunization coverage for all other antigens since it is a parameter for the fully immunized child. Another indicator in use for the fully immunized child is pentavalent vaccine. By 1990 in Africa, only 31% of the children had access to immunization and only 20% had completed their full immunization (KEPI, 2000). A variety of factors are responsible for development of resistance during immunization. Specific factors are formation of antibody and rise in lymphocytes which are primed to recognize specific antigens. The non-specific factors in the host's defense to infections depend upon physical and anatomical barriers, phagocytes and complement fixation assays (Anderson, 1985).

In routine immunization, children can be classified into two categories: Dropout of immunization child and Fully immunized child (KEPI, 2003). The dropout of immunization child is one who has not finished all immunizations. There are many reasons that would make a child to drop out some of which are shifting from one residence/area to another far away from the service delivery point, poor infrastructure, poverty as in the cost of travel, competing
interests - being busy at work e.g. farming, ignorance by mothers or guardians on immunizations. The dropout rate which is an indicator of the performance in immunization is targeted at 10 percent or below for a good performance (MOH/KEPI 2000). Any percentage above the recommended 10 percent is regarded as poor performance. A fully immunized child is one who has had all the immunizations as per the immunization schedule and intervals recommended by KEPI (Table 1).

Table 1: Routine Immunization Schedule

<table>
<thead>
<tr>
<th>IMMUNIZATIONS</th>
<th>At birth or 1st contact with child.</th>
<th>At six weeks of life or 2nd contact with child.</th>
<th>At ten weeks of life or 4 weeks from last vaccine.</th>
<th>At 14 weeks or 4 weeks from last vaccine.</th>
<th>At 9 months from birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) BCG - at birth or at 1st contact with the child</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(b) 1st Polio - at birth</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) 1st Pentavalent - 6 weeks from birth</td>
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<tr>
<td>(d) 2nd Polio</td>
<td></td>
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<tr>
<td>(e) 2nd Pentavalent - 4 weeks from last vaccination</td>
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<tr>
<td>(f) 3rd Polio</td>
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<tr>
<td>(g) 3rd Pentavalent - 4 weeks from last vaccination</td>
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<td>(h) 4th Polio</td>
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<tr>
<td>(i) Measles</td>
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</tr>
</tbody>
</table>
In a recent study (KDHS, 2003) the routine immunization coverage in Kenya was 75%. Central Province had highest coverage (79%), Coast (66 %), Eastern (65 %), Nairobi (63%), Rift valley (56 %), Western (50%), Nyanza (38 %) and North Eastern (9 %).

### 2.3 Impact of Immunization

The best measure of effectiveness of immunization is the impact on the occurrence of the targeted diseases. The highest degree of diseases from immunizable diseases occurs among children under five years (KEPI, 2003). The vulnerability of children under five is due to their low immunity. The objective of immunizations is to prevent diseases and promote health (Spradley, 2000).

#### 2.3.1 Advantages of immunization

The benefits of immunization include generation of immunological memory that provides long term immunity. After immunization schedule has been covered there is no need for boosters because they provide long term immunity to the immunized subject (Polit, 1993). Immunization is cost effective compared to chemotherapy as a disease management strategy (Saunders, 1996). Immunization results in reduced morbidity and mortality trends which governments can translate into financial savings for use in other priorities (ROK, 1999b).

#### 2.3.2 Disadvantages of immunization

Lack of immunization usually impacts negatively in life. The cost is incurred when a child presents with a severe infection, leading to admission and treatment. The loss in man hours, financial drainage incurred in purchase of drugs and the psychological effects on the mother in an unfamiliar surrounding of the ward while in admission adds to the increasing morbidity and mortality and psychosocial trauma on the mothers or guardian (Barbara, 2001).
Constant movement of the child from class to hospital pursuing treatment results in absenteeism from classes and loss of learning. There is increase on bed occupancy from admission due to the vaccine preventable diseases (MOH/KEPI, 2000). The lack of immunization will also lead to diseases, disabilities and deformities of the extremities, conjunctivitis, blindness, inability to thrive, vulnerability to diseases, and risks of infecting others (Feacham, 1991). The side effects of the vaccines may hinder the presentation of a child to AnteNatal Clinic for immunization by their mothers.
CHAPTER 3: MATERIALS AND METHODS

3.1 The Study Area

This study was carried out in Nyeri District in Mukurweini and Tetu Divisions. Nyeri District is situated in Central Kenya and is one of the seven districts comprising Central Province. It borders Kirinyaga in the East, Murang’a to the South, Nyandarua in the West, Meru to the North East and Laikipia to the North (Appendix iv). Both Mt. Kenya and the Aberdare forests occupy a major area of the North Eastern and Western zones, respectively. Nyeri is located between latitudes 01°E S and 01°E N and longitudes 35°13’ E and 38E. It has a total area of 3356 sq. Km. (CBS, 1999). The district can be divided into two main agricultural regions: the rich fertile zone in the hilly southern parts and the semi-arid zone in the table North-Western part. It has an equatorial type of climate with two rainy seasons in a year with an annual rainfall of 500 mm to 2300 mm. Both Tetu and Mukurweini occupy an area of 830 sq. km and have a population of 174,384 (CBS, 1999).

3.2 Study Population

The study population consisted of mothers or caretakers, (who accompanied their children for routine immunization), opinion leaders and District Health Management Team members and Health Workers in the immunizing health facilities who consented to participate in the study (Appendix II). The population of children targeted for immunizations in the hospitals’ child welfare clinics were included in the study.

3.3 Inclusion Criteria

Those included in the study were all children up to five years of age, birth cohorts who appeared for immunization at the time of the study, mothers/caretakers who with their children
appeared at the immunizing health facilities, and all health workers who worked at the immunizing health facilities who consented to participate in the study.

3.4 Exclusion Criteria

Those excluded in the study were all children above 5 years of age at the time of the study, mothers/caretakers who with or without their children did not appear at the immunizing health facilities, all health workers who did not work at the immunizing health facilities other than the DHMT, and any respondent or interviewee who declined to participate in the study.

3.5 Study Design

The study was descriptive, cross sectional with an aim of collecting both quantitative and qualitative data to determine the impact of routine immunization coverage on morbidity and mortality of children under five years of age within Mukurweini and Tetu divisions of Nyeri District, Kenya.

3.6 Research Methodology

This was both a retrospective and prospective study from the year 1999 to 2003. The retrospective component involved desk review of medical records in the health facilities for children aged 0-5 years, birth cohorts expected for immunization and those already immunized routinely and the prospective study took into consideration the social, cultural, economic and operational factors which influence routine immunization, with suggested measures of intervention. A structured questionnaire was used to collect quantitative and qualitative data (Appendix III – A – F). Pre-testing of the research questionnaires was done outside the research area.
3.7 Sample Size Determination and Sampling Techniques

In the two divisions, all the records of routine immunization coverage for the under five years children were received against the data of the expected birth cohorts in the immunization clinics. This included those children immunized routinely. Selection of the study subjects for key informant interviews was done through purposive sampling technique while mothers or caretakers were selected from the clinics using systematic sampling.

The formula as used by Fisher et al. (1998) was used to determine the sample size as follows.

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

Where

- \( n = \) sample size (population to be sampled)
- \( z = \) standard deviate which corresponds to 95% confidence interval = 1.96
- \( p = \) proportion in target population estimated to have particular characteristics = 0.5
- \( q = 1 - p = 1 - 0.5 = 0.5 \)
- \( d = \) degree of accuracy = 0.05 usually
- \( D = \) Design effect = 1

\[
\frac{(1.96^2)(0.5)(0.5)(1)}{0.05^2} = \frac{0.9604}{0.0025} = 384.16
\]

To allow for attrition, a study sample of 400 respondents was considered as appropriate.
Proportional equal to size sampling in the immunizing health facilities was used to determine the number of respondents from the two divisions.

### 3.7.1 Ethical considerations

Clearance was sought from the following institutions: Kenyatta University and Ministry of Education, Science and Technology. Informed consent was obtained from the respondents with assurance of confidentiality. Coded numbers were used instead of names of the subjects.

### 3.8 Data Collection Methods and Research Instruments

Before this study was carried out, research assistants were trained and pre-testing of research tools done in Nyeri town in April, 2004. The actual collection of data was done over a period of three months from June to August 2004. Systematic sampling technique of mothers/caretakers was used where every 5th mother was included.

### 3.9 Questionnaires

Checklist questionnaires for all participants in the research study were used to collect data on trends of routine immunization demographically, trends of morbidity and mortality as well as routine immunization coverage for the five year period from 1999 to 2003. (See appendix III A – F).

### 3.9.1 Exit Interviews

Questionnaires for one-to-one in depth interviews were also used for mothers / caretakers who accompanied their children for immunization. These covered social, cultural, economic and operational determinants of routine immunization trends.
Other interviewees who participated in the key informant interviews using the structured questionnaires during the study were the DMOH, C.O, DPHN, DHRIO, PHO and in charges of Health Centers and dispensaries where the study was carried out.

3.9.2 Focus Group Discussion

Eight FGDs with mothers / caretakers, opinion leaders, motivators (CBOs) and health workers in the health facilities were held; four in each division to give clarity on the factors captured in the one to one in depth interview.

3.10. Data Management And Analysis

Data collected from both divisions was coded before entry and captured using integrated micro-computer processing system (IMPS) version 3.1. This was done because the IMPS has few outliers and data editing is done on the screen during entry. Then the data was converted to the SPSS Program version 11.5 through a written program. Chi –square test was used to determine associations between variables at $p = 0.05$ level of significance. The odds ratio estimates of 95% confidence interval for every model were used for comparison of strength of relationship between the variables as in multivariate regression. Qualitative data from each FGD was transcribed, coded and analyzed descriptively.
CHAPTER 4 : RESULTS

4.0 STUDY RESPONDENTS.

A total of 412 respondents were interviewed on socio-cultural, economic and operational factors that influenced routine immunization in Nyeri District. 398 of these were mothers/caretakers, eight were health workers and six were opinion leaders.


A total 18847 children were immunized in the two Divisions of Mukurweini and Tetu divisions of Nyeri District between 1999 and 2003. Among these, Tetu had 10196 (54%) and Mukurweini 8651 (46%) children immunized. There was no significant statistical difference in the immunization coverage between the two divisions ($\chi^2$ 1817.15, 021.29, $p>0.05$). 50% of the immunized children in both divisions were aged one month (9538), with Tetu having 5393 (56.5%) of the total. Children aged 12 months were the least immunized in the two divisions (Table 4.1). There was however no significant difference between immunization coverage and age of the children ($p>0.001$, $t = 38592.36$, df 11) in both divisions. There was however reduction in immunization coverage with increase in age (Fig 4.3).
Table 4.1: Age and Sex distribution of immunized children in various health facilities in Mukurweini and Tetu divisions, Nyeri District.

**MUKURWEINI DIVISION**

<table>
<thead>
<tr>
<th>AGE IN MONTHS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>SEX M</th>
<th>F</th>
<th>IMMUNIZED</th>
<th>OUTCOME ALIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mukurweini</td>
<td>111</td>
<td>783</td>
<td>278</td>
<td>192</td>
<td>24</td>
<td>86</td>
<td>4</td>
<td>22</td>
<td>15</td>
<td>18</td>
<td>2</td>
<td>0</td>
<td>468</td>
<td>467</td>
<td>2975</td>
<td>0</td>
</tr>
<tr>
<td>Tambaya</td>
<td>346</td>
<td>277</td>
<td>119</td>
<td>59</td>
<td>16</td>
<td>46</td>
<td>9</td>
<td>20</td>
<td>10</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>465</td>
<td>445</td>
<td>910</td>
<td>0</td>
</tr>
<tr>
<td>Njoki</td>
<td>457</td>
<td>251</td>
<td>70</td>
<td>46</td>
<td>10</td>
<td>10</td>
<td>16</td>
<td>19</td>
<td>20</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>511</td>
<td>439</td>
<td>950</td>
<td>0</td>
</tr>
<tr>
<td>Muthuthiini</td>
<td>319</td>
<td>243</td>
<td>130</td>
<td>63</td>
<td>27</td>
<td>11</td>
<td>7</td>
<td>29</td>
<td>50</td>
<td>47</td>
<td>24</td>
<td>0</td>
<td>511</td>
<td>439</td>
<td>950</td>
<td>0</td>
</tr>
<tr>
<td>Thangathi</td>
<td>515</td>
<td>320</td>
<td>45</td>
<td>12</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>446</td>
<td>452</td>
<td>896</td>
<td>0</td>
</tr>
<tr>
<td>Mweru</td>
<td>179</td>
<td>49</td>
<td>39</td>
<td>13</td>
<td>13</td>
<td>9</td>
<td>6</td>
<td>5</td>
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<td>2</td>
<td>2</td>
<td>0</td>
<td>165</td>
<td>154</td>
<td>319</td>
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<td>Karaba</td>
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<td>115</td>
<td>44</td>
<td>13</td>
<td>10</td>
<td>5</td>
<td>12</td>
<td>12</td>
<td>21</td>
<td>5</td>
<td>0</td>
<td>442</td>
<td>412</td>
<td>864</td>
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<tr>
<td>Ichamara</td>
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<td>97</td>
<td>59</td>
<td>22</td>
<td>9</td>
<td>4</td>
<td>6</td>
<td>12</td>
<td>22</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>205</td>
<td>199</td>
<td>404</td>
<td>0</td>
</tr>
<tr>
<td>Gumba</td>
<td>118</td>
<td>53</td>
<td>24</td>
<td>48</td>
<td>35</td>
<td>96</td>
<td>19</td>
<td>14</td>
<td>25</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>246</td>
<td>206</td>
<td>452</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>4145</td>
<td>2253</td>
<td>889</td>
<td>499</td>
<td>150</td>
<td>236</td>
<td>92</td>
<td>139</td>
<td>145</td>
<td>151</td>
<td>50</td>
<td>2</td>
<td>4417</td>
<td>4234</td>
<td>8651</td>
<td>0</td>
</tr>
</tbody>
</table>

**TETU DIVISION**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>SEX M</th>
<th>F</th>
<th>IMMUNIZED</th>
<th>OUTCOME ALIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Njoguini</td>
<td>46</td>
<td>52</td>
<td>17</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>2</td>
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<td>11</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>82</td>
<td>69</td>
<td>151</td>
<td>0</td>
</tr>
<tr>
<td>Ihururu</td>
<td>385</td>
<td>261</td>
<td>136</td>
<td>67</td>
<td>30</td>
<td>23</td>
<td>19</td>
<td>19</td>
<td>28</td>
<td>27</td>
<td>16</td>
<td>3</td>
<td>507</td>
<td>507</td>
<td>1014</td>
<td>0</td>
</tr>
<tr>
<td>Kinunga</td>
<td>528</td>
<td>374</td>
<td>57</td>
<td>18</td>
<td>15</td>
<td>11</td>
<td>1</td>
<td>21</td>
<td>14</td>
<td>20</td>
<td>17</td>
<td>0</td>
<td>494</td>
<td>582</td>
<td>1076</td>
<td>0</td>
</tr>
<tr>
<td>Ndugamano</td>
<td>410</td>
<td>401</td>
<td>152</td>
<td>59</td>
<td>42</td>
<td>19</td>
<td>16</td>
<td>24</td>
<td>47</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td>553</td>
<td>634</td>
<td>1187</td>
<td>0</td>
</tr>
<tr>
<td>Wandumbi</td>
<td>416</td>
<td>328</td>
<td>30</td>
<td>23</td>
<td>20</td>
<td>18</td>
<td>12</td>
<td>23</td>
<td>2</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>402</td>
<td>390</td>
<td>792</td>
<td>0</td>
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<tr>
<td>Wamagana</td>
<td>1112</td>
<td>726</td>
<td>112</td>
<td>12</td>
<td>11</td>
<td>7</td>
<td>5</td>
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<td>0</td>
<td>1065</td>
<td>966</td>
<td>2031</td>
<td>0</td>
</tr>
<tr>
<td>Unjiru</td>
<td>536</td>
<td>129</td>
<td>65</td>
<td>51</td>
<td>18</td>
<td>11</td>
<td>28</td>
<td>83</td>
<td>19</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>468</td>
<td>485</td>
<td>953</td>
<td>0</td>
</tr>
<tr>
<td>Aguthi</td>
<td>887</td>
<td>46</td>
<td>17</td>
<td>14</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>201</td>
<td>35</td>
<td>16</td>
<td>2</td>
<td>595</td>
<td>651</td>
<td>1216</td>
<td>0</td>
</tr>
<tr>
<td>Luchira</td>
<td>1073</td>
<td>324</td>
<td>147</td>
<td>50</td>
<td>34</td>
<td>10</td>
<td>17</td>
<td>8</td>
<td>65</td>
<td>16</td>
<td>2</td>
<td>0</td>
<td>907</td>
<td>839</td>
<td>1746</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>5393</td>
<td>2551</td>
<td>733</td>
<td>301</td>
<td>180</td>
<td>101</td>
<td>91</td>
<td>146</td>
<td>288</td>
<td>162</td>
<td>64</td>
<td>7</td>
<td>5073</td>
<td>5123</td>
<td>10196</td>
<td>0</td>
</tr>
</tbody>
</table>
In the five year period under review (1999-2003), it was found that there were more boys (9490) than girls (9357) who were immunized. There was no statistical difference in the males and females immunized in both Divisions ($\chi^2 1.053$, p>0.05, df 4). There were more boys (4417) than girls (4234) immunized in Mukurweini Division. However, there were more girls (5123) immunized than boys (5073) in Tetu.

TABLE 4.2: Sex Distribution of Immunized Children in Mukurwe-Ini and Tetu Division, Nyeri District.

<table>
<thead>
<tr>
<th></th>
<th>MALE</th>
<th>FEMALE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUKURWEINI</td>
<td>4417</td>
<td>4234</td>
<td>8651</td>
</tr>
<tr>
<td>TETU</td>
<td>5073</td>
<td>5123</td>
<td>10196</td>
</tr>
<tr>
<td>TOTAL</td>
<td>9490</td>
<td>9357</td>
<td>18847</td>
</tr>
</tbody>
</table>

4.2 Annual trends of routine immunization coverage.

In the year 1999, there were 1901 birth cohorts reached by routine vaccination in Tetu and only 1782 reached in Mukurweini. Considering the expected numbers for this particular year (2265 children for Tetu and 2473 in Mukurweini), the percent immunizations realized were 83.9% and 72.1%, respectively, for the two divisions. In the year 2000, the number who were immunized significantly reduced in the two divisions with Tetu registering only 1554 (68.1%) and 1491 (59.8%) in Mukurweini. The immunization trends in the two divisions changed considerably in 2001 with an increase of 2299 (99.9%) birth cohorts in Tetu and 1620 (64.3%) in Mukurweini. In 2002, there was a reduction in the number of children immunized in both divisions. Tetu had 2100 (90.5%) and 1625 (64.1%) in Mukurweini. There was an improvement in the increase of the number of children immunized in the two divisions in the year 2003. In this particular year, Tetu realized 2342 (100%) in the number they expected to immunize for the year and Mukurweini had 2133 (83.5%) (Fig 4.2). There was a significant relationship between immunization coverage in the two divisions and year ($\chi^2 1619.9$, p<0.05, df 4).
Figure 4.1: Age related trends of routine immunization coverage between Mukurweini and Tetu divisions, Nyeri district.
A total of 18847 children were immunized over the five year period out of a total of 24074 expected in both divisions of Mukurweini and Tetu. There was an increase in percent coverage in both divisions from 1999 to 2003 with 11.49% increase in Mukurweini and 16.20% increase in Tetu. This was a significant improvement in immunization in both divisions ($\chi^2$ 1817.15, OR 1.29, p < 0.05, df 1) (Table 4.3, Fig 4.2).

Table 4.3 : Trends of routine immunization coverage (1999 to 2003).

<table>
<thead>
<tr>
<th>Year</th>
<th>Observed</th>
<th>Expected</th>
<th>Observed</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>1782 (72.06%)</td>
<td>2473</td>
<td>1901 (83.93%)</td>
<td>2265</td>
</tr>
<tr>
<td>2000</td>
<td>1491 (59.81%)</td>
<td>2493</td>
<td>1554 (68.07%)</td>
<td>2283</td>
</tr>
<tr>
<td>2001</td>
<td>1620 (64.46%)</td>
<td>2513</td>
<td>2299 (99.87%)</td>
<td>2302</td>
</tr>
<tr>
<td>2002</td>
<td>1625 (64.15%)</td>
<td>2533</td>
<td>2100 (9052%)</td>
<td>2320</td>
</tr>
<tr>
<td>2003</td>
<td>2133 (83.55%)</td>
<td>2553</td>
<td>2342 (100.13%)</td>
<td>2339</td>
</tr>
</tbody>
</table>

4.3. Trends of immunization coverage by age

The 1st month of birth had the highest number of immunized children in both divisions. The number of those immunized reduced towards the twelfth month (Fig 4.3). When correlating the two sexes in the various health facilities and Child Welfare Clinics in the two divisions, it was found that there was a high significant correlation at 0.01 percent level in the number of males and females in all the health facilities (Fig 4.4).
Figure 4.3 Age related trends of routine immunization in the two divisions.

4.4 Sex related trends of immunization coverage.

The female to male ratio was 1:1.2, showing that there were more male children than female in both divisions. There was a significant improvement in both Mukurweini and Tetu with 11.49% and 16.20% for respective divisions at 0.05% level of significance.

Figure 4.4: Sex related trends of childhood immunization coverage in the various health facilities during the five year period.

KEY
1. Mukurweini Subdivision
2. Tambaya hospital Dispensary
3. Njoki Dispensary
4. Muthuthiini Disp.
5. Thangathi Disp.
8. Ichamara Disp.
11. Ihururu Disp.
12. Kinunga Health Center
15. Wamagana Health Center
16. Unjiru Disp.
17. Aguthi Disp.
18. Gichira Health Center
Whenever there was an increase in immunizations for males, the same was for females in all health facilities (Fig. 4.4). Thus, there was no difference in the trend of immunization between sex with a significant correlation co-efficient at 0.01% level (Table 4.4).

**Table 4.4**: Correlation co-efficient level between both sexes in the number of children routinely immunized in both divisions of Nyeri district.

<table>
<thead>
<tr>
<th></th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson</td>
<td>1</td>
<td>1.000(**)</td>
</tr>
<tr>
<td>Correlation</td>
<td>.</td>
<td>.000</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>FEMALE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson</td>
<td>1.000(**)</td>
<td>1</td>
</tr>
<tr>
<td>Correlation</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>19</td>
</tr>
</tbody>
</table>

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

Whenever there was an increase in the number of male children, there was also an increase in the number of females. Hence the males to females had a significant correlation as shown in table 4.4.

4.5 Relationship between occupation of mothers /caregivers.

Results of the socio-economic characteristics of the mothers/caregivers accompanying their children for immunization showed that 163 (40.9%) were housewives, 112 (28.1%) farmers, 52 (13.2%) business women, 27 (6.9%) students and 44 (10.9%) were involved in other economic activities (Fig 4.5). There was a significant relationship between occupation of mothers and practice of immunization at 0.01% level, \( \chi^2 2.451, p<0.01, df 4 \).

There was an association between occupation of the mother/caregiver and mode of travelling to the immunization center. Those who were walking on foot to the health facility were 299 (75.1%), 58 (14.6%) used public transport to reach the health facilities, 9 (2.3%) used bicycles and only 32 (8.0%) respondents used private vehicles. There was no significant correlation above 0.05% level in ways used to reach the health facilities \( \chi^2 6.350, p>0.05, df 4 \).
Table 4.5: Occupation of mothers/caregivers.

<table>
<thead>
<tr>
<th></th>
<th>Housewives</th>
<th>Farmer</th>
<th>Business</th>
<th>Any other</th>
<th>Student</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Mukurweini</td>
<td>88</td>
<td>48</td>
<td>20</td>
<td>26</td>
<td>16</td>
<td>98</td>
</tr>
<tr>
<td>Tetu</td>
<td>75</td>
<td>64</td>
<td>32</td>
<td>18</td>
<td>11</td>
<td>200</td>
</tr>
<tr>
<td>Total</td>
<td>163</td>
<td>112</td>
<td>52</td>
<td>44</td>
<td>27</td>
<td>398</td>
</tr>
</tbody>
</table>

There were more housewives (44.4%) and students (8.08%) who brought children for immunizations in Mukurweini than in Tetu (Fig. 4.7). However there were more farmers (32%) and business women (16%) who brought their children for immunizations in Tetu than in Mukurweini (Fig. 4.6).

Figure 4.5: Occupation of mothers / care givers.
4.6 Occupation of mothers / caretakers in Tetu division.

The majority (37.5%) of the caregivers in Tetu division were housewives (Fig. 4.6) and students were the least (5.5%).

![Figure 4.6: Occupation of mothers / caretakers in Tetu](image)

4.7 Occupation of mothers / caretakers in Mukurweini.

The majority (44.44%) of mothers / caretakers in Mukurweini were housewives while

![Figure 4.7: Occupation of mothers / caretakers in Mukurweini](image)
The occupation of the mother/caretakers influenced the amount of money spent on transport to the immunization center. In Tetu, 10 (2.5%) respondents paid ten shillings, 22 (5.6%) paid twenty shillings, 13 (3.3%) paid thirty shillings and 150 (38%) spent no money to reach the health facility. In Mukurweini, the amount of money spent on transport was lower with 3 (0.76%) mothers/caretakers spending ten shillings, 9 (2.3%) paid twenty shillings, 6 (1.5%) spent thirty shillings and 182 (46.1%) spent no money to reach the health facility. There was no significant difference in the amount of money used to reach health facilities in the two divisions ($\chi^2 = 6.224$, p<0.05, df 3).

4.8 Factors influencing immunization as reported by mothers / caretakers.

Eight hundred twenty four responses were received from the mothers / caretakers to establish the factors that influenced participation in routine immunization. Ninety nine (12%) of mothers/caretakers in Tetu experienced long waiting time at the clinics as the major problem preventing them from presenting their children for immunization. In Mukurweini, 114 (13.8%) respondents had fear of side effects of immunization as their major hindrance (Figure 4.8 and Table 4.6).

Table 4.6 : Factors influencing immunization as reported by mothers / caretakers.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Tetu (%)</th>
<th>Mukurweini (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture not allow</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Busy with other work</td>
<td>10.3</td>
<td>7.7</td>
</tr>
<tr>
<td>Lack of knowledge on immunization</td>
<td>0.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Religion not allow</td>
<td>1.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Child not taken for immunization</td>
<td>4.0</td>
<td>9.3</td>
</tr>
<tr>
<td>Day of immunization not convenient</td>
<td>0.9</td>
<td>0</td>
</tr>
<tr>
<td>Fear of side effects</td>
<td>7.0</td>
<td>13.8</td>
</tr>
<tr>
<td>No faith in immunization</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Long waiting time</td>
<td>12.0</td>
<td>6.4</td>
</tr>
<tr>
<td>Rumours about vaccine</td>
<td>7.9</td>
<td>9.8</td>
</tr>
<tr>
<td>No response</td>
<td>1.9</td>
<td>3.5</td>
</tr>
</tbody>
</table>
4.9 Operational factors influencing routine immunization coverage as reported by all respondents

One hundred twenty six (44.33%) of the mothers/caretakers in Tetu division and 136 (55.67%) in Mukurweini indicated the lack of staff at the health facilities as a hindrance to routine immunizations. In the two divisions, a total of 262 out of 460 (57%) responses from the mothers/caretakers singled out staff problem as their operational hindrance to childrens’ immunization. Fifty two (11.3%) of the respondents from Tetu and 73 (15.9%) of the respondents from Mukurweini were not happy with the attitude of the health workers (Table 4.7).

The lack of vaccines was reported by respondents from Tetu but not Mukurweini. Other operational factors which prevented the mothers/caretakers from presenting their children for routine immunization were as shown in Fig 4.9.
Table 4.7: Operational factors influencing routine immunization coverage as reported by mothers / caretakers

<table>
<thead>
<tr>
<th>Response</th>
<th>Tetu (%)</th>
<th>Mukurweini (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude of health workers</td>
<td>11.3</td>
<td>15.9</td>
</tr>
<tr>
<td>Lack of staff</td>
<td>27.4</td>
<td>29.6</td>
</tr>
<tr>
<td>Lack of vaccine</td>
<td>1.3</td>
<td>0</td>
</tr>
<tr>
<td>Not reminded by Health workers on dates</td>
<td>2.4</td>
<td>0.2</td>
</tr>
<tr>
<td>No response</td>
<td>4.6</td>
<td>7.4</td>
</tr>
</tbody>
</table>

Figure 4.9: Operational factors that prevented mothers / caretakers from taking their children for routine immunizations in Mukurweini and Tetu division.

4.10 Corrective measures to be taken to improve immunization services as reported by all respondents.

The respondents indicated various measures necessary to improve immunization coverage. The need to employ more health staff in the two divisions had 222 (24.8%) responses, while one hundred and eighty nine responses (21.1%) said that there should be an increase in the
health workers' salaries. 180 (20.1%) felt transport system should be improved. 90 (10.1%) named building of modern maternity wards, 70 (7.8%) mentioned establishment of mobile clinics to improve attendance. The need to carry out staff rotation and transfers was also indicated as a measure to improve mothers/caretakers attendance by 74 (8.2%) responses (Table 4.8, Fig 4.10).

**Table 4.8: Corrective measures to improve immunization coverage as recommended by mothers / caretakers**

<table>
<thead>
<tr>
<th>Corrective measure</th>
<th>Tetu (%)</th>
<th>Mukurweini (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary increase for health workers</td>
<td>12.6</td>
<td>8.5</td>
</tr>
<tr>
<td>Employ more staff</td>
<td>14.0</td>
<td>10.6</td>
</tr>
<tr>
<td>Health education</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Build modern maternity wards</td>
<td>10.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Staff rotation and transfers</td>
<td>0.3</td>
<td>7.9</td>
</tr>
<tr>
<td>Post doctors and clinicians</td>
<td>2.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Prompt payment to farmer produce</td>
<td>0.1</td>
<td>0.7</td>
</tr>
<tr>
<td>Repair roads for communication</td>
<td>10.3</td>
<td>9.8</td>
</tr>
</tbody>
</table>

**Fig 4.10 Corrective measures recommended by mothers / caretakers in the two divisions.**
4.11 Factors influencing routine immunization as reported by health workers.

The eight health workers interviewed were in the ages 20-24 years (12.5%), 30-34 years (25%), 40-44 years (50%), 49 and above (37.5%). Two male and two female health workers from each division were chosen. For this group of respondents, the socio-cultural factors influencing immunization in Nyeri district were rumours about the vaccines (100%), long waiting time at the clinics (50%), health condition of child (sick hence not taken for immunization) (37.5%), fear of side effects (25%), lack of knowledge of immunization (12.5%), and no response (25%).

The health workers indicated that the major factor that led to low routine immunization was unavailability of money and long distances and cost to the immunizing health facilities (100%). At their respective health facilities, all the health workers 8 (100%) reported lack of staff as a leading problem resulting into low routine immunizations. Three of the health workers (37.5%), two from Mukurweini and one from Tetu division reported poor attitude of their fellow workers towards the mothers / caretakers as a contributing factor to low immunization coverage in Nyeri. The health workers gave various suggestions in order to improve mothers / caretakers attendance for routine immunizations (Figure 4.10 and Table 4.9).

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Tetu (%)</th>
<th>Mukurweini (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary increment</td>
<td>62.5</td>
<td>50</td>
</tr>
<tr>
<td>Employment of more staff</td>
<td>50</td>
<td>37.5</td>
</tr>
<tr>
<td>Health education in barazas</td>
<td>12.5</td>
<td>25</td>
</tr>
<tr>
<td>Mobile clinics</td>
<td>12.5</td>
<td>37.5</td>
</tr>
<tr>
<td>Introduce mmr vaccine</td>
<td>0</td>
<td>12.5</td>
</tr>
<tr>
<td>Staff transfers</td>
<td>0</td>
<td>12.5</td>
</tr>
</tbody>
</table>
Figure 4.11: Corrective measures recommended by health workers to improve immunization coverage in both divisions.

4.12. Responses from the opinion leaders in the district on immunization coverage.

The socio-economic and cultural factors that led to low routine immunization in Nyeri district were identified by the opinion leaders as rumours about the vaccine and work load at the homes that occupied most of the mothers/caretakers. The people in Nyeri have faith in immunization and had heard of its existence (100%). In Nyeri, the opinion leaders did not believe that culture hindered immunization (Figure 4.12 and Table 4.10).

Table 4.10: Factors influencing routine immunization as reported by opinion leaders.

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. Respondents</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture does not allow</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Busy with other work</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>Has never had existence</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Religion does not allow</td>
<td>1</td>
<td>16.7</td>
</tr>
<tr>
<td>Child not taken for immunization</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>No faith in immunization</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fear of side effects</td>
<td>1</td>
<td>16.7</td>
</tr>
<tr>
<td>Rumours about vaccine</td>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>
Figure 4.12: Factors influencing routine immunization as reported by opinion leaders

One opinion leader from Tetu division considered paying for services at the health facilities by mother/caretakers as one of the factors leading to low routine immunization. All opinion leaders interviewed from Mukurweini division indicated the problem of long distance to the immunization facility as a hindrance.

4.13 Corrective measures recommended by opinion leaders.

The leaders recommended corrective measures as indicated (Table 4.11). They strongly suggested the need to employ more staff in the health centers, and establishment of mobile clinics to achieve a high immunization target (Fig. 4.13).
Figure 4.13: Corrective measures to increase immunization coverage as recommended by opinion leaders in both divisions of Tetu and Mukurweini.

Table 4.11: Measures recommended by opinion leaders to improve immunization coverage in Nyeri District.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>% respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary increase for health workers</td>
<td>33.3</td>
</tr>
<tr>
<td>Employ more staff</td>
<td>66.7</td>
</tr>
<tr>
<td>Health education</td>
<td>16.7</td>
</tr>
<tr>
<td>Staff mobile clinics</td>
<td>50</td>
</tr>
<tr>
<td>Staff rotation and transfer</td>
<td>16.7</td>
</tr>
<tr>
<td>Building maternity wards</td>
<td>33.3</td>
</tr>
<tr>
<td>Free medical services</td>
<td>33.3</td>
</tr>
</tbody>
</table>

4.14: The relationships between immunization coverage in the two divisions.

Analysis of 2 x 5 contingency table was carried out to investigate the association between the year and actual immunization coverage (Table 4.12) in the two divisions. The analysis showed that there was no relationship between actual immunization as the expected as shown by statistics in the table. Recommended immunization coverage in the two divisions was not achieved.
Table 4.12: Chi-square table showing correlation between the two divisions in the actual and the expected number immunized (1999 – 2003).

<table>
<thead>
<tr>
<th>Year</th>
<th>Tetu Actual no. Immunized</th>
<th>Expected no. Immunized</th>
<th>Chi-square</th>
<th>Mukurweini Actual no. Immunized</th>
<th>Expected no. Immunized</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>1901</td>
<td>2265</td>
<td>$\chi^2=58.5$, p&gt;0.05</td>
<td>1782</td>
<td>2473</td>
<td>$\chi^2=193.1$, p&gt;0.05</td>
</tr>
<tr>
<td>2000</td>
<td>1554</td>
<td>2283</td>
<td>$\chi^2=232$, p&gt;0.05</td>
<td>1491</td>
<td>2493</td>
<td>$\chi^2=402$, p&gt;0.05</td>
</tr>
<tr>
<td>2001</td>
<td>2299</td>
<td>2302</td>
<td>$\chi^2=0.004$, **</td>
<td>* p&lt;0.001</td>
<td>1620</td>
<td>$\chi^2=317$, p&gt;0.05</td>
</tr>
<tr>
<td>2002</td>
<td>2100</td>
<td>2320</td>
<td>$\chi^2=20.9$, p&gt;0.05</td>
<td>1625</td>
<td>2533</td>
<td>$\chi^2=325.5$, p&gt;0.05</td>
</tr>
<tr>
<td>2003</td>
<td>2342</td>
<td>2339</td>
<td>$\chi^2=0.004$, **</td>
<td>* p&lt;0.001</td>
<td>2133</td>
<td>$\chi^2=69.1$, p&gt;0.05</td>
</tr>
</tbody>
</table>

* Indicates a significant correlation between the expected and the actual value

4.15 Socio-economic factors influencing routine immunization.

The socio-economic factors influencing immunization as indicated in focus group discussions (FGDs) by opinion leaders were long distances covered by the mothers/caretakers in Nyeri district to get to immunization centers and lack of money. The mothers/caretakers indicated lack of money (46.2%), long distances to immunization centers (40.5%) and the need to pay for services (Table 4.13).

Table 4.13: Mothers/caretakers socio-economic responses for barriers in routine immunization services.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Mothers/caretakers</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paying for services offered</td>
<td>14</td>
<td>3.5%</td>
</tr>
<tr>
<td>Long distance to immunization</td>
<td>161</td>
<td>40.5%</td>
</tr>
<tr>
<td>Lack of money</td>
<td>184</td>
<td>46.2%</td>
</tr>
<tr>
<td>No response</td>
<td>77</td>
<td>19.3%</td>
</tr>
</tbody>
</table>
4.16 Operational factors influencing routine immunization.

Operational factors at the immunization centers that hinder immunization as reported by the opinion leaders in FGDs and health workers in FGDs showed the hindrances as being caused by lack of enough staff (100%). The long waiting time for mothers / caretakers before attendance (100%) also contributed to low immunization. The mothers / caretakers reported lack of staff (65.6%) and negative attitude of the health workers (31.4%) as the main operational barriers. (Table 4.14)

Table 4.14: Operational factors influencing immunizations as reported by Mothers / caretakers in Nyeri District.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Mothers/caretakers</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude of health workers</td>
<td>125</td>
<td>31.4%</td>
</tr>
<tr>
<td>Lack of staff</td>
<td>262</td>
<td>65.6%</td>
</tr>
<tr>
<td>Lack of vaccines</td>
<td>6</td>
<td>1.5%</td>
</tr>
<tr>
<td>Reminder by the health workers</td>
<td>12</td>
<td>3.0%</td>
</tr>
<tr>
<td>No response</td>
<td>55</td>
<td>13.8%</td>
</tr>
<tr>
<td>Inconvenient days</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Waiting for long before attendance</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
DISCUSSION

5.1 Trends of Routine Immunization Coverage in the Area of Study.

The study focused on comparison on the trends of routine immunization coverage between the two divisions of Tetu and Mukurweini and evaluated the outcome. The resultant coverage over 5 years in the two divisions was low in Mukurweini with a mean percent coverage of 68.8 % (1999 – 2003) compared to Tetu with a mean percent coverage of 88.5 %. The average coverage for both divisions (78.65%) was still lower than that recommended by KEPI (80%) in performance monitoring handbook (KEPI, 2003). From 1999 – 2003, the range coverage in the two divisions were 11.5% and 16.2 % for Mukurweini and Tetu, respectively (OR 10.289, p < 0.05). This is considered good coverage in the district though much needs to be done for Mukurweini division. Mukurweini division had very poor infrastructure; more rural, poor accessibility to health service delivery points and had long distances from one health facility to the other. It also has a smaller geographical area (179 sq. km) compared to Tetu which has 651 sq. km. (ROK, 1997 - 2001).

The higher immunization coverage in Tetu division could have been due to higher accessibility with better infrastructure and its situation next to an urban setup of Nyeri town. The health facilities were reasonably closer to each other in this division. Comparatively, tea and coffee farming was more concentrated in Tetu division while milk or dairy and coffee farming in small scale was practiced in Mukurweini. The results of this study suggest that immunization was lower than the recommended 80% coverage and much needs to be done to achieve the recommended immunization coverage in both divisions.
5.2  **Age and sex related annual trends of routine immunization in Nyeri district.**

The study showed that most (88.7%) of the children immunized in both Mukurweini and Tetu division were aged 0 -4 months with Mukurweini having 9978 (50.5%) while Tetu had 7566 (38.2%). The male to female ratio of the study population showed a 1:1.2 with a significant correlation of 0.01% level among health facilities. It was noted that whenever there was an increase in immunization of one sex, the same was reflected in the other sex. These results compare well with a study conducted in India, aimed at imparting surveillance, where there was no variation in sex of the cohorts under study (Thankur, 2002).

Those children aged one month comprised 50% of the total children immunized. This immunization coverage could be due to vaccinations offered at both of the cohorts in those health facilities which have maternity wards. This makes it easier to capture all the children born in the maternities for immunization.

In 1999, the immunization coverage for Tetu was 83.93% while Mukurweini had 72.06%. However, by the end of 2003 there was a significant improvement ($\chi^20.004, p < 0.05, \text{df} 1, \text{OR} .7772$). Though Mukurweini had more problems due to its poor communication network and infrastructure, its status was reflected in the difference in trends of routine immunization practices ($\chi^20703; p>0.05, \text{df} 1$). There was a significant relationship at the 0.01% level (2 tailed) between male and female children who appeared for immunization services.

5.3  **Socio – cultural factors influencing routine immunizations.**

There were several socio – cultural factors that were identified as barriers to routine immunizations. The factors identified were affordability, accessibility and acceptability of the immunization services provided to the under five year old children. Of the two divisions, Mukurweini had the majority 438 (53.2%) of the responses while Tetu had 386 (46.8). 55 (13.8%) of the respondents were males while 343 (86.18 %) were females.
The respondents who were mothers / caretakers could pick on one or more responses on the social –cultural problems which prevented children from being presented to the Health facilities for immunization. Only 7 (0.02%) of the respondents who included males (13.82%) were outside the age bracket of mothers of childbearing age (15 – 49 yrs). Though routine immunization services were free, there were those who could not access them because of long distance from their homes and poor roads. Similar findings were also reported in Siaya (Odanga, 2003).

The majority of the respondents 172 (20.9%) indicated that fear of side effects associated with vaccines was a major hindrance to immunization with Mukurweini having 14 (66.3%) of the responses. This also featured in the plan of action for Integrated Disease Surveillance and Response (ROK, 2001), which reports that disease outbreaks mostly affect those who avoid immunizations leading to high morbidity and mortality. Other respondents cited long waiting time while queuing to get services as a major problem (18.4%) as is the case in Tetu 99 (65.5%) compared to Mukurweini 53 (34.5%). A good number of responses 148 (18%) noted that being busy with other works could jeopardize chances of making children appear to the CWC for immunizations. Some rumours which were associated with vaccines 146 (17.7%) resulted in mothers / caretakers fear to get their children immunized. Most of the fear (55.5%) was being felt in Mukurweini and the attached information was that the vaccines were mixed with drugs that would make children impotent when they grew up. This was said to be a form of family planning to reduce the population of people of Central Province since they were viewed as opponents of the government or antigovernment before the current government came to power. This affects disease surveillance and response activities as supported by the guideline for epidemic response on measles (WHO, 1999). It is worthy to note that since Nyeri District is an area of different religions, 20 (24%) said their sects do not allow them to take their children for immunization or medical treatment. Out of these 12 (60%) of the responses were from Mukurweini. A total of 110
(13.3%) responses noted that, if a child is sick he/she should not be taken for immunizations. Seven (0.8%) of the responses with 5 (71.4%) of them from Tetu Division indicated that they had never heard of existence of immunization. This was unlikely to be so since all the 7 respondents who gave the 7 responses were in the different clinics for immunizations. Another 7 (0.8%) of the responses which were all from Tetu indicated that immunization days were inconvenient with their calendar of events. These results compare well with the findings of a study on factors influencing measles immunization coverage in Siaya District (Odanga, 2003) where mothers / caretakers were only available on market days for immunization. Only 12 (1.5%) with 50% responses from each division aired their views in not having faith in immunizations. They preferred herbal cure for any disease than the conventional treatment or immunizations. In all the responses, 45 (11.3%) respondents out of 398 did not tick for any response. Only 5 (0.6%), with majority 4 (80%) from Tetu said culture does not allow them to take their children for immunizations.

5.4 Social – economic determinants of routine immunization.

Those interviewed gave different views on factors that determine routine immunizations. In the facilities, the amount of money paid for the services and lack of money were a barrier in accessing routine immunization services for the under five year old children. The majority of mothers / caretakers (75%) walked to the immunizing health facilities. These are the ones who found it easier to walk to the health facilities since they could not afford to pay for any means of transport such as matatus, bicycles or private vehicles. Only 58 (14.6%) of the respondents used matatus. Due to the cold weather and poor roads which are muddy and hilly, not many respondents used bicycles for transport. So only 2 (28.6%) mothers / caretakers used bicycles in Mukurweini and 7 (71.4%) used them in Tetu. At least 32 (8%) of the respondents 28 (87.5%) most of them in Tetu used private vehicles to bring their children for
immunization. This explains that people of Tetu are better placed economically than their counterparts in Mukurweini and 7 (71.4 %) use them in Tetu. At least 32 (8%) of the respondents used vehicles to bring their children for immunization than their counterparts in Mukurweini. These findings explain that the transport system is more available, accessible and affordable in Tetu compared to Mukurweini division.

5.5 Operational determinants of routine immunizations

There were some major determinants identified as setbacks to high coverage of routine immunizations in the operational areas. Some respondents gave more than one response. A total of 402 responses were received from the mothers / caretakers, with 55 (13.8 %) respondent abstentions. Of those received, 192 (47.8%) responses were from Tetu while 210 (52.2%) were from Mukurweini.

Poor and unethical attitude of health workers was cited as a hindrance to routine immunization by 125 (31.1 %) responses with Tetu giving 52 (41.6 %) and Mukurweini 73 (58.4%). This attitude of health workers which was said to be unacceptable could be due to overwork and understaffing in the health facilities. That is why 262 (65.2%) of the responses cited lack of staff as a major contributory factor to the barrier in accessing routine immunizations whose effect is almost equally felt in the two divisions. There were only 6 (1.5%) responses which indicated lack of vaccines as a barrier to routine immunizations, all (100%) of who were from Tetu and none (0%) from Mukurweini. There was a time when B.C.G vaccine was out of stock in the vaccine stores in Nyeri. Lack of supply of drugs and vaccines in time may have contributed to the low immunization coverage. This had earlier been mentioned by the department of vaccines and biologicals (WHO, 1999 b), that the untimely supply of drugs and vaccines or lack of their supply contributed to low immunization coverage. This crisis in the lack of BCG vaccines was also said to have been reported in other areas of the country. Though
short lived, many children who would have been immunized were not done so and at the time required leading to low routine coverage. Twelve (3%) of the responses cited they were not reminded of the return date for the next vaccination by the health workers. Of these, 11 (91.7%) responses were from Tetu and 1 (8.3%) from Mukurweini. This could be attributed to the much work in the coffee and tea farms which would make the respondents forget the date of next appointment which is normally written in their clinic cards.

5.6 Intervention measures proposed for strengthening routine immunizations.

A total of 895 responses were received from the mothers / caretakers citing various proposed measures. Ninety five (42.8%) of the responses were from Mukurweini and 127 (57.2 %) were from Tetu. This related well with corrective measures cited from Tetu and corrective measures cited by opinion leaders 4 (26.7%). Salary increase to health workers was proposed by 189 (21.1%) responses as an important measure in strengthening routine immunization. This had also been reported in a report on review of EPI African regional workshop on strengthening immunization (WHO, 1998) which stated that the salary increases for health workers can be a very important intervention because of the enormous amount of work experienced by the few available health workers. The staff shortages were evident in all health facilities during the study period. These results suggest that there is need to review employment strategies and salaries for health workers.

Repairs of the rural access roads was proposed by 180 (20.1%) for easy accessibility to the health facilities. The majority of the mothers / caretakers (75%) walk on foot, but with the roads repair many vehicles will traverse the interior to pick on the passengers. All the 90 (100%) responses who proposed building, modernizing and equipping maternity wards in all health facilities came from Tetu. The respondents in this category may have had in mind that to achieve a good immunization coverage, newborns must be targeted at birth for vaccinations. Seventy
(7.8%) responses indicated that starting mobile clinics in the district would be a strengthening measure in achieving high routine immunization status. This is also supported by a book on introduction to IMCI (ROK/MOH, 2003) which cites mobile clinics as a way of increasing immunization coverage. A total of 28 (3.1%) respondents proposed that doctors / clinicians should be posted to all health facilities. They mentioned that they are needed more so for treatment of paediatric illnesses and as a measure of attracting more children to the health facilities C.W.Cs. Health education and community sensitization in Barazas was mentioned as an intervention measure by 34 (3.8%) responders. The health education may take place as a continuous micro teaching exercise in the MCH / FP Clinic where CWC services take place. The two of them should take place on market days also. This compares well with information in child health book (AMREF, 1993) which emphasizes on health education to mothers in MCH/ FP clinics. This will ensure creation of awareness especially to the upcoming mothers as was the case with the 7 (0.8%) mothers / caretakers who had never heard of existence of immunizations.

About 74 (8.3%) responses cited staff rotations, changes and transfers as a measure to rid off the unproductive health workers so as to improve immunization services. Of these, 71 (96%) responses were from Mukurweini. Mukurweini could be having un-cooperative rude or reluctant health workers prompting the mentioned corrective measures. Eight (0.9%) of the responses suggested the need for better payment for their farm produce for them to get money to enable them get good transport and for other dividends. This was so especially in Mukurweini division where 7 (87.5%) of the responses came from. This could be so due to the existing poor living standards in the division. This is supported by a special report on immunization in Kenya (KDHS, 2003), which showed that poverty contributed a lot to low immunizations.

Health workers were in support of the corrective measures indicated by the mothers / caretakers, though salary increment came first (36%) in the order of their proposals. The employment of more staff was also cited as an alleviating measure to improve immunization
with 7 (28%) responses. Other measures were Health Education in Barazas (12%) re-establishment of mobile clinic services (16%) while both introduction of MMR Vaccine and staff transfers had 4% responses for each. The opinion leaders supported the proposals of the mothers / caretakers and the Health workers. About 25% of the responses highly supported employment of more health workers while 12.5% viewed increase of salary for health workers as a measure to increase immunization coverage. Three (18.7%) of the responses cited establishment of mobile clinics as an alleviating measure, so as to reach people with difficulties of travel. These responses came from Tetu and none from Mukurweini. Some responses (12.5%) from opinion leaders especially those of Mukurweini division suggested free medical services to mothers, as a measure of attracting the unimmunized children to accompany their mothers/caretakers to the MCH/FP clinic and C.W.C. This would increase chances of children being immunized at the C.W.C. Other responses targeted staff rotation (6.25%) and posting of a doctor or clinician (6.25%) to all the health facilities. Building of a functional maternity ward in every health facility was viewed as a measure to boost immunization of the newborn children by the opinion leaders’ responses (12.5%). Offering free medical services was more likely to improve routine immunization coverage than intensifying mobile outreach clinics as mentioned by many opinion leaders. This compares well with a study on morbidity and mortality in Sub Saharan Africa (Feacham and Jamison, 1991) which showed that immunizations reduce diseases and deaths from immunizable diseases.

5.7 Focus group discussion with mothers/ caretakers, opinion leaders and health workers.

During FGD.s, mothers/ caretakers whose bigger percentage is a farming community (71.9%) knew well the causes of the common EPI diseases i.e measles, polio and tetanus; but decried the persistent staff shortages and poor attitudes of some health workers. They proposed for remuneration and renumeration of health workers as well as taking services to the people.
The session on FGD which lasted from 9.30 am to 3.00pm was attended by 27 out of the invited 32 mothers/ caretakers of children. The cost of travel and the social-cultural demotivating factors were in conformity with the earlier findings. In essentials of nursing research, the methods, appraisal and utilization of FGDs (Polit and Hungler, 1993) determines the type of information one can get. Out of the 25 invited opinion leaders / motivators, 22 (88%) attended the FGDs starting from 8.30 A.M. to 3.00 P.M. Twelve (54.5%) were from Tetu and the rest (45.5 %) were from Mukurweini. The majority (82%) were farming members of the community in the two divisions equally distributed. All of them had heard of the three common immunizable diseases and they also knew their causes. They were also aware of the good effects of immunization in protecting children from diseases with all of them admitting having had experience of safety with a child who is immunized against diseases. Provision of lifelong immunity in a child who is immunized, the safety and protection of infection in exposed persons were cited as a result of vaccination.

In social-cultural exploration, responses from mothers/ caretakers were that they were busy in other works at home (34.5%), and these were equally distributed between the two divisions. Those responses which suggested taking a lot of time to cover long distances (27.6%), were higher in Mukurweini (62.5%), while responses on care of other sick children and siblings (32.8%), and those who responded on the mother / caretaker being sick as prohibitive factors were all cited as factors influencing children’s’ routine immunizations. When exploring the economic factors, all the responses cited poverty levels, others reported competing priorities such as provision of food and school fees, and poor or lack of transport to the health facilities as prohibitive measures which should be addressed urgently. Same findings were previously exhibited in a health survey on immunization coverage in Kenya (KDHS, 1998), which cited that low economy and poverty levels played a role in the low immunization coverage. In operational problems, the shortage of staff compared with the low morale featured prominently and called
for employment and posting of more staff especially with clinical background, as pointed by 25% of the responses. Building of maternity wards (28%), constant supervision of health workers by DHMT (27%) and lastly staff motivation with salary hikes (20%), were measures proposed to promote routine immunizations. Of these responses 45 (57%) were from Tetu and 34 (43%) were from Mukurweini.

Eighteen health workers appeared for FGDs out of the possible 22 who had been invited. Tetu division had 11 (61%) who attended, while Mukurweini division had 7 (39%). All health workers (100%) reported that they provided relevant information to their clients and patients on the importance of immunization and hospital delivery. Other information provided to the visiting mothers / caretakers is on importance of family planning services (78%) and good nutrition (78%). To ensure that mothers bring their children for routine immunization, the health workers in various health facilities check on C.W.C. Cards (100%), and record in the C.W.C Permanent register (100%). They hold micro-teaching sessions with immunization talks in the health facilities (67%). The socio-cultural factors which prevent mothers / caretakers from bringing their children to the immunization centres were pointed as domestic cores (68%) and long travelling distances (32%). Rumours about the vaccine (54.5%) and fear of associated side effects (45.5%) were also said to be hindering the success of immunization in both divisions almost equally. Religious believes in some sects (23%) especially the Akorino sect, which are retrogressive was named as a predicament to successful immunization activities and disease management. This cult believes in spiritual healing and not in the modern chemotherapy. A few others believed in herbs a fact which compares well with Cambodian study where interventions were three fold (Barbara, 2001). Much of the response (80%) was derived from Mukurweini division where the cult is concentrated.

All (100%) of the responses suggested that for effective operational undertaking and successive achievement in routine immunizations, more staff should be employed and posted to
various health facilities; and that there should be staff motivation in remuneration package as in salary hikes. An equal number in both divisions (16.7%) suggested staff rotation for those perceived to have low output in work as measure of promoting high immunization uptake. Generally the communities were said to have a good response towards routine immunizations in the divisions but needed support to alleviate their poverty levels. This was also echoed in a presentation to DPHNs meeting in Nairobi on Polio eradication and EPI disease surveillance status in Kenya (KEPI / MOH, 2001).
CHAPTER 6: CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS FOR FUTURE WORK.

6.1 Conclusions

a. There was a moderate routine immunization coverage (78.6%) in Nyeri district, and a 68.8% coverage for Mukurweini division with 86% coverage for Tetu during the five year period under study (1999 – 2003). This was below the KEPI/UNICEF/WHO requirement of 80% and above for good routine immunization coverage.

b. The main factors that influenced routine immunizations in the two divisions of Mukurweini and Tetu were economic, social, cultural and operational.

c. With effective corrective measures and cooperation between the stake holders and health service providers, strengthening of the routine immunization services was mentioned by responders to be an achievable task.
6.2 Recommendations

a) There is need for networking between Community Based Organizations (CBOs), Provincial administration, NGOs and other health sector stake holders for strengthening intersectoral collaboration to enhance effective implementation of sensitizing the public on importance of routine immunization.

b) Health workers should embark on a vigorous campaign on health promotion and advocacy in all health sectors, targeting MCH /FP Clinics, C.W.Cs and school based health programmes with emphasis on primary health care activities to include importance of the immunizations.

c) Quality assistance and support supervision by the PHMTs and DHMT must be maintained at all costs by provision of adequate financial, logistical and professionally sound resources.

d) Acceleration of routine immunization activities should be put in place by re-introduction of mobile clinic services in the district. Also the government should employ and post trained and skilled health care providers in all the rural health facilities to enhance effective quality health service delivery.

e) There should be periodical evaluation of immunization activities. Also a study which can rule out other factors that hinder progressive routine immunization coverage for purposes of intervention should be done. A research on the drop out rates in the study area should be embarked on to shed light on how many children finish their immunization and require the status of a fully immunized child (F.I.C)
6.3 Suggestions for Future Work

a) Conduct a study on children who have suffered from Polio (Acute Flaccid Paralysis - AFP), Measles and Neonatal Tetanus (NNT) and establish their specific management.

b) Study on how previous disease epidemics have occurred and their effective management and response in Nyeri district.

c) Study on factors that influence drop out rates, with an aim of identifying best methods of enabling a child to be fully immunized.
REFERENCES


Thankur J (2002) Factors influencing the imparting of surveillance in India.


World Health Organization (1999b). Department of Vaccines and Biologicals. Consensus Meeting on Assessment and Monitoring of vaccine Preventable Diseases. WHO/VB/00.15
APPENDIX I

CONSENT FORM FOR THE DISTRICT MEDICAL OFFICER OF HEALTH /DPHN/EPI NURSES/CLINICAL OFFICERS AND OTHERS/CARETAKERS WHO ACCOMPANIED THEIR CHILDREN FOR IMMUNIZATION

Introduction

Hello! My name is Sammy Kagoiy Njeru a student at Kenyatta University. I have an interest of knowing the situation of routine immunization coverage among children in Nyeri district. Please give me any relevant information that will assist me meet my interest as an MPHE student carrying out the study for my thesis.

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 without any penalty. I am assured of privacy and confidentiality of the information that I may provide.

Signature of informant

 Date

Signature of investigator

 Date
APPENDIX 11

Section A

CHECKLIST QUESTIONNAIRE TRENDS OF ROUTINE IMMUNIZATION BY AGE, SEX, IMMUNIZATION STATUS AND TRENDS OF MORTALITY FOR THE YEAR 1999 - 2003

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

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Section B

CHECKLIST QUESTIONNAIRE ON TRENDS OF ROUTINE IMMUNIZATIONS

COVERAGE (Please insert in the boxes/spaces below the figures as specified)

1. (a) Number of birth cohorts reached by routine vaccination per division in the year 1999.
   Tetu [ ] Mukurweini [ ]

   (b) Total number of birth cohort expected for routine immunization in the year 1999.
   Tetu [ ] Mukurweini [ ]

2. (a) Number of birth cohorts reached by routine vaccination per division in the year 2000.
   Tetu [ ] Mukurweini [ ]

3. (a) Number of birth cohorts reached by routine immunization per division in the year 2001.
   Tetu [ ] Mukurweini [ ]

   (b) Total number of birth cohort expected for routine immunization in the year 2001.
   Tetu [ ] Mukurweini [ ]

4. (a) Number of birth cohorts reached by routine immunization per division in the year 2002.
   Tetu [ ] Mukurweini [ ]

   (b) Total number of birth cohorts expected for routine immunization in the year 2002.
   Tetu [ ] Mukurweini [ ]

5. (a) Number of birth cohorts reached by routine immunization per division in the year 2003.
   Tetu [ ] Mukurweini [ ]

   (b) Total number of birth cohorts expected for routine immunization in the year 2003.
   Tetu [ ] Mukurweini [ ]
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 IMMUNIZATION TRENDS.**

One to one in depth interview with mothers/caretakers. (Please tick as appropriate in the spaces/boxes provided below).

1. Division ..........................................................................................................................

2. Age ............................................................................................................................... 

3. Sex: Female [ ] Male [ ]

4. Residence Rural [ ] Urban [ ]

5. What is your occupation/source of income (tick as appropriate)
   (a) Housewife [ ]
   (b) Farmer [ ]
   (c) Business woman [ ]
   (d) Any other (e.g. teacher) [ ]
   (e) Student [ ]

6. How do you travel to the health facility while taking your child for immunization?
   (Tick as appropriate)
   (a) Walking on foot [ ]
   (b) Using a matatu [ ]
   (c) Bicycle [ ]
   (d) 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).

(a) 10 kshs. [ ]
(b) 20 kshs. [ ]
(c) 30 kshs. [ ]
(d) no money paid [ ]

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

Yes [ ] No [ ]

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

(a) Card [ ]
(b) Needles and syringe [ ]
(c) Watchman’s fee [ ]
(d) No money paid [ ]

10. How much do you pay?

(a) 5 kshs. [ ]
(b) 10 kshs. [ ]
(c) 20-30 kshs. [ ]
11. What problems probably prevent you from presenting your child for routine immunizations? (Tick as appropriate for the responses in the following question - a tick for a ‘yes’ response and a dash for a ‘no’ response, where there is no response - leave it blank)

(i) **Social-cultural**

(a) Culture does not allow [ ]

(b) Busy with other work at home [ ]

(c) Has never heard of the existence of immunization [ ]

(d) Religion does not allow [ ]

(e) Child sick hence not taken for immunization [ ]

(f) Days of immunization inconvenient [ ]

(g) Fear of side effects [ ]

(h) No faith in immunization [ ]

(i) Long waiting time at the clinic [ ]

(j) Rumours about the vaccine [ ]

(k) No response [ ]

(ii) **Socio-economic**

(a) Mothers/caretakers paying for services offered [ ]

(b) Long distances to the immunizing facility [ ]

(c) No money available [ ]

(d) No response [ ]
Operational

(a) Attitude of health workers [ ]
(b) Lack of staff [ ]
(c) Lack of vaccines [ ]
(d) Not reminded by the health care staff when to return [ ]
(e) No response [ ]

12. Corrective measures

What in your opinion do you think can be done to improve your attendance for immunization?

(a) .........................................................................................................................
(b) .........................................................................................................................
(c) .........................................................................................................................
(d) .........................................................................................................................
SECTION D

(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 [ ] Male

3. Designation ..........................................................................................................................

4. What is the main source of income for the communities in this division?
   (a) .................................................................................................................................
   (b) .................................................................................................................................
   (c) .................................................................................................................................
   (d) .................................................................................................................................

5. What do you consider as the social, economic, cultural factors that probably lead to low routine immunization in Nyeri District? (Tick as appropriate for the responses in the following questions - a tick for a ‘Yes’ response and a dash for a ‘No’ response, where there is no response - leave it blank).

   (i) Socio-cultural
      (a) Has never had of existence of immunization [ ]
      (b) Culture does not allow [ ]
      (c) Child sick hence not taken for immunization [ ]
      (d) Days of immunization inconvenient [ ]
      (e) Fear of side effects [ ]
(f) No faith in immunization

(g) Long waiting time at the clinic

(h) Rumours about the vaccine

(i) No response

(ii) Socio-economic

(a) Mothers/caretakers paying for services offered

(b) Long distances to the immunizing facility

(c) No money available

(d) No response

(iii) Operational

(a) Attitude of health workers

(b) Lack of staff

(c) Lack of vaccines

(d) Not reminded by the health care staff when to return

(e) No response

6. Corrective measures

What in your opinion do you think can be done to improve mothers’ attendance for routine immunization?

(a) ........................................................................................................

(b) ........................................................................................................

(c) ........................................................................................................
SECTION E

QUESTIONNAIRE (KEY INFORMANT INTERVIEW) FOR OPINION LEADERS

Name ..............................................................................................................

1. Division ........................................................................................................

2. Age ............................................................................................................... 

3. Occupation ...................................................................................................

4. Residence (tick as appropriate) Rural [ ] Urban [ ]

5. What is the source of income for the communities in this division? (Tick as appropriate).
   
   (a) .............................................................................................................
   (b) .............................................................................................................
   (c) .............................................................................................................

6. What do you consider as the social, economic, cultural factors that probably lead to low routine measles immunization in Nyeri District? (tick as appropriate)
   
   (i) Social-cultural
   
   (a) Culture does not allow [ ]
   (b) Busy with other work at home [ ]
   (c) Has never had existence of immunization [ ]
   (d) Religion does not allow [ ]
   (e) Child sick hence not taken for immunization [ ]
   (f) No faith in immunization [ ]
   (g) Fear of side effects [ ]
   (h) Rumours about the vaccine [ ]
(ii) Socio-economic

(a) Mothers/caretakers paying for service

(b) Long distance to the immunizing facility

(c) No response

(iii) Operation

(a) Lack of vaccines

(b) Lack of staff

(c) Attitude of health workers

(d) Not reminded by the health care staff of return date

(e) No response

(f) Inconvenient days of immunization

(g) Waiting for long without attendance at the clinic

7. Corrective measures

What in your opinion do you think can be done to improve mother’s/ caretakers attendance for routine immunization?

(a) ..............................................................................................................

(b) ..............................................................................................................

(c) ..............................................................................................................

(d) ..............................................................................................................
SECTION F

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

Focussed group discussion with motivators

Guidelines

Welcome the whole group

Introducing the focus group members and the research team

Explain the purpose of the discussion

Explain the process to be followed

Number invited for focussed 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?

What causes Polio?

What causes Tetanus?

What messages do you give about routine immunization?

1. What factors impede routine 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
- Minor 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
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 etc.

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 immunization in the divisions?

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

Time session ends
FOCUS GROUP DISCUSSIONS WITH OPINION LEADERS

Guidelines

Welcome to the group

Introducing the members and the research team

Explain the purpose of the discussion

Explain the process to be followed

Number invited for focussed 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?
   
   What is polio and what causes it?
   
   What is tetanus and what causes it?
   
   Have you ever heard of immunization, what have you heard about it?
   
   What is your experience with a child immunized against diseases?
   
   At what age is measles immunization administered?

2. What messages are you given concerning routine immunization?

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

**Explore:**

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

5. Economic

Explore

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

6. What can you say about operational problems?

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

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

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

Time session ends
FOCUSED 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

(a) What do your responsibilities include apart from giving immunization?

   (i) What messages do you give to mothers in the subsequent visits for immunization?

   (ii) How do you ensure that mothers bring their children for routine immunization?

   (iii) What factors from your experience makes mothers not bring their children for the immunization in terms of

(b) Social

   Explore

   Family problem

   Mothers unaware of need for routine immunization

   Immunizations scheduled on certain days of the week

   Mothers have no faith in routine immunization
(c) Culture

Explore

Beliefs

Cultural practices

Any other

(d) What can you say about operational problems

Explore

(i) Shortage of staff

(ii) Attitude of health workers

(iii) Lack of vaccines

(iv) Opening late and early.

(e) What is the communities' response towards routine immunization in the division?

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

Time session ends ..................
Routine immunization coverage have been low in developing countries with being the leading causes of morbidity and mortality. These diseases therefore become major public health problems given the low levels of immunization. A study on the factors influencing routine immunization coverage among children in Nyeri district, Kenya, was conducted between July and August 2004 which covered Mukurweini and Tetu divisions. This was a descriptive cross sectional survey which determined trends of routine immunization coverage in the study area with an aim to identify factors that were possible hindrance to the immunization, and finding ways of correcting the situation. Desk reviews of children records in the immunizing health facilities of the two divisions were done to determine the routine immunization trends from 1999-2003. Information was collected from mother/ caretakers, who visited the immunizing health facility and covering socio-cultural, economic and operational determinants which can act as barriers to routine immunization strategy. The informants also established corrective measures as an alternative strategy for strengthening routine immunization coverage through systematic interviews questionnaires. Key informant interviews were held with the District Health Management Team (DHMT) members who were purposively selected and Focus Group Discussions (FGDs) were held with opinion leaders.

Results showed that during the 1999 – 2003 period Mukurweini division recorded an immunization coverage of 72.06% compared to 83.93% in Tetu ($\chi^2 = 27.030$, $p<0.05$ and O.R. 4938, $p<0.05$), thus the coverage was moderate in Mukurweini and high in the Tetu division.
The ratio of female to male of the children immunized was 1:1.2. The higher number of immunized children in both divisions was in the 1-4 months age bracket (88.7%). This showed a good immunization coverage in the start of life after birth but dwindled with age as children grow to celebrate the first year (12 months) of their lives to 0.05%. This showed few children come for immunization as they grew up.

Majority of informants (20.9%) indicated that they had fear of side effects associated with vaccines being lased with drugs which would make children impotent were rife (17.07%) in both divisions. A few (2.4%) said their religious sect did not allow them to take their children for immunization or medical conventional treatment. These socio cultural factors impacted negatively to routine immunization coverage in both divisions.

Poor economic status as exemplified by lack of money for utility purposes, and more so for transport to the immunizing health facilities was cited as a hindrance to immunization. The most affected area was Mukurweini division \( (\chi^2 = 10.295, p < 0.001 \text{ and or } 2.6962, p < 0.05) \) where poor financial status made mothers/caretakers not to bring their children for immunization services.

The negative attitude of some health workers portrayed a barrier in the operational factor impeding routine immunization (O.R.6951; \( \chi^2 22836 \text{ p< 0.001} \)). This was more likely to weaken immunizations by barring mothers/caretakers from preventing their children for the immunizations. Recruitment of more health care staffs in both divisions was a likely measure in strengthening routine immunizations as recorded from 222 (24.8%) responses. To strengthen routine immunization, elimination of obstacles by policy makers and radical but careful implementation of the recommendations should be done.