IMMUNIZATION IN KENYA

by

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DEDICATION

To my husband John and our son Jeffrey.

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university to the best of my knowledge.

Signature _____ 9/2/95

Alice A. Waweru

This thesis has been submitted for examination with our approval as university supervisors.

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ABSTRACT

This thesis highlights the levels of immunization coverage by antigen in three provinces of Kenya namely: Central, Coast and Western, using the 1989 Kenya Demographic and Health survey. The survey was conducted by the National Council for Population and Development (NCPD) in collaboration with the Central Bureau of Statistics (CBS) and the Institute of Research Development (IRD).

The main objective of the study was to determine the levels of immunization for each antigen, namely BCG, DPT1,2 and 3; Polio 1, 2 and 3; and Measles. The study was also to some extent, to find out some of the social economic, demographic and cultural factors that could have influenced the levels of immunization in the three study areas. The variables that were considered were education, age, religion, type of place of residence (urban/rural), current work status and the marital status of the mother.

The two main methods of data analysis that were used were cross tabulations and logistic regression. The major findings of the study were that, children whose mothers had primary education and above had the highest chances of being immunized than those children whose mothers had no education. Central province had the highest coverage of immunised children for most of the antigens received as follows: BCG (96%); DPT (97%); Polio 2 (95%); Polio 3 (91%); Measles (63%). Coast and western province had varied immunization levels received against mothers education: Coast had BCG (93%), DPT 1 (94%), DPT 2 (89%); DPT 3 (83%); Polio 1 (95%); Polio 2 (88%); Polio 3 (89%); Measles (63%). Western Kenya had: BCG (93%); DPT 1 (93 %); DPT 2 (83%); DPT 3 (68%); Polio 1 (92%); Polio 2 (79%); (Polio 3 (66%); Measles (45%).

The age of the mother on the other hand was a determining factor for increased immunization levels according to results from cross-tabulations. Mothers whose ages ranged between 20-39 years had the highest numbers of children who had received most of the vaccinations compared to mothers whose ages ranged between 15-19 years. Central province had the highest children immunized based upon the age levels of the mothers as follows: BCG (95%); DPT 1 (97%); DPT 2 (93%); DPT 3 (85%); Polio 1 (96%); Polio 2 (96%); Polio 3 (91%); Measles (63%). Western and cost province showed a fluctuating levels of immunization of children based on the ages of the mothers. Coast had: BCG (93%); DPT 1 (93%); DPT 2 (89%); DPT 3 (83%); Polio 1 (95%); Polio 2 (88%); Polio 3 (89%); Measles (54%). Western Kenya had: BCG (94%); DPT 1 (96%); DPT 2 (79%); DPT 3 (68%); Polio 1 (93%); Polio 2 (79%); Polio 3 (66.5%); Measles (45%).

In summary, immunization coverage for BCG was recorded as the highest with Central province leading (96%), followed by Coast (93%) and Western Kenya (93%). Measles coverage was the least covered with Western Kenya recording the lowest (45%), followed by Coast (63%) and Central (63%). This study therefore recommends that intensive mass immunization campaign should be undertaken by both the government and non governmental organizations concerned with primary health to raise levels of immunized children and at the same time create awareness for the need to have children immunized. A special measles antigen campaign should be considered as measles was the least covered in the three areas of study.

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

The extent to which immunization influences the lives of children is not easy to determine or quantify. Complex interactions between various childhood diseases combined with low levels of nutritional status contribute to poor health in children and if not treated may lead to death (Demographic and Health Surveys, World Conference 1991). Inspite of these intervening factors, immunisation of infants and children is still one of the ways in which to prevent children from getting disease (Ministry of Health, 1992).

The Expanded Programme on Immunisation (E.P.I) has played an important role in the drive towards "Health for all by the Year 2000" (Kenya Expanded Programme on Immunization, 1987). The six major childhood killer diseases for which immunizations have been developed are: measles which affects nearly all unimmunised children and kills 2 million children annually; pertussis (whooping cough) kills some 600,000 children each year and affects millions more; neonatal tetanus, contracted through contamination of umbilical cord at birth, kills at least 880,000 each year; polio is a major cause of lameness in the developing world and each year kills about 30,000 children; tuberculosis, which each year attacks 10 million can especially be severe in young children; Diphtheria is less common, but kills 10 to 15 percent of its victims (Population and Development Review, 1986).

There are vaccines today that are able to prevent diseases in infants and children, and this study therefore identifies the cause of each preventable disease, and the extent to which prevention in terms of immunisation has taken place in selected

areas in Kenya.

1.2 GEOGRAPHICAL AND DEMOGRAPHIC BACKGROUND

BACKGROUND

The background of the 3 study areas namely western, coast and central province will reflect the geographical and demographic information.

1:2;1 Coast Province

Coast Province is a rural-cum-urban province that is bounded on the East by the Indian Ocean. It is comprised of six districts, namely: Tana River, Taita-Taveta, Kilifi, Kwale, Lamu and Mombasa. Coast Province covers an area of 83603 sq. Km. According to the 1979 census, the population density was 16 persons per sq. Km.

Table 1.1: The population censuses of 1979 and 1989, Coast Province

DISTRICT	POPULATION		SQ KM	DENSITY		POPULATION GROWTH
	1979	1989		1979	1989	1979/89
Tana river	94,401	128,426	38,694	2	3	3.1
Kwale	288,363	383,053	8,257	34	46	2.8
Lamu	42,299	56,738	6,506	6	8	2.9
Mombasa	341,148	461,753	210	1,622	1,622	3.0
Taita-Taveta	147,597	207,273	16,959	8	12	3.4
National	15,327	21,449	581,787	26	37	3.4%

Source: Kenya Population Censuses, 1979 and 1989.

Geologically, the area is diverse and this is reflected by the wide variation of soil type and fertility. The climate is hot and humid throughout the year, except where the altitude yields a locally cooler climate as in Taita Hills.

The coolest months are July and August, when afternoon temperatures may average

28°C and nights 20°C. But Taita area has a tolerable climate as it has a low rainfall of about 500mm a year, mainly falling in between December and May.

The main economic activity is tourism, however, fishing and agriculture, particularly horticultural fruits are practice (Development Plans, 1989-93).

It was noted that measles was prevalent among children under five years in this region.

1.2.2 Western Province

Western Province falls within the portion of the Lake Victoria Basin that is within Kenya. It is divided into Kakamega, Busia and Bungoma Districts. Western Province covers an area of 8,360 sq. Km. and the population size was estimated at 1,832,663 according to the 1979 Census. The population density was 223 persons per sq. Km.

Table 1.2: The Population Censuses of 1979 and 1989, Western Province

DISTRICT	POPULATION		SQ KM		DENSITY	GROWTH RATE
	1979	1989	1979	1989		
Kakamega	1,030,887	1,463,525	3,495	294	411	3.5
Bungoma	503,935	679,146	3,074	163	221	3.0
Busia	297,841	401,658	1,626	183	243	3.0
National	15,327	21,449	581,787	26	37	3.4

Source: Kenya Population Censuses, 1979 and 1989.

Western Province is a predominantly rural area with agriculture being the main economic activity. Population pressure on land has caused considerable male out-migration to the urban centres in search of employment.

Western Province has no really dry season or month, but rainfall totals in the region show considerable variations. It has two rainfall seasons, with the primary one

occurring in April, while the secondary one in December. The hottest months are from October to March. Measles was noted to be a childhood killer disease in this province (KDHS, 1989).

1.2.3 Central Province

Central Province is predominantly an agricultural area, whereby the majority of the people are tied up in farming activities. The next major economic activities are related to commerce and industry, though most trade is on small scale. This province is fairly served with health facilities which range from district hospitals to local dispensaries [Development Plan, 1983-1993].

Education standards in Central Province as a whole, are much higher than other rural oriented Province in Kenya. There are several primary, secondary and post-secondary training institutions, run by both government and private entrepreneurs.

It was noted that chest related diseases threatened children's i.e. whooping cough among others (KDHS, 1989).

Table 1.3: The Population Censuses of 1979 and 1989, Central Province

DISTRICT	POPULATION		SQ KM	DENSITY		POPULATION GROWTH RATE
	1979	1989	1979		1989	1979/89
Kiambu	686,290	914,412	2,448	283	353	2.9
Nyeri	486,477	607,292	3,284	148	186	2.2
Muranga	684,333	858,063	2,476	261	340	2.3
Kirinyanga	291,431	391,516	1,437	202	264	3.0
Nyandarua	233,302	345,420	3,528	66	102	3.9

Source: Kenya Population Censuses, 1979 and 1989.

FIGURE 1: LOCATION OF CENTRAL, COAST AND WESTERN PROVINCES IN KENYA

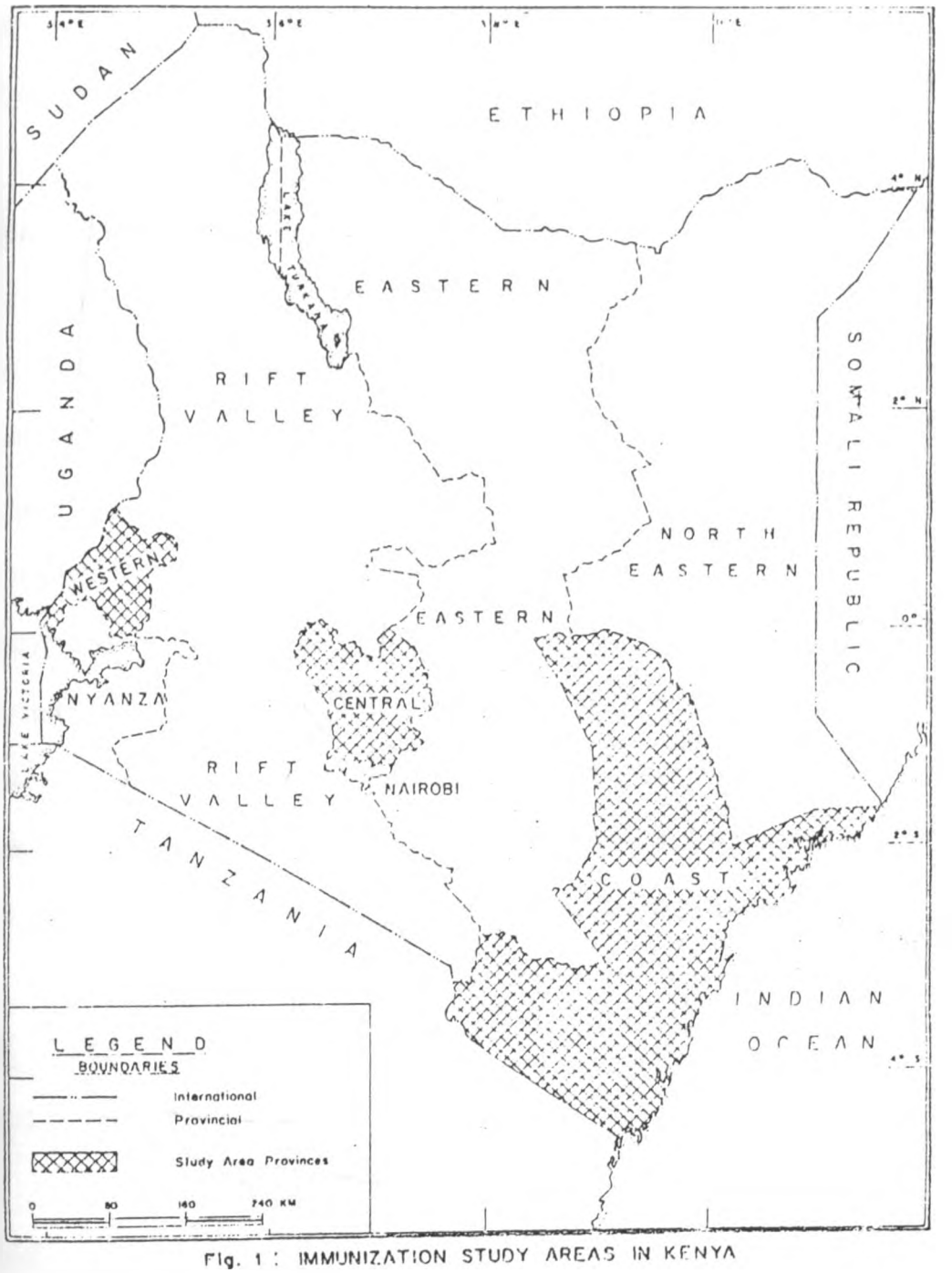


Fig. 1 : IMMUNIZATION STUDY AREAS IN KENYA

1.3 PROBLEM STATEMENT

There are wide differentials in the immunisation coverage against the six childhood killer diseases. The factors responsible for influencing these differentials have not been adequately investigated according to the available research findings.

Various studies which have been carried out in Kenya concerning the immunisation of children under the age of 5 years have shown that the higher levels of immunisation in any given area, the higher the chances of better health and survival of children (Ministry of Health 1987; Harvey 1992; and Waweru 1991). The levels and trends of immunisation coverage varies from region to region due to complex factors. Central province is known to have achieved the highest levels of immunisation for all the 6 antigens namely: BCG, Polio, Tetanus, Diphtheria, Measles and Whooping cough. While Western and Coast provinces are amongst the provinces with the lowest coverage. So far, there is no adequate information linked to the variations in the immunisation coverage. The information gathered from this study may provide some information that will explain the great disparities in levels and trends of immunisation coverage in the three main study areas.

1.4 OBJECTIVES OF THE STUDY

1.4.1 General Objective

This study attempts to determine immunization coverage levels against the 6 childhood killer disease [Tuberculosis, Polio, Tetanus, Whooping cough, Diphtheria and Measles] targeted by the National Kenya Expanded Programme on Immunisation (KEPI) programme and to explain the differentials in the coverage levels in central, coast and western provinces.

1.4.2 Specific Objectives

1. To determine immunisation levels
2. To examine socio economic, demographic and socio-cultural factors influencing immunisation levels.
3. To explain the immunisation coverage levels.

1.5 JUSTIFICATION OF THE STUDY

The literature on effectiveness of vaccination interventions in developing countries, Kenya included, generally shows a positive and optimistic view of immunisation as a powerful agent for health and mortality improvement (U.N, 1984). This includes studies which deal with the success of specific immunisation programmes, where immunisation is part of an integrated primary health care scheme (Ministry of Health, 1987).

It is broadly accepted that vaccination technology eventually contributes to the reduction of immunisable diseases, although the extent of this benefit and how the impact is transmitted in the deprived environment of a third world country is not fully understood (Population and Development Review, 1986).

KEPI was started in 1980 (Ministry of Health Survey, 1992) in Kenya, but its schedule is not well clarified in all those regions that offer immunisation to the children. This study attempts to show the extent to which immunization by antigen has been covered and the socio-economic, socio-cultural and demographic factors that influence its administration.

At the time KEPI was established, the national immunisation coverage in the country was approximately 30% (National Immunisation Coverage Survey, 1992).

By 1987 some districts had achieved over 70% immunisation coverage (Dondi, 1992). For example, Muranga had 81%; Taita Taveta and Embu 74% respectively.

1.6 SCOPE AND LIMITATION OF THE STUDY

The study focuses on Western, Coast and Central provinces. The levels and trends of immunisation coverage of each antigen given against the 6 childhood killer diseases has been analysed. The results i.e levels and trends observed in the areas of study are expected to show the effect that the intervening variables have on immunisation such as: socio-economic, socio-cultural and demographic factors.

The limitation of this study is focused mainly on the data used. The researcher used secondary data from the Kenya Demographic and Health Survey carried out in 1989. The data set used for immunisation variable was insufficient since immunisation was treated as a minor variable.

The methods used in analysing this data, for example the logistic regression failed in some cases to establish the hypotheses that had been projected, thus giving results that had not been anticipated. Large samples should have been used to give meaningful trends and levels of immunisation coverage. Therefore the results of certain variables may be inaccurate due to the sample size of the respondents used in the KDHS, 1989.

CHAPTER TWO

LITERATURE REVIEW

2.1 Levels and trends of immunization coverage in developed countries

(a) Polio:

In developed countries in the first half of the 20th century, polio occurred in periodic outbreaks in the summer or early fall. Usually school age children were affected most severely. For example, in the United States between 1944 and 1954, the annual incidence was about 20 cases per 100,000 population (Lonata and Novara et al, 1985). The widespread use of effective vaccines starting in mid 1950s has virtually eliminated polio from developed nations.

(b) Diphtheria:

Diphtheria occurs primarily in children under age 15 years, who have not been immunised and particularly in those under age 7 years. It is most common in countries with very poor urban populations who live in overcrowded, unsanitary conditions and have limited access to health care. Among the immunisable diseases, the prevalence of diphtheria is the least documented (World Conference, 1991). Once prevalent worldwide, diphtheria has been virtually eliminated in the developed world by the high level of immunisation coverage. For instance, in the United States, five or fewer case of diphtheria were reported each year between 1980 and 1983. (Population Reports, 1986).

(c) Whooping Cough:

Among the vaccine preventable diseases, pertussis, commonly called whooping cough, is second only to measles as a cause of serious illness in childhood (Population and Development Review, 1986). Negative publicity against pertussis vaccine, for example in Great Britain beginning in 1974, led to a rise in the incidence of pertussis from as low as 4 per 100,000 population to 150 per 100,000 by late 1970s (UN, 1984). Similarly in Japan in 1974 and 1975 publicity of about a few children who had suffered brian damage presumably related to pertussis vaccine led to a sharp decline in immunisation levels (Ghana Demographic and Health Survey, 1988). The number of reported cases of pertussis increased from about 300 to 400 per year in 1972-74 to about 13,000 in 1979. The number of deaths due to pertussis increased from fewer than 5 per year in 1972 to 41 in 1979.

(e) Tuberculosis:

Tuberculosis remains a health problem throughout the world, but rates are particularly high in many developing areas. Tuberculosis (TB) is easily spread (Bunyasi, 1984 and Population Journal 1986). It is most common in poor, crowded areas, since these conditions favour transmission of infection and people in these areas often have lowered resistance to infections.

2.2 Levels and trends of immunisation coverage in developing countries

(a) Measles:

Of the vaccine preventable diseases, measles is the most important cause of childhood morbidity and mortality in developing countries. Nearly every child who is not immunised, contracts measles and currently over two million die from the disease each year, many of them from Africa and Latin America (Lopex 1983).

Severely malnourished children probably develop more serious cases of measles (IUSSP 1989). These children are likely to die. In Africa for instance, the case fatality rate of severely malnourished children with measles has been estimated at 25 to 50 percent. This is partly because malnourished children tend to have a less effective immune response (Meegama, 1980). Thus measles symptoms are more severe, with secondary infection leading to such complications as pneumonia and diarrhoea are more likely (Measles Initiative, 1992). Measles on the other hand, may contribute to malnutrition. A Nigerian study found that 25 percent of children with measles lost over 10% of their body weight (Population and Development Review, 1986). A study in Bangladesh found that in children aged 4 or younger, had measles with prolonged diarrhoea weighed less than average of weight (Population and Development Review, 1986).

In West Africa, in the late 1960s, it was estimated that vaccination campaign halved the number of cases and prevented about 170,000 deaths each year. During a measles epidemic in six South Indian villages in the late 1970s, none of 121 immunised children developed measles, but nearly a fourth of almost 1,000 unimmunised children died (Meegama, 1980).

(b) Whooping cough

It is estimated that among the vaccine - preventable diseases, pertussis (whooping cough) is second only childhood illness in developing countries (Population and Development Review, 1986). Currently over, 600,000 children die from pertussis each year.

In developing countries, few children are treated, because the health care is not easily available but also because pertussis often is difficult to diagnose, particularly in very young children (IUSSP, 1985).

It is clear from evidence recorded that the importance of continuing to achieve high rates of coverage with currently available vaccine is to prevent the illness and save lives.

(c) Tetanus

Neonatal tetanus is often called "neglected disease" because few cases are reported (Population and Development Review, 1986). Recent data suggest that it kills at least 800,000 infants each year in developing countries. Yet tetanus is not a contagious disease. It can be easily prevented through immunisation as well as through better maternity care (Lopez, 1985). Neonatal tetanus is almost exclusively caused by unhygienic treatment of the umbilical cord, cutting the cord with non-sterile instrument, covering the umbilical stump with a non-sterile dressing or treating the stump with a contaminated substance, such as mud, or in some areas, animal dung (IUSSP, 1985). While neonatal tetanus is virtually unknown in most developed areas, it remain a major problem in many developing countries (Population and Development Review, 1985). Data on exact incidence are not extensive, but

community surveys have been conducted recently in Asia, Middle East and African countries as follows: Yemen Arab Republic, 3 neonatal tetanus deaths per 1000 live births and 8% of all neonatal deaths. Thailand 5 and 23%; Sudan 9 and 32%; Somalia 21 and 23%; Nepal 15 and 39%; Bangladesh 37 and 56%; Pakistan 31 and 60%; India 67 and 72% (Population and Development Review, 1986).

Studies in Bangladesh, Colombia and Malaysia have proved that effectiveness of immunising pregnant women to prevent neonatal tetanus (Waweru, 1991). In Matlab-than district of Bangladesh for instance, a study involving over 45,000 women found that vaccinating women against tetanus during pregnancy reduced the death rate among babies who were 4 to 14 days by two thirds, and from 34 to 11 deaths per 1000 live births. Survey data support these results (Washington Conference, 1991). On the average, immunising of pregnant mothers against tetanus contributes to about 70% reduced deaths of infants aged between 4 to 14 days old (Mosley and Chen, 1984; and Meegama, 1980).

(d) Polio

Poliomyelitis is a major cause of lameness in many developing countries. Where it remains endemic, an estimated 3 to 4 of every 1000 children develop paralytic polio. World wide, close to 300,000 cases occur each year. Some 30,000 may die (Population Medical Journal, 1986).

It was once assumed that polio was not a major problem in the developing world since highly visible outbreak were rare. Since 1974, however, some 100 "lameness survey" in 25 countries have found that polio occurs at leat as often in developing areas at the height of the epidemic (Ghana Demographic Health Survey,

1988). For instance in Ghana in 1974, between 5.8 and 7% 1,000 aged 6 to 19 had some residual paralysis due to polio. From these data, it was estimated that the annual incidence of symptomatic polio was about 22 per 100,00 people of all ages.

In developing areas today, polio is endemic to polio viruses at a very young age, almost all have been infected before age five (Harvey, 1992). Unless immunisation coverage of the disease may emerge as countries develop.

Polio vaccination programs have markedly reduced the incidence of polio in some developing countries. In Costa Rica, where polio has been eliminated no cases have occurred since 1984 (Population and Development Review, 1984). Other countries, including Brazil, Cuba and Merica, have had great success with mass campaigns that administer oral polio vaccine to all young children once or twice a year. Chile and China are also good demonstrative examples.

(e) Diphtheria

Although diphtheria is endemic in many developing countries, it is not a significant public health problem as other expanded. Programme on immunization diseases (Kenya Expanded Immunization program report, 1989).

In developing countries, children acquire natural immunity to diphtheria from having mild skin or chronic, nasal diphtheria infection early in life (WHO, 1986 and IUSSP, 1989). Chronic nasal infections are common. For example a study in India found 3.5 per cent pre-school children were nasal diphtheria carriers. The rate was higher in children living in poorly ventilated houses and in those not fully immunized (population information program, 1986). In Thailand, high levels of diphtheria antitoxins (indicating immunity to the disease) have been found in 64 percent of

children with no history of immunization. This natural immunity probably prevented the disease outbreak despite low immunization coverage.

(f) Tuberculosis

Tuberculosis (TB) is a complex disease that can affect many different organs (Ministry of Health Report, 1992). Since TB usually progresses slowly, sudden epidemics as such can occur with measles or polio occur infrequently and transmission of the disease often, goes unnoticed. Nonetheless, TB is a major cause of disability and death (Ministry of Health report, 1987).

In developing countries such as some parts of Africa, Asia and Oceania, the incidence of pulmonary TB alone is as high as 300 cases per 100,000 (Population Reports , 1986 and Washington Conference, 1991). Reported cases in South America range as high as 225 per 100,000 while in Bolvia 70 per cent per 100,000 is typical. Even though the rate of TB incidence in United States of America is low (12 cases per 100,000) is still common. On the average, in the developing countries in the 1970's, the rates of death from TB ranged from 1 to 76 per 100,000 population per year. Mortality rates generally have declined over the years due to improving case-finding, treatment and immunization efforts.

BCG vaccine is thought to provide the most effective immunity. Further follow-up in South India study has recently produced results that BCG is most effective when given to very young children. In South Korea, Malaysia and Singapore, studies show that children who had been vaccinated with BCG vaccine had a protective effect for 60 to 90 per cent (IUSSP, New Delhi, 1985). Further research to evaluate BCG is underway in a number of developing countries.

2.3 Levels and trends of immunization coverage in Kenya

In Kenya, measles is prevalent in children between ages one to four years. In these age groups, the incidence ranged from 62 to 98 per cent per 1000. For example in Nairobi, between 1960 and 1965, before immunisation program was set-up, measles caused nearly one fourth of all deaths among children under age seven (Population and Development Review, 1986).

Measles - related diarrhoea is an important factor in interaction between measles and malnutrition. For example in Kenya, an estimated 6 to 26 per cent of diarrhoea - related deaths in children under age 5 could be prevented by extensive immunisation program (Muller, 1984).

A recent study carried out by the Ministry of Health (National Coverage 1992) found out that Elgeyo Marakwet District had a coverage of 65.7 per cent; Embu by divisions: Runyenjes 87.8 percent; Manyatta, Siakago and Gachoka, 81.0 per cent, 91.4 and 87.1% respectively on the hand, Siaya in Nyanza had a coverage of 50 per cent one major factor that faced mothers in Nyanza is that they did not know at what age this immunization should be given. The revised KEPI immunisation policy for measles is that it should be given at 9 months. Therefore communication to this effect is important (Harvey, 1992).

Pertussis vaccine is almost in combination with diphtheria and tetanus toxoid referred to as DPT. The three doses of DPT generally protect 70-90 per cent of children against pertussis for at least 2 years and according to some studies (WHO, 1986) for as long as 10 years.

In Kenya a two year study found that 90 per cent of pertussis cases involved children aged 6 years or younger with a median age of three and a half years (Muller,

1984). The attack rate was highest in Infants - two and a half times higher than average 3.3 year olds.

Studies in Nyanza and Machakos (Muller, 1986 and Harvey, 1992) indicated that two does of the vaccine provide fairly high levels of protection. Most studies suggest that would protect only 50 per cent.

It is clear that a vaccine with fever side effects is desirable. These experiences demonstrate the importance of continuing to achieve high rates of coverage with currently available vaccine for pertussis to prevent the illness and save lines.

The polio vaccine has dramatically reduced the incidence of polio (Population and Development Review, 1986). A national survey carried out in Elgeyo Marakwet found out that 75 percent of the respondents had their children vaccinated against polio (Ministry of Health, 1992).

A more specific National Survey was carried on in 1987 by Kenya Expanded programme on Immunization in 100 randomly, selected districts namely; Nairobi, Machakos, Kisii, Busia, Kilifi, Kiambu Nakuru, Siaya, Kericho and Narok. The survey showed that full Immunization coverage had risen from 51 percent from 43 per cent that was experienced in 1980 (KEPI, 1980), and drop out rate of 17 per cent.

The sample size of the survey size in Kenya, it was noted that, for all the selected antigens (polio, BCG, measles and DPT) there was an increase in coverage compared to the previous surveys performed before KEPI was introduced. For example, the 1987 survey showed that BCG - 1987 was 87% while in 1983 was 78%. Polio vaccine - 1987 was 89% while in 1983 was 80%. Measles - 1987 was 60 while 1983 was 55%. Therefore the fully immunized rate was in 1987 was 51 as compared to 43% in 1983. For all the antigens,m a high coverage was found in central

province and other central districts, while the rest of the country and especially Nyanza had a low coverage. Central Province and other Central districts, was 69 per cent; Rift Valley and some parts of Eastern province was 64 percent; Nyanza 37 percent; western kenya and parts of Rift valley, 44 percent and Coast was 42 percents, Nyanza province was still lagging behind compared to other regions.

The KEPI immunization survey attributed the low coverage in Nyanza province to the following factors: ignorance about vaccines; no time for immunization, no proper instruction from the health personnel as to when to return the child to the clinic; failure to attend vaccination clinic due to the sick child; sent home from clinic because of the sick child, vaccine out of stock the distance to clinic too great; witchcraft, discouraging mothers in-law and husbands; immunization side effects, attitude of the medical personnel etc.

A measles survey in Machakos carried between 1974 and 1981 showed that 27 per cent of all measles cases were aged 5 years or older, half of them were aged between 5-7 years and the other half was between 7 and 15 a years. Considering measles deaths, it was obvious that though the numbers were small, the largest proportion of deaths occurred before the second birth day. This is the age where if immunization has been available and is effective, such deaths could have been averted.

2.4 Determinants of Immunization coverage in Kenya

The differentials in immunisation coverage by antigens in Kenya are attributed by varying factors that could be categorised as follows:-

- Demographic

- Socio-economic
- Socio-cultural
- Health/service delivery factors

(a) Demographic factors

The age of the mother in various studies carried out in Kenya on immunisation coverage attributed high immunisation. For example, there was a clear tendency towards the youngest and oldest mothers having their children with the lowest coverage. The peak of the fully immunised children was seen in mothers age group 20-24 years (National Coverage Survey by KEPI, 1987; Immunisation Coverage Survey for measles in Kisumu and Siaya districts, Kenya 1992).

(b) Socio-Economic factors

The education of the mother was seen to have an influence on immunisation. For example, Nairobi had the highest percentage of mothers who had completed 8 or more years in school, while Kilifi had the lowest number of mothers who had completed 8 years or more in school. As, a result of this observation it was noted that, BCG coverage of children whose mothers had 8+ years of school was 96%; Polio 97%; measles 78%. On the contrary mothers with no education in this study had their children with an immunisation coverage of 54% compared to 78% of mothers who had schooling of over 8 years (KEPI, 1987; KEPI, UNICEF and REACH initiative, 1992).

Available literature shows that the rate of fully immunised children was slightly higher in urban than rural areas. A presumed explanation that the general

awareness of immunisation in urban areas than rural areas. At the same time, more health institutions were available and within reach due to good infrastructure in towns as compared to rural areas. (KEPI, 1987 and Immunisation Coverage Survey for measles in Kisumu and Siaya districts, 1992). Kisumu urban had more children immunised (96%) as compared to Kisumu rural (92%) and Siaya districts (90%).

Economic power of the mother to some extent determined the greater lengths a mother would have a child immunised. For example, mothers who had money would travel long distances to have their children immunised. At times even if they found hostile nurses, the same mothers paid for stationery and paraffin that was used in keeping the cool storage going for the storage or vaccines.

Socially mothers with some money to spend kept clean and were able to dress appropriately while taking their children to the clinic. It was alleged in some studies that mothers who dressed poorly and had their children worn out clothes got poor treatment from the nurses and other medical personnel. Such an attitude discouraged mothers from attending clinic. Some mothers with less supportive husbands were able to get their children immunised if they had money of their own. For example, a mother with some income could afford to hire a maid to assist her with household chores, as she took the child to clinic or at the same time hire somebody to tend her kitchen garden or other economic activity while she attended to the health of the child (Immunisation Coverage Survey for measles 1992; KEPI, UNICEF and REACH Initiative 1992).

In general, a mother with a high social economic status benefitted from the availability of the immunisation services in the community. For example, such a mothers knows that good health achieved through immunisation reduces visits to the

doctors for common colds and other diseases, hence the child grows faster. Mothers who are socially well placed understood the side effects that arose after the child received certain immunisation that led to high fever. The ignorant mothers did drop-out when their children often suffered from fever after immunization. Distance did not deter well informed mothers from seeking immunisation even if it meant walking long distances and even finding the clinic closed. They would return during the next appointment. Mother-in-laws were
a hindrance to mothers seeking immunisation. But well socialised mothers would ignore their mother-in-laws discouragement and sought immunisation for the child.

(c) Socio-cultural factors

Lack of motivation to take children to clinic for immunisation was apparent in some works carried out on immunisation. Some mothers needed persuasion to go to the clinic; others to be reminded on follow-up appointments and to be constantly educated on the value of immunisation. This factor, compounded with cultural factors such as, superstitions, witchcraft, mother-in-laws and husbands negative attitudes had negative influence on immunisation coverage mainly in Nyanza and some parts of western Kenya (KEPI, UNICEF and REACH Initiative 1992; Immunization Coverage Survey on measles, 1992).

Religion on the other hand worked against immunisation in Kisumu and Siaya districts. Some religious sects did not believe in medicinal treatment and prevention of illness. Mothers belonging to such sects found "God to be adequate", therefore leading to poor health of their children. Some religious sects believed in medicinal herbs only and not medicine sought from a hospital such as immunisation antigens.

Mothers in such situations believed in herbal treatment pointing out that in the past, they had raised children on herbs without the help of immunisation.

(d) Service delivery factors

According to a joint study by UNICEF and the Division of Family Health of Ministry of Health in 1992, factors that promote and hinder immunization establish that: Long waiting time; negative attitude of the health workers; lack of vaccines and stationery at times discouraged mothers from attending clinics. For example, mothers who were petty business women or farmers found it extremely time wasting to wait for long hours and sometimes the service would be delivered at the expense of their businesses of other economic activities.

Other factors found to hinder delivery of services included: failure of the medical/health staff in writing on the clinic card date of next appointment, mothers did not know when to return for follow-up boosters; and failure to display the immunisation schedule. It was also felt that the health personnel failed at times to educate the mothers on the benefit of the immunisation and the effects for failure of the follow-up antigens.

CHAPTER THREE

STUDY DESIGN, DATA AND METHODOLOGY

This chapter examines the study design, procedures used in data collection, sources of data, sampling design, the limitation and the statistical technique used for data analysis. The data collected aimed at finding out the levels of immunization coverage which were influenced by the following independent variables: socio-economic, socio-cultural and demographic factors. The methods of analysis used in this study were cross-tabulations and logistic regression.

3.1 THEORETICAL FRAMEWORK

The problem of discriminating between various aspects of health interventions are essentially caused by interactions between mortality determinants which are present in Third world countries. These occur at two levels and have been referred to by Mosley (1985) as biological synergy and socio-economic synergy. Biological synergy means that an improvement or change in the epidemiology of one disease will have an impact on the severity of another e.g. measles, a disease which is much aggravated by diarrhoea. In developing countries it is the severity of measles which endangers lives, rather than the incidence level. This can be seen as an integral part of the well known "malnutrition" syndrome which act like a biological vicious circle and affects death rates in a complex way (Population Reports, 1986).

Socio-economic synergy acts upon biological factors in a similar fashion. A single social improvement such as maternal education can affect the progress of health gains through many biological channels (e.g hygiene behaviour, more knowledge

about vaccinations, nutrition, birth spacing). It is socio-economic synergistic mechanisms which cause the success of interventions to be patchy, due to the social heterogeneity of most populations, where the risks of dying and falling ill are unevenly distributed.

3.2 CONCEPTUAL FRAMEWORK: MOSLEY AND CHEN MODEL (1984)

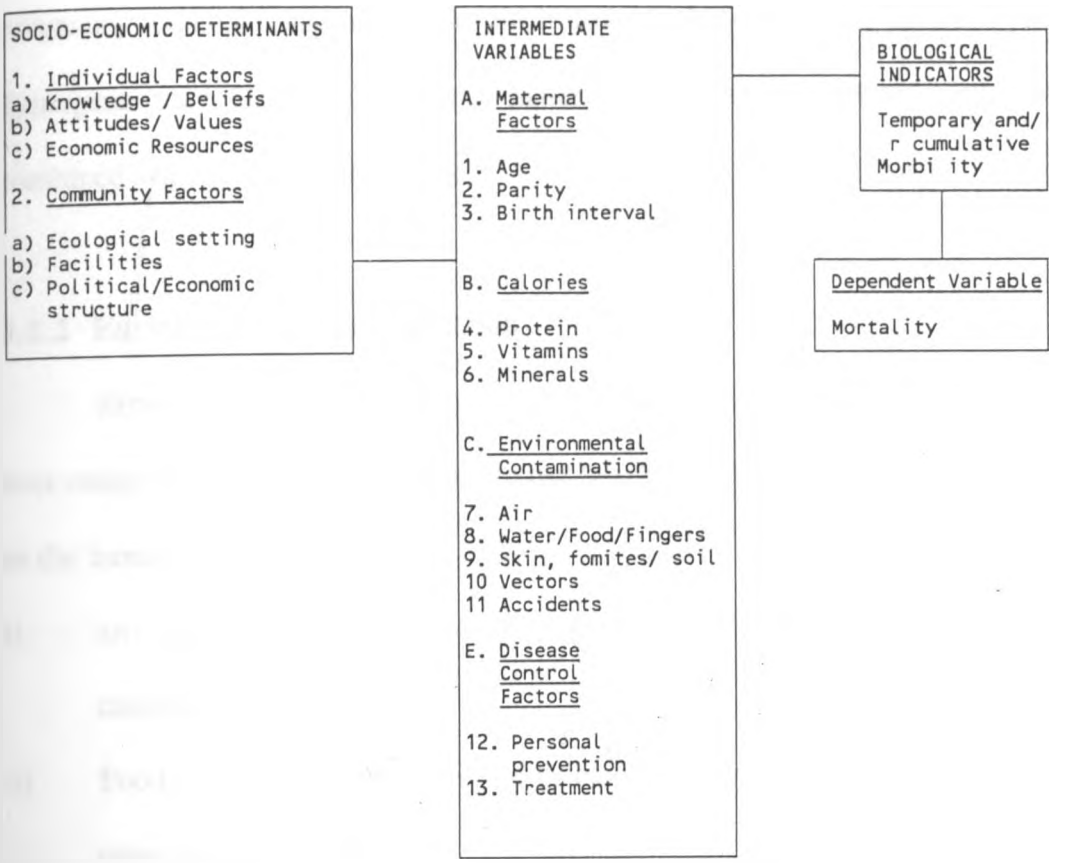
From the literature review, several factors have emerged which influence the immunization of infants and children in any given place. Some of these factors are, socio-economic, socio-cultural, demographic and health factors. The model used in this study is adopted from Mosley and Chen (1984).

The model developed by Mosley recognizes the fact that socio-economic determinants operate through some biological mechanisms, i.e. intermediate variables, to produce the levels and patterns of mortality observed in given populations (Mosley, 1984).

The key to the model is the identification of a set of proximate determinants, or intermediate variables, that directly influence the risks of morbidity and mortality. All social and economic determinants must operate through these variables to affect child survival. (Population and Development Review, 1984).

Mosley's framework has attempted to bridge both the demographic and biomedical research approach of studying mortality by coming up with proximate determinants that are grouped into five categories as shown in figure 2.

FIGURE 2: A Framework of Variables Used in the Study of Factors that Influence Child Survival



Mosley has divided the proximate determinants into broad groups as follows:

1. Demographic
2. Economic and Political
3. Environmental
4. Medical and Health Care
5. Cultural
6. Geographic

3.2.1 Maternal Factors:

Age, parity and birth interval are shown to exert an independent influence on pregnancy outcome and infant survival through its effects on maternal health. Synergism may also exist between maternal variables e.g. short birth spacing combined with young maternal age.

3.2.2 Environmental Contamination

Refers to the transmission of infectious agents to children (and mothers). The four categories representing the main routes whereby infectious agents are transmitted to the human host are:

i) air, the route of spread for the respiratory and many "contact" transmitted diseases;

ii) Food, water, fingers - these are principal routes of spread for diarrhoea and other intestinal diseases;

iii) Skin, soil and (inanimate) objects are routes for skin infections;

iv) Insect vectors, which transmit parasitic and viral diseases.

3.2.3 Nutrient Deficiency

This relates to the intake of the three major classes of nutrients; calories, protein, vitamins, minerals. The critical point here is that survival of children is influenced by nutrients available not only to the child, but also to the mother. Maternal diet and nutrition during pregnancy affect birth weight and, during lactation, influence the quantity and nutrient quality of breast milk.

3.2.4 Accidents

This includes physical injury, burns and poisoning. Although accidental injuries are often considered random events, their frequency and pattern in a population reflect environmental risks that differ according to socio-economic and environmental contexts. Injuries may also be intentionally inflicted, the most extreme being infanticide.

3.2.5 Disease Control Factors

The personal illness control factors influence both the rate of illness through prevention, (and this is where this study will mainly focus), and the rate of recovery, through treatment.

3.3 DEFINITION OF KEY CONCEPTS

(a) Demographic Factors

These are factors which affect the risk of death mainly during the time of conception. In this study, age of mother and marital status have been considered.

(b) Socio-Economic Factors

These are the factors which reflect the social and economic status of individuals in a society. This study will consider the current work status of the mother which can greatly influence the accessibility of the child to an immunization centre. For example, a mother can easily travel from home to an immunization centre and also, possibly pay for any other levies that are related to immunization at the centre.

(c) Education as a socio-economic indicator has been considered in this study as it influences the type of work the mother does.

(d) Type of place of residence, whether it is urban or rural, may to some extent influence coverage of some of the immunization antigens.

(e) Socio-cultural Factors

These are factors which reflect the social and cultural norms of a society or a community. For example, in this study, religion has been viewed in three categories; namely, Protestant, Catholic and Muslim. A religion may negatively or positively influence immunization of an infant.

(f) Health Factors

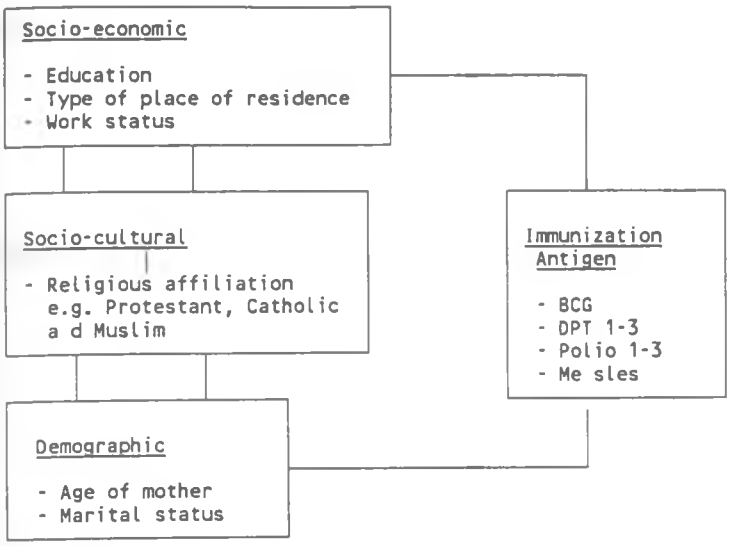
These are factors related to the availability and utilization of medical health care services. For example, in this study, immunization of infants and children at delivery and during the post-natal period is expected to influence child survival.

3.4 CONCEPTUAL HYPOTHESES

The following are conceptual hypotheses derived from the theoretical framework:

1. Demographic factors influence immunization coverage.
2. Socio-economic factors influence immunization coverage.
3. Socio-cultural factors influence immunization coverage.

FIGURE 3: **Operational Model**



Variables in the study are as follows:

Independent Variables

1. Age of the mother
2. Education level of mother
3. Religion of the mother
4. Type of place of residence (Urban or Rural
5. Current marital status
6. Current work status

Dependent Variables

Immunization by antigens

3.5 OPERATIONAL HYPOTHESES

Hypothesis 1: Children whose mothers have higher education are associated with increased immunisation levels by each antigen as compared to children whose mothers have lower or no education.

Hypothesis 2: Children whose mothers are not so young (24-29 and 30-34) and also not so old (35+), experience a higher immunisation coverage of each antigen than those whose mothers are younger, (15-19 and 20-24) or older, (35-39 and 40-44).

Hypothesis 3: Children from protestant and Catholic families associated with higher immunisation by each antigen than those children from traditional and Moslem religious families.

Hypothesis 4: There is a positive correlation between the working status of mother and immunization.

Hypothesis 5: There is a positive association between urban residence and immunization than rural residence.

Hypothesis 6: Ever-married mothers associated with higher immunization compared to single.

3.6 OPERATIONAL DEFINITIONS

Maternal Age

Age refers to the number of years lived by the mother since birth. It was used as an independent variable in this study. The categories considered were: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44 and 45-49 years.

Maternal education

It refers to the highest level completed. It was categorized as: No education, primary, secondary and above. It was considered as an independent variable.

Religion

Religion in this study refers to the denomination to which the mother belongs. It was considered as an independent variable. Seen in three categories, namely: Protestant, Catholic and Muslim.

Type of place of residence

This variable refers to the mother's place of residence, either urban or rural.

Current work status

The work status of the mother was used to determine resources available for use inorder to facilitate immunization. The two categories identified were:

i) Working: was interpreted as a gainful employment of mother, other than working in a family business or farm.

ii) Not working: was interpreted as either not working in a farm or business run by the family.

Current marital status

Two categories were used. The term single was used as never married and ever-married was used to include all those mothers who were currently married and those who had been in stable unions but were living apart during the interview. These were the divorced, widowed, or separated. The variable was considered as an independent variable.

3.7 SOURCES OF DATA AND METHODS OF DATA COLLECTION

The data used in this study is secondary data obtained from the Kenya Demographic and Health Survey (KDHS) which was conducted between December 1988 and May 1989. The Kenya Demographic and Health Survey was a national survey that was carried out by the National Council for Population and Development (NCPD) in collaboration with the Central Bureau of Statistics (CBS) and the Institute of Resource Development (IRD).

The sample for the KDHS was based on the National Sample Survey and Evaluation Programme (NASSEP) master sample maintained by the Central Bureau of Statistics. The KDHS had a national coverage with the exclusion of North Eastern Province, which accounts for only 5% of Kenya's population. The sample was designed to produce a completed interview with 7,500 women aged 15-49 with a sub-sample of 1,000 husbands of these women. Finally, 9,836 households were selected. Of these, 8,343 were identified as occupied households during field work. The actual number that was interviewed were 8,173 households.

The NASSEP master sample is a two-stage design, stratified by urban and rural residence, and within the rural stratum, by individual district. This design was purposely used in an effort to minimize both sampling and non-sampling errors through such measures as accurate mapping of the sampling units and close supervision. In the first stage, the 1979 Census Enumeration Areas (EAs) were selected with the probability proportional to size. The selected enumerated areas were segmented into expected number of standard sized clusters, one of which was selected at random to form the NASSEP cluster. The selected clusters were then mapped and listed by the Central Bureau of Statistics field staff. In rural areas, the

household listings made between 1984 and 1985 used to re-list households in selected urban areas.

The KDHS utilized three questionnaires. One to list members of the selected households (household questionnaire), another to record information from all women aged 15-49 years who were present in the selected households the night before the interview (Woman's questionnaire); and, the third to record the information from husbands of the interviewed women in a sub-sample of the household (Husband's questionnaire). The questionnaires were pre-tested in August, 1988.

The field staff for the KDHS consisted of nine teams, each of which was fluent in one of the major languages. The teams were composed of four or five female interviewers, one editor, one supervisor, and one male interviewer. There was a smaller tenth team that had three interviews for the Narok-Kajiado region. The teams were supervised by the local District Population Officer, the District Statistical Officer, and officer from the National Council for Population and Development (NCPD) headquarters.

This study selected the immunization variable which was considered as a health measure for child survival. The women who had children under 5 years were interviewed. They were asked if their children had health cards. If the card was available the interviewers copied from it, the dates on which the child was immunized and the disease for which the child was immunized. If the card was not available, or the interviewer was not able to examine the card, the mother was asked if the child had ever received a vaccination. However, no information was obtained for children with no cards.

3.8 METHODS OF DATA ANALYSIS

Cross-tabulations and logistic regression have been used to analyse data in this study.

3.8.1 Cross-tabulations

Cross-tabulations have been used in this study as a systematic method of presenting data in rows and columns. Cross-tabulation is an intermediate process between collection of data on one hand and the statistical analysis on the other. Cross-tabulations form the gateway for further statistical analysis and interpretation of data, where in this case use of multiple regression. Cross-tabulations also facilitate the detection of errors and omissions in the data. In this study, cross-tabulations have been used to show the distribution of immunization levels by each antigen (dependent variable) to each category of the selected independent variables.

3.8.2 Logistic Regression Analysis

To be able to establish the direct relationship between the selected socio-economic, socio-cultural and demographic factors, and immunization coverage levels, logistic regression analysis was used.

Logistic regression directly estimates the probability of an event occurring. The logistic regression model can be written as

$$\text{Prob (event)} = \frac{e^{y}}{1+e^{y}} = \frac{1}{1+e^{-y}}$$

This is the probability of an event occurring where Y is the linear combination.

$Y = B_o + B_1X_1 + B_2X_2 + \ldots\ldots\ldots + B_pX_p$

$B_o, B_1, \ldots\ldots B_p$ are coefficients estimated from the data.

$;X_1;\ldots\ldots, X_p$ are independent variables.

e is the base of the natural logarithms, approximately 2.718.

The probability of an event not occurring is Prob (no event) = 1 - Prob (event). In this chapter therefore, we estimate the probability of an event that a child is immunized against the different immunizable diseases. The independent variables are, mothers level of education, age, marital status and work status. The variables that were not significant and hance were left out were, mothers religion and type of place of residence.

In logistic regression, the parameters of the model are estimated using the maximum likelihood method. That is, the coefficients that make our observed results most 'likely' are selected.

(a) Testing the hypotheses about the coefficients

Generally the hypothesis tested in a regression model is:

H_0: $B_0 = B_1 = B_2 \ldots B_p = 0$

H_1: $B_0 \# B_1 \# B_2 \ldots B_p \# 0$; at some level of significance. In this case the level is p=0.05 or 95% confidence interval.

In logistic regression, whenever there are large samples like in the case of the Kenya Demographic and Health Survey (1989), the test that a coefficient is 0 can be based on the Wald Statistic, which has a chi-square distribution. For categorical variables such as the ones in our model, the degree of freedom is equal to one less than the number of categories. However, the Wald statistic is known to be unreliable

whenever the coefficients, i.e b^i's are large, which is not the case in the results of our analysis.

(b) Partial Correlation (P)

The contribution of individual variables in logistic regression is difficult to determine. However, the contribution of each variable depends on other variables in the model. A statistic that is used to look at the partial correlation between the dependent variable and each of the independent variables is R statistic and it ranges in value from -1 to +1. A positive value indicates that as the variable increases in value, so is the likelihood of the event occurring. If R is negative the opposite is true.

(c) Interpreting the Regression Coefficients

In order to facilitate a clearer interpretation of the logistic coefficients, the logistic model can be re-written in terms of the odds of an event occurring. The odds of an event occurring is defined as the ratio of the probability that it will occur to the probability that it will not.

The logistic model can be re-written in terms of the log of odds, which is called a logit.

$$\frac{\text{Prob(event)}}{\text{Prob(no event)}} = e^{Bo + B_1X_1 \ldots B_PX_P}$$

From the equation the logistic coefficient can be interpreted as the change in log odds associated with one unit change in the independent variable. Again the logistic regression can be written further as:

$$\frac{\text{Prob(event)}}{\text{Prob(no event)}} = e^{Bo} + {}^{Bo+B}{}_{1} + {}_{B2X2} + \cdots {}^{B}{}_{P}{}^{X}{}_{P}$$

$$= e^{Bo}e^{B1X1B2X2\cdots}e^{BpxP}$$

The e raised to the power of B_i is the factor by which the odds change when the ith independent variable increases by one unit.

CHAPTER FOUR

DEFERRENTIALS AND DETERMINANTS OF IMMUNIZATION COVERAGE

4.1 INTRODUCTION

This chapter deals with the presentation and analytical interpretation of results of cross-tabulations and multiple regressions as tools of data analysis. The chapter is divided into two parts. Part one covers cross-tabulations and part two deals with logistic regression results.

Child survival is usually determined by many factors, among them immunization of infants and children. This study aims at establishing some of the socio-economic, socio-cultural and demographic factors which influence the levels of immunization in selected provinces. The dependent variable were immunization antigens received, while the independent variables are the socio-economic, socio-cultural and demographic factors.

The analysis concentrated on the percentage distribution of immunized children by selected socio-economic, socio-cultural and demographic factors. The immunization antigens considered were BCG for tuberculosis, DPT 1-3 for Diphtheria, Whooping cough and tetanus, Polio 1-3 for Poliomyelitis, and measles antigen for measles.

4.2 DIFFERENTIALS IN IMMUNIZATION COVERAGE

4.2.1 Age of Mother and immunization coverage

Table 2.1: Distribution of Immunized and Non-Immunized Children by Mother's Age and BCG Antigen

AGE GROUP OF MOTHER	CENTRAL PROVINCE		COAST PROVINCE		WESTERN PROVINCE	
	NO	YES	NO	YES	NO	YES
15-19	0	22 (100%)	1	5 (83%)	2 (10%)	18 (90%)
20-24	2 (2%)	86 (97%)	(17%)	28 (93%)	2 (23%)	84 (97%)
25-29	2 (2%)	86 (97%)	2 (6%)	36 (97%)	4 (6%)	62 (93%)
30-34	3 (8%)	33 (91%)	1 (2%)	35 (85%)	6 (10%)	52 (89%)
35-39	4(10%)	33 (89%)	6	21 (100%)	0	16 (100%)
40-44	1 (7%)	13 (93%)	(14%)	7 (100%)	2 (13%)	13 (86%)
45-49	0	7 (100%)	0	4 (100%)	0	0
			0			
			0			
TOTAL	12 (4%)	280 (95%)	10 (6%)	136 (93%)	16 (6%)	245 (93%)

The cross-tabulations show that, Central province had attained 100 percent immunisation coverage against tuberculosis for children whose mothers were within ages 15-19 years. This may be partly attributed to the fact that, many young mothers in this region had been to school and at the same time, there were many health units in each division of the province (Kiome, 1991). This being the case, many children in Central Province were born under the supervision of paramedic or medical personnel. Therefore immunization of BCG is likely to take place. On the other hand, the sample size of children considered whose mothers were between age 15-19 years, was small (22), though all of them had received the antigen. Coast and Western provinces had a coverage of 83 and 90 percent respectively. The magnitude of these differentials can be better understood when viewed in a broader context of the factors associated with child survival in these regions. For example, many girls do not go to school, or most of them drop out of school at an early age to be married off (Development Plans, 1989-93). Since these women are young, they were likely to be ignorant of the availability and

importance of immunisation vaccines. Mombasa as a district in Coast province, has 8 hospitals, 15 health centres and sub-centres. 27 dispensaries, 2 nursing homes and 14 clinics (Development Plan, 1989-1993). Most of the health centres and hospitals are located in the Island and Changamwe Divisions, while Likoni is poorly served, and at the same time, the ferry crossing between Likoni and the mainland is not conducive in dealing with medical emergencies. Immunization vaccines can only be given by authorized personnel who are situated in identified hospitals and health centres. In this case, the availability and accessibility of health facilities in a region, directly contributes to a wider immunization coverage.

Table 2.1 also shows that the three provinces, that is Central, Coast and Western had a high coverage of BCG antigen among children whose mothers were between age 20-24 and 25-29 years. For example, Central had a coverage of 97%, Coast, 93% and Western, 90%, children whose mothers were between age 20-24 years. These children have received BCG antigen for age 20-24. While for age 25-29, the coverage was as follows: Central 97%, Coast 97% and Western 93%. These findings are not unique. The Ministry of Health (National Coverage, 1992), found similar results during their immunization survey in Kenya. At the same time, Hill (1990) observed that in Rwanda, women ranging between ages 20-24 and 25-29 years had the highest number of children who had been presented for BCG antigen.

The proportion of children receiving BCG antigen as seen from Table 2.1 declines with each successive age group, i.e. age groups 30-34, 35-39 and 40-44 years show a declining trend. Hill (1990), attempted to explain that, younger mothers were more likely to have their children vaccinated than older mothers with a difference of 10% separating the youngest and oldest groups. The same table shows an increase in BCG coverage for children whose mothers fall under age group 44-49 years. This observation cannot be

clearly explained. For example, both Central and Coast Provinces have 100 percent coverage of BCG, though the sample size of children considered was very small, 7 and 4 in Central and Coast respectively.

The Coast province shows that there were no children immunized for mothers aged 35-49 years. This could be explained by the fact that mothers may not have had children aged between 0-5 years who were included in the research sample size or the households that were visited did not have mothers within that age range.

Table 2.2: Distribution of immunized and non-immunized children by mother's age and DPTI Antigen.

AGE GROUP OF MOTHER	CENTRAL PROVINCE		COAST PROVINCE		WESTERN PROVINCE	
	NO	YES	NO	YES	NO	YES
15-19	0	22 (100%)	0	6 (100%)	4 (19%)	17 (81%)
20-24	1 (1%)	86 (98%)	1 (3%)	29 (96%)	3 (3%)	82 (96%)
25-29	3 (3%)	86 (96%)	1 (2%)	36 (97%)	2 (2%)	64 (97%)
30-34	4 (11%)	32 (88%)	6 (15%)	34 (85%)	2 (3%)	56 (96%)
35-39	1 (2%)	35 (97%)	1 (4%)	21 (95%)	0	16 (100%)
40-44	1 (7%)	13 (92%)	0	7 (100%)	0	16 (100%)
45-49	0	7 (100%)	0	4 (100%)	0	0
TOTAL	10 (3%)	283 (96%)	10 (6%)	137 (93%)	11 (4%)	251 (95%)

The table shows that, the proportions of children receiving the first dose of DPT 1 (prevention against whooping cough, diphtheria and tetanus) were high, but declined with each successive dose (DPT2 and DPT3). For example, children whose mothers were in age group 15-19 years and had received DPT1 were as follows: Central 100%, Coast 100% and Western 81%. The levels were continuously high for the BCG antigen upto age group 44-49 years in each province and were as follows: Central 100%, and Coast 100%. DPT is given when the infant is 6 weeks (1½ months) or soon after this age (KEPI, 1989). Mothers who attended post-natal clinics for their personal health were likely to remember to go with their children for immunization vaccine, since at 6 weeks after delivery, the mothers were due for

personal medical check-up. Western province shows zero for children whose mothers aged 35-39 while Coast was zero for children whose mothers aged 40-49 years. Again as observed previously, of the sample of women interviewed, none could have had children aged 0-5 years, or not received the antigen.

Table 2.3: Distribution of immunized and non-immunized children for DPT2 Antigen by mother's age:

AGE GROUP OF MOTHER	CENTRAL PROVINCE NO	YES	COAST PROVINCE NO	YES	WESTERN PROVINCE NO	YES
15-19	1 (4%)	22 (95%)	1 (16%)	5 (83%)	6 (30%)	14 (70%)
20-24	6 (6%)	83 (93%)	1 (3%)	30 (96%)	10 (11%)	75 (88%)
25-29	4 (4%)	84 (91%)	1 (2%)	36 (97%)	3 (4%)	63 (95%)
30-34	6 (16%)	30 (83%)	12 (2%)	29 (70%)	19 (32%)	39 (67%)
35-39	2 (5%)	34 (94%)	1 (4%)	20 (95%)	4 (2%)	12 (75%)
40-44	1 (7%)	13 (92%)	0	7 (100%)	2 (13%)	13 (86%)
45-49	0	7 (100%)	0	4 (100%)	0	0
TOTAL	20 (6%)	272 (93%)	16 (11%)	130 (89%)	45 (17%)	218 (83%)

Table 2.3 shows the cross-tabulation of the children who had received DPT2 antigen by mothers' age in Central, Coast and Western Provinces. DPT2 antigen coverage shows a slight drop of children immunized in the three provinces, with Western having the lowest coverage. For example, the percentage of children who had received BCG from mothers of age group 15-19 to 45-49 years in Western were as follows: 70%, 88%, 95%, 67%, 75% and 8% respectively. Within the same age range, Central Province had the following coverage, 95%, 93%, 91%, 83%, 94%, 92% and 100% respectively. These percentages are much higher than for Western province. These figures can be partly explained by the fact that, though Western Province had fairly localized health amenities, they were ill equipped to handle even the simplest cases due to lack of supplies which had be ordered from the Central Stores, (Nairobi). This could take months to arrive (Muhanda, 1988). Immunization is closely linked with availability and accessibility to health facilities in a region.

Therefore the above observation made in Western Kenya, directly affects immunisation coverage. In addition ignorance regarding benefits of immunization and generally the health of children is rampant among mothers in this age group (15-19) (Dondi, 1992).

Table 2.4: Distribution of immunized and non-immunized children for DPT3 Antigen by mother's age

AGE GROUP OF MOTHER	CENTRAL PROVINCE NO	YES	COAST PROVINCE NO	YES	WESTERN PROVINCE NO	YES
15-19	3 (14%)	18 (85%)	1 (16%)	5 (8%)	9 (42%)	12 (57%)
20-24	17 (19%)	71 (80%)	6 (19%)	25 (80%)	22 (25%)	63 (74%)
25-29	14 (15%)	75 (84%)	2 (5%)	34 (94%)	15 (22%)	51 (77%)
30-34	7 (19%)	29 (80%)	15 (36%)	26 (63%)	25 (43%)	33 (56%)
35-39	2 (5%)	34 (94%)	1 (4%)	20 (95%)	5 (31%)	11 (68%)
40-44	2 (14%)	12 (85%)	0	6 (100%)	7 (43%)	9 (56%)
45-49	0	7 (100%)	0	4 (100%)	0	0
TOTAL	45 (15%)	247 (84%)	25 (17%)	120 (82%)	83 (31%)	179 (68%)

Table 2.5: Distribution of immunized and non-immunized children for Polio 1 by mothers' age.

AGE GROUP OF MOTHER	CENTRAL PROVINCE NO	YES	COAST PROVINCE NO	YES	WESTERN PROVINCE NO	YES
15-19	0	22 (100%)	1 (16%)	5 (83%)	3 (15%)	17 (85%)
20-24	3 (3%)	85 (96%)	1 (3%)	29 (96%)	5 95%)	80 (94%)
25-29	2 (2%)	87 (97%)	0	36 (100%)	5 (7%)	62 (92%)
30-34	1 (2%)	35 (97%)	4 (10%)	36 (90%)	4 (6%)	54 (93%)
35-39	0	36 (100%)	1 (4%)	21 (95%)	0	16 (100%)
40-44	1	13 (92%)	0	7 (100%)	2 (13%)	13 (86%)
45-49	0	7 (100%)	0	4 (100%)	0	0
TOTAL	7 (2%)	286 (97%)	7 (4%)	138 (95%)	19 (7%)	243 (92%)

Table 2.6: Distribution of immunized and non-immunized children by mothers' age: Polio 2 Antigen

AGE GROUP OF MOTHER	CENTRAL PROVINCE NO	YES	COAST PROVINCE NO	YES	WESTERN PROVINCE NO	YES
15-19	0	22 (100%)	0	6 (100%)	6 (30%)	14 (70%)
20-24	2 (2%)	85 (97%)	1 (3%)	29 (96%)	11 (12%)	75 (87%)
25-29	4 (4%)	85 (95%)	1 (2%)	35 (97%)	11 (16%)	56 (83%)
30-34	4 (11%)	32 (88%)	14 (35%)	26 (65%)	21 (36%)	37 (63%)
35-39	1 (2%)	35 (97%)	1 (4%)	21 (95%)	2 (12%)	14 (87%)
40-44	1 (7%)	13 (92%)	0	7 (100%)	5 (31%)	11 (68%)
45-49	0	7 (100%)	0	4 (100%)	0	0
TOTAL	12 (4%)	279 (95%)	17 (11%)	128 (88%)	56 (21%)	208 (79%)

According to tables 2.5, 2.6 and 2.7, Western Province had the lowest immunization coverage against Polio 1, 2 and 3. For example, the children who had received Polio 3 antigen in Western Kenya for mothers aged 15-19 to 45-49 were as follows: 60%, 70%, 76%, 53%, 62% and 62 respectively. While the coverage of children in Coast Province for the same mothers' age bracket (15-49) was much higher than Western, i.e 100%, 93.3%, 97.2%, 73%, 95%, 100% and 100%, respectively.

Table 2.7: Distribution of immunized and non-immunized Polio 3 Antigen children by mothers' age 3 Antigen

AGE GROUP OF MOTHER	CENTRAL PROVINCE NO	YES	COAST PROVINCE NO	YES	WESTERN PROVINCE NO	YES
15-19	1 (4%)	21 (95%)	0	6 (100%)	8 (40%)	12 (60%)
20-24	6 (6%)	82 (93%)	2 (6%)	28 (93%)	25 (29%)	61 (70%)
25-29	8 (9%)	80 (90%)	1 (2%)	35 (97%)	16 (23%)	51 (76%)
30-34	7 (20%)	28 (80%)	11 (26%)	30 (73%)	27 (46%)	31 (53%)
35-39	2 (5%)	34 (94%)	1 (4%)	20 (95%)	6 (37%)	10 (62%)
0-44	1 (7%)	13 (92%)	0	7 (100%)	6 (37%)	10 (62%)
45-49	0	7 (100%)	0	4 (100%)	0	0
TOTAL	25 (8%)	266 (91%)	15 (10%)	130 (89%)	88 (33%)	175 (66%)

Table 2.5, 2.6 and 2.7 show immunization coverage levels for Polio 1, 2 and 3 in Central, Coast and Western Provinces by age group of the mother. Once again, proportions of children receiving the first dose of polio were quite high, but declined with each successive dose, i.e., Polio 2 and Polio 3. Central province still registered the highest percentage coverage. While Western Kenya had registered the lowest. For example, Nyeri alone as a district in Central province had 5 hospitals, 9 health centres and 54 dispensaries, i.e. the hospitals were located in Nyeri town (Provincial General Hospital, Mathari Mission and Mt. Kenya), while Karatina hospital and Tumu Tumu Mission Hospital are in Mathira division (Development Plan 1989-1993).

The health centres and dispensaries were rather well spread out in the district, therefore facilitating higher immunisation coverage than any other district in Kenya. Immunization antigens require cold chain storage and as a result, only authorized hospitals and health centres with such facilities are allowed to immunize children (Ministry of Health 1987).

Polio 1 antigen is given at 6 weeks (1½ months) after the child is born, while Polio 3 antigen is given at 14 weeks (3½ months) (KEPI Policy Schedule 1989). This schedule in itself to some extent influences against completion of the required antigens in the first 9 months, as they are intended by KEPI policy schedule (1987). The time interval between each successive dose is long, for example, BCG and oral Polio are given at birth, while the last antigen for measles is given when the child is 9 months. Mothers are likely to forget taking their children to clinic after the first vaccination (Hill,1990).

These two findings can partly be explained by the fact that girls in both regions marry young (Muhanda, 1990; Odhiambo, 1991). They do not stay in school long enough to learn about personal hygiene and other health related subjects. In terms of health facilities, Western province was not endowed with these facilities to that extent of influencing immunization to higher levels than what is depicted on table 2.7. For example, in Western province, Bungoma district had 4 hospitals (1 government, 2 Mission and 1 private) There were 10 health centres, 23 dispensaries, 4 mobile government clinics and 2 private clinics (Development Plan 1989-1993). Busia District had 39 health facilities, 7 of which were hospitals (4 government and 3 private or mission hospitals). In addition, there were 14 health centres (11 government and 3 private) and 16 dispensaries. These health facilities were not

equitably distributed within the district. Access to most of these health facilities was not that good (Bungoma Development Plan, 1989-1993). Kakamega District on the other hand, had 6 hospitals, 36 health centres, 12 dispensaries and 9 mobile clinics. Most of these health facilities lack electricity and water facilities. This was also compounded by impassable roads, especially during heavy rains, which reduced the level of their utilisation (Development Plan 1989-1993). Immunization as mentioned earlier in this chapter cannot be given by any health facility, unless it has been approved by the Ministry of Health (KEPI, 1987). If the cold storage facilities are not available then such services cannot be provided.

Table 2.8: Distribution of immunized and non-immunized children for measles Antigen by mothers' age

AGE GROUP OF MOTHER	CENTRAL PROVINCE NO	YES	COAST PROVINCE NO	YES	WESTERN PROVINCE NO	YES
15-19	10 (43%)	13 (56%)	3 (50%)	3 (50%)	13 (62%)	8 (38%)
20-24	33 (37%)	55 (62%)	12 (40%)	18 (60%)	45 (53%)	40 (47%)
25-29	36 (40%)	53 (59%)	11 (29%)	26 (70%)	33 (49%)	34 (50.7%)
30-34	13 (36%)	23 (63%)	15 (37%)	25 (62%)	36 (62%)	22 (38%)
35-39	8 (22%)	27 (77%)	9 (42%)	12 (57%)	7 (43%)	9 (56%)
40-44	7 (50%)	7 (50%)	4 (57%)	3 (42%)	9 (56%)	7 (44%)
45-49	1 (14%)	6 (85%)	0	4 (100%)	0	0
TOTAL	108 (37%)	183 (62%)	54 (37%)	92 (63%)	143 (54%)	(46%)

Table 2.8 shows the cross-tabulation of immunization coverage for measles in Central, Coast and Western provinces by mothers' age.. Measles antigen, according to the National immunization schedule (KEPI, 1989), is given when the child is 9 months or soon after 9 months. The observation from this table was that, in all the three provinces, measles coverage was the poorest when compared to the earlier mentioned antigens, namely: BCG, Polio 1, 2 and 3, DPT 1, 2 and 3. For example, the coverage of measles across the provinces for children whose mothers age group is 15-19 years was as follows: Central 56%, Coast 50% and Western 38%.

According to Ghana Demographic Survey (1988), measles vaccination coverage was the lowest and as a result, measles took the highest death toll of the immunizable diseases.

4.2.2 Education of Mother and Immunization Coverage

The following table shows the immunization coverage for BCG antigen in the study areas by mothers education level.

Table 2.9: Distribution of immunized and non-immunized children for BCG Antigen by mothers' education

MOTHER'S HIGHEST LEVEL OF EDUCATION	CENTRAL PROVINCE		COAST PROVINCE		vESTERN PROVINCE	
	NO	YES	NO	YES	NO	YES
NO EDUCATION	1 (3%)	29 (96%)	2 (2%)	74 (97%)	7 (11%)	54 (88%)
PRIMARY	7 (3%)	183 (96%)	7 (14%)	43 (86%)	10 (68%)	136 (93%)
SECONDARY(+)	3 (4%)	68 (95%)	1 (5%)	18 (94%)	1 (1%)	56 (98%)
TOTAL	11 (3%)	279 (96%)	10 (6%)	136 (93%)	18 (6%)	245 (93%)

Central Province had the highest coverage of BCG antigen in all the levels of education. For example, mothers who had no education recorded 96% BCG antigen coverage among their children. Children whose mothers had attained primary and secondary education were 96% and 95% respectively. These results can be attributed to the fact that, Central Province had a high literacy level, especially among the women compared to the other two regions. The distribution of education facilities especially in Central Province was intended to meet all the needs of the population (Development Plan 1989-93). Apart from the formal education system, facilities also exist for professional and adult education in form of Youth Polytechnic, Technical Institutes and Training Centres (Kiome, 1991). From the above overview, it is quite evident that the Province had a high level of literacy, which was very crucial in

understanding of immunization and its benefits. These mothers were likely to protect their children against some diseases since the concept of health was so clear in their minds. The mother was ready to make sacrifices and find alternative ways to ensure that the child had been immunized. The same view was shared by (Dondi, 1992), in South Nyanza where he found that mothers who understood the role of immunization, would get round the difficulties they encountered to have their children immunized. For example, if their regular clinic was not providing immunizations, they would sacrifice to walk to the next clinic when they did not have bus fare and continued to go to the clinic even when they knew that the health staff would scold them.

BCG coverage in Central Province (Table 2.9) can also be seen from the point of view discussed earlier in this chapter that, BCG vaccine is generally given at birth. Central Province according to Kiome (1991) had a fair distribution of hospitals and other medical facilities. Mothers who were literate would also understand that the child clinic card had other advantages other than that of their children's health. For example, in urban areas, when applying for a pre-school place for the child (Waweru, 1991) the card needs to be produced and also when seeking for a birth certificate later when the child is older or in adulthood the card is also necessary. In this country where most deliveries still take place outside health facilities (Dondi, 1992), the clinic card is often the most reliable document for establishing age when an individual applies for a birth certificate. With the above knowledge a significant number of mothers are pressurized to bring their children to clinic regularly and to keep the clinic card safely.

Western Province (Table 2.9) shows a good BCG coverage by mothers' education. The only significant observation was that, it had the lowest BCG coverage

percentage (88%) for children whose mothers had no education compared to Central and Coast which were 96% and 97% respectively. This could be explained as follows: Kakamega District alone had 876 primary schools, 184 secondary, 33 Youth and one Village Polytechnic that were inadequate and not well distributed (Development Plan, 1989-93). Yet education, especially that of the mother plays a significant influence on the health of the child.

While Busia District in Western province had 313 primary schools, 41 secondary schools and only 1 post-secondary institution. In both Kakamega and Busia, primary and secondary enrolment was low. There were more boys enroled in school than girls, especially in secondary schools. Girls education was not receiving adequate attention. The main reason for lack of adequate support given to girls education could be attributed to early pregnancies, lack of money and negative social belief toward girls education (Busia Development Plan, 1989-93). Yet if the girls could receive basic education, to some extent, immunization awareness and coverage could be higher than what was reflected (Kibet, 1981).

Coast Province (Table 2.9), showed the lowest immunization coverage for children whose mothers have primary education (86%). Central and Western Provinces had 96.3% and 93.2% coverage respectively. Coast Province is comprised of several districts some of which are Kwale, Kilifi, Lamu and Mombasa. For example, Kwale District had 238 primary schools and total pupil population of 68,946 with 2,215 teachers. The ratio of pupil/teacher was 31:1 unlike Central which had a pupil/teacher ratio of 18:1, Development Plan (1989-93). These schools were poorly maintained. The problems of schools range from poor buildings, lack of teachers' houses, and lack of trained teachers. Early marriages and search for

employment among girls contribute greatly to high drop-out rate from schools. These factors had greatly contributed to low immunization coverage since the girls did not stay in school long enough to understand health values. On the other hand, availability and accessibility to health centres also directly influenced immunization coverage. For example, Kwale had 33 static health services delivery points, which included Msambweni District Hospital, Kinango and Kwale sub-District hospitals, 5 health centres, 1 sub-health centre and 24 dispensaries, including two that were run by Non-Governmental Organizations. Outreach services that were provided by Family Planning Association of Kenya were limited. The average population per facility was approximately 12,000 persons, while there were 285 hospital beds that corresponded to 72 beds per 100,000 persons, which were considerably below national and Coast Province averages (Kwale, Mombasa and Kilifi Development Plans, 1989-93). The same District had only 5 physicians and 206 medically trained staff. With these health information, it can be claimed that, since immunization antigens require cold chain for their effectiveness, trained personnel to administer the vaccines and obviously a structure or a place to carry out the exercise, Kwale District does not provide any of the above factors in abundance, thus immunization coverage was low. On the other hand, Kilifi District in Coast Province is also not endowed with health personnel structures and equipment. There are only 3 hospitals in Kilifi district, 6 health centres, 1 sub-health centre and 34 dispensaries. Most of these health centres and dispensaries were under-utilized because of lack of adequate transport and lack of adequate drugs, which tended to discourage attendance. The report on education facilities was also not encouraging. For example, primary school attendance is discouraging (Development Plan, 1989-93) in the district. There was

under-utilization of the existing school facilities because of the poor conditions of the classrooms, lack of adequate workshops, lack of good teachers' houses and inadequate transport network. Lamu District also suffered from a similar inadequacies in education and health services. These are some of the factors that militate against high immunization percentage rates in the province as a whole.

Table 2.9 shows high percentages for immunization in all the three provinces for children whose mothers had secondary education. Central, (95%), Coast, (94%) and Western, (98%). Mothers with secondary education were associated with high immunization coverage (Hill 1990), but the education enrolment and time spent in school by girls, was not high. For example, secondary school and post-school enrolment of girls in Coast Province was still low. Kwale, for example, does not compare very well to other districts in Coast Province. The whole district had only one government maintained girls' school, and that was, Matuga Girls' High School. The three government maintained mixed schools were Waa, Taro and Lukore Secondary schools. The mixed Harambee Schools, had a low enrolment for girls, The schools were: Diani Day Mixed Secondary, Murimoni, Lunga Lunga, and Ngombeni, while Bombolulu was exclusively for girls. These schools were under-utilized, and also the drop-out rate among the girls was very high. According to Ghana Demographic Health Survey (1988), influence of mother's education on immunization coverage was positive. A child of a mother with secondary or further education was more likely to have been vaccinated than a child of a mother with no or with primary education. According to Hill (1990), highly educated mothers tended to live in closer proximity to health centres. They had have a higher rate of vaccination uptake which was unconnected to increased health awareness or

motivation.

Table 2.10: Distribution of immunized and non-immunized children for DPT 1 Antigen by mother's education

MOTHER'S HIGHEST LEVEL OF EDUCATION	CENTRAL PROVINCE NO	CENTRAL PROVINCE YES	COAST PROVINCE NO	COAST PROVINCE YES	WESTERN PROVINCE NO	WESTERN PROVINCE YES
NO EDUCATION PRIMARY SECONDARY(+)	1 (3%) 6 (3%) 2 (2%)	29 (96%) 184 (96%) 69 (97%)	2 (2%) 5 (10%) 2 (10%)	75 (97%) 45 (90%) 17 (89%)	1 (1%) 7 (4%) 4 (7%)	60 (98%) 138 (95%) 53 (93%)
TOTAL	9 (3%)	282 (96%)	9 (6%)	137 (93%)	12 (4%)	251 (93%)

Table 2.11: Distribution of immunized and non-immunized children for DPT 2 Antigen by mother's education

MOTHER'S HIGHEST LEVEL OF EDUCATION	CENTRAL PROVINCE NO	CENTRAL PROVINCE YES	COAST PROVINCE NO	COAST PROVINCE YES	WESTERN PROVINCE NO	WESTERN PROVINCE YES
NO EDUCATION PRIMARY SECONDARY(+)	4 (13%) 11 (5%) 5 (7%)	26 (86%) 180 (94%) 66 (93%)	7 (9%) 7 (14%) 2 (10%)	70 (91%) 43 (86%) 17 (89%)	13 (21%) 27 (18%) 5 (8%)	48 (78%) 118 (81%) 52 (91%)
TOTAL	20 (16%)	271 (93%)	16 (11%)	130 (89%)	45 (17%)	218 (82%)

Table 2.12: Distribution of immunized and non-immunized children for DPT 3 Antigen by mothers' education

MOTHER'S HIGHEST LEVEL OF EDUCATION	CENTRAL PROVINCE NO	CENTRAL PROVINCE YES	COAST PROVINCE NO	COAST PROVINCE YES	WESTERN PROVINCE NO	WESTERN PROVINCE YES
NO EDUCATION PRIMARY SECONDARY+	5 (76%) 29 (15%) 11 (15%)	25 (83%) 161 (84%) 60 (84%)	14 (18%) 9 (18%) 2 (10%)	63 (81%) 41 (82%) 17 (89%)	23 (37%) 47 (32%) 14 (24%)	39 (62%) 98 (67%) 43 (75%)
TOTAL	45 (15%)	246 (84%)	25 (17%)	121 (82%)	84 (31%)	180 (68%)

Children who had been immunized against DPT1, 2 and 3 showed a marked reduction with successive antigens. For example, DPT 1 had been well covered in the three provinces by all levels of mothers' education. For no education mothers (none), the following children were immunized by Province; Central (96%), Coast (97%) and 98% for Western, while children whose mothers had for primary

education in the same provinces were 96%, 90% and 93%. Children whose mothers had secondary education, were 97%, 89% and 93% respectively. DPT1 vaccine is given at one and half months or at 6 weeks, which could have been arranged by the medical personnel to coincide with the mothers personal check-up after 6 weeks of delivery (Waweru,1991). It appears that the coincidence has a bearing on the good response towards DPT1 (KEPI, 1989). DPT2 (Table 2.11) showed a slight drop in coverage compared to DPT1. For example, the immunized children whose mothers had no education in the three provinces were as follows, 86%, 91% and 78%, while children who were immunized by mothers' primary education were 94%, 86% and 81%, for Central, Coast and Western, respectively. This is already a marked drop compared to DPT1. The children who had been immunized by mothers' secondary education in Central were, (93%), Coast (89%) and Western (91%). DPT 2 is given at 2½ months (10 weeks), which is a difference of 1(one) month between DPT1 and DPT2 antigens. DPT3 (Table 2.12) showed a significant drop, compared to DPT1 and DPT2 antigen in all levels of mothers' education. For example, for children of No education mothers showed the following immunization coverage: Central, (83%), Coast, (81%) and Western, (62%) respectively.

The children whose mothers' education level was primary education had the following percentages: Central, (84%), Coast, (82%) and Western (67.6%). Western province had consistently showed a low immunization coverage especially among its children whose mothers had no education, (62.9%) compared to 83% for Central, and 81% for Coast province. Western province had depicted a pattern that (Hill, 1990), identified in Rwanda. This pattern showed that children whose mothers had higher education had the highest coverage followed by primary and then lastly

the no education mothers. The same table shows the following levels, for Western Kenya: Children of mothers with No education, (69%), Primary (67%), and secondary, (75%). One of the explanations that could be offered for this situation was that, traditional beliefs, types of religions, husbands' influence, witchcraft, distance to clinic, unawareness that immunization was needed, long waiting time at clinics and inconvenient clinic times for mothers could have been some of the characteristics that hinder immunization coverage in Western province. Some of these factors were identified by (Dondi, 1992) in his research in South Nyanza district. School enrolment for girls was not very high compared to their male counterparts. Girls dropped out due to early pregnancies, lacked incentives to remain in schools and early marriages (Busia Development Plan, 1989-93).

Tables 2.13, 2.14 and 2.15 show the cross-tabulation levels of immunization for Polio 1, 2 and 3 by mothers' education.

Table 2.13: Distribution of immunized and non-immunized children for Polio 1 Antigen by mothers' education

MOTHER'S HIGHEST LEVEL OF EDUCATION	CENTRAL PROVINCE NO	CENTRAL PROVINCE YES	COAST PROVINCE NO	COAST PROVINCE YES	WESTERN PROVINCE NO	WESTERN PROVINCE YES
NO EDUCATION	1 (3%)	29 (96%)	1 (1%)	75 (98%)	5 (8%)	57 (91%)
PRIMARY	3 (1%)	187 (98%)	5 (10%)	45 (90%)	10 (6%)	134 (93%)
SECONDARY +	2 (2%)	68 (97%)	1 (5%)	18 (94%)	5 (8%)	52 (91%)
TOTAL	6 (2%)	284 (97%)	7 (4%)	138 (95%)	20 (7%)	243 (92%)

Oral Polio is given at birth. Polio 1 is given at 1½ months, polio 2 at 2½ months and polio 3 at 3½ months (KEPI, 1987). The schedule is the same as for DPT 1, 2 and 3 given against Diphtheria, Whooping Cough and Tetanus. The pattern depicted by DPT antigen is almost the same as that of Polio antigen. It shows a high coverage during the first dose and then consequently declining with subsequent doses, i.e Polio 2 and Polio 3. For example, Polio 1 coverage by no education mothers in Central, is

(96%), Coast, (98%) and (91%), for Western. For Polio 2 the coverage of children for No education mothers in Central is (93%), Coast, (86%), Western, (77%) while Polio 3 antigen for the same variable in the same provinces is as follows: Central (83%), Coast, (89%) and Western, (67%). The declining pattern is very clear. Mothers either forgot or they did not, know the value of booster doses. As mentioned elsewhere in this report, some mothers (Dondi 1992), offered some explanation , such as many injections were assumed to reduce the blood level in the body (anaemia). Witchcraft, lack of bus fare to clinic, if it was far and generally lack of awareness regarding immunization and more so the repeated boosters hinder immunization.

Table 2.14: Distribution of immunized and non-immunized children for Polio 2 Antigen by mothers' education

MOTHER'S HIGHEST LEVEL OF EDUCATION	CENTRAL PROVINCE NO	YES	COAST PROVINCE NO	YES	WESTERN PROVINCE NO	YES
NO EDUCATION PRIMARY SECONDARY+	2 (6%) 7 (3%) 2 (2%)	28 (93%) 183 (96%) 68 (97%)	10 (13%) 5 (10%) 2 (10%)	66 (86%) 45 (90%) 17 (89%)	14 (23%) 34 (23%) 7 (12%)	47 (77%) 111 (76%) 50 (87%)
TOTAL	12 (4%)	279 (95%)	17 (11%)	128 (88%)	55 (21%)	208 (79%)

Table 2.15: Distribution of immunized and non-immunized children for Polio 3 Antigen by mothers' education

MOTHER'S HIGHEST LEVEL OF EDUCATION	CENTRAL PROVINCE NO	YES	COAST PROVINCE NO	YES	WESTERN PROVINCE NO	YES
NO EDUCATION PRIMARY SECONDARY+	5 (6%) 15 (7%) 5 (7%)	25 (83%) 175 (92%) 65 (92%)	8 (10%) 6 (12%) 2 (10%)	69 (89%) 44 (88%) 17 (89%)	20 (32%) 56 (38%) 12 (21%)	41 (67%) 89 (61%) 45 (78%)
TOTAL	25 (8%)	265 (91%)	16 (11%)	130 (89%)	88 (33%)	175 (66%)

Table 2.16 shows cross-tabulation percentages of children who had been immunized against measles in the three provinces, by mothers education level. The table shows very low percentages for measles coverage in all the three provinces. For example, children whose mothers had no education, Central, was (63%), Coast, (58%) and Western, (43%). Children whose mothers had primary education showed the following: Central, (63%), Coast, (68%) and Western, (44%). While the children whose mothers had secondary and higher education showed the following figures: 61% for Central, 73% for Coast, and 50% for Western.

The levels of immunization to some extent have shown that higher education in Western province had a positive influence on immunization. Research done elsewhere in Ghana, in 1988, offered similar findings that, as a mother attained more education, her awareness towards health of the family increased. (Waweru, 1991) found similar results for Nairobi immunization survey.

Measles is given at 9 months (KEPI, 1987). This is a long internal from birth when the first vaccines (BCG and Oral Polio) were given. This time factor could be attributed to the failure of mothers taking their children for measles vaccine. Again, many children in rural African homes had suffered from measles before attaining 9 months (Ghana, DHS 1988 and Dondi, 1988). As a result some mothers had sought treatment and hence did not see the need for a vaccine at 9 months.

Table 2.16: Distribution of immunized and non-immunized children for Measles Antigen by mothers' education

MOTHER'S HIGHEST LEVEL OF EDUCATION	CENTRAL PROVINCE		COAST PROVINCE		WESTERN PROVINCE	
	NO	YES	NO	YES	NO	YES
NO EDUCATION PRIMARY SECONDARY +	11 (36%) 69 (36%) 27 (38%)	19 (63%) 121 (63%) 43 (61%)	31 (41%) 16 (32%) 5 (26%)	44 (58%) 34 (68%) 14 (73%)	35 (56%) 80 (55%) 28 (49%)	27 (43%) 64 (44%) 29 (50%)
TOTAL	107 (36%)	183 (63%)	52 (36%)	92 (63%)	143 (54%)	120 (45%)

4.2.3 Religion of Mother and Immunisation coverage

Table 2.17 shows Catholic and protestant children who had received immunization in the three provinces as follows: Central, (96%), Coast (75%) and Western, (96%) for catholics. The children of protestant mothers were as follows: Central (96%), Coast (93%), and Western (92.3%). These findings reflect approval by these churches in utilizing modern medicine for child survival. Studies done elsewhere in Kenya on child survival (Odhiambo, 1992 and Dondi, 1992) found that many women who belonged to some faiths like the catholic church, attended Child Health Clinics as opposed to those who belonged to some minority denominations such as. "Voice of Salvation", "Miracle Church", "Power of the Holy Trinity", "Roho Red Cross", among others, and did not approve of modern methods of child survival because according to them, "God is adequate". Dondi (1992), in South Nyanza came across a church called "Power of Jesus Round The World", who totally disapproved of immunization because God would provide the children with the protection they needed.

Immunization of children for BCG antigen by mothers' muslim faith showed an obvious bias for Coast Region which had a high percentage of children whose mothers were muslims, compared to the other regions in Kenya.

Table 2.17: Distribution of Immunized and Non-immunized Children for BCG Antigen by Mother's Religion

Religion	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Catholic	4(3%)	105(96%)	5(25%)	15(75%)	6(5%)	96(94%)
Protestant	7(3%)	172(96%)	2(6%)	27(93%)	12(7%)	144(92%)
Muslim	0(0%)	1(100%)	1(1%)	55(98%)	0(0%)	4(100%)
Total	11(3%)	278(96%)	8(7%)	97(92%)	7(18%)	244(93%)

Tables 2.18, 2.19, and 2.20 show the distribution of DPT 1,2, and 3 antigen in the three provinces. Children whose mothers were catholics and protestants had registered high immunization coverage for all the DPT antigens. What was remarkable again was that the number of muslim children, who were sampled in the study in all the regions of study was small, except for Coast province which was dominated by muslims and hence, the sample was higher.

Table 2.18: Distribution of Immunized and Non-immunized Children for DPT 1 Antigen by Mother's Religion

Religion	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Catholic	4 (3%)	105 (96%)	40(20%)	161(80%)	2(2%)	100(98%)
Protestant	5(2%)	175(97%)	3(10%)	27(90%)	10(6%)	146(94%)
Muslim	1(100%)	0(0%)	2(4%)	54(96%)	0(0%)	4(100%)
Total	10(3.4%)	280(96%)	45(16%)	242(84%)	12(5%)	250(95%)

Information given earlier in the Literature Review indicated that DPT antigen is given at intervals of 4 weeks each (1 month), after the first dose having been given at 6 weeks (1½ months) after delivery of the child. This interval was expected to be close enough for many mothers to have remembered to present their children for the vaccinations KEPI, (1987).

Table 2.19: Distribution of Immunized and Non-immunized Children for DPT 2 Antigen by Mother's Religion

Religion	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Catholic	8 (7%)	101 (93%)	6(30%)	14(70%)	16(17%)	86(83%)
Protestant	11(6%)	168(94%)	2(7%)	27(93%)	27(17%)	128(83%)
Muslim	1(100%)	0(0%)	3(5%)	53(95%)	1(33%)	2(97%)
Total	20(7%)	269(93%)	11(10%)	94(80%)	44(17%)	216(83%)

Table 2.20: Distribution of Immunized and Non-immunized Children for DPT 3 Antigen by Mother's Religion

Religion	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Catholic	20(18%)	89 (82%)	5(9%)	53(91%)	30(29%)	72(71%)
Protestant	24(13%)	156(87%)	6(20%)	24(80%)	51(33%)	104(67%)
Muslim	1(100%)	0(0%)	8(14%)	48(86%)	1(25%)	3(75%)
Total	45(%)	245(%)	19(13%)	125(87%)	82(31%)	179(69%)

Tables 2.21, 2.22, and 2.23 show the distribution of polio 1, 2 and 3 antigen in the three provinces by religion of the mother. Though the polio coverage for the three antigens was high, Western province had shown a slight drop in percentages of children vaccinated for polio 3 antigen, and was as follows: catholics 69%, protestants 66% and muslims 67%. The polio antigen schedule is the same as for DPT antigen, except for polio O and BCG which are given at birth. These results could be attributed to the fact that Western province is a predominantly rural area (Kakamega, Bungoma and Busia Development Plans, 1989-1993). Due to poor roads especially during the rain weather to some extent, prevented some mothers from reaching the clinics where immunization took place. Another reason for a lower immunization coverage compared to the other provinces could be due to customs and

beliefs regarding childbearing and child rearing which were more rigidly practised in Western Kenya (El-Tom, 1991). Again, elsewhere in this report it was mentioned that some mothers forgot to present their children for the last vaccinations, for example, DPT 3, polio 3 and measles that is given at 9 months.

Table 2.21: Distribution of Immunized and Non-immunized Children for Polio 1 Antigen by Mother's Religion

Religion	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Catholic	1(1%)	108(99%)	4(20%)	16(80%)	2(3%)	99(97%)
Protestant	6(3%)	174(97%)	1(3%)	29(97%)	17(11%)	138(89%)
Muslim	0(0%)	1(100%)	2(4%)	54(96%)	0(0%)	4(100%)
Total	7(2%)	283(98%)	7(7%)	99(93%)	20(8%)	241(92%)

Table 2.22: Distribution of Immunized and Non-immunized Children for Polio 2 Antigen by Mother's Religion

Religion	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Catholic	4(4%)	105 (96%)	4(20%)	16(80%)	20(20%)	82(80%)
Protestant	7(4%)	172(96%)	2(7%)	27(93%)	35(23%)	120(77%)
Muslim	1(100%)	0(0%)	6(11%)	50(89%)	0(0%)	4(100%)
Total	12(7%)	277(96%)	12(11%)	93(89%)	55(21%)	206(79%)

Table 2.23: Distribution of Immunized and Non-immunized Children for Polio 3 Antigen by Mother's Religion

Religion	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Catholic	11(10%)	97(90%)	4(20%)	16(80%)	32(31%)	70(69%)
Protestant	13(7%)	167(93%)	2(7%)	27(93%)	53(34%)	102(66%)
Muslim	1(100%)	0(0%)	4(7%)	52(93%)	1(33%)	2(67%)
Total	25(90%)	264(91%)	10(10%)	95(90%)	86(33%)	174(67%)

Table 2.24 shows the coverage distribution of measles antigen, by mother's religion in the study areas. Compared to the other antigens which had been considered, it had registered the lowest coverage among the three provinces. For example, catholics in Central province were 59% compared to 96% BCG coverage in the same province. Whilst Coast had 40% immunized children whose mothers were catholics compared to 75% coverage for BCG in the same province, Western province had a coverage of 47% for measles and 94% for BCG. Once again Western Kenya had the lowest measles coverage for all the religions compared to the other two provinces, Central and Coast.

Table 2.24: Distribution of Immunized and Non-immunized Children for Measles Antigen by Mother's Religion

Religion	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Catholic	44(41%)	63(59%)	8(40%)	12(60%)	54(53%)	48(47%)
Protestant	61(34%)	119(66%)	10(33%)	20(67%)	85(54%)	71(45%)
Muslim	1(100%)	0(0%)	21(38%)	35(62%)	1(67%)	1(33%)
Total	106(37%)	182(63%)	39(37%)	67(63%)	141(54%)	120(46%)

Measles antigen is given at 9 months according to the revised KEPI policy (Kenya expanded programme on immunization) schedule of 1987 (Ministry of Health, 1987). The time lapse from birth of the child to 9 months is along one such that a mother was likely to forget to take the child to the clinic unless the distance to clinic was close, or unless she attended constant Child Health Monitoring clinics. Studies carried out elsewhere on measles in Kenya show that, many mothers do not exactly know when to present their children for measles antigen (Harvey, 1992). A measles project in Kisumu and Siaya districts showed that 50% of mothers who were

interviewed and had not presented their children for measles alleged that they did not know the exact age for measles vaccination while other mothers in same religion claimed that their children were either too old to be carried to vaccination centres, since most centres were not in close proximity to their residences. Dondi (1992) carried out a research in South Nyanza and found that, some parents, including grandmothers of the children who were included in the survey sample claimed that they knew about herbs that could treat childhood diseases, including immunizable diseases, and especially measles. Older family members, especially grandmothers reinforced the belief that herbs were adequate by pointing out that in the past, they raised children on herbs without the help of immunization. In the same survey some respondents believed that measles could strike even after a child had received the antigen. This fact discouraged them from taking the children for vaccination as a proof that immunization was ineffective and not worth taking seriously. The ministry of Health (1987) survey rated measles as the most poorly covered antigen in the ten districts that were sampled, as reflected in the Literature Review. Measles coverage then (1987) was 60%, while other immunizable diseases such as tuberculosis, Oral Polio 1 and 3 were allows: 87%, 89% and 74% respectively. This showed clearly that measles was still poorly covered.

4.2.4 Type of place of residence of mother and immunisation coverage

Table 2.25: Distribution of Immunized and Non-immunized Children for BCG Antigen by Place of Residence

Place of Residence	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Urban	0(0%)	1(100%)	3(7%)	41(93%)	0(0%)	16(100%)
Rural	1(4%)	263(96%)	6(6%)	95(94%)	19(8%)	229(92%)
Total	11(4%)	280(96%)	9(6%)	136(94%)	19(7%)	245(93%)

Table 2.25 shows the distribution of immunized and non-immunized children by place of residence for BCG antigen in the three (3) provinces.

BCG coverage in the 3 provinces, for both urban and rural place of residence is high, though the urban areas' coverage is higher than rural. For example, Central urban coverage is 100% while rural is 94% and Western urban is 100% and rural is 92%. The probable reason for these differences could be as a result of the urban areas having better health facilities. They also provide basic services such as, dispensaries, better infrastructure, which means easy access to health and medical services, unlike in rural areas where lack of proper infrastructure made services inaccessible to many people. People walking long distances to health centres attended the centres infrequently (Mwangi 1990).

BCG antigen is given at birth. Thus if a child was born in a hospital proximity, then chances of receiving the BCG antigen was higher. Central province has the highest number of kilometres of roads (Kibet, 1981) with Kiambu district in Central Province, having the highest. This is one of the factors that Kibet found in his research on child health differentials in Kenya which promoted the health of children. Western province, which has recorded the lowest BCG coverage in the

rural area (92%), had only 20% of its population (1,832,663) according to the census (1979), living in the urban areas, while Coast Province had a total population of 1,342,794 with 60% of its population found in the urban areas. It is also said that some of the provinces with low infant and child mortality were as a result of improved health interventions, such as immunization. They also had small geographical areas in comparison with those with high infant and child mortality. It may be argued that the smallness of the district enhances the administrative effectiveness and control of health, which is obviously related to the decline of infant and child mortality in these small districts Kibet (1981). For example, in Central Province, Kiambu (2,448 sq.km) had low mortality and Kwale (8,257 sq.km) in Coast had high mortality rate. Kiambu had an infant/child mortality of less than 50 deaths per 1,000 live births, while Kwale had over 100 deaths per 1,000 live births (Kenya Demographic and Health Survey, 1989).

Table 2.26: Distribution of Immunized and Non-immunized Children for DPT 1 Antigen by Place of Residence

Place of Residence	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Urban	1(6%)	17(94%)	4(90%)	41(91%)	1(6%)	15(94%)
Rural	9(3%)	266(97%)	5(5%)	96(95%)	11(4%)	236(96%)
Total	10(3%)	283(97%)	9(6%)	137(94%)	12(5%)	251(95%)

Tables 2.26, 2.27, 2.28 show the distribution of immunized and non-immunized children by place of residence for DPT 1,2, and 3, respectively. The three tables show a consistently high coverage of DPT 1,2 and 3 antigen in the urban areas of Central, Coast and Western provinces. For example, urban Central was

94%, Coast, 91% and Western 94% for DPT 1 while DPT 2 antigen was 78%, 89% and 90% for Central, Coast and Western provinces respectively. DPT 3 urban Central was 67%, 84% and 81%. The expected results were to show a decline in coverage of DPT 3 due to the interval at the time of giving DPT 1 and DPT 3 antigen. But from these trends shown by tables 2.26, 2.27 and 2.28, there is no definite declining consistency. This could be interpreted as the urban population sample size was not large enough to give such results. For example, table 2.26 for Central province had only 18 children whose mothers were interviewed while tables 2.27 and 2.28 had 21 and 18 children respectively. For Coast, table 2.26 had 45 children, table 2.27 had 44 children and table 2.28 had 44 children for the same province. If these figures were compared with any rural sample size of respondents, there was a remarkable difference. For example, let us examine table 2.28's rural sample size whose mothers were interviewed: Central had 274 children while Coast had 102 and Western province had 246 children.

Table 2.27: Distribution of Immunized and Non-immunized Children for DPT 2 Antigen by Place of Residence

Place of Residence	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Urban	4(22%)	17(78%)	5(11%)	39(89%)	2(10%)	18(90%)
Rural	16(6%)	259(94%)	11(10%)	91(90%)	43(17%)	204(83%)
Total	20(7%)	273(93%)	16(11%)	130(89%)	45(17%)	222(83%)

Tables 2.26, 2.27 and 2.28 have also presented interesting results for their rural population. The rural immunization coverage for the three provinces were just as high as for the urban population with exception of Western's province DPT 3 rural

coverage, which was 66%, while for the other provinces were, 92% for Central and 89% in Coast province. Western province is predominantly rural with agriculture being the main economic activity (Bunyasi,l 1984). It does not really have a dry season or month as it receives substantial rainfall all the year round. According to the development Plan (1989-93), Western province had few all-weather roads, and at times it was impossible to reach health facilities in time to save emergencies and also for routine visits, such as, immunization for children and that is the case in this study.

Table 2.28: Distribution of Immunized and Non-immunized Children for DPT 3 Antigen by Place of Residence

Place of Residence	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Urban	6(33%)	12(67%)	7(16%)	37(84%)	3(19%)	13(81%)
Rural	39(14%)	235(86%)	19(19%)	83(81%)	80(32%)	166(69%)
Total	4515%)	247(85%)	26(18%)	120(82%)	83(32%)	179(68%)

Table 2.29: Distribution of Immunized and Non-immunized children for Polio 1 Antigen by Place of Residence

Place of Residence	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Urban	1(6%)	17(94%)	3(7%)	42(93%)	1(6%)	15(94%)
Rural	6(2%)	269(98%)	4(5%)	76(95%)	19(8%)	228(92%)
Total	7(2%)	286(98%)	7(6%)	118(94%)	20(8%)	243(92%)

Tables 2.29, 2.30 and 2.31 show the distribution of immunized and non-immunized children by place of residence for polio 1, 2, and 3 antigen. The results are not different from DPT coverage in the same provinces. The coverage for both urban and rural is high, except declining trend in its coverage of polio 1, 2, and 3.

For example, Western province's coverage in urban areas for polio 1, 2 and 3 was as follows: 94%, 82% and 7%. While for the rural areas, it was 92%, 79% and 66%. According to Hill (1990), the trend in coverage declines with successive doses of the antigen due to various reasons. Some of the reasons could have been due to failure of mother to remember the clinic day or the correct age at which to present the child for the immunization. In South Nyanza, Dondi (1992) explained that some mothers feared the repeated doses as this could "finish the child's blood". In other words, they felt that repeated boosters of the same jab (antigens) had side effects on the child, hence failure to take the children to clinic for immunization.

Table 2.30: Distribution of Immunized and Non-immunized children for Polio 2 Antigen by Place of Residence

Place of Residence	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Urban	2 (12%)	15 (88%)	4 (9%)	41 (91%)	3 (18%)	14 (82%)
Rural	10 (4%)	264 (96%)	14 (14%)	87 (86%)	53 (21%)	194 (79%)
Total	12 (4%)	279 (96%)	18 (12%)	128 (88%)	56 (21%)	208 (79%)

Table 2.31: Distribution of Immunized and Non-immunized children for Polio 3 Antigen by Place of Residence

Place of Residence	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Urban	4 (22%)	14 (78%)	5 (11%)	40 (89%)	5 (29%)	13 (71%)
Rural	21 (8%)	252 (92%)	11 (11%)	90 (89%)	83 (34%)	164 (66%)
Total	25 (9%)	267 (91%)	16 (11%)	130 (89%)	88 (34%)	176 (66%)

Table 2.32: Distribution of Immunized and Non-immunized Children for Measles Antigen by Place of Residence

Place of Residence	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Urban	9 (53%)	8 (47%)	17 (38%)	28 (62%)	6 (38%)	10 (62%)
Rural	98 (36%)	175 (64%)	36 (36%)	64 (64%)	137 (55%)	110 (45%)
Total	107 (37%)	183 (63%)	53 (37%)	90 (63%)	143 (54%)	120 (46%)

Table 2.32 shows the distribution of immunized and non-immunized children by place of residence for measles antigen. Measles coverage as seen from this table is low for both urban and rural areas of Central, Coast and Western provinces, compared to the other previously discussed antigens, namely: BCG, DPT 1-3 and polio 1-3. For example, urban Central had 47%, Coast 62% and Western, 62%. While the rural Central had 64%, Coast, 64%, and 45% for Western province. Western province has again showed the lowest immunization coverage for polio 3 in

the rural areas. Measles as mentioned in the Literature Review, is given at 9 months of age. According to Muller (1984), a Machakos study showed that this antigen could not be administered earlier than 9 months as the maternal antibodies interfered with its effectiveness in the body. Consequently, the revised 1987 KEPI schedule policy is still the guiding factor as to when the antigens should be given. Mothers do forget the clinic dates, while others argue that if the child had survived upto 9 months, then the child would not suffer from measles in life and hence, do not take the child for measles immunization (Measles initiative, 1992).

4.2.5 Current Marital Status of Mother and Immunisation Coverage

Table 2.33: Distribution of Immunized and Non-immunized Children for BCG Antigen by Mother's Marital Status

Marital Status	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Married	1 (2%)	45 (98%)	0 (0%)	7 (100%)	0 (0%)	10 (100%)
Ever Married (include living together)	9 (4%)	218 (96%)	6 (5%)	123 (95%)	17 (7%)	211 (93%)
Total	10 (4%)	263 (96%)	6 (4%)	130 (96%)	17 (7%)	221 (93%)

Table 2.33 shows the distribution of immunized and non-immunized children by mother's marital status for BCG antigen. The marital status under consideration were: children whose mothers are not married (single) and those whose mothers have ever married (divorced, widowed and living together).

BCG coverage was very high for children whose mothers were not married

(could not be explained). For example, Central had 100%, Coast 100% and Western 80%, while for the ever married mothers, Central shows 98%, Coast 97% and Western 93%. The explanation here could be that, single mothers had low parity compared to ever-married mothers. From table 2.33, Central had only 46 children whose mothers were single and were interviewed, while the ever-married mothers who were interviewed had 317 children. Coast had only 7 children whose mothers were single, this could be attributed to the muslim influence (El-Tom 1991). Few muslim women live outside marriage unions (Ocholla-Ayayo 1990). Western province had 10 children whose mothers were interviewed. According to Odhiambo (1991) who carried out a study in Kisii, he found that many girls marry young which was also the case with Western Province. The Kenya Demographic and Health Survey (1989) found that Central province had the highest number of single mothers with high parity (over 4 children per woman).

BCG coverage is generally high in most parts of Kenya, as pointed out in the literature review. In Embu, a study carried out by the ministry of health (1992), showed that over 80% of children who were sampled had either the card to show that they had received the antigen or had the BCG scar.

Table 2.34: Distribution of Immunized and Non-immunized Children for DPT 1 Antigen by Mother's Marital Status

Marital Status	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Married	0 (0%)	46 (100%)	0 (0%)	71 (100%)	1 (10%)	9 (90%)
Ever Married (include living together)	9 (4%)	218 (96%)	6 (5%)	124 (95%)	10 (4%)	236 (96%)
Total	9 (3%)	264 (97%)	6 (3%)	195 (%)	11 (4%)	245 (96%)

Table 2.35: Distribution of Immunized and Non-immunized Children for DPT 2 Antigen by Mother's Marital Status

Marital Status	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Married	3 (6%)	43 (94%)	0 (0%)	7 (100%)	3 (33%)	6 (67%)
Ever Married (include living together)	16 (7%)	211 (93%)	2 (2%)	116 (88%)	41 (17%)	205 (83%)
Total	19 (7%)	254 (93%)	2 (2%)	123 (88%)	44 (17%)	211 (83%)

Tables 2.34, 2.35 and 2.36 show the distribution of immunized and non-immunized children for DPT 1-3 antigen in the three provinces.

Table 2.34 shows a high coverage for both children of single mothers and ever-married mothers but with children of ever-married being fewer. For example, Central province for single mothers children had a coverage of 100%, Coast 100% and Western 90%. The ever-married mothers children, had a coverage of 96%, Coast 95% and Western 96%.

Table 2.36: Distribution of Immunized and Non-immunized Children for DPT 3 Antigen by Mother's Marital Status

Marital Status	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Married	6 (13%)	39 (87%)	1 (14%)	6 (86%)	3 (33%)	6 (67%)
Ever Married (include living together)	34 (15%)	193 (85%)	21 (16%)	108 (84%)	70 (30%)	166 (70%)
Total	40 (15%)	232 (85%)	22 (16%)	114 (84%)	73 (30%)	172 (70%)

Table 2.35 shows that DPT 2's coverage declined especially for Western province which was 67% for children whose mothers were single, while the ever-married was high, but had also dropped from 93% for DPT 1, to 83% for DPT 2.

Table 2.36 showed a remarkable change in the coverage of DPT3. For example, Central province dropped from 94% (DPT 2) to 87% (DPT 3), while Coast dropped from 100% (DPT 2) to 86% (DPT 3). Western's single mothers' children for DPT 2 were 67% while DPT 3 was again 67%. The coverage of children whose mothers' were ever-married was slightly lower than for the single mothers.

A survey carried out by the Ministry of Health (1992) in Embu, showed that in one of the divisions (Runyenjes) the DPT 2 dropped by 2% compared to DPT 1 in the same division which was 91%. DPT 3 dropped in all the divisions by 0.5%; (Runyenjes, Manyatta, Siakago and Gachoka). Some of the reasons that were given for missed DPT antigen was either the card had been misplaced so the mother could not remember whether the child was immunized or not, or the medical personnel

undertaking immunization did not know how to record the successive doses of DPT, and hence could not be easily reflected on the card.

Table 2.37: Distribution of Immunized and Non-immunized Children for Polio 1 Antigen by Mother's Marital Status

Marital Status	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Married	0 (0%)	46 (100%)	0 (0%)	7 (100%)	2 (20%)	8 (80%)
Ever Married (include living together)	5 (2%)	222 (98%)	4 (3%)	125 (97%)	17 (7%)	230 (93%)
Total	5 (2%)	268 (98%)	4 (3%)	132 (97%)	19 (7%)	238 (93%)

Tables 2.37, 2.38 and 2.39 show the distribution of polio 1-3 coverage in the three provinces. Central, Coast and Western Kenya. Polio 1 was well covered among the children whose mothers were single compared to those whose mothers had been ever-married. For example, in Central Province, 100% children had received Polio 1 antigen. While 98% children were recorded as having been immunized. Coast Province also reflected almost a similar pattern. Western Province had slightly lower coverage of immunized children in both groups i.e, single mothers and ever-married mothers. Children whose mothers were single had a coverage of 80% for Polio 1., while the children of the Ever-married mothers had 93%. Elsewhere in the report, it had been indicated that women in western Kenya married early (Ocholla Ayayo, 1990; Muhanda, 1989 and El-Tom, 1991). This may have contributed to the slightly less number of children whose mothers were single during the study. It is expected that married women were more economically secure, hence could afford to

take their children for treatment, including immunization Odhiambo (1991).

Table 2.38: Distribution of Immunized and Non-Immunized Children for Polio 2 Antigen by Mother's Marital Status

Marital Status	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Married	0 (0%)	45 (100%)	0 (0%)	7 (100%)	3 (33%)	6 (67%)
Ever Married (include living together)	11 (5%)	216 (95%)	14 (11%)	115 (89%)	52 (21%)	196 (79%)
Total	11 (4%)	261 (96%)	14 (10%)	122 (90%)	55 (21%)	202 (79%)

Table 2.39: Distribution of Immunized and Non-immunized Children for Polio 3 Antigen by Mother's Marital Status

Marital Status	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Married	2 (4%)	43 (96%)	1 (14%)	6 (86%)	4 (40%)	6 (60%)
Ever Married (include living together)	22 (10%)	204 (90%)	12 (9%)	117 (91%)	84 (34%)	164 (66%)
Total	26 (10%)	247 (90%)	13 (10%)	123 (90%)	88 (34%)	170 (66%)

Table 2.38 shows the distribution of polio 2 antigen. Here, the coverage in Central and Coast was still high. For single and the ever-married mothers, Western Kenya distinctly shows a decline in the coverage of Polio 2. For example, children

of single mothers had 67% coverage, while the children of the ever-married mothers had 79%. Table 2.39 shows the distribution of polio 3 antigen coverage in the three provinces by mothers' marital status. In this table there was a general reduction in the immunization coverage of polio antigen. For example, Central Province had 96% children whose mothers were single and 90% for the ever-married. Coast had 86% and 91%, while Western Province had 60% and 66%, respectively. Coast showed a slightly higher coverage of children whose mothers were married than children of single mothers. The explanation given elsewhere in this report shows that, coast had fewer single mothers than married mothers, mainly because of the cultural and religious following in this region. Western province had the lowest coverage of polio 3. It was not easy for this study to offer detailed explanations that contributed to the low immunization coverage in Western province because of having used secondary data which lacked such details. I would suggest that a comprehensive study be undertaken to highlight causes and solutions for the low immunization in this region.

Table 2.40: Distribution of Immunized and Non-immunized Children for Measles Antigen by Mother's Marital Status

Marital Status	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Married	9 (20%)	35 (80%)	1 (14%)	6 (86%)	75 (24%)	235 (76%)
Ever Married (include living together)	85 (37%)	142 (63%)	47 (37%)	81 (63%)	123 (56%)	96 (44%)
Total	94 (35%)	177 (65%)	48 (35%)	87 (65%)	198 (37%)	331 (63%)

Table 2.40 shows the distribution of measles antigen in the three provinces. Central Province showed a drop in the coverage (80%)children whose mothers were single compared to DPT3 which was 87 and Polio 3 (96%). For Coast and Western, the coverage is still almost the same for this group of children: Coast, (86%) children for single mothers who had received measles and the previous antigens, DPT3 and Polio 3 were 86% and 86% respectively.

Children whose mothers were Ever-married and had received measles antigen reduced drastically compared to DPT3 and Polio 3. Central Province for example, had 63%,Coast 63% and Western 44%. According to the KEPI revised policy schedule (1987), Immunization for DPT3 and Polio 3 are given at 14 weeks (three and a half months) after the baby is born, while measles is given at 9 months. The long time lag between DPT3, Polio 3 and Measles is readily apparent from this schedule. For improved measles coverage, attention needs to be focused on finding better ways than those that are currently being used. For example, writing next appointment date on immunization card (Measles initiative, 1992); or to notify parents three months after the third polio dose that their child needs to return for measles vaccine. The information gathered from the Kisumu, and Siaya districts Harvey (1992), showed that it might also be difficult in these districts at least to obtain high measles coverage even if KEPI policy is changed and measles is given at 6 months, (26 weeks) of age, due to other cultural and socio-economic factors that were beyond the scope of this study.

4.2.6 Current Work Status of the Mother and Immunization Coverage

Table 2.41: Distribution of Immunized and Non-immunized Children for BCG Antigen by Mother's Work Status and BCG Antigen

Work Status of Mother	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Working	10 (4%)	246 (96%)	6 (4%)	130 (96%)	19 (8%)	229 (92%
Working	0 (0%)	32 (100%)	3 (38%)	5 (62%)	0 (0%)	14 (100%)
Total	10 (3%)	278 (97%)	9 (6%)	135 (94%)	19 (7%)	243 (93%)

Table 2.41 shows the distribution of BCG antigen by mothers work status. It is seen clearly from the table (2.41) that, the children whose mothers were not working have a slightly lower immunization coverage compared to those children of working mothers. Coast province had the lowest coverage of children for the working mothers, compared to Central and Western Kenya. Most mothers who originate from the Coast and who are muslims by faith, were not encouraged to go out to work (El-Tom 1991 and Mwangi 1990). Generally mothers who were working and were in the formal sector were likely to be educated and would be in close proximity to health centres (Kibet, 1981; Kiome, 1991 and Muganzi, 1984). These factors would influence the mothers to take their children for treatment and also to receive the immunizations as scheduled.

Table 2.42: Distribution of Immunized and Non-immunized Children by Mother's Work Status: DPT 1 Antigen

Work Status of Mother	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Working	9 (3%)	249 (97%)	5 (4%)	132 (96%)	11 (4%)	235 (96%)
Working	1 (3%)	32 (97%)	4 (50%)	4 (50%)	1 (7%)	13 (93%)
Total	10 (3%)	281 (97%)	9 (6%)	136 (94%)	12 (5%)	248 (95%)

Table 2.43: Distribution of Immunized and Non-immunized Children by Mother's Work Status: DPT 2 Antigen

Work Status of Mother	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Working	18 (7%)	240 (93%)	11 (8%)	126 (92%)	44 (18%)	203 (82%)
Working	1 (3%)	31 (97%)	4 (50%)	4 (50%)	1 (7%)	13 (93%)
Total	19 (7%)	271 (93%)	15 (10%)	130 (90%)	45 (17%)	216 (83%)

Tables 2.42, 2.43 and 2.44 show the distribution of DPT 1-3 antigen among children in three districts for working and non-working mothers.

Table 2.44: Distribution of Immunized and Non-immunized Children by Mother's Work Status: DPT 3 Antigen

Work Status of Mother	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Working	43(16%)	214(84%)	21(15%)	116(85%)	82(33%)	165(67%)
Working	1(3%)	31(97%)	4(50%)	4(50%)	2(14%)	12(86%)
Total	44(15%)	245(85%)	25(17%)	120(83%)	84(32%)	177(67%)

Table 2.42 shows a high coverage of DPT1 for children in both groups of non-working and working mothers, with the exception of Coast Province which had a low coverage of DPT1 among children of working mothers (50%). It is not so clear as to why the coverage in Coast is low, but it could be that, Central and Western have more working mothers both in formal and non-formal sectors compared to Coast. The sample size at the Coast for working mothers could have also been smaller.

DPT2 (table 2.43) shows an expected pattern for Central Province for children of working and non-working mothers. It is higher for working mothers (97%) and slightly lower for children whose mothers are not working, (93%). As general knowledge about immunization may be assumed to be more widespread in white collar families than in casual labourers' families. The same factor could have been responsible for the higher coverage in the urban areas, according to KEPI (1987).

DPT3 antigen coverage for children whose mothers were either working or not working showed a decline with the exception of working of mothers in Central Province who still maintained a high coverage (97%). The children of non-working who had received DPT3 antigen were slightly lower than for the working mothers. The type of work the mother does was to some extent associated with the level of education. The KEPI (1987) found that those children who had received almost or all

the immunization were associated with mothers who had a higher level of education and at the same time were working and living near a health centre, whether in the urban or rural area. The Not-working mothers sometimes dropped out of the immunization schedule due to flimsy reasons such as, "the nurses were too harsh", "the distance to the clinic was too much" or "the child was sick at the time it was due for an immunization"

(Harvey, 1992; Dondi, 1992 and KEPI, 1987).

Table 2.45: Distribution of Immunized and Non-immunized Children by Mother's Work Status: Polio 1 Antigen

Work Status of Mother	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Working	5(2%)	25(98%)	4(3%)	133 (97%)	19 (8%)	228 (92%)
Working	1(3%)	31(97%)	3(38%)	5 (62%)	1 (7%)	13 (93%)
Total	6(2%)	284(98%)	7(5%)	138(95%)	20(8%)	241(92%)

Tables 2.45, 2.46 and 2.47 shows the distribution of Polio 1-3 antigen in the three provinces for children of working and non-working mothers.

Polio 1 antigen (table 2.45) was well covered in children of both groups of working and non-working mothers, with the exception of Coast Province, which showed a slightly lower percent coverage for children of working mothers, (62%), while Central was 97% and Western is 93%. Immunization status was associated with the occupation of head of household, but more so the mother, when she was educated KEPI (1987). Coast Province according to Mwangi (1990), had many non-working mothers due to the traditional practices and low levels of schooling. Knowledge of the value of immunization increases the urge in a mother to take the child for health monitoring and immunization clinic. This was a factor that may not have been well

advanced in most parts of Coast Province, hence low levels of immunization especially for the booster vaccination such as, DPT 3, Polio 3 and Measles.

Table 2.46: Distribution of Immunized and Non-immunized Children by Mother's Work Status and Polio 1 Antigen

Work Status of Mother	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Working	10 (4%)	247 (96%)	13 (10%)	123 (90%)	52 (21%)	194 (89%)
Working	1 (3%)	31 (97%)	4 (50%)	4 (50%)	3 (21%)	11 (89%)
Total	11 (4%)	278 (96%)	17 (12%)	127 (88%)	55 (21%)	205 (89%)

Polio 2 antigen coverage is slightly lower than Polio 1, but with the exception of Central Province again which had a Coverage of 97% for children whose mothers were working, compared to Polio 1 antigen which was 97% for the same group of mothers.

Table 2.47: Distribution of Immunized and Non-immunized Children by Mother's Work Status and Polio 3 Antigen

Work Status of Mother	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Working	24 (9%)	233 (91%)	11 (8%)	126 (92%)	85 (34%)	162 (66%)
Working	1 (3%)	31 (97%)	4 (50%)	4 (50%)	3 (21%)	11 (78%)
Total	25 (9%)	264 (91%)	15 (10%)	130 (90%)	88 (33%)	173 (66%)

Polio 3 antigen, coverage was lowest for Western Province, especially for children whose mothers were not working, (66%) compared to Polio 2 in the same

group that was 89%. According to previous surveys carried out in Western Province, levels of literacy especially among women was low (El-Tom, 1991; KEPI 1987 and 1992). The level of schooling determines the type of occupation and hence, affects level of immunization coverage. Kibet (1991) carried out a comparative study on child mortality differentials in Kenya.

According to his findings, Western Kenya was among the regions with the highest infant mortality, due to various reasons, low education of the mothers being one of them. Elsewhere in this report, the booster doses of vaccines had been low partly due to time lag between the first and the last doses.

Table 2.48: Distribution of Immunized and Non-immunized Children by Mother's Work Status and Measles Antigen

Work Status of Mother	Central Province		Coast Province		Western Province	
	No	Yes	No	Yes	No	Yes
Not Working	104 (40%)	153 (60%)	48 (35%)	88 (65%)	140 (57%)	107 (43%)
Working	3 (9%)	30 (91%)	5 (62%)	3 (38%)	4 (29%)	10 (71%)
Total	107 (37%)	183 (63%)	53 (37%)	91 (63%)	144 (55%)	117 (45%)

Table 2.48 shows the distribution of measles antigen among children of working and non-working mothers, which were 60% and 43% respectively. If these levels are compared with DPT3 and Polio 3, that were Central DPT3 and Polio 3, 84% and 91% respectively. While Western Kenya for DPT3 was 67% and Polio 3 was 66%. Coast province showed a high immunization coverage for children of non-working mothers for all the antigens. This could be partly explained by the fact that, coast women could be educated and not employed due to cultural factors, a practise

that is not common in Western and Central Province. The Coast mothers would therefore take their children to health clinics even if they are not employed in either formal or non-formal sectors.

4.3 DETERMINANTS OF IMMUNIZATION COVERAGE

This analysis sought to determine whether the following variables had any influence on the likelihood of a mother presenting her child for immunization against each of the immunizable diseases. Only the significant variables were present. The significant variables included: Education (i.e None, Primary and Secondary), Age (15-19, 20-24, 25-29, 30-34, 40-44 and 45-49 years), Working status (not working and working), Current Marital Status (not married and ever married). Since these variables are categorical, one category had to assume a dummy variable 0 and this is the reference category, while the other categories took dummy variable 1. For example, the case of education, the reference category was "no education" (none).

The following list gives the names of the variables used in the regression analysis.

Education

None, Primary, Secondary (Sec).

Age

15-19 years (AgeA), 20-24 years (AgeB), 25-29 years (AgeC), 30-34 years (AgeD), 35-39 years (AgeE), 40-44 years (AgeF), and 45-49 years (AgeH).

Working Status

Not Working (No), Working (Yes).

Current Marital Status

Not Married (Single mothers), Ever Married (divorced, widowed and separated).

Only significant variables were presented. The level of significance was 0.05.

4.3.1 Results and Discussion

The analysis generated eight regression equations for each antigen separately.

(a) BCG

The antigen BCG was considered as the dependent variable and a model was consequently generated. The following results were found.

Table 3.1: Determinants of BCG Antigen Coverage

Variable	Coefficient b	Standard Error (S.E)	Significance	R	Exp(b)
SEC	0.7883	0.3544	0.0261	0.0586	2.1997
Constant	3.1907	0.1071	0.0000		

Significance level = 0.05

The results from the table indicate that for a mother who had attained secondary education (Sec), her child was twice as likely to be immunized against BCG (Exp(b)=2.1997) compared to a child whose mother had no education. The variables that were insignificant here were mother's age, marital status and work status.

(b) DPT 1 Antigen

The antigen DPT 1 was considered as the dependent variable and the following results were found.

Table 3.2: Determinants of DPT1 Antigen Coverage

Variable	Coefficient b	Standard Error (S.E)	Signi-ficance	R	Exp(b)
AgeD	-0.588	0.2111	0.0058	-0.076	0.5589
Yes	-0.7607	0.2818	0.0069	-0.0735	2.1997
Constant	3.3212	0.1160	0.0000		

Significance level = 0.05

The results presented in the table indicate that for children whose mothers were aged 30-34 years, they were unlikely to be immunized (exp(b)=0.5589) compared to those children whose mothers were aged 15-19 years. The same result was found for mothers who were working (exp(b)=0.4673). There is a possibility that mothers aged 30-34 years and the working mothers were under-represented in the sample thus the unexpected. The education of the mother and her marital status were insignificant in this regression for DPT 1.

(c) **DPT 2 Antigen**

The antigen DPT 2 was considered as the dependent variable and the results are represented in the table below.

Table 3.3 Determinants of DPT 2 Antigen Coverage

Variable	Coefficient b	Standard Error (S.E)	Signi-ficance	R	Exp(b)
AgeD	-0.6200	0.1433	0.0000	-0.0948	0.5379
Primary	0.4281	0.1423	0.0026	0.0616	1.5343
Sec	0.3878	0.1956	0.0474	0.0322	1.4738
Constant	1.9919	0.1244	0.0000		

Significance level = 0.05

The results for DPT 2 antigen can be explained as follows: Children whose mothers were in age group 30-34 years (AgeD), appeared to be less likely to be immunized compared to those who were aged 15-19 years by 46%, (exp(b)-0.5379). These results were also unexpected but it could have been due to under-representation of the mothers in this age group in the sample.

For the same antigen, DPT 2, mothers whose children had primary school education were 1.5 times more likely to receive the antigen than those children whose mothers had no education. Children whose mothers had secondary education (SEC) were also 1.5 times more likely to receive the antigen compared to those whose mothers have no education. It appears that there was no significant difference between children whose mothers had primary education and those with secondary education. The rest of the variables were not significant at level 0.05. In this regression, it is only the current work status which was insignificant.

(d) DPT 3 Antigen

DPT 3 was considered as the dependent variable and the following results were obtained.

Table 3.4: Determinants of DPT 3 Antigen Coverage

Variable	Coefficient b	Standard Error (S.E)	Signi-ficance	R	Exp(b)
AgeD	-0.3885	0.1178	0.0010	-0.0575	0.6780
Constant	1.549	0.0551	0.0000		

Significance level = 0.05

Almost all variables were not significant with respect to DPT 3 except for children whose mothers were aged 30-34 years (AgeD). The results indicate that for this children they were less likely to receive the antigen by 32%.

Table 3.5: Determinants of Polio 1 Antigen Coverage

Variable	Coefficient b	Standard Error (S.E)	Signi-ficance	R	Exp(b)
Married	-1.39	0.680	0.0410	-0.0503	0.2491
Primary	0.477	0.2048	0.0198	0.0063	1.6115
Constant	4.364	0.6817	0.0000		

Significance level = 0.05

The results from the table indicate that those children whose mothers had primary education were 1.6 times more likely to receive the polio antigen than those whose mothers had primary education (Exp(b)=1.6115). For children whose mothers were married, they were 75% less likely to receive the antigen compared to those whose mothers were not married. This result was also surprising. The variables that were insignificant were age of mother, and her current working status.

Table 3.6: Determinants of Polio 2 Antigen Coverage

Variable	Coefficient b	Standard Error (S.E)	Signi-ficance	R	Exp(b)
Married	-0.7965	0.3337	0.0170	-0.0466	0.4509
AgeD	-0.7206	0.1467	0.0000	-0.114	4.4865
Constant	3.2114	0.3265	0.0000		

Significance level = 0.05

The results indicate that those children whose mothers were married were less likely to receive polio 2 vaccination by 55% compared to those whose mothers were not married. At the same time, those children whose mothers were aged 30-34 years (AgeD) were less likely to receive polio 2 vaccine by 52%. These results were also unexpected and the reason may be due to the representation of the respective mothers. The variables that were insignificant were the education of the mother and her current work status.

Table 3.7: Determinants of Polio 3 Antigen Coverage

Variable	Coefficient b	Standard Error (S.E)	Signi-ficance	R	Exp(b)
AgeD	-0.3856	0.1254	0.0021	-0.0549	0.6800
AgeF	0.5904	0.2845	0.0380	0.0305	1.8048
Primary	0.4425	0.1190	0.0020	0.0691	1.5565
Sec	0.6933	0.1712	0.0001	0.0763	2.0004
Constant	1.3269	0.1060	0.0000		

Significance level = 0.05

The results of polio 3 as a dependent variable indicate that a child whose mother was aged 35-39 years (AgeF) was 1.8 times more likely to be immunized against polio 3 than a child whose mother was 15-19 years (Exp(b)=1.8048). For children whose mothers had attained only primary level of education, they were 1.5 times more likely to receive the polio 3 vaccine compared to those whose mothers had no education. On the other hand, for children whose mothers had secondary school education, they were twice as likely to receive the polio 3 vaccine compared to those whose mothers had no education, (Exp(b)=2.0004). For this regression the working status of the mother was insignificant.

(e) **Measles Antigen**

The regression results for measles which was considered as dependent variable is presented in the table below.

Table 3.8: Determinants of Measles Antigen Coverage

Variable	Coefficient (b)	Standard Error (S.E)	Signi-ficance	R	Exp(b)
AgeC	0.2024	0.0941	0.0315	0.0271	1.2244
AgeE	0.3533	0.1260	0.0050	0.0405	1.4238
AgeF	0.6510	0.2032	0.0014	0.0481	1.9174
AgeH	0.8514	0.4070	0.0364	0.0258	2.3429
Primary	0.5828	0.0980	0.0000	0.0966	1.7911
Sec	0.6091	0.1307	0.0000	0.0743	1.8388
Constant	0.0565	0.0928	0.5426		

Significance level = 0.05

It is seen from the table that a child whose mother was 25-29 years (AgeC) was 1.2 times more likely to be immunized than that whose mother was aged 15-19 years, (Exp(b)=1.2244). A child whose mother was aged 35-39 (AgeE) years was 1.4 times more likely to be immunized against measles than that child whose mother was 15-19 years, (Exp(b)=1.4288). A child whose mother was 40-44 (AgeF) years was 1.9 times more likely to be immunized (Exp(b)1.9174). The one whose mother was 44-49 (AgeH) years is 2.3 times more likely to be immunized, (Exp(b)=2.3429). There is an indication that as the age of the mother increases, she was more likely to present her child for measles vaccination. Children whose mothers had primary education were 1.72 times more likely to receive the measles vaccine (Exp(b)=1.7911), while those whose mothers had attained secondary education were 1.8 times more likely to receive measles vaccine than those whose mothers have no education, (Exp(b)=1.8388). The mothers' marital status and current work status were insignificant in this regression.

4.3.2 Summary

From the foregoing discussions, education of the mother was the only determinant variable that significantly influenced higher levels of immunization, for all the antigens that were studied. The age, work, religion and type of place of mothers residence did not seem to influence immunization. These factors cannot be dismissed altogether, because the sample size of mothers considered in this study at times was too small to give out conclusive results.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This study set out to achieve the following objectives. The first objective was to find out the levels of immunization for the following antigens, BCG; DPT 1, 2 and 3; Polio 1, 2 and 3; and Measles. The second objective was to find out the levels of immunization for each antigen by mothers education. The third objective was to find out the levels of immunization for each antigen by age of the mother. The fourth objective was to find out the levels of immunization for each antigen by the religion of the mother. The fifth objective was to find out the levels of immunization for each antigen by type of place of residence of the mother while the sixth objective was to find out the immunization levels by mothers current marital status and finally the immunization levels by mothers current work status.

This chapter attempts to show how these objectives have been achieved by first of all presenting the summary of the major findings with reference to the hypotheses in chapter one, and secondly, by showing how these findings have an impact on the levels of immunization for the different antigens. Finally recommendations have been made for policy makers in areas that need more attention and further research arising from the study.

5.1 SUMMARY OF FINDINGS

The following variables were significant in the regression model; education, age, current working status and the marital status of the mother. Those variables that were insignificant in the model were the religion and the type of place of residence of the mother.

According to the BCG regression, only secondary education of the mother significantly influenced the level of immunization, (exp(b) = 2.1997). A child whose mother had attained secondary education was twice likely to be immunized against tuberculosis, compared to a child whose mother had no education. The DPT1 regression showed that age 30-34 of the mother negatively influenced DPT1 immunization. Mother aged 30-34 years were unlikely to have their children immunized (exp(b) = 0.5589) compared to those children whose mothers were aged 15-19 years. The same regression showed that working mothers were less likely to have their children immunized (exp(b) 0.4673) compared to the mothers who were not working. These results were not expected.

The regression model run for DPT2 showed that age 30-34 , primary and secondary education of the mother were significant in influencing immunization levels in children, children whose mothers primary education were 1.5 times more likely to receive the DPT 2 antigen than those children whose mothers had no education. While at the same time children whose mothers had secondary education were 1.5 times more likely to receive DPT2 antigen compared to those children whose mothers had no education. DPT 3 antigen showed that age 30-34 was significant but negatively, which was also unexpected.

The regression models run for Polio 1,2 and 3 showed that education of the mother both at primary and secondary levels had a great influence on the immunization of a child. children whose mothers had primary education were 1.6 times likely to be immunized compared to children whose mothers had no education, while children whose mothers had secondary education were twice likely to be vaccinated compared to children whose mothers had education. Polio 1,2 and 3 antigen regression analysis also showed that the marital status was significant. Children whose mothers were not

married were more likely to be vaccinated [exp[b] 0.4509] compared to married mothers. This result was not expected.

The measles regression model showed that primary and secondary education were the only variables that were significant in positively influencing the level of measles immunization. Children whose mothers had primary education were 1.7 times more likely to receive the measles vaccine, while those whose mothers had attained secondary education were 1.8 times more likely to receive measles vaccine than those whose mothers had no education.

Children whose mothers had higher education were associated with increased immunization, and this was seen in the cross-tabulations as hypothesized.

The age of the mother was hypothesized as influencing immunization. The cross-tabulations showed that children of younger mothers (20-24 years) had more children immunized than children of older mothers (40-44 years) as it had been hypothesized.

Religion was hypothesized as having an influence on immunization. The cross tabulations reflected that there was little difference between catholic and protestant children who had been immunized. The coast province had more moslem children who had been immunized.

Cross-tabulations showed that children whose mothers were working had received most of the immunisations compared to children whose mothers were not working. This might be due to compounding effect of education since a significant proportion of working mothers are most likely to have received some education.

The urban and rural immunization levels did not show much difference in cross-tabulations. Yet, it had been hypothesized that more urban children were

expected to be immunized than rural children. But the BCG antigen was significantly higher in urban areas of the study compared to the rural areas.

Children of mothers who were married showed a higher level of immunization compared to children of non-married children, as it had been hypothesized.

5.2 CONCLUSIONS

From the foregoing discussion, the researcher found that, not all the significant variables confirmed stated hypotheses. For example, the regression for age of mother did not confirm the hypothesis, that more children born of younger mothers (20-29 years) were likely to be vaccinated than children of older mothers, (40-44 years). This could have been attributed to sample size of children whose mothers were interviewed. The sample was small.

Religion was not significant in the regression model, hence it was not considered.

Children of working mothers were associated with higher levels of immunization, but this was rejected by the regression model. Mothers who were not working had more children immunized than the working mothers. Again, this could be due to the small number of women who were sampled in the study.

The ever-married women had their children associated highly with immunization. This was not the case in this study. The regression analysis showed that children of single mothers had higher levels of immunization compared to children of married mothers. The sample size again of mothers could have been too small to give out the expected results.

Finally, education was the only variable that was highly associated with a wider immunization coverage of all antigens. It was confirmed by both cross-

tabulations and the regression model.

5.3 RECOMMENDATIONS

5.3.1 Policy Formulation

1. Education campaigns on the value of immunization should be intensified by the government through the Ministry of Health and the other related institutions. This is to be aimed at increasing awareness about immunization and its advantages.
2. More immunizing units should be set up in both urban and rural areas, including the mobile clinics, where setting up of permanent facilities is difficult.
3. There should be increased in-service training of the paramedical staff who man the immunization centres. It was observed that health workers did not stress the need for immunization, especially where repeated boosters were required.
4. Immunization schedule for all the required antigens namely: BCG, DPT 1 to 3, Polio 1 to 3, and measles should be made universal in the country. This can be enhanced by displaying an immunization poster/chart on the notice board of each immunizing centre. It is a quick way of educating the mothers on the antigens that are received and those that are yet to be given.
5. Immunization cards should be always available at the immunization centres for proper documentation of antigens received and those that are not yet received for a quick follow-up. Information received from the literature review indicated that there was shortage of cards or writing materials that prevented children from receiving the immunization at the right age.
6. More research should be carried out to establish vaccines which can be stored under room temperature and not entirely in cold chains. This would enable

the vaccines to be potent and therefore available in most dispensaries around the country.

7. More research projects should be undertaken by both government and non-governmental organizations in the areas where immunization levels are very low and solutions found on how to raise these levels.

5.3.2 Further Research

8. Vaccinations with fewer side effects should be developed to encourage mothers to take their children for immunization. For example, BCG antigen causes a raised papule at the injection site, which gradually heals leaving a scar. Fever is also experienced when DPT antigen is given.

9. More research should be done on vaccines that do not require repeated doses. Information available showed that BCG was well covered since it was given only once, and at the beginning of the new life, compared to DPT and polio antigens that showed a decline in coverage especially for the second and third doses. Mothers tended to forget, while others did not see the need for the repeated boosters.

10. Measles vaccine is given too late in life when many children have already suffered from the diseases. Dondi(1992) in South Nyanza interviewed mothers who were discouraged over the measles vaccine, arguing that they had already sought alternative treatment, hence did not see the need for measles vaccination. In the three study areas, measles was the most poorly covered, therefore more research should be carried out on this diseases.

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APPENDIX

QUESTIONNAIRE ON CHILD HEALTH (IMMUNIZATION).

This is an extract of questions related to the study from the main questionnaire.

NATIONAL COUNCIL OF POPULATION AND DEVELOPMENT MINISTRY OF HOME AFFAIRS AND NATIONAL HERITAGE. KENYA DEMOGRAPHIC AND HEALTH SURVEY. WOMAN'S QUESTIONNAIRE. (FOR WOMEN AGED 15-49 WHO SLEPT THERE LAST NIGHT).

PROVINCE _____

DISTRICT _____

LOCATION _____

SUB-LOCATION/WARD _____

CLUSTER NUMBER _____

STRUCTURE NUMBER _____

URBAN/RURAL (URBAN=1, RURAL=2)

_____

NAME OF HOUSEHOLD HEAD

_____

LINE NUMBER OF WOMAN

_____

1. TYPE OF PLACE OF RESIDENCE:

104: For most of the time until you were 12 years old, did you live in the countryside, in Nairobi or Mombasa, or in another town?

COUNTRYSIDE _____ 1
NAIROBI/MOMBASA _____ 2
OTHER TOWN _____ 3

105: How long have been living continuously in (Name of sub-location, Town, City)?

ALWAYS _____ 95}107
VISITOR _____ 96}
YEARS _____

106: Just before you moved here, did you live in the countryside, in Nairobi or Mombasa, or in another town?

COUNTRYSIDE _____ 1
NAIROBI/MOMBASA _____ 2
OTHER TOWN _____ 3

2. AGE OF MOTHER:

107: It is important to know your exact age. In what month and year were you born?

MONTH _____ 98
YEAR _____ 98

108: How old were you at your last birthday?

AGE IN COMPLETE YEARS _____

3. EDUCATION LEVEL OF MOTHER:

109: Have you ever attended school?

YES _____ 1}112A
NO _____ 2}

110: What was the highest level of school you attended: Primary, Secondary, higher or University?

PRIMARY _____ 1
SECONDARY _____ 2
HIGHER _____ 3
UNIVERSITY _____ 4
OTHER _____ 5

111: What was the highest (standard, form, year) you completed at that level?

STANDARD/FORM/YEAR _____

112: Interviewer: Check 110

PRIMARY _____}114
SECONDARY OR ABOVE _____}

112A: Have you ever attended an adult literacy class?

YES _____ 1
NO _____ 2

113: Can you read a letter or newspaper in any language, easily, with difficulty, or not at all?

EASILY _____ 1
WITH DIFFICULTY _____ 2
NOT AT ALL _____ 3

4. RELIGION OF MOTHER:

130: What is your religion?

CATHOLIC _____ 1
PROTESTANT/OTHER CHRISTIAN _____ 2
MUSLIM _____ 3
OTHER (SPECIFY) _____ 4
NO RELIGION _____ 5

5. IMMUNIZATION ANTIGENS GIVEN TO CHILD

419: ENTER THE NAME, LINE NUMBER, AND SURVIVAL STATUS OF EACH BIRTH SINCE JANUARY 1983 BELOW: BEGIN WITH THE LAST BIRTH.

LAST BIRTH
NAME _____
ALIVE _____ DEAD _____

NEXT-TO-LAST BIRTH
NAME _____
ALIVE _____ DEAD _____

SECOND FROM LAST
NAME _____
ALIVE _____ DEAD _____

420: Do you have a child health card for (NAME). If YES: May I see it please?

YES, SEEN _____
YES, NOT SEEN _____
NO CARD _____

(This information should be recorded against the name of each child according to line number as in question 419).

421: RECORD IMMUNIZATION DATES FROM CHILD HEALTH CARD.

	NOT GIVEN	DAY	MONTH	YEAR
BCG	1			
DPT1	1			
DPT2	1			
DPT3	1			
POLIO 1	1			
POLIO 2	1			
POLIO 3	1			
POLIO 4	1			
MEASLES	1			

422: Has (NAME) ever had a vaccination to prevent him/her from getting diseases?

YES_____ 1
NO_____ 2

6. CURRENT MARITAL STATUS.

501: Have you ever been married or lived with a man?
YES_____}519
NO_____}

502: Are you now married or living with a man, or are you widowed or not now living together?
MARRIED_____ 1}507
LIVING TOGETHER_____ 2}
WIDOWED_____ 3}
DIVORCED_____ 4}
NOT NOW LIVING TOGETHER_____ 5}

503: Does your husband/partner live with you or is he now staying elsewhere?
LIVING WITH HER_____ 1
STAYING ELSEWHERE_____ 2

508: In what month and year did you start living with your (first) husband or partner?
MONTH_____ YEAR_____

509: How old were you when you started living with him?
AGE_____

7. CURRENT WORK STATUS OF MOTHER:

714: Since you were first married have you ever worked regularly to earn money other than on a farm or in a business run by your family?
YES_____ 1=717
NO_____ 2=718

715: Have you ever worked regularly to earn money, other than on a farm or in business run by your family?
YES_____ 1
No_____ 2=718

717: Are you now working to earn money other than on a farm or in a business run by your family?
YES_____ 1
NO_____ 2

8. INTERVIEWER'S OBSERVATIONS:

(To be filled in after completing interview).

PERSON INTERVIEWED:_____
_____
SPECIFIC QUESTIONS:_____
_____
OTHER ASPECTS:_____
NAME OF INTERVIEWER:_____ DATE:_____

SUPERVISOR'S OBSERVATIONS:

_____
NAME OF SUPERVISOR:_____ DATE:_____

EDITOR'S OBSERVATION:

_____
NAME OF FIELD EDITOR:_____ DATE:_____
NAME OF KEYER:_____ DATE:_____