EVALUATION OF CHILDHOOD IMMUNIZATION COVERAGE IN JASIKAN DISTRICT

RAPHAEL NTUMY

A DISSERTATION SUBMITTED TO THE

SCHOOL OF PUBLIC HEATLH, UNIVERSITY OF GHANA

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE

OF MASTER IN PUBLIC HEALTH 1995

TABLE OF CONTENTS

DEDICATION

This work is dedicated to the children of Jasikan District.

DECLARATION

I, Raphael Ntumy do hereby declare that except for the duly acknowledged citations and ideas, this work contains a true account of a study personally conducted in the Jasikan District of the Volta Region. I do declare also that this work has not been published in any form elsewhere.

Student;.............................
Raphael Ntumy

Academic Supervisors

....
Dr. Phyllis Antwi

....
Dr. R.B. Biritwum

ACKNOWLEDGEMENTS

My thanks are due to the health staff of Jasikan District for their assistance in my field work.

My major debt of thanks is to my lecturers in general who opened up a new field in my mind about the tripod of observations, calculations and inferences.

Lastly, I am very grateful to my Field Supervisor Dr. T. Letsa and my Academic Supervisors; Dr. R.B. Biritwum and Dr. Phyllis Antwi for their unending supervision.

LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BCG	Bacillus Calmette-Guerin vaccine
DHMT	District Health Management Team
DPT	Diphtheria/Pertusis/Tetanus vaccine
EPI	Expanded Programme on Immunization
GAG	Global Advisory Group
GDHS	Ghana Demographic and Health Survey
HIV	Human Immune Deficiency Virus
JSS	Junior Secondary School
LQAS	Lot Quality Assurance Sampling
MCH	Maternal and Child Health
MOH	Ministry of Health
OPV	Oral Poliomyelitis vaccine
PHC	Primary Health Care
RTH	Road to Health card
SSS	Senior Secondary School
TB	Tuberculosis
TT	Tetanus Toxoid vaccine
UN	United Nations
UNICEF	United Nations Children's Fund
WHO	World Health Organization

LIST OF TABLES

ABSTRACT

This is a study of the evaluation of the Expanded Programme on Immunization Coverage in the Jasikan District of the Volta Region of Ghana between October and December, 1995 with particular attention to childhood immunization coverage. This was a cross-sectional study using the WHO 30-7 cluster sampling method. The sample population were 219 children aged 12-23 months and their mothers. The primary objective of the study was to assess the childhood immunization coverage in the Jasikan District.

In the study population 48.4 per cent of the children were fully immunized, 49.3 per cent partially and 2.3 per cent non immunized. The individual valid vaccine coverage was 83.1 per cent for BCG, 75 per cent for DPT3, 75.8 per cent for OPV3 and 67.1 per cent for measles.

The drop out rate for DPT1-DPT3 was 8.2 per cent whilst that of BCG-measles was 18.3 per cent . Of the 182 children who had BCG recorded on their Road to Health cards, 4.4 per cent did not have the BCG scars.

The completion of immunization schedules by one year among the 219 children was positively associated ($P<0.005$) with mothers' parity being less than five children and mothers' ability to mention at least two of the vaccine-preventable diseases. Formal education and place of delivery however, did not show any association with the completion of childhood immunization by one year.

The recommendations given include:

to issue Road to Health card to all children at birth in both government and private health facilities.

- ensure that BCG is administered to the newly born before discharging them from health facilities.
- intensification of home visits to trace defaulters so as to reduce drop-out rates.
- intensification of EPI health education at all places of contact and not necessarily only at child welfare clinics.

CHAPTER ONE:INTRODUCTION

1.1 BACKGROUND INFORMATION

1.1.1 Global History of Expanded Programme on Immunization (EPI)

The Expanded Programme on Immunization (EPI) was established by the World Health Assembly (WHA) of the World Health Organization (WHO) in May 1974. The programme had its origin in the recommendation of the WHA that member states develop or maintain immunization and surveillance programme against measles, poliomyelitis, tuberculosis, diphtheria, pertussis and tetanus. In furtherance of this recommendation, a special funding was established to support EPI and a Global Advisory Group (GAG) was convened involving experts in immunization and disease control (Sebastian 1979). Subsequently, WHA decided to merge EPI with Smallpox Eradication Programme which was nearing completion, and to use the expertise of this highly successful programme (Henderson 1987). In 1974 when the EPI began, vaccination coverage of all children in the developing world for immunisable diseases was estimated at less than 5 per cent for all vaccines other than smallpox and perhaps BCG (Population Information Programme 1986).

After the WHA resolution, the WHO, and its 168 members, United Nations Children's Fund (UNICEF) and other United Nations (UN) agencies assumed responsibility for EPI. EPI thus became a long-term programme to provide ever increasing immunization coverage and to reduce the morbidity and mortality of the six immunisable diseases in children.

The goal of providing immunization for all children of the world was approved by the WHA in 1977, and the following long term objectives were set:

1. To reduce morbidity and mortality from six major diseases, tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus and measles by immunizing all children before their first birthday
2. To promote national self-reliance in vaccine production.
3. To promote national self reliance in delivering immunization services.

In 1989 the WHO and UNICEF (WHO 1989) revisited the initial objectives and revised the goals of the EPI as follows:

1. Elimination of neonatal tetanus by the year 1995.
2. Reduction of measles death by 95 per cent and cases by 90 per cent by the year 1995.
3. Eradication of poliomyelitis worldwide by the year 2000.
4. Achieving and sustaining at least 90 per cent immunization coverage by the year 2000.

1.1.2 History of EPI in Ghana

Ghana has a fairly long history of immunization. Vaccination agaisnt smallpox started from the middle of the 19th century, when the first native vaccinator was appointed in Cape Coast in 1852. Smallpox vaccination was intensified during the 1920s and later culminating in the WHO/USAID supported smallpox/measles campaign from 1967 to 1969 as part of the World Eradication Programme of Smallpox. Immunization against specific childhood diseases were started in the 1950s using DPT and BCG vaccines as they became available and later polio and measles vaccines were added in the 1960s (UNICEF Ghana 1984).

However, the present sustained interest and expansion of immunization programmes are traceable to the first preparatory workshop on EPI held in Kumasi in 1974. Ghana was chosen as a site for field trials by WHO/EPI programme from 1976 to 1979, with the collaboration of the Swedish International Development Agency (S.I.D.A). Thus, Ghana officially launched the EPI in 1978 with the objective of fully immunizing 80 per cent of its children aged 0 - 11 months by 1983. This was reviewed in 1983 and in 1989 a new target of 80 per cent coverage by 1990 was set.

1.1.3 Control of Immunization Programme

In planning any immunization in the population, the efficacy of the vaccine, the uptake necessary to contain or eradicate the infection, the most effective system of delivery, surveillance and the cost benefits must be considered.

Control strategies aimed to reduce the incidence of infections to such a level that it is no longer a public health problem. The proportion of the community requiring vaccination to control the spread of an immunisable disease depends very critically on the contagiousness of the infection. The more contagious the diseases, the higher the levels of immunity needed in the population to control it. Compared to other control programmes, eradication programmes demand greater effort and cost but once eradication has been achieved, costs are eliminated because immunization is no longer necessary. Eradication of a disease has to be planned on a global basis because of the risks involved in importation of cases.

1.1.4 The immunisable diseases and their vaccines

Tuberculosis: This is a mycobacterial disease caused by the *Mycobacterium tuberculosis* primarily from humans, and *Mycobacterium bovis* primarily from cattle. The organism was isolated by Koch in 1882.

It is a major cause of deaths among young children and adults alike. The initial infection usually goes unnoticed, with tuberculin sensitivity appearing within a few weeks. This may progress directly to pulmonary tuberculosis or spread to other parts of the body. The disease may also spread by the lymphatic route and produce pulmonary, miliary, meningeal or other extrapulmonary disease in children. A serious outcome of the initial infection is more frequent in infants, adolescents and young adults particularly among malnourished or undernourished persons.

Transmission is usually by exposure to bacilli in airborne droplets from the sputum of persons with infectious tuberculosis. The subsequent risk of progressive pulmonary or extrapulmonary tuberculosis is greatest within a year or two after infection, but may persist for a lifetime as a latent infection. Cases are infectious for as long as the infectious tubercule bacilli are being discharged in the sputum. Cases that are untreated or inadequately treated remain sputum-positive for years. Extrapulmonary tuberculosis is generally not communicable. Where the disease is not controlled in cattle, infection with the bovine tubercule bacilli may occur as a result of drinking raw milk from infected cows.

It is estimated that by the year 2000 the global incidence of tuberculosis would be 3.5 per 100,000 population. Currently it is estimated that there are 11 million cases of tuberculosis reported each year and that about 3 million people will die of it (WHO 1994).

Tuberculosis vaccine, Bacillus Calmette-Guerin (BCG) was first developed by Calmette and Guerin to boost the immune status of individuals. BCG vaccination given at or soon after birth seems to be a cheap and safe way of preventing TB infection in particular tuberculous meningitis.

As shown by tuberculin sensitivity, BCG alerts T-lymphocytes, sensitises the body against invasion by mycobacterium and in prospective trials have been shown to reduce the chance of those vaccinated from being infected. It is now known that infants infected with mycobacterium have a 10 per cen trisk of developing TB (Benenson 1990).

In countries like the United Kingdom in which the incidence of infection was falling, there have been questions as to the effectiveness of BCG (Hart and Sutherland 1977). Similar concern was shown in the reports from India on long term outcome trials of BCG and its cost effectiveness (Tuberculosis Prevention Trials 1980). Yet Curtis et al. 1984 have shown that BCG is still able to prevent the disease within moderate risk populations.

Human immunodeficiency virus (HIV) infection poses a major threat to TB contacts because impairment of the immune system entails a substantial risk of developing TB (Styblo 1990). BCG vaccines consist of live attenuated strain of mycobacterium bovis and will pose additional risk to children with HIV Infection.

Diphtheria: *Corynebacterium diphtheriae* is the causative agent of diphtheria. The bacillus affects only humans and lives in the upper respiratory tract, but can also be found in other parts of the body. Diphtheria is transmitted by contact, aerosol droplets, formites and sometimes by milk. It is a disease of the upper respiratory tract in which a grayish membrane and inflammation of the larynx causes obstruction and asphyxia. Infants die from airways obstruction which causes acute respiratory failure. This complication accounts for 50 per cent mortality amongst all cases of infant diphtheria. The case fatality rate is 5 to 25 per cent .

Diphtheria toxoid is generally administered in combination with tetanus toxoid, or additionally with pertussis vaccination as DPT. First dose antitoxin titres are low and fall rapidly below protective levels. Two doses produce 90 - 100 per cent protection to the vaccinated individual while the third dose extends the immunity to one year (Orenstein et al. 1983).

Pertussis: *Bordetella pertussis* is the causative agent for pertussis infection commonly known as whooping cough. Man is the only host.

Transmission is by droplet spread from the respiratory tract of infected perons. Communicability is greatest during the early catarrhal stage becoming negligible in about three weeks after the onset of the paroxysmal stage.

Onset begins with an irritating cough which becomes paroxysmal. This progresses to repeated violent cough (whoop or paroxysmal cough). This ends with the expulsion of clear, tenacious mucus often followed by vomiting. Infants less than 6 months and adults do not have the classical whoop. Diagnosis is based on the recovery of the etiological organism from nasopharyngeal swab. Results from direct fixation agglution provide rapid presumptive diagnosis. High white blood cells with increased lymphocytes are found in the whooping stages. However, diagnosis is usually dependent on clinical features as the current tests are non-specific. Culture is the most specific method but is slow and time consuming (Ororato and Wassilak 1987).

Whooping cough is less common in the industrialized countries. However, in the developing world the disease is still a great problem. The attack rate has been estimated to be more than 90 per cent in susceptible populations (Beneson 1990). Immunization with DPT starting at 6 weeks in the most cost effective immunization strategy with optional immunity reached after the third dose. The interval between the doses is four weeks.

Tetanus: This is an acute neurological disease caused by the toxin of tetanus bacilli known as *clostridium tetanus*. It is found world-wide but is more common in agricultural regions. It is epidemiologically important to distinguish neonatal tetanus in infants under 28 days from all other age groups. Untreated neonatal tetanus may have a nearly 100 per cent fatality rate. With appropriate specialized care, the case fatality may be reduced to less than 50 per cent .

Neonatal tetanus results from contamination of the infants umbilical stump at the time of cutting the cord using unsterile equipment or during dressing of the stump after delivery (Stanfield and Galazka 1984). Neonatal tetanus is characterized by a new born who sucks and cries well for the first few days after birth and subsequently develops progressive difficulty and inability to breastfeed, because of trismus, generalized stiffness with spasm and or convulsion. It is estimated that the case fatality rate is 80 per cent (Kim-Farley et al. 1988 and Benenson 1990).

Schofield et al. (1992) demonstrated that 2 doses of TT administered to mothers at least 6 weeks apart during pregnancy has 95 per cent efficacy transplacental transfer of maternal antibody.

Poliomyelitis: Poliomyelitis is an acute viral infection caused by three antigenic types of poliovirus (I,II and III) which infects and is transmitted by human beings only. The polio viruses are transient inhabitants of human alimentary tract, and may be isolated from the throat of patients just before onset of signs and symptons to a week after onset or from the lower intestine just before onset to several weeks after the onset. In warm countries, under insanitary conditions and low socio-economic conditions, up to 90 per cent children may show serological evidence of infection in early years.

In 1993, 109,000 cases polio were reported by developing countries compared to 140,000 reported in 1992, (WHO and UNICEF 1995). The widespread use of vaccine has virtually eliminated polio from developed nations. In Ghana, polio is on the downward trend.

There are two polio vaccines in use, a live virus taken orally (OPV) and an inactivated virus that is injected (IPV). In Ghana the OPV is what is being used. Infants are to receive at least three doses at minimum intervals of four weeks within the first nine months of age.

The occurrence of paralytic poliomyelitis from OPV has been of concern. However paralytic complications only occur once for every three million doses distributed whilst paralysis occurs 1,000 times more frequently following natural infection (Esteves 1988, Halsey and Steler 1983).

Measles: Measles is a highly communicable viral disease. The genus morbillivirus of the family paramyxoviridiae is responsible for the disease in young children (Chen and Lam 1985).

The clinical manifestation commences with a prodromal fever, conjunctivitis, coryza, cough and koplik spots on the buccal mucosa. The rash appear on the seventh day and later becomes generalized. Diagnosis is made on clinical and epidemiological grounds, confirmed by the presence of measles specific immunoglobulin M (Igm) antibodies or a significant rise in antibody concentrations between convalescent sera.

Humans are the principal host and in urban settings measles is often endemic throughout the year. Vaccine currently used are the attenuated live measles virus vaccine. These vaccines are reliable and relatively heat stable. Serological studies have revealed that this vaccine induced seroconversion in 95 per cent to 98 per cent of recipients who were old enough to have lost all maternal antibodies (Job et al. 1988). In Ghana, the measles vaccine is given at nine months. However, vaccination at 6 months must be repeated at 9 months for complete protection for young children. This vaccine is considered safe with little or no side effects. To attain the goal of reducing measles mortality by 90 per cent , WHO has recommended that all districts achieve above 90 per cent immunization coverage (WHO/EPI 1991).

1.1.5 Techniques of vaccine administration

The WHO recommends routes of administration for each vaccine in order to avoid unnecessary local or systematic effects and to ensure optional efficacy. BCG is given intradermally, whereas DPT and measles are given intramuscularly and subcutaneously respectively and polio orally. Vaccine and antisera should be administered in an area where there is minimal opportunity for local, neural, vascular or tissue injury (WHO 1990)

Contraindications

While complications from EPI vaccines do occur, it is important that both health workers and parents understand that vaccine complications are far less frequent than complications caused by the disease themselves. Immunization is frequently postponed if children are ill or malnourished but these are the very children who most need vaccination (Galazka et al. 1984). Generally there are no major complications, however the following specific contraindications need to be observed.

Contraindication to BCG vaccination: According to WHO, BCG vaccine should not be given to a child with clinical AIDS (WHO/EPI 1991).

Contraindications to polio vaccine: The general contraindications to live vaccines apply to oral polio vaccine and should be observed. These are:

1. Febrile patients
2. Patients receiving corticosteroid or immunosuppressive treatment including radiation
3. Patients suffering from malignant conditions like leukaemia, lymphoma and Hodgkin's disease.

Contraindications to DPT vaccines: Any major reaction following DPT is likely to be due to the pertussis component, and further monovalent pertussis vaccine is contraindicated. Major reactions may include:

1. Fever above 40.5^0c
2. Convulsions - (uncommon)
3. Hypotonic/hyporesponsive episode (uncommon)
4. Shock, anaphylaxis, thrombocytopenia and encephalopathy (all extemly rare)
5. Severe local reactions.

The second and third dose of DPT vaccine should not be given to a child who has had severe reaction to previous dose, especially if the reaction was a convulsion or shock within three days of injection (WHO EPI 1991).

Contraindications to measles vaccine: According to WHO vaccination should be avoided in:

1. Patients suffering from febrile illness.
2. Patients receiving treatment by corticosteroids or immunosupressives including

radiation.

3. Patients suffering from malignant conditions such as Hodgkin's disease, leukaemia or other tumours of the reticulo-endothelial system.

1.1.6 Study location

This study was conducted in the Jasikan District, located in the northern part of the Volta Region. It is bounded by the Togo-Ghana mountain ranges to the east, Kpandu and Hohoe Districts to the south, Kadjebi District to the north and the Volta Lake to the west (Fig 1).

The topography of the district is generally undulating becoming almost flat in the Western area. An important characteristic of the district is the manmade lake which extends from the north to the south of the western boarder.

The population of the District is estimated to be 115,000 projected from the 1984 population census. The population of children under one year in the district is 4619, under five years 23096 and women in fertile age 23096 (Jaskikan District Health Administration 1995).

The district capital is Jasikan town with a population of 74000 and is about 120 km from the regional capital of Ho. The major ethnic groups in the district are the Buem, Bowiri, Tapa, Akan and Nkonya (Fig 2). There are also migrant fishing communities along the Volta Lake who are mostly Ewe.

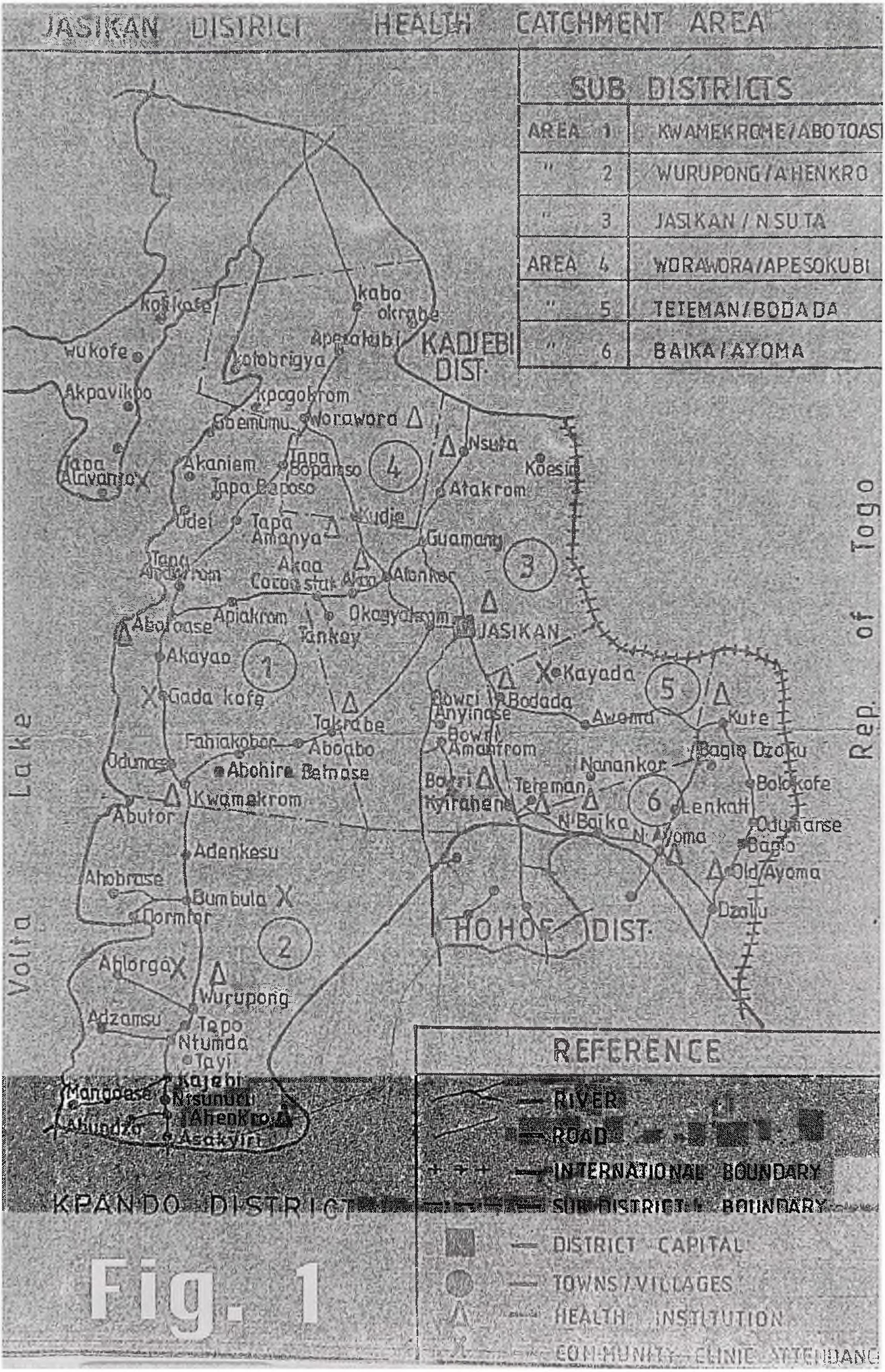
JASIKAN DISTRICT HEALTH CATCHMENT AREA
SUB DISTRICTS
AREA 1 KWAMEKROME/ABOTOASE
" 2 WURUPONG/AHENKRO
" 3 JASIKAN/NSUTA
AREA 4 WORAWORA/APESOKUBI
" 5 TETEMAN/BODADA
" 6 BAIKA/AYOMA
KADJEBI DIST
HOHOE DIST
KPANDO DISTRICT
Volta Lake
Rep. of Togo
JASIKAN
Worawora
Nsuta
Kute
Wurupong
Kwamekrom
Abotoase
Teteman
Bodada
REFERENCE
RIVER
ROAD
INTERNATIONAL BOUNDARY
SUB DISTRICT BOUNDARY
DISTRICT CAPITAL
TOWNS/VILLAGES
HEALTH INSTITUTION
COMMUNITY CLINIC ATTENDANC

Fig. 1

MAJOR ETHNIC GROUPS

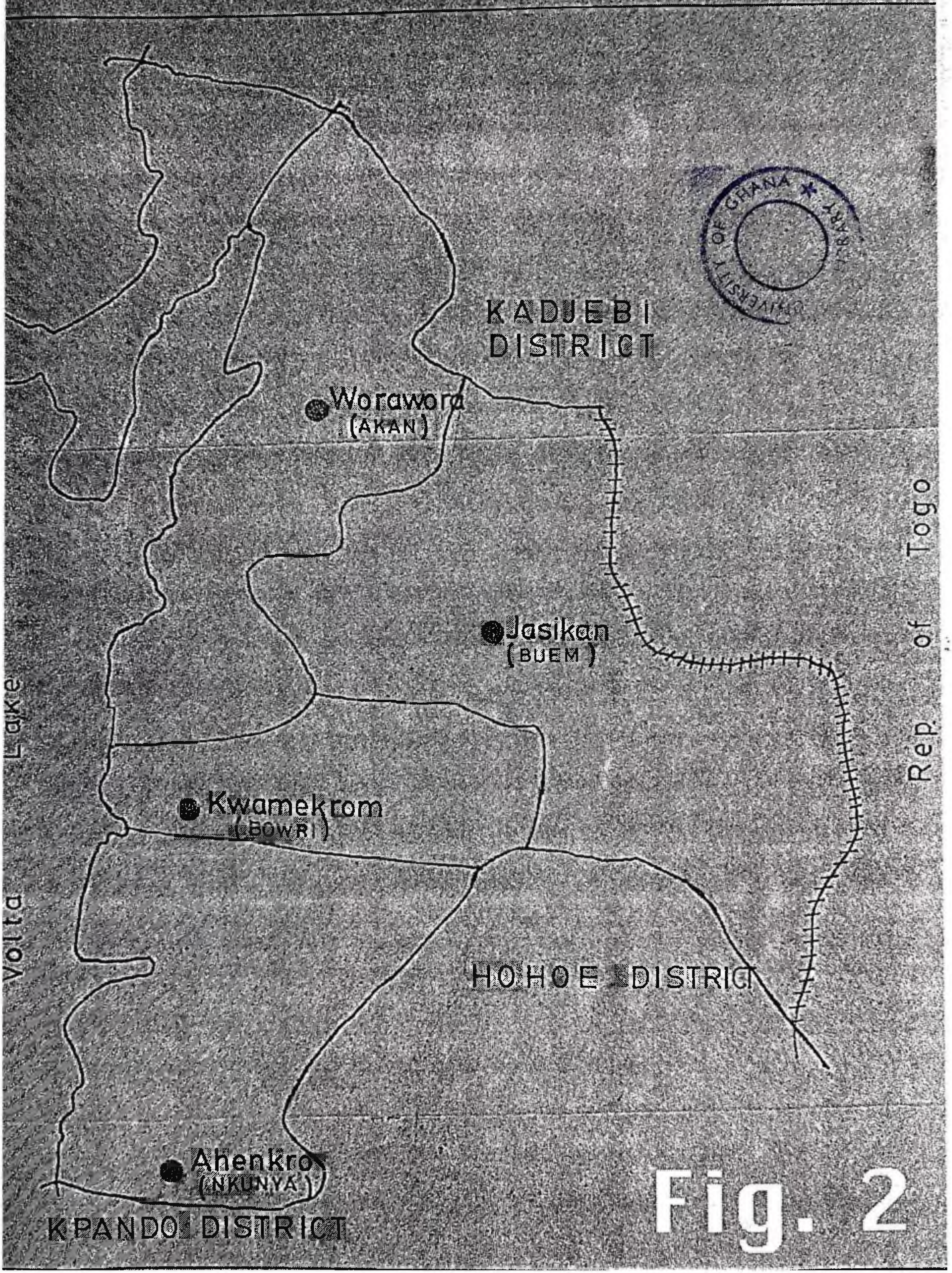

Fig. 2

Almost all the roads in the district are feeder type and are usually unmotorable during the raining season. There are therefore, a lot of areas which are inaccessible during the raining season. Electricity supply is available to about 50 per cent of the district. Jasikan District has the following health facilities:

1. A 120 bed hospital at Worawora which is owned by the Presbyterian Church.
2. An eighteen-bed private hospital in Jasikan.
3. Five health centres located in Jasikan, Bodada, Baika, New Ayoma and Nkonya Wuropong.
4. Five health posts located at Abotoase, Nsuta, Tetema, Old Ayoma and Kute.
5. Seventeen MCH static clinics.
6. About 85 outreach clinics.
7. Five private maternity homes.

The MCH static and the outreach clinics provide immunization services to children and pregnant women.

1.2 PROBLEM STATEMENT

The Jasikan District like any other district in the Volta Region of Ghana, has followed a steady immunization programme that is considered to be consistent with the National Accelerated EPI launched in 1985, with the view of reducing morbidity and mortality due to the six immunizable diseases. Annual reports have shown remarkable coverage over the period, but there exists pockets of persistent low EPI coverage. Despite the high level of effort devoted to the programme, the Jasikan District had an immunization coverage of 53 per cent for DPT3 in 1994 as estimated from routine data. The district has set a target of 80 per cent coverage by the year 2000. To validate the current coverage from routine data, as well as identify any weaknesses, a coverage survey is necessary.

Rationale for Study: As part of the Master of Public Health Programme, students are to spend some time in the districts which will provide the opportunity to apply some of the skills obtained on the course. Apart from providing an opportunity to learn and understand the health system in the district, it is also to help the district in solving some of its problems. Jasikan District is one of the field stations of the School of Public Health and I was sent there for my field experience. This study is therefore to assist the Jasikan District to evaluate the immunization coverage in the district.

1.3 OBJECTIVES OF THE STUDY

In this study my aim is to asses the childhood immunzation coverage of the Jasikan District. This will be done by undertaking the following specific objectives.

SPECIFIC OBJECTIVES

1. To determine the percentage of children aged 12 23 months vaccinated with BCG, DPT, OPV and measles vaccines.
2. To determine the percentage of children aged 12 - 23 months fully immunized by one year of age.
3. To determine the percentage of mothers or care takers of children who possess Road to Health (RTH) card.

4. To determine the drop-out rates for the vaccines.
5. To identify reasons for immunization failure in children.
6. To identify any factors that may influence immunization coverage amongst the population.
7. To make recommendations for the service implementation.

1.4 DEFINITION OF CONCEPTS

EVALUATION: Like most concepts in public health, evaluation presents numerous problems of definition. That is there are several ways in which a framework for thinking about evaluation may be constructed. However, if evaluative exercises are to be successful and truly to inform mangerial decision making, it is vital that some framework be agreed by both the doers and recipients of evaluation.

The term 'evaluate' has in general usage been defined as 'ascertain the amount of; find numerical expression for'. In another context it is extended to mean "the critical assessment, on as objective basis as possible, of the degree to which entire services or their component parts fulfil stated goals". The two definitions will be of use in this study. Primarily, determining immunization coverage is finding a numerical expression. Secondly, the reference to goals or targets will mean comparison with some standard. Evaluation has a very broad scope and has many levels; from inputs fed into processes which in turn produce outputs and ultimately outcome. Time and resources are the factors which will allow anyone to undertake all or some of these levels of evaluation.

EPI evaluation in general follows these levels and ranges from assessing the cold chain adequacy, morbidity and mortality of the vaccine-preventable diseases, disease outbreaks, human and material inputs and finally immunization coverage.

COVERAGE: Health service coverage is considered as a concept expressing the extent of interaction between the service and the people for whom it is intended. This concept gives coverage a very comprehensive view. The number of people for whom the service can be provided expresses the service capacity and indicates the potential of the service. On the other hand, the number of people who have received the service expresses the services output and indicates the actual performance of the service. Coverage may therefore be defined as *potential coverage* if it is related to service capacity and that related to service output as *actual coverage* (Tanahashi, 1978). Immunization coverage is an actual coverage and the measures is a *contact coverage*; that is, the ratio between the number of children within the age group who have had contact with a service and the size of the target population.

IMMUNITY: Immunity is the state of resistance of the body to agents foreign to it. Immunity may be natural, actively acquired or passively acquired. An immunized child therefore has been protected and no longer susceptible to the disease.

VACCINATION: This is the administering of a substance (vaccine) of any origin capable of eliciting a protective response.

CHAPTER TWO: LITERATURE REVIEW

2.1 IMMUNIZATION COVERAGE

Childhood immunization has become one of the greatest discoveries in medicine. The aim of vaccination may be for containment, elimination or eradication of a disease. Several factors influence the choice of any of the above. The immunization coverage then becomes a determining factor for monitoring the progress towards the level of containment, elimination or eradication. Therefore assessing immunization coverage can rapidly identify major trends in the programme of an area.

Immunization coverage can be estimated from both routine data and surveys. Estimation of immunization coverage from routine data of vaccinations is quick and cheap, however there are several potential problems that should be considered at each level;

> Target population estimates may be inaccurate and will distort the denominator of the calculation.
>
> The age categories given in routine reports of vaccination may be incorrect.

Different coverage methods have been used in different places to assess programme progress more accurately. The cluster sampling survey is the most commonly used method of coverage evaluation.

The World Health Organization introduced this sampling method for estimation of immunization coverage. The design is a type of cluster sampling in which 30 clusters are identified and 7 children of the required age are selected from each cluster (Henderson and Sundaresan 1982;

WHO/EPI 1991). This method is simple, relatively inexpensive and allows estimation of immunization coverage with a precision of $\pm$10per centwith confidence level of 95 per cent (Lemeshow and Robinson 1985). Despite the relative simplicity and low cost of this method, some researchers have critized the design. According to Lanata et al. (1990) the design cannot provide current information on small population units such as small health areas. Kok (1986) argues that the design was based on the assumption of the presence of geographically more distinct villages and therefore not applicable to places where population are dispersed such as is common in East Africa. In addition Kok reported that the design could lead to selection bias in selecting the first household particularly in big heterogenous villages. Kok therefore suggested that a modified random sampling method for dispersed populations be used. The basis of this sampling method is the assumption that the Standard One primary school child is the most randomly and proportionally distributed registered sampling unit in the community. Therefore 30 Standard One children are randomly selected out of the total Standard One school population and this becomes the 30 starting points in a given area. The limitation of this method is that, the sampling method is dependant on the school and schooling level of the community.

The latest method which has been used for estimating immunization coverage is the Lot Quality Assurance Sampling (LQAS) method. This method originated from industrial quality control methods where it is used to assess whether lots of newly manufactured items should or should not be accepted for shipment. For each lot, this determination is made by sampling a certain number of items. If the number of defective items exceed a certain threshold, then the lot is rejected. It is important to note that the LQAS cannot be used to calculate precise percentage immunization coverage, it only allows a broad estimation of coverage which can be classified as "acceptable" or "not acceptable". In January 1994, the national public health authorities in

Burkina Faso in collaboration with WHO conducted a field survey in Bobo Dioulasso to evaluate immunization coverage for children 12 -23 months of age using the LQAS method rather than the 30 - cluster survey method. Out of 11 zones, 4 were said to be not "not acceptable" and were targeted for supervisory intervention (WHO 1995). In 1992 the LQAS method was also used to look for potential pockets of low coverage in Maputo, Mozambique (Cutts et al. 1992, Lemeshow and Stroth 1988).

The LQAS method therefore is best suited for judging the quality of coverage within an area covered by specific health centre or vaccination site. In the case of my study, since the whole Jasikan District is being evaluated, therefore the 30 - 7 cluster sampling technique would be more applicable.

High immunization coverage rates in African cities, reaching 83 per cent in Harare, Zimbabwe in 1988 (Kambarani et al. 1991), have failed to prevent epidemic outbreaks of measles due to delayed immunization in pockets of unimmunized children in urban slums (Cutts 1991, Unicef 1990). This confirms the fact that in estimating immunization coverage, the time of the vaccination must be noted and taken into consideration. Immunization coverage may not necessarily be higher in urban areas as has been thought of. In a cluster survey undertaken in both rural and urban areas of Mozambique (Cutts et al. 1981) 53 per cent of the children between 12 - 23 months were fully immunized in urban areas. By contrast, 60 per cent of the children in rural areas were fully immunized. In another study using 25 urban clusters and 29 rural clusters in Iran, Nasseri et al. (1990) reported that a total of 55 per cent of the children (12-23 months) had complete immunization. Of these 43.5 per cent were urban while 54.7 per cent were rural.

In Ghana, determining immunization coverage using the 30 - 7 cluster sampling technique has shown an improvement in the level of coverage over the past 3 years (Table 2.1).

Table 2.1 National Immunization Coverage for Children 0 - 11 months 1992 - 1994.

Year	BCG	DPT3	OPV3	MEASLES
1992	61%	40%	39%	43%
1993	68%	48%	47%	50%
1994	70%	50%	50%	54%

Source MOH/EPI 1994

According to the results of the Ghana Demographic and Health Survey (GDHS) 1993, the percentage of fully immunized children during the first year of life was 55 per cent and 53 per cent for Ghana and Volta Region respectively (GDSHS 1993). (Table 2.2)

Table 2.2 Vaccination by the first year of life. Children 12-23 months: 1993

Vaccine	Percentage
BCG	80.8%
DPT1	79.1%
DPT2	69.3%
DPT3	57.3%
Polio 1	78.9%
Polio 2	68.6%
Polio 3	57.1%
Measles	50.6%
All vaccinations	42.9%
No vaccination	17.5%

Source: GDHS 1993

Estimation of immunization coverage in the Jasikan District has always been based on routine data (Table 2.3). The use of the cluster sampling method has never been used to estimate immunization coverage in the district.

Table 2.3 Immunization Coverage, Jasikan District 1993/94 (Routine Data)

ANTIGENS	1993	1994
BCG	63%	53%
OPV3	48%	53%
DPT3	51%	53%
MEASLES	55%	64%

Source: Jasikan District Health Administration 1994 Annual Report

Observations in a number of developing countries identified some anomalies in returns of immunization coverage. Schofield (1992) reported that under pressure from regional authorities for regular annual returns on coverage, some mobile teams periodically falsified vaccination registers and individual cards. This results in misclassification. Hence, children who have not completed their third doses of DPT and Polio would be labelled as fully immunized and be deprived of full vaccination protection. The effect of this type of error is an overestimation of coverage. High expectations for coverage may also act as a disincentive for staff to identify unvaccinated cases through outreach. Apart from deliberate errors in recording, genuine errors in recording could also result in misclassification, therefore immunization coverage survey is necessary to correct this type of errors.

2.1.2 Factors influencing immunization coverage

Studies in immunization coverage have highlighted the fact that, immunization coverage depends on the interaction of many factors. These factors include the characteristics of the health system; its accessibility, costs, organization and attitude of health workers and the characteristics of the target population including individual behavioural, socio-economic, ethnic and demographic factors (Heggenhougen and Clements 1990, Fried et al. 1985).

Knowledge: In Thailand Luksamijarvlkul and Wong-arsa (1989) found that lack of mothers' knowledge about vaccines is an inhibiting factor for acceptance of immunization. In an intervention study undertaken in Thailand, Limtragool et al. (1992) found that immunization coverage varies with the level of knowledge that the health workers and the mothers have about infectious diseases and immunization. The intervention areas had health workers who have been retrained intensively for one week. Three years later when the impact of the intervention was evaluated, it was found that the proportion of mothers in the intervention areas with high level of knowledge about infectious diseases had risen from 1 per cent to 8 per cent . In contrast, there was virtually no change in the control villages. Similarly, the proportion of health workers in the intervention, villages with high level of knowledge about infectious diseases increased from 3 per cent to 72 per cent . The control areas had a decline of 2 per cent . Increase in knowledge was accompanied by an increase in the proportion of children under one year, who were fully immunized from 65 per cent to 89 per cent in the study area.

Accessibility and frequency at vaccination centres: Eng et al. (1991) found in focus group discussions with mothers in Togo, that another contribution to partial immunization was inaccessibility of the clinics during the rainy season. In a survey in Inhambane, Mozambique, Cutt et al. (1990) reported that children whose nearest health centre provided vaccination once per week had a relative risk of 8.5 for incomplete vaccination compared with children whose nearest health centre vaccinated more than three times per week.

Mothers' perception, attitude and beliefs: Mothers' decision to attend vaccination clinics, or to comply with immunization programmes was found to be determined by their previous knowledge of post-vaccination complications, such as abscesses. Consequently, mothers become apprehensive and failed to complete further vaccine doses (Cutts et. al. 1989).

Beliefs and attitudes have been shown to be culturally determined. Onuaha (1981) claimed that belief in the efficacy of traditional medicine, as well as adherence to culturally specific explanations of disease aetiology, treatment and prevention may inhibit the use of western medicine including immunization. Furthermore, ethnic minorities have cultural beliefs which restrict their access to health services or acceptance of immunization. Such groups are considered likely to form large pockets of susceptible groups who require special attention (WHO 1992).

Other factors: Socio-economic status is frequently identified as a potent determinant of immunization acceptability and coverage. Although Pahman (1982) found little socio-economic difference between high and low acceptors of vaccinations, Stratfield et al. (1989) reported that low educational level of mothers is associated with low acceptability. It is however debatable whether a mother's education *per se* is a determinant or whether it reflects a complex of socio-economic factors.

Akesode (1982) in a study of 120 Nigeria children attending a health centre, noticed that those fully immunized were children of younger mothers, better educated, and with small family sizes. The importance of traditional authority in influencing immunization coverage was highlighted by Henderson et al. (1973) and Singaribun et al. (1986). They showed that in societies where the central authority is strong the task of motivating the community is much easier. In a recent study conducted in the Eastern Region of Ghana (Brugha and Kevany 1995) the area of residence and the place of delivery were found to influence immunization coverage. They found out that the completion of immunization schedules by one year among 294 children was positively associated ($p<0.005$) with the town of residence of the child and mother.

Few studies have used multiple data collection techniques to validate information obtained from records and questionnaire. This study aims at evaluating the EPI coverage using both quantitative and qualitative methods in order to identify the factors which may be responsible for the current situation in order to improve immunization coverage in Jasikan District.

CHAPTER THREE: METHODOLOGY

3.1 STUDY POPULATION

The study population were children between the ages of 12-23 months and their mothers in the Jasikan District.

3.2 STUDY DESIGN

The research was a community based cross-sectional study which combined both qualitative and quantitative methods. Information about coverage are best obtained from quantitative methods, whiles the information for reason for immunization failure and factors affecting coverage can be obtained from qualitative techniques.

3.3 SAMPLING

The 30 cluster sampling method was used for the survey. The procedure for selecting the villages or towns to be sampled is as below:

1. From the available census data, which was conducted with the assistance of UNICEF in 1992, a list of all the villages and towns in the Jasikan District was constructed.
2. The cumulative population of each town and village was calculated and a final cumulative population of 82,287 was obtained.
3. Since 30 clusters were required, a sampling interval was obtained as follows.

$$\text{Sampling Interval} = \frac{\text{Total Population}}{30} = \frac{82287}{30} = 2742.9 \; \underline{(2743)}$$

4. A random number was selected from calculator which was less than or equal to the sampling interval, but has the same number of digits as the sampling interval. This number was 1421.

5. Apesokubi was selected as the first cluster since its cumulative population of 2536 encompasses the number 1421.

6. The additional 29 clusters were selected by adding the sampling interval (2743) 29 times to the starting point number selected as the random number. ie

   cluster 1 = 1421

   cluster 2 = 1421 + 2743 = 4164

   cluster 3 = 4164 + 2743 = 6910

   etc. (Appendix A)

3.4 DATA COLLECTION

Data collection techniques used were interviewing using structured questionnaires, focus group discussions and observations using a check list.

3.4.1 Focus Group Discussion

In this study two focus group discussions were held with mothers to find out more about their knowledge, attitude and beliefs towards immunization. The discussions were focused by the following questions.

- What do you think causes childhood diseases?
- What do you think protects children against diseases?
- What are the manifestations of childhood diseases?

- Have you heard about any side effects of immunization?
- Have you heard about mothers who fail to bring their children for immunization and if so what reason do they have?
- Did you find any problems with the nurses when you brought your children for immunization?

Two discussions each lasting about 45 minutes, were conducted in Jasikan and Abotoase. The mothers were recruited with the help of the assmeblyman in Abotoase and the Public Health Nurse in Jasikan Health Centre. An environmental technical officer was trained as a focus group recorder to assist me conduct the discussions.

In Jasikan, six mothers with at least one child under five years and not more than 25 years were selected. On the other hand, in Abotoase the six mothers were older women of between 30 and 40 years with at least one child under five years. The composition of the two groups was aimed at getting different perspectives on the subject of discussion as well as facilitate free discussion among each group. In each case, the participants were informed one day in advance and told that we shall be discussing issues about children. In Jasikan, the focus group discussion was conducted in a classroom at the Roman Catholic Primary School. This location was chosen because it was quiet and the school was on holidays. In Abotoase, the focus group discussion was conducted in the compound of the Assemblyman which was equally quiet. The discussions were conducted in Ewe in Jasikan and Twi in Abotoase.

3.4.2 Coverage Survey

The data on EPI coverage and knowledge, attitude and practices were collected by a simple matrix format questionnaire based on the WHO/EPI cluster sampling method (WHO/EPI 1991) to evaluate coverage and reasons for immunization failure (Appendix B, C1, C2). Research assistants were recruited to fascilitate data collection during the survey. In all 8 assistants were recruited consisting of 2 Advanced Level National Service personnel, 2 from the National Commission for Civic Education and 4 public health nurses. The assistants were trained for 5 days during which time team members responsibilities were discussed, the data collection instrumentes were reviewed in detail, role playing took place, translations into Twi and Ewe occurred and practice interviews were conducted. A final pretesting was conducted at Guaman (a village which is not part of the selected clusters) after which the questionnaire was reviewed.

The field work began with familiarization visits to some of the towns and villages within the districts. In each cluster, the Assemblyman or chief was consulted and told the reason for the survey and then permission was sought.

The first house to be visited in each cluster was selected randomly. This was done by selecting a central location in the village or town and balloting for the direction and the first house. The team moved from the first house to the next-nearest household and this was done until a minimum of seven children within the age group of 12 23 months were identified. In each household selected the mother was interviewed and child's Road to Health (RTH) card was checked for immunization record. The RTH card is a Ministry of Health folded card issued to newly born babies with the following informations in it:

- date and place of birth

- birth weight
- mother's name
- father's name
- date of registration
- date of immunization for: BCG, DPT, OPV and measles
- child's health and weight records over five years
- history of illnesses and remarks

In order to validate whether a child had received BCG vaccination, the right upper arm was checked for a BCG scar.

3.4.3 Observation

Apart from the interviews and observations made during the survey in the selected clusters, additional observations were made at health centres using an observation checklist. Health personnel at the health centres were not given prior notice about the observation. Some of the observations were performed unobtrusively to avoid the Hawthorne effect; people changing their behaviour when they know they are being watched.

The following immunization activities were observed:

- Opening hours of clinics
- Atendance
- Relationship between mothers and health workers
- Techniques used for administration of vaccines
- Education of mothers about such issues as the vaccine given, any adverse effects and the next appointment.

3.4.4 Survey data entry, storage and analysis.

In the field, data collected at the end of every interview was checked for completeness and accuracy. Similarly, at the end of each day data collected were re-checked for completeness, accuracy and consistency. Preliminary analysis was performed to make early identification of errors and also to prevent accumulation and recurrence of errors. Finally, the data were stored in EPI INFO ENTER PROGRAMME (Appendix E).

At the end of the survey data collection, the 219 records entered were edited using EPI INFO ANALYSIS PROGRAMME. Frequency distributions were carried out on all the variables to check for inconsistency. Anomalies detected were identified from the records and edited using update commands.

3.4.5 Potential sources of bias

The main areas of bias in the study are selection and interviewer bias.

Sampling bias was reduced by the use of the EPI/WHO 30-7 cluster sampling technique. However the method of selecting households was biased in favour of selecting household located near the centre of the villages or towns. This bias was however reduced by the fact that most of the sampled villages or towns were small and almost all the households were surveyed.

Since the interviews were conducted in Twi and Ewe, the potential for interviewer bias was eminent. This was however, minimized by the provision of standard words for each disease in Twi and Ewe.

3.4.6 Limitations of study

The survey was dependent on mothers and their children being present at home. In some cases the survey had to be rescheduled in some clusters because mothers and their children had gone to either market or farm. Also the sampling framework was based on only the listed villages or towns. There could be smaller and less distinct villages which were not listed and as such not included in the study. Time and resources were very limited for the study. The period of two months was not enough to go into details and probe more into all possible factors responsible for immunization uptake in the district.

CHAPTER FOUR: RESULTS

4.1 COVERAGE SURVEY

4.1.1 CHARACTERISTICS OF MOTHERS AND CHILDREN

A total of 219 mothers and their children were surveyed in 30 clusters of 26 towns in the Jasikan District. The clusters and the number of children is shown below; (Table 4.1). The differentials in the number of children in each area, is due to the fact that if an eighth child is present in a household he or she is included in the survey.

Table 4.1: Clusters and number of children surveyed

AREA	NO. OF CHILDREN
ABOTOASE	7
AHENKRO	7
AKAA	7
AMANYA	7
APESOKUBI	7
ATONKO	7
BAGLO	7
BODADA (2 clusters)	16
BOWIRI AMANFROM	7
BUMBULA	8
DZOLU	8
JASIKAN (2 clusters)	15
KABOSU	7
KUTE	7
KWAMEKROM (2 clusters)	15
NEW AYOMA	7
NEW BAIKA	8

NKONYA WURUPONG	7
NTSUMURU	7
NTUMDA	7
OKADJAKROM	8
OLD AYOMA	8
OLD BAIKA	7
TEPO	7
TETEMA	7
WORAWORA (2 clusters)	14
TOTAL	219

At the time of the interview 202 (92.2%) of the 219 children had their Road To Health (RTH) card available, while 17(7.8%) did not (Table 4.2). Any mother that did not possess the RTH card at the time of the survey was classified as 'no card' no matter the condition surrounding the non-avalaibility of the card. The date of birth was on all the RTH cards. The mean age of the sample population was 16.9 months. The sex distribution was 91(41.6%) males and 128(58.4%) females.

Table 4.2 RTH Card Possession

Possess RTH card	**Number**	**Percentage**
Yes	202	92.2%
No	17	7.8%
Total	219	100%

Table 4.3 Age and Sex Distribution of Children Survey

Age (months)	Number Male	Female	Total
12	11	7	18
13	7	6	13
14	10	13	23
15	7	9	16
16	3	11	14
17	9	14	23
18	6	13	19
19	8	12	20
20	5	11	16
21	9	9	18
22	7	8	15
23	11	6	17
Total	91	128	219
Percentage	41.6%	58.4%	100%

Table 4.4 Place of birth of children

Place of Birth	Number	Percentage
Hosp/Health Centre	103	47%
Home	105	48%
Private Maternity	11	5%
Total	219	100%

4.1.2 Place of birth of children

Of all the children surveyed, 105 (48%) were delivered at home while 103 (47%) were delivered in either a hospital or a health centre. Those delivered in private maternity homes were 11(5%).

(Table 4.4). As regards children delivered at home questions were not asked about whether or not were delivered by traditional birth attendants (TABs). The study was more particular about delivery at a health facility with nurses or without nurses.

4.1.3 Educational level of mothers

The educational level of mothers was catergorised into three groups. The first group was those without any formal education 27(12.3%). The second group was those with formal education up to Junior Secondary School (JSS) or Middle School (Form 4) 176 (80.4%). The third group was those with Senior Secondary School (SSS) and above 16(7.3%). (Table 4.5). Information on the formal education level of the mothers was to find out its association wih immunization status of the children.

Table 4.5 Educational Level of mothers

Educational	Number	Percentages
No formal Education	27	12.3%
Up to JSS	176	80.4%
SSS and above	16	7.3%
Total	219	100%

4.1.4 Immunization status

Immunization coverage is categorized into fully immunized, partially immunized and non immunized child. In this study a fully immunized child is defined as one who by the time of the study, had received three doses each of OPV and DPT, one dose of measles and one dose of

BCG. A partially immunized child is one who has started immunization but failed to complete the subsequent doses. A non immunized child is one who has not received any vaccine (WHO/EPI 1991). The absence of BCG scar, the time interval between birth and the subsequent doses of DPT/OPV do not affect "fully immunized status" but are considered under valid immunizations".

The immunization status of the children was therefore determined by the mothers history, validated by the RTH card or by the presence of a scar in the case of BCG. A total of 214 (97.7%) have even been immunized of which 165 (75.7%) were fully immunized while 49 (22%) were partially immunized and 5 (2.3%) were not immunized.

Table 4.6: Immunization status of children

Immunization Status	Number	Percentage
Fully Immunized	165	75.7%
Partially immunized	49	22.0%
Non Immunized	5	2.3%

4.1.5 Immunization coverage for individual vaccines

The immunization coverage for individual vaccines is the total number of children who have received a dose of that vaccine before 23 months in the study population. In the case of BCG, the coverage was determined by records of BCG received and those without cards but had scars. There were 174 records with documented BCG vaccination, and 8 without cards but with BCG scars. The BCG coverage was therefore 182 doses. The highest individual vaccine coverage was

BCG with 182 (85.4%) with DPT1 193 (88.1%). The lowest coverage was measles 160(73.1%). There were 175 (79.9%) children fully immunized for DPT3 and OPV3 (Table 4.7).

Table 4.7: Individual Vaccine Coverage

Vaccine	No. of Children	Percentage
BCG	182	85.4%
DPT1	193	88.1%
DPT2	186	84.9%
DPT3	175	79.9%
OPV1	192	87.7%
OPV2	185	84.5%
OPV3	175	79.9%
MEASLES	160	73.1%

4.1.6 Valid immunization

Estimation of valid immunizations status of children took into account the time intervals between OPV and DPT doses and the age at which measles vaccine were given.

High circulating levels of maternal antibodies in the children have the potential to interfere with DPT seroconversion if given less than 6 weeks from birth. Doses of DPT given earlier than 6 weeks are therefore considered invalid. A second or third DPT or OPV immunization given less than 28 days after the preceeding immunization is invalid. Valid BCG immunization was ascertained as follows:

1. recorded on RTH card and a visible scar is present
2. reported by the mother and a visible scar is present
3. reported on a RTH card but no scar is visible.

This is because the coverage survey is trying to determine how successful the immunization service have been at reaching people, rather than monitoring immunological response to BCG vaccine (WHO/EPI 1991).

Table 4.8: **Valid, invalid and total immunization status of children aged 12-23 months in Jasikan District**

Vaccine	Total Immunization	Invalid Immunization	Valid Immunization
BCG	182 (83.1%)		182 (83.1%)
DPT1	193 (88.1%)	18 (8.2%)	175 (79.9%)
DPT2	186 (84.9%)	14 (6.4%)	172 (78.5%)
DPT3	175 (79.9%)	9 (4.1%)	166 (75.8%)
OPV1	192 (87.7%)	18 (8.2%)	174 (79.5%)
OPV2	185 (84.5%)	9 (4.1%)	176 (80.4%)
OPV3	175 (79.9%)	9 (4.1%)	166 (75.8%)
MEASLES	160 (73.1%)	13 (5.9%)	147 (67.1%)

There were 182 (83.1%) valid BCG vaccinations of which 11 had no RTH card but had BCG scars present and confirmed by mothers history and therefore were classified as valid. There were 8 children who had BCG recorded on their RTH Card but showed no BCG scar.

There were 13 (4.6%) out of 160 measles vaccination given at less than 9 months, only 3 out of those who had received their vaccination before 9 months had been given follow up dose at the age of 9 months.

The overall valid immunization coverage by one year is 48.4 per cent . This shows that a high proportion of children were not protected against EPI diseases by the age of one year.

4.1.7 Dropout rate

The dropout rate is the percentage of children who have started their vaccination but failed to receive subsequent doses. This is often linked to BCG as the first vaccination given at birth. In this study it was found that out of 182 (85.4%) children who had BCG recorded on their RTH card, only 147 (67.1%) had their measles vaccination by one year. That is 18.3 per cent of the children dropped out from BCG to measles. The dropout rate from DPT1 to DPT3 is 8.2 per cent .

4.1.8 Non immunized children

There were a total of 5 (2.3%) non immunized children. Their ages were between 12.8 months and 20.3 months. None of the mothers had received formal education. Two of the mothers said the place of immunization was too far. Only one mother said she was unaware of the need for immunizing her child

and the other two said they had family problems and no money respectively.

4.1.9 Place of immunization

A total of 147 (67.1%) of all the immunizations were administered at health centres or health posts, 37 (6.9%) at the outreach centres and 35 (7.8%) at the hospital. Fifty five percent of all the children delivered in health centres or hospitals were discharged after one week without BCG vaccination (Table 4.9).

Table 4.9 Place of Immunization

Provider	Number	Percentages
Health Centres	147	67.1%
Hospitals	35	7.8%
Outreach	37	6.9%

4.2 PERCEPTION OF MOTHERS IN RELATION TO EPI

4.2.1 Mothers' knowledge about reason for immunization

Out of the 219 mothers, 191 (87.2%) knew that immunization is to prevent their children from some disease. If a mother could explain that immunization has to go with prevention of disease was taken as knowing the purpose of immunization. Some mothers said immunization help to keep their babies fat, whilst others said it makes the baby grow well.

4.2.2 Mothers knowledge about EPI diseases

Mothers were asked to name the EPI diseases. A total of 69 (31.5%) were able to name TB, 37(16.9%) named whooping cough, 29 (13.2%) named diphtheria, 59 (26.9% named tetanus, 42

(19.2%) named polio and 169 (77.2%) named measles (Table 4.10). It was also observed that 24 (10.9%) of the mothers could not mention any of the vaccine-preventable diseases. Only 4 (1.88%) of the mothers could mention all the six vaccine-preventable diseases (Table 4.11). The six EPI targeted diseases were translated into Twi and Ewe. The name for diphtheria was difficult to come by in both Twi and Ewe. The response for dipthteria may therefore not represent the true knowledge of the mothers about the disease.

Table 4.10 MOTHERS KNOWLEDGE ABOUT VACCINE PREVENTABLE DISEASES

Disease	Number of Mothers	Percentage
Tuberculosis	69	31.5%
Pertusis	29	13.2%
Diphtheria	37	16.9%
Tetanus	59	26.9%
Poliomyelitis	42	19.2%
Measles	169	77.2%

Table 4.11 NUMBER OF VACCINE-PREVENTABLE DISEASE KNOWN BY MOTHERS

Number of Diseases	Number of Mothers	Percentage
Nil	24	10.9%
One	47	21.5%
Two	90	41.1%
Three	39	17.8%
Four	13	5.9%
Five	4	1.8%
Six	4	1.8%

4.2.3 Mothers knowledge about total doses of vaccine

The mothers were asked to give the number of doses each vaccine. For BCG 39 (17.8%) gave the correct dose, 43 (19.6%) gave the correct answer for DPT, 34 (15.5%) gave the correct answer for OPV and 61 (27.9%) gave the correct answer for measles.

4.2.4 Reasons for immunization failure

Mothers who did not complete their children immunization were asked to give the most important reason why they did not receive the immunization. Out of the 54 who did not receive all the immunizations 6 (2.8%) was due to lack of information, 2 (0.9%) was due to lack of motivation and 46 (20.6%) due to obstacles. The obstacles range from lack of money, place of immunnization being too far, family problems including illness and death (Table 4.12).

4.2.5 History of Post-Vaccination Adverse Reactions

Experience of post vaccination adverse reactions of a child was reported by 178 mothers (82.4%). Of these, 154 (70.3%) reported of fevers, 74 (34.3%) said their children cried continuously, 12 (5.6%) reported of swelling at the site of the injection, 6 (2.8%) said their children presented with abscesses at the site of injection.

4.2.6 Relationship Between Factors and Valid Immunization Status of Child

Table 4.1.3 shows the relationship between mothers' parity, mothers ability to name at least two EPI targeted diseases, mothers' level of education and place of delivery; and the immunization status of the child.

Mother's parity being less than five children was positively associated with the valid immunization status of the child (X^2 11.21, $P < 0.05$). Mothers ability to mention at least two of the EPI targeted diseases was also positively associated with the valid immunization status of the child (X^2 6.98, $P < 0.05$).

The mother having formal education or not, as well as place of delivery being a health facility or not, did not have any association with the immunization status of the child (Table 4.13).

Table 4.12 REASONS FOR IMMUNIZATION FAILURE (PARTIALLY AND NOT IMMUNIZED)

REASONS	NUMBER	PERCENTAGE
Lack of Information		
Unaware of need for immunization	1	
Unaware of need for 2nd and 3rd dose	3	
Place and time of immunization unknown	2	2.8%
Subtotal	6	
Lack of motivation		
Postponed until another time	1	0.9%
No faith in immunization	1	
Rumours	-	
Subtotal	2	
Obstacles		
Place of immunization too far	11	
Time of immunization	4	
inconvenient	2	
Mother too busy	8	20.6%
Family problems	3	
Long waiting time	13	
Financial difficulties	4	
Death of relatives		
Subtotal	46	
Total	54	25.3%

Table 4.13 **RELATIONSHIP BETWEEN FACTORS AND OUTCOME**

FACTORS		OUTCOME VALID IMMUNIZATION Yes	No	CHI-SQUARE	P VALUE
Mother had formal education.	Yes	94	98	0.19	0.6603327
	No	12	15		
Mother delivered at health facility	Yes	52	62	0.74	0.3896869
	No	54	51		
Mothers parity less than five children	Yes	81	62	11.21	0.0008149
	No	25	51		
Mother can mention 2 EPI Diseases	Yes	90	79	6.98	0.0082455
	No	16	34		

4.3 FOCUS GROUP DISCUSSION

Participants in all the focus group discussions seemed to have a good knowledge about immunization and supported their views with their own experiences. However, not all the mothers were aware against which diseases their children could be protected by immunization.

4.3.1 Causes of childhood diseases

A mother initiated the response by listing the causes of childhood diseases as "lack of good food" "heat" and not wearing protective clothing. Other members of the group agreed by nodding. According to one of the mothers, " children become sick when you don't look after them well. Others mentioned unhygienic environment as a cause of childhood diseases.

4.3.2 Protection of children against childhood diseases

One participant said "You should take your children to the child welfare clinic". Another mother acknowledged by saying "We have to do what we are taught at the child welfare clinic". Others said food and drinking cups should be kept clean.

4.3.3 Manifestation of childhood diseases

The mothers listed cough, fever, diarrhoea. Other mothers listed measles, convulsions and constipation as other manifestations.

4.3.4 Knowledge about immunization

The first mother said "immunization protect children from diseases". A second mother said "there will be no sickness if you are immunized. A mother said immunization helps prevent children from suffering from measles. When asked to name other diseases that can be prevented by immunization the mothers mentioned, "yellow fever, malaria and tuberculosis".

4.3.5 Knowledge about side effects of vaccine

Many of the participants observed that their children ran temperature after vaccination. A mother said "When a child is injected he will cry the whole night and the body will be hot". Another said "Sometimes I am afraid that the injection is not good for my child". The other side effects mentioned by the mothers were swelling at the site of the injection, fever and excessive crying. Two mothers said vaccination can cause paralysis. Almost all the mothers nodded in response.

4.3.6 Reasons why mothers do not take their children for vaccination

Two mothers said it was just laziness of some mothers. Another mother said because the children are not sick they do not bring them to the child welfare clinic. Others said that sometimes they are afraid their children will become paralysed, when brought for immunization. A mother disputed the fact that laziness was the cause of mothers not bringing their children for immunization, but rather walking long distances.

4.3.7 Efficiency of vaccination service

Most participants agreed that the service was efficient and the MCH staff were very nice to them. But one mother said "Sometimes they shout on us especially if your card is dirty or missing". Other mothers complained about the time spent at the clinic is too long.

4.3.8 Source of information on immunization

A mother said she heard about immunization on radio and television. Most agreed with her. Another mother said she got to know about immunization only at the child welfare clinic. A mother said "They always teach us about immunization at 'weighing'". Weighing is the name most of the mothers give to the child welfare clinic.

CHAPTER FIVE: DISCUSSION AND CONCLUSION

Evaluation of immunization coverage is part of the whole process of evaluating the Expanded Programme on Immunization. In this study, the results which have been analysed will become the first coverage survey for the Jasikan District.

The possession of the Road to Health Card is an indication of contact with a health facility. In this study, 202 (92.2%) of the mothers were able to produce their RTH card. This is not very different from the results obtained in a recent survey conducted in Ho district of the Volta Region where card possession was 89 per cent . However, there are still areas in the Volta Region like Nkwanta district where RTH card possession during the survey was only 46 per cent . It can therefore be said that children in the Jasikan District have a high degree of contact will health facilities.

The overall tentative immunization coverage in the study population for fully immunized children is 165 (75.5%). However, analysis revealed that only 48.4 per cent out of the total number of children fully immunized had their immunization being valid. This means less than half of the children surveyed had their immunization at the correct time before one year. The target for the immunization coverage is 80 per cent . The national immunization coverage is 55 per cent and Volta Region 53 per cent according to the coverage survey conducted by the Ghana statistical service in 1993. Jasikan District therefore falls below the national level of coverage.
The difference between the valid immunization and total immunization is made worse by the fact

that both health workers and mothers do not keep to the immunization schedule. For instance, 13 (8.9%) of the children surveyed had their measles vaccination earlier than the stipulated 9 months. DPT1 was administered to 18 (8.2%) of the children before 6 weeks.

However, despite the high individual vaccine coverage, the dropout rates between the first and the third doses of DPT and OPV as well as between BCG and measles are quite high. In this study the dropout rate between DPT1 to DPT3 is 8.2 per cent and between BCG and measles is 18.3 per cent which is above the WHO acceptable limit of 10 per cent (WHO/EPI 1991). These dropout rates maybe due to the fact that health workers do not consistently explain the importance of follow up and revisits to the mothers. This is confirmed by the results of the survey which revealed that only 15 per cent of the mothers knew that DPT is to be given three times.

The association between the mothers education and immunization status was analysed. There was no association between formal education level of the mother and the immunization status of the child. In as much as formal education plays an important part in the way mothers care for their children, there may be other confounding factors which could be responsible. Thus, mother's formal educational level *per se* may not be a determining factor. Education specifically on immunization may rather be the factor should be considered in isolation. This has been shown in a study by Limtragool et al. (1992) where they found out that teaching mothers specifically about immunization led to increase in the immunization coverage in their area. A control group which was used showed no difference in their coverage over the three year of the study. A mother's specific knowledge about EPI showed to have a relationship with the immunization status of the child.

This study in Jasikan District found out that there is a statistical association between the mother naming at least two EPI targeted diseases and immunization status of the child. The choice of hospital or health centre as a place of birth was also not found to be associated with valid immunization status. This suggests that even though health staff educate mothers at health facilities and administer BCG vaccines in some cases before discharging the mother and the child, they are not able to continue and complete the immunization schedule.

The focus group discussions highlighted the fact that mothers are not totally unaware of immunization in general. Quite a high proportion have idea about what immunization is all about. This was confirmed by the results obtained from the survey where 191 (87.2%) of the mothers interviewed knew that immunization had something to do with prevention of diseases. However, when the mothers were asked about what to do to prevent their children from falling ill they could not mention immunization as a means of prevention.

Most mothers seem to know that measles is one of the vaccine preventable diseases, but some of them felt once you are immunized all diseases are prevented. No wonder some mothers were mentioning malaria and diarrhoea as vaccine preventable diseases. The awareness is also there that some mothers for one reason or another do not send their children for immunization. The reasons given for failure to attended immunization sessions were varied from lack of information to obstacles like sickness or death of a member of family or no money. It is interesting to note that some mothers still have the belief that injections at immunization sessions could lead to paralysis. However, during the survey no mother complained about the paralysis being the reason for not continuing the schedule. The study reveals that most of the reasons for immunization failure are due to "obstacles". These obstacles range from place at immunization being too far, inconvenient times of immunization and family problems including illness or death of a relative. The study found that 20.6 per cent of the mothers stated obstacles as reasons for immunization failure (Table 4.12) This is not too different from 21.9 per cent obtained in a coverage survey in the Western Region of Ghana (MOH/WVI 1991). It is not too difficult to find mothers postpone immunization of their children just to attend funerals. This may be because society frowns more on missing a funeral than on missing an immunization session. When asked about quality of service rendered, the answers showed the typical Ghanaian practice of not wanting to say anything bad about a person in public. However, some mothers complained about the time spent at the clinic being too long. Mothers felt it was waste of time to come and wait so long at child welfare clinics with their children who are not sick. Some mothers complained about the health staff shouting at them. This type of behaviour is bound to keep mothers away especially if they feel humiliated among other women.

Lessons drawn from the focus groups discussions are that most mothers know and understand the benefits of immunization. Traditional and religious beliefs are no longer major factors responsible for failure of immunization. Care must also be taken in attributing low immunization coverage to ignorance. Maybe the health providers sometimes need to listen to mothers' suggestions so as to attract them to immunization service.

During the survey, it was observed that 8 (3.7%) out of the 182 children with documentation of BCG vaccines did not have scars. This could be due to loss of potency of the vaccine. The level at which the potency could be lost cannot be ascertained in this study. Absence of BCG scar could also be due to improper technique of administration of the vaccine or inaccurate entry of records by health workers. Schofield (1991) in an evaluation of EPI services in developing countries reported improper technique of administration as being a major cause of no BCG scar. In another study by MOH (1992) BCG scar failure was 15.7 per cent in the Volta Region.

The study also showed that 55 per cent of all the children delivered at health facilities were discharged after one week without BCG vaccination. This high proportion of children discharged without BCG coupled with those with BCG scar may result in children not being protected from TB meningitis which is common among children (Clark et al. 1992). BCG is of particular concern especially in view of the increasing prevalence of HIV/AIDS in Ghana. Children with HIV infection are highly susceptible to disseminated BCG (Ninane et al. 1988) and similarly to TB meningitis. Therefore care must be taken to identify HIV positive children at birth.

To improve on immunization coverage in the district, BCG must be administered to all children delivered in health facilities before being discharged home. Maternal and Child Health staff should try as much as possible to issue RTH card to all newly born babies. It would be good if BCG and RTH card could be supplied to maternity homes and private hospitals for use by their staff. The issuing of RTH card and BCG vaccination should be the initiation event of all newly born babies into the immunization programme. Administering BCG to each newly born will mean the policy of opening a new vial whenever the opportunity arises must be enforced. Health workers should not be worried about wastage at this stage of fighting to improve immunization coverage.

The study results showed that 67.1 per cent of the immunizations took place at health centres or health posts and 6.9 per cent at outreach centres (Table 4.9). The policy of conducting immunization sessions once a week or a month could account for the low coverage at outreach sites. Intensification of outreach clinics by regular and frequent contacts will increase the contact between health workers and mothers. This will increase EPI coverage by reducing missed opportunities and invalid immunizations. Consideration can be given to gradually setting up more MCH static clinics in the district to replace the outreach sites. This has been shown by study by (Cutts et al. 1990) in Guinea.

The dropout rates are moderately high (8.2 per cent for DPT1-DPT3, 18.3 per cent for BCG-measles). This leads to incomplete and invalid immunization and subsequently keeps coverage at a low level. Health staff must be motivated to intensify home visits to follow up dropouts. Getting dropouts back on track will ensure programme continuity. The other means of getting dropouts and also reducing missed opportunities is to enforce the practice of bringing the RTH card to each curative health service so that the immunization status of children can be checked.

Health education on EPI must be focused on the mothers and all care-takers of children at all points of contact and not only at immunization sessions. Mothers should be given the opportunity to discuss their problems and make suggestions. By listening to the mothers suggestions, the health workers can learn about how to make their services more attractive. Issues about the need to keep to 3 doses of DPT and OPV as well as continuing and completing the immunization schedule has to be stressed. This will increase mothers knowledge about the need to complete immunization schedule.

Upgrading the knowledge of the health staff on EPI can be achieved by organizing regular quarterly training and review meetings. This type of meetings in addition to identifying problems will also motivate the staff at the peripheral level. Supervisory visits must follow the training sessions to monitor how well the MCH staff are conducting the immunization sessions.

CONCLUSION

The results of this study has highlighted the immunization coverage of Jasikan District. With a valid immunization coverage of 48.4 per cent , the district's coverage is said to be below the national coverage of 55 per cent . Some reasons for immunization failure have been identified as well as other factors which are associated with the immunization status of children. The results suggest that lack of motivation or information is not the main reason for immunization failure but rather individual problems which act as obstacles to immunization. Low parity of mothers coupled with increase awareness of EPI targeted diseases may contribute to better acceptance of immunization.

Jasikan district is a culturaly heterogeneous district made up of different and distinct sub districts. In view of this further studies are recommended with samples drawn from a much wider range of communities in order to identify factors which may be peculiar to each community. Finally, annual immunizations coverage surveys need to be conducted in order to monitor the progress of the EPI in the Jasikan District.

CHAPTER SIX: *RECOMMENDATIONS*

This study has identified some of the factors responsible for the present low immunization coverage level as well as reasons for non completion of immunization schedule. To improve on the current coverage, the measures which need to be taken must stimulate service utilization through the combined effort of the District Health Management Team (DHMT), the health staff at the health institutions and finally the community. Therefore the following recommendations are made:

6.1 THE D H M T AND POLICY

The DHMT, being the sole body responsible for the day to day running of the health services in the district, has to communicate to all the health institutions the policies on the implementation of EPI. This will enable the health workers to understand the rationale for these policies and comply with them. This will also enhance the compliance and enforcement of these policies instituted by the DHMT. The practice of issuing all newly born babies with RTH cards as well as administering BCG vaccines prior to discharge must be enforced. This will mean that the RTH cards are always available and distributed to all maternity units. The administration of BCG at birth or prior to discharge may mean that even if a new vial of vaccine should be opened to vaccinate only one baby this should be done.

The number of outreach points in the district must be increased in areas identified as very rural. There are remote areas where there are a collection of scattered and sparsely populated communities, they will benefit from regular weekly outreach clinics.

The DHMT should institute a policy that the RTH card of all children under five years must be brought to clinics at all times. This practice must be enforced so as to check the immunization status of all children during any contact. This will help to reduce the number of missed opportunities.

As part of its annual plans, the DHMT must plan to hold regular quarterly EPI review meetings. This will help to monitor the programme and assist the health staff to upgrade their knowledge in EPI as well as find solutions to problems they are encoutering in their respective areas. During the supervisory visits by the DHMT they should review the EPI activities in the respective health institutions and provide inservice training where necessary.

6.2 HEALTH INSTITUTIONS

At the health instution levels, effort must be made to implement all policies on EPI from the DHMT. The health staff at all places of vaccination must ensure that RTH cards are always available. There must be good laison between all units to make sure maternity units also have the RTH card. During visits inspection of stock levels of RTA card must be checked. At curative clinics the health staff must make it a practice to insist on inspecting RTH cards of all children under five years. This will also help to reduce the number of missed opportunities.

Home visiting by health staff should be intensified because this has the potential of bringing them into close contact with groups in the community who may be defaulting. Drop-out rates could be reduced drastically. Provision and reinforcement of health education on EPI must not only be at the child welfare clinics but at all points of contact; home visits, curative clinics and outreach points.

Information on the type of vaccine and the number of doses to be administered as well as the side effects to be expected must all be stressed during the health education. These informations will help in making mothers bring their children to complete the immunization schedule. It will also upgrade their knowledge and allay their fears and anxieties they have in relation to immunization.

6.3 THE COMMUNITIES

Apart from the policies from the DHMT and the work of the health staff, the communities themselves have to taken an active part in improving immunization coverage.

The community's involvement will have to start from the District Assembly. Members of the District Assembly must be schooled in the importance of EPI to give the programme political support. Political will is important in ensuring acceptance and the drive towards improving the coverage. Indentification of community volunteers in all communities to keep community registers will help to follow-up the drop-outs.

These community volunteers can also be used to disseminate health education messages on EPI to the community and also notify the community on dates of immunization.

REFERENCES

Akesode F.A. Factors affecting the use of primary health care clinics for children. *Journal of Epidemiology and Health Community Health*, 1982 36:310-314

Benenson AS (Ed) Fifteenth Edition 1990 Tuberculosis. *American Publican Health Association.* Washington, DC.

Brugha R, and Kevany J. Immunization determinants in the Eastern Region of Ghana. *Health Policy and Planning* 10 3; 1995.

Burgess A M 1991 Immunisation strategies for developed countries, P 192. In (ed) Gardiner W and Foley W *Proceeding of the Annual Australian Tropical Health and Nutrition Conference,* Brisbane.

Bruce GW, Khanchit L, Kumnuan U, Sombat T, Kachit C *et al* 1991 The epidemiology of HIV infection and AIDS in Thailand. *AIDS* 5:S71-S85.

Chen ST, Lam SK 1985 Optimal age for measles immunisation in Malaysia. *South East Asia Journal of Medicine and Public Health* 16:493-499.

Cutts FT, Rodrigues LC, Colombo S and Bennett S 1989 Evaluation of factors influencing vaccine uptake in Mozambique. *International Journal of Epidemiology* 18:427-433.

Cutts FT, Glik DC, Gordon A, Parker A, Diallo S, Haba F and Stone R 1990(a) Application of multiples method to study the immunisation program in an urban area of Guinea. *Bulletin of the World Health Organization* 68:769-776.

Cutts FT, Soares A, Jacque AV, Cliff J, Kortbeek S and Colombo S 1990(b) The use of evaluation to improve the Expanded Program on Immunisation in Mozambique. *Bulletin of the World Health Organization* 68:199-208.

Cutts FT, Henderson RH, Clement CJ, Chen RT and Patricia PA 1991 Principle of measles control. *Bulletin of the World Health Organization* 69:1-9.

Curtis HM, Leck I and Bramford FN 1984. Incidence of childhood tuberculosis after neonatal vaccination. *Lancet* i:145-148.

Eng E, Naimoli J, Naimoli G, Parker KA and Lowenthal N 1991 The acceptability of childhood immunisation to Togolese mothers: a sociobehavioural perspective. *Health Education Quarterly* 18:97-110.

Esteves K 1988 Safety of oral poliomyelitis vaccine:result of a WHO enquiry. *Bulletin of World Health Organization* 66:739-746.

Friede AM, Waternaux C and Guyer B, 1985 An epidemiological assessment of immunisation program participation in the Philippines. *International Journal of Epidemiology* 14:135-41.

Galazka A, Lauer BA, Henderson RH and Keja J 1984 Indications and contraindications for the vaccines used in the expanded program of immunisation. *Bulletin of the World Health Organization* 62:357-366.

Galazka A and Stroth G 1986 Guidelines on the community-based survey on neonatal tetanus mortality. Mimeographed document WHO\EPI\GEN\86\8 Geneva: *World Health Organization.*

Halsey NA and Stetler HC 1983 Adverse reactions associated with vaccines administered in EPI projects. *In recent advances in immunization.* Washington DC: Pan American Health Association 1983 Scientific publication no.451

Hart PD and Sutherland I 1977 BCG and Vole Bacillus Vaccine in the prevention of tuberculosis in adolescence and early adult life: final report to the Medical Research Council. *British Medical Journal* 2:293-295.

Heggenhougen H.K was Clements C.J. An anthropological perspective on the acceptability of immunization services. *Scandinavian Journal of Infectious Diseases,* 1990 Supplement 76 20-31.

Henderson RH 1973 Assessment of vaccine coverage, vaccination scar rates, and smallpox scarring in five areas of West Africa. *Bulletin of the World Health Organization* 48:183-194.

Henderson RH and Sundaresan T 1982 Cluster sampling to assess immunization coverage:a review of experience with a simplified method. *Bulletin of the World Health Organization* 60:253-260.

Henderson DA 1987 Principles and lessons from the smallpox eradication program. *Bulletin of the World Health Organization* 65:535-546.

Henderson R, Keja J, Hayden G, Galazka A and Clements T 1988 Immunising the worlds' children: progress and prospects. *Bulletin of the World Health Organization* 66:535-543.

Kambarami R A, Nathoo K J, Nkrumah F K and Pirie D J 1991. Measles epidemic in Harare, Zimbabwe, despite high immunization coverage rate. *Bulletin of World Health Organization* 69: 213-219

Kim-Farley R, Schnur AH and Mochny IS 1987 Immunisation in urban Southeast Asia. *Southeast Asian Journal of Tropical Medicine and Public Health* 18:433-437.

Kim-Farley R, Mochny I, Schnur A 1988 Tetanus in South East Asia. *sia- Pacific journal of Public Health* 2:175-178.

Kok WP 1986 Cluster sampling for immunisation coverage. *Social Science and Medicine* 22:781-783.

Lambert H J 1965 Epidemiology of a small outbreak of poliomyelitis in Kent County Michigan. *Public Health Report* 80:365-369.

Lanata CF, Stroh GJR, Black ER and Gonzales H 1990 An evaluation of lot quality assurance sampling to monitor and improve immunisation coverage. *International Journal of Epidemiology* 19:1086-1990.

Lemeshow S and Robinson D 1985 Surveys to measure program coverage and impact: a review of the methodology used by the Expanded program on Immunisation. *World Health Statistic Quarterly* 38:65-75.

Limtragool P, Panichaceewakul P, Stoeckel J and Charoenchai A 1989 Health program effects upon acceptance of immunisation in Northeast Thailand. *Asia-Pacific Journal of Public Health* 3:26-31.

Luksamijarulkul P, and Wong-arsa C 1989 Factors influencing the basic immunisation coverage in the Din-Daeng Community, Bangkok. *Chula lonekorn Medical Journal* 34:49-57.

Ministry of Health/World Vision International 1991 Expanded Programme on Immunization, Evaluation Report 15 - 25.

Nasseri K, Mehdi L, Azordegan F, Shahi F and All-E-Agha R 1990 Determinants of partial participation in the immunisation program in Iran. *Social Science and Medicine* 3:379-383.

Orenstein WA, Weisfeld JS and Halsey NA 1983 Diphtheria, tetanus toxoid and pertussis vaccine combined. In (Ed) Hasley NA, Dequadros CA, *Recent Advances in Immunisation: a Bibliographic Review* Scientific Publication No 451:30-51 Pan American Health Organization Washington DC.

Onuaha GBI 1981 Factors responsible for under-utilisation of available health services by the rural people in Nigeria. *East African Medical Journal* 58:859-566.

Ωrorato IM and Wassilak SGF 1987 Laboratory diagnosis of pertussis: the state of the art. *Paediatrics Infectious Disease Journa*l 6:145-151.

Population Information Program, John Hopkins University 1986 Immunising the world's children. *Population Reports* 14:L153-L190.

Schofield FD, Tucker VM and Weastbrook GR 1992 Neonatal tetanus in New Guinea *British Medical Journal* ii:785-789.

Sebastian EV 1979 Expanded Program on Immunisation for children. *Health and Population Perspective and Issues* 2:67-79.

Singarimbun M, Streatfield K and Singarimbun I, 1986 Some factors affecting use of childhood immunisation. *Research Note in Child Survival No,7CS.* Canberra: Australia National University, Research School of Social Science.

Stanfield J, Galazka A 1984 Neonatal tetanus in the world today. *Bulletin of the World Health Organization* 62:647-669

Styblo K 1990 The global aspects of tuberculosis and HIV infection. *Bulletin of International Union Against Tuberculosis and Lung Disease* 65:28-32.

Takanashi T 1978 Health service coverage and its evaluation. *Bulletin of World Health Organisation* 56:295-303

Tuberculosis prevention trial, 1980 Trial of BCG vaccines in South India for tuberculosis: report of prevention Madras. *Indian Journal of Medical Research.* 72(S):1-74.

UNICEF Ghana 1984 EPI in Ghana. *Situation analysis of women and children* 338- 342.

WHO 1981 Poliomyelitis in 1980. *Weekly Epidemiological Record* 16:27-30.

WHO 1985 Expanded Program on Immunisation: Reappraisal of early OPV and DPT immunisation. *Weekly Epidemiology Record* 60:284-285.

WHO 1987 Expanded Program On Immunisation. *Weekly Epidemiological Record* 62:278-280.

WHO 1989 Expanded Program on Immunisation *Weekly Epidemiological Record* 64:361-368.

WHO 1990 Expanded Program on Immunisation. *Weekly Epidemiological Record* 68:135-138.

WHO 1991 Expanded Program on Immunisation. *Weekly Epidemiological Record* 30:220-221.

WHO 1995 Expanded Programme on Immunization. *Weekly Epidemiological Record* 261-268

WHO/EPI 1991 The EPI Coverage Survey *WHO/EPI/MLM/91.10* Unpublished mimeograph. Geneva, WHO.

Appendix A

CLUSTER IDENTIFICATION

Village/Town Name	Village/Town Population	Cumulative Population	Cluster Number
1. Apesokubi	2536		1
2. Apekrom	765	3301	
3. Kogokrom	659	3960	
4. Worawora	5699	9659	2, 3,
5. Tapa Alavanyo	1219	10878	
6. Tapa Abotoase	2764	13642	4
7. Tapa Amanya	1740	15382	5
8. Tapa Odei	539	15921	
9. Tapa Breniase	695	16616	
10. Tapa Gbemumu	524	17140	
11. Kabosu	475	17615	6
12. Tapa Amanfrom Zugu	261	18176	
13. Kwamekrom	5134	23310	7, 8,
14. Bowiri Odumase	433	23743	
15. Mangoase	388	24131	
16. Nsum Blorgakope	426	24557	
17. Adzamasu	494	25051	
18. Bumbular	904	25955	9
19. Kadjebi	654	26012	
20. Tayi	1163	27118	
21. Ntumda	2009	29127	10
22. Guaman	1252	30379	
23. Ntsumuru	1701	32080	11
24. Wurupung	3055	35135	12
25. Odormitor	371	35506	
26. Akloba	751	36257	
27. Ahenkroo	941	37198	13
28. Asakyiri	810	38008	
29. Bowiri Anyiase	573	38581	
30. Takrabe	698	39279	
31. Amanfro	919	40198	14
32. Anyinase	347	40545	
33. Abohire	643	41188	
34. Kyirahin	951	42139	
35. Old Baika	1514	43653	15
36. Tetema	2085	45738	16
37. Lekanti	943	46681	
38. Ketudze	469	47150	
39. Bodada	4028	51178	17, 18
40. Awoma	1034	52212	
41. Kayada	943	53155	
42. Dzolo Buem	1830	54985	19
43. Baglo	1757	57642	20
44. New Ayoma	2434	59176	21
45. Kute	2232	61408	22
46. New Baika	558	61966	23
47. Odumasi	1213	63179	
48. Old Ayoma	1283	64462	24
49. Jasikan	7470	71932	25, 26
50. Nsuta	1001	72933	
51. Lebanta	786	73719	
52. Atonkor	1044	74763	27
53. Ketsi Nkwanta	643	75406	
54. Okadjakrom	2703	78115	28
55. Atakrom	676	78790	
56. Tereboanda	557	79347	
57 Akaa	1969	81316	29
58. Tepo	971	82287	30

Sampling Interval: 2743 Random number: 1421

Cluster Form
Infant Immunization

(1) Cluster Number: ______
(2) Date: ______
(3) Area: ______
(4) Range of birth dates:
From: ______
Until: ______

		(5) NAME								TOTAL	
										Card	Card plus history
Child number in cluster		1	2	3	4	5	6	7	8		
(6) Birth date											
(7) Immunization Card	Yes/No										
(8) BCG	Date/+/0										
	Scar: Yes/No/A										
	Source										
(9) DPT 1	Date/+/0										
	Source										
DPT 2	Date/+/0										
	Source										
DPT 3	Date/+/0										
	Source										
(10) OPV 1	Date/+/0										
	Source										
OPV 2	Date/+/0										
	Source										
OPV 3	Date/+/0										
	Source										
(11) Measles	Date/+/0										
	Source										
(12) Immunization Status	Not										
	Partially										
	Fully										
(13) Fully immunized before one year of age	Yes/No										

(14) Tally of households visited: ______
(15) Name of interviewer: ______
Signature: ______

KEY: Date/+/0:
Date = copy date of immunization from card, if available
+ = mother reports immunization was given
0 = immunization not given

Source:
OUT = Outreach
HOS = Hospital
HC = Health Centre
PRIV = Private/non-government

Cluster Form
Reasons for Immunization Failure

1) Cluster number: ____________________ (4) Range of birthdates: From: ____________________

2) Area: ____________________ Until: ____________________

3) Date: ____________________

NOTE: ASK ONLY ONE QUESTION: "Why was the child not fully immunized? Mark (X) the single most important reason according to your judgment.

Child number in cluster		1	2	3	4	5	6	7	8	TOTAL
Immunization Status	Not immunized									
	Partially immunized									
	Fully immunized									
Lack of information	a. Unaware of need for immunization									
	b. Unaware of need to return for 2nd or 3rd dose.									
	c. Place and/or time of immunization unknown									
	d. Fear of side reactions									
	e. Wrong ideas about contraindications									
	f. Other									
Lack of motivation	g. Postponed until another time									
	h. No faith in immunization									
	i. Rumors									
	j. Other									
Obstacles	k. Place of immunization too far									
	l. Time of immunization inconvenient									
	m. Vaccinator absent									
	n. Vaccine not available									
	o. Mother too busy									
	p. Family problem, including illness of mother									
	q. Child ill - not brought									
	r. Child ill - brought but not given immunization									
	s. Long waiting time									
	t. Other									

APPENDIX D

CLUSTER FORM

INFANT IMMUNISATION

1. {Cluster} ##

3. {Area} ________________

4. {Childnum}#

7. {Immcard} <Y>

8.a {BCG} # 0=0; Date=1; +=2;

8.b {Scar} # Yes=1; No=2; A=3

8.c {Source1} # OUT=1; HOS=2; HC=3; PRV=4

9.ai {DPT1} # a.ii {Source2} #

9.bi {DPT2} # bii {Source3} #

9.ci {DPT3} # cii {Source4} #

10.ai {OPV1} # aii {Source5} #

10.bi {OPV2} # bii {Source6} #

10.ci {OPV3} # cii {Source7} #

11.ai {Measles} # aii {Source8} #

12 {Immstat} # Not=1 Partial=2 Full=3

13. {Reasons} # Infolack=1; Motilack=2; Obstacle=3 NA=4

14. {Underone} <Y>

15. {Education} # Nil=1; Primary/Middle=2; Secondary & above=3

16. {Purpose} <Y>

17.a{TB} <Y> 17b. {W/Cough}<Y> 17c.{Diphteria}<Y> 17d. {Tetanus}<Y>

17e.{Poilio}<Y> 17f. {Measles}<Y>

18.a {TB}# b. {DPT}# c. Polio# d. Measles#

19.a Crying<Y> 19b.{Fever}<Y> 19c. {Swelling}<Y> 19d. {Abscess}<Y>

20. {Place}# Home=1; HC/Hosp=2 Private=3

21. {Children}##

22. {Transport}# Nil=1 ¢500-1000=2 ¢1000+=3