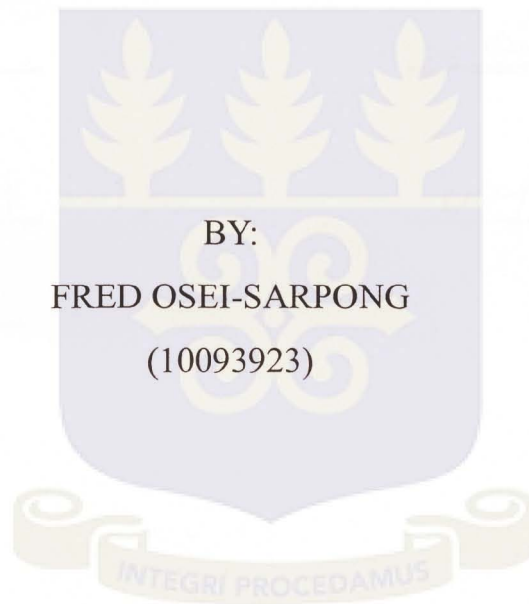


SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA, LEGON

FACTORS ASSOCIATED WITH VACCINATION STATUS OF
CHILDREN IN GA SOUTH MUNICIPALITY



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THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF
GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE

JULY 2014

DECLARATION

I hereby declare that, except for other people's works, which have been duly acknowledged, this work is the result of my own research. This dissertation, either in whole or in part has not been presented elsewhere for another degree. I am therefore responsible for the views expressed in this report.

Fred Osei-Sarpong
(Student)



Sign

01/10/2014

Date

Dr Samuel O. Sackey
(Supervisor)



Sign

07/10/2014

date



DEDICATION

I dedicate this work to my mother, Mrs Mary Ofori-Attah, and my father, Mr Sarpong Ofori-Attah, for their immense contribution to my life.



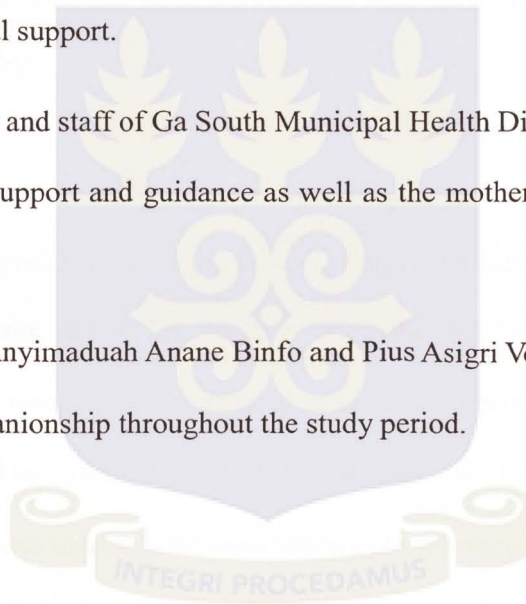
ACKNOWLEDGEMENT

I would like to acknowledge the contribution of my Supervisor, Dr Samuel Sackey, and Dr Patricia Akweongo, the Head of Department of the Epidemiology and Disease Control Department of the School of Public Health, University of Ghana, for their support and guidance throughout the study. I would also like to acknowledge the former National EPI Programme Manager, Dr K. O. Antwi-Agyei, and the current National EPI Programme Manager, Dr George Bonsu, for their technical inputs to the study.

I am grateful to Dr Kwame Amponsa-Achiano and Mr John Frederick Dadzie for their inspiration and technical support.

The Municipal Director and staff of Ga South Municipal Health Directorate are hereby acknowledged for the support and guidance as well as the mothers and children who were interviewed.

My mates, Nana Ama Anyimaduah Anane Binfo and Pius Asigri Von Labaran, deserve mention for their companionship throughout the study period.



ABSTRACT

Introduction

High immunization coverage is essential in the control, elimination and eradication of vaccine preventable diseases. Though, immunization coverage rates have improved in recent times, there are pockets of poorly covered areas that could result in the build-up of susceptible children and possibly lead to disease outbreaks.

Objectives

The aim of the study was to assess factors associated with vaccination status of children in Ga South Municipality.

Methods

The study was an analytical cross-sectional survey among a sample of children aged between 12 – 23 months old in Ga South Municipality of Greater Accra Region. Vaccination card and maternal recall were used to assess vaccination status. Structured questionnaire was used to collect data on child and maternal characteristics. Logistic regression model was used to assess the association between vaccination status and the explanatory variables.

Results

Two hundred and ten (210) mothers of children aged between 12 – 23 months old were interviewed from 30 clusters in Ga South Municipality. The vaccination records of all 210 children were also assessed. The coverage for fully vaccinated children by card and history was 88.6% (Card=90%, history=60%). One (0.5%) child did not received any vaccine at all. Incomplete vaccination was significantly associated with level of

education of mother (AOR 5.24, 95% CI: 1.30; 21.08), suitability of date for child welfare clinic (AOR 8.54, 95% CI: 1.67; 43.57), availability of vaccination card (AOR 22.69, 95% CI: 4.13; 124.76, $p < 0.0001$), parity of mother (AOR 1.50, 95% CI: 1.03; 2.18) and area of residence (AOR 8.41, 95% CI: 2.12; 33.32).

Conclusion

The vaccination coverage for children aged 12 – 23 months in Ga South Municipal is high. It however fell short of the recommended target of 90%. Level of education, parity, area of residence, availability of vaccination card and suitability of date for child welfare clinic were significantly associated with vaccination status.

Recommendation

The municipality should intensify information, education and communication activities to heighten awareness on routine immunization, encourage mothers to keep the vaccination cards of their children safely and also open more outreach points especially in rural areas in order to bring immunization services closer to people in these areas.

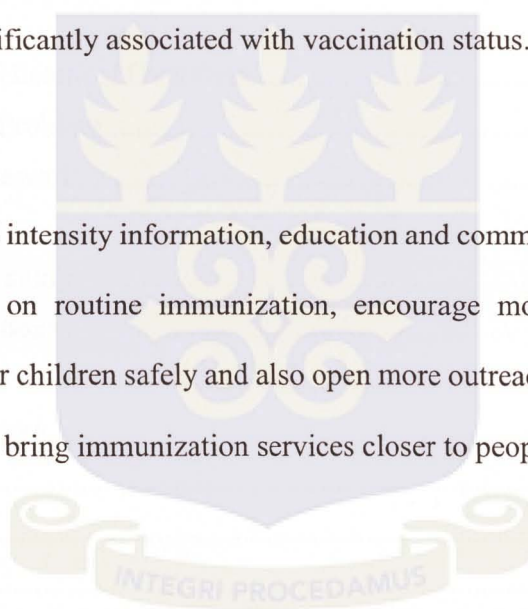


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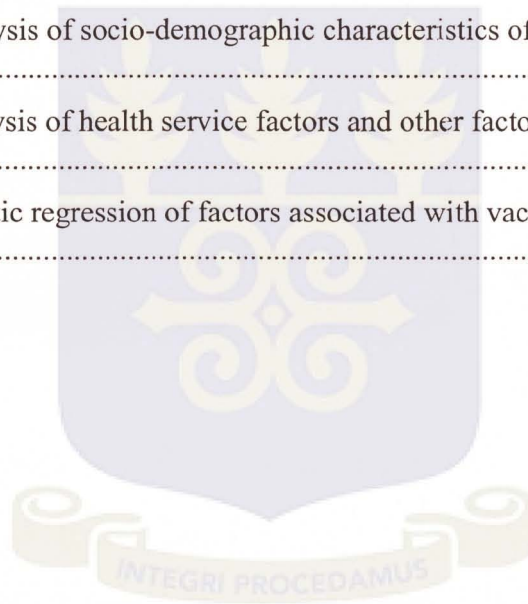
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LIST OF ABBREVIATIONS

AEFI	Adverse Events Following Immunisation
BCG	Bacille Calmette-Guerin
CDC	Center for Disease Control and Prevention
CHPS	Community Health Planning and Services
CHR	Child Health Records
CWC	Child Welfare Clinic
DANIDA	Danish International Development Agency
DCD	Disease Control and Prevention Department
DFID	Department for International Development
DPT	Diphtheria, Pertussis and Tetanus toxoid vaccine
DSD	Disease Surveillance Department
EPI	Expanded Programme on Immunisation
GAVI	Global Alliance for Vaccines and Immunisations
GDHS	Ghana Demographic and Health Survey
GHS	Ghana Health Service
GIVS	Global Immunisation Vision and Strategies
GoG	Government of Ghana
GPEI	Global Polio Eradication Initiative
GVAP	Global Vaccine Action Plan
ICC	Inter-agency Coordination Committee
IEC	Information, education and communication
JICA	Japan International Cooperation Agency

MCV	Measles Containing Vaccine
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey
MNTE	Maternal and Neonatal Tetanus Elimination
MoH	Ministry of Health
MR	Measles-Rubella
MSD	Measles Second Dose
NGOs	Non-Governmental Organizations
NIDs	National Immunisation Days
OPV	Oral Polio Vaccine
PEN	Predisposing Enabling Need
PHC	Primary Health Care
PHD	Public Health Division
PPME	Policy, Planning, Monitoring and Evaluation
RED	Reaching Every District
SIA	Supplemental Immunisation Activities
SSA	Sub Saharan Africa
TT	Tetanus Toxoid vaccine
UNICEF	United National Children Fund
USAID	U.S. Agency for International Development
VPD	Vaccine Preventable Diseases
WHA	World Health Assembly
WHO	World Health Organization

DEFINITION OF TERMS

Antigen: A live or inactivated substance (e.g., protein, polysaccharide) capable of producing an immune response

Fully vaccinated: A 12 – 23 months old child who had received one (1) dose of BCG, three (3) doses of OPV, PCV and DPT-HepB-Hib (Pentavalent), two (2) doses of rotavirus vaccine and one (1) dose of measles and yellow fever vaccines.

Herd immunity: A situation in which a sufficient proportion of a population is protected against an infectious disease (through vaccination and/or prior illness) that makes spread from person-to-person unlikely.

Immunisation: The process by which a person becomes protected against a disease.

Never vaccinated: A 12 – 23 months old child who did not receive a single dose of vaccine

Partially vaccinated: A 12 – 23 months old child who took at least one (1) vaccine but could not take all vaccines

Susceptible: A person who is not protected against disease

Vaccination coverage: the number of children vaccinated with a specific vaccine dose administered through routine immunisation services divided by the estimated target population.

Vaccination: Injection of an antigen into a person in order to prevent the disease

CHAPTER ONE

INTRODUCTION

1.1 Background and Historical Overview

Communicable diseases have been known to be the major cause of high levels of morbidity and mortality in the history of man. These diseases were responsible for several recurrent pandemics which resulted in high mortality levels and subsequently, low population growth and low life expectancy. Man sought desperately to rid himself of these diseases. It was only in the 18th Century that the search flowered into vaccination of children which has saved millions of lives and also prevented millions of disabilities (Daumerie et al., 2010).

Immunization has however been practiced many centuries ago. Chinese monks drank the venom of snakes to build immunity against snakebites. Snake charmers who had repeatedly received small volumes of venom from cobra bites became immune to the venom from snake bites (Gutiérrez, 2014). During the small pox era, healthy persons were intentionally infected with pus taken from pocks of infected persons to protect them against the disease. This was the practice in Africa and Turkey, before it spread to Europe and the Americas. Edward Jenner, the father of vaccination, successfully inoculated a 13 years old boy with vaccinia virus (cowpox) and demonstrated immunity to small pox using this principle (Riedel, 2005). Following this success, mass vaccinations against the disease which were conducted in the 18th and 19th Centuries culminated in the global eradication of small pox in 1979.

The 27th World Health Assembly (WHA) held in May 1974 established the Expanded Programme on Immunisation (EPI) to ensure that all children, in all countries, benefited from life-saving and efficacious vaccines (Lee and Fang, 2012). This decision was

arrived at based on the success of the smallpox eradication programme (Henderson, 1987). The purpose for establishing the EPI Programme was to protect against the six killer diseases namely tuberculosis, diphtheria, tetanus, pertussis, measles and poliomyelitis. For infectious diseases that can only be transmitted from person to person, immunisation results in the elimination of the disease and, eventually, can achieve the eradication of the organism that causes it (Miller et al., 2006). This was the case with smallpox and may be the case with two other diseases; polio and measles (WHO, 2012).

Immunisation has contributed significantly in reducing the number of hospitalizations and treatment costs through the prevention of infectious diseases (Barlow et al., 2014). Thus, apart from the provision of clean water and sanitation, immunisation against vaccine preventable diseases has saved more lives than any other public health intervention (Barlow et al., 2014). It is estimated by the World Health Organization that immunization prevents about 2 to 3 million deaths every year from vaccine preventable diseases (WHO, 2010). In the developing world where healthcare services can be hard to come by, vaccinations are a child's best chance of survival against life-threatening and debilitating diseases. Routine immunisation, an ongoing system that provides timely protection through vaccination to all children, is at the centre of these immunisation efforts. The continued discovery, research and the development of new and improved vaccines has made immunisation more effective in combating major causes of childhood illness and death.

The standard measure of vaccination coverage is the percentage of children who have received the requisite number of vaccine doses, irrespective of the age at receipt of the vaccine (Zhao and Luman, 2010). However, for maximal protection against vaccine-

preventable diseases, a child should receive all immunisations within recommended intervals (Sadoh and Eregie, 2009). Receipt of vaccines at recommended ages and intervals ensures that a child has adequate protection from target diseases at all times.

1.2 Statement of the Problem

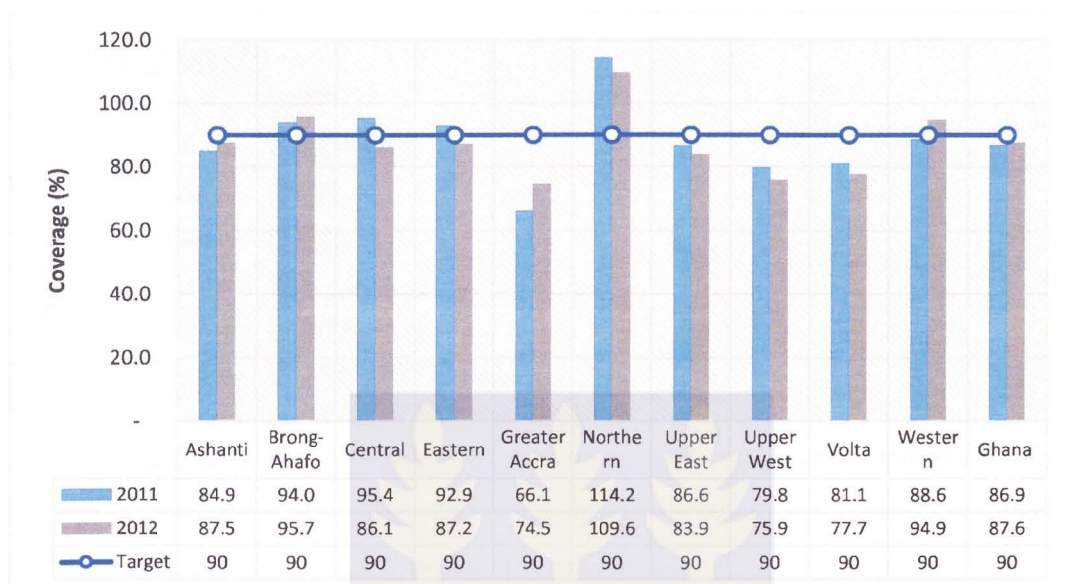
Achieving and maintaining high vaccination coverage is critical for the control, elimination and eradication of vaccine-preventable diseases in any country. The results of the 2008 Ghana Demographic and Health Survey (DHS) show that, 79% of Ghanaian children aged 12 – 23 months received all the recommended vaccines at any time prior to the survey (GSS and Macro, 2009). Compared to 1988 DHS, where only 47% of Ghanaian children received all recommended vaccines, Ghana has made remarkable progress in increasing the proportion of children that are fully immunized (DHS, 2008). However there was a 2% drop in 2011 in comparison to the 2008 DHS figure. The Multiple Indicator Cluster Survey (MICS) reported that the proportion of fully immunized children in Ghana was 77% (MICS, 2011).

The goal of the EPI Programme is to attain 90% coverage for each antigen in line with WHO global target. The national immunization records show that there has been an increase in vaccination coverage rates for all vaccines in the country over the last ten years. However, the 90% target has not been achieved to date. There are variations in vaccination coverage rates between regions and within regions.

The Annual Reports of the Expanded Programme on Immunization (2011 and 2012) indicate that five (5) regions were unable to achieve the national coverage target of 90% for the third dose of the pentavalent vaccine. Among these five (5) regions, the Greater

Accra Region recorded the lowest coverage of 66.1% (2011) and 74.5% (2012) as shown in Figure 1.

Figure 1: Regional Pentavalent-3 Performance for 2011 – 2012



Immunization data for 2011 and 2012 indicate that a high number of children were left unvaccinated. A total of 133,769 children in 2011 and 128,465 in 2012 children were not vaccinated. In Greater Accra Region nearly half (45.7%) of the targeted children were not vaccinated in 2011 and 33.8% were not vaccinated in 2012 (GHS, 2012).

On the other hand, the Northern Region vaccinated more children than were targeted. The proportion of unvaccinated children in the remaining regions ranged from 2.8% to 23.0% in 2011 and from 3.2% to 19.6% in 2012 as illustrated in Figure 2.

Within the Greater Accra Region, Ga South Municipality contributed less than 1% (247) of the total number of unvaccinated children in 2011 compared to 62.8% (38,371) in Accra Metropolis. However, in 2012, whilst the proportion of unvaccinated children in Accra Metropolis reduced from 62.8% to 54.9% (23,813), the number of unvaccinated children in Ga South Municipal increased from less than 1% to a

staggering 18.5% (8,030) of the total number of unvaccinated children in the region. This obviously is a cause for concern.

Figure 2: Proportion of unvaccinated children in Ghana by Region, 2011 and 2012

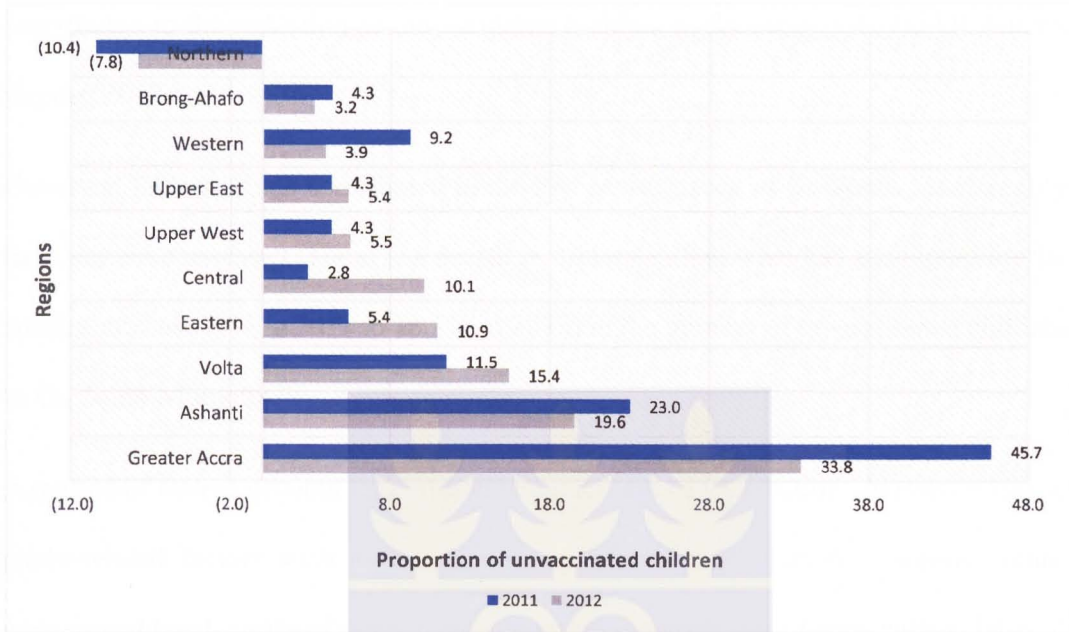
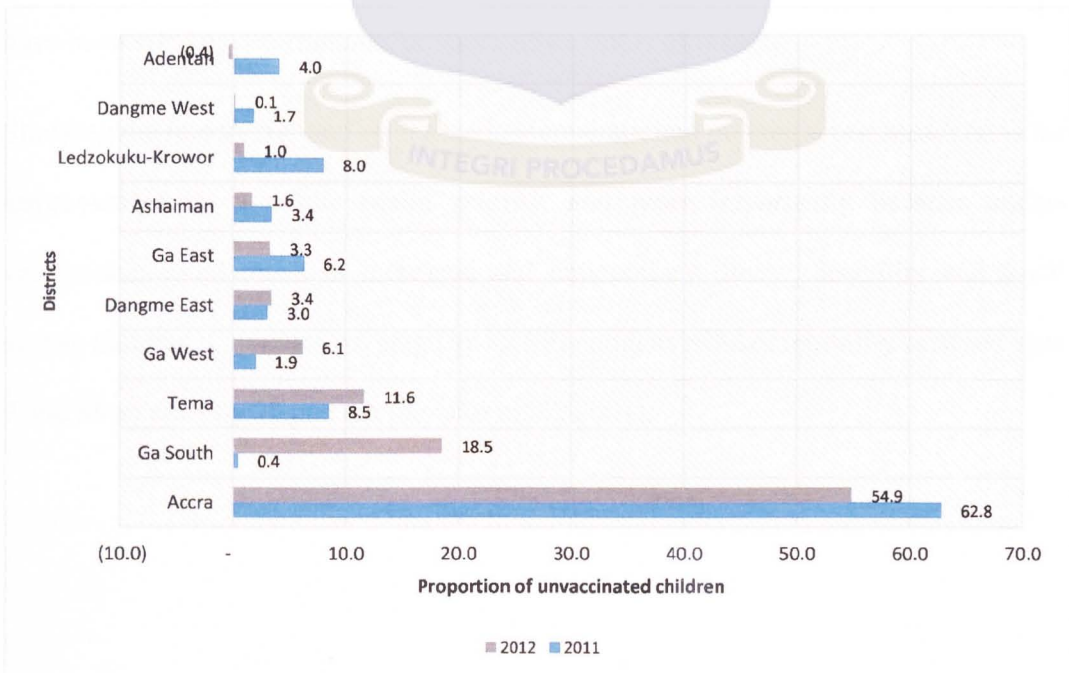


Figure 3: Proportion of unvaccinated children in Greater Accra Region by districts



Since 2010, the Greater Accra Regional Health Directorate has been conducting immunization coverage surveys every year in Accra Metropolis to assess the reasons for the low performance. Implementation of recommendations from these surveys have contributed to the reduction of unvaccinated children in the metropolis (GAR Annual Report, 2012).

However, factors which contributed to the low performance in Ga South Municipality have not been assessed. There is a dearth in understanding what has accounted for the sudden increase (1% in 2011 to 18.5% in 2012) in the number of unvaccinated children in Ga South Municipality in just one year.

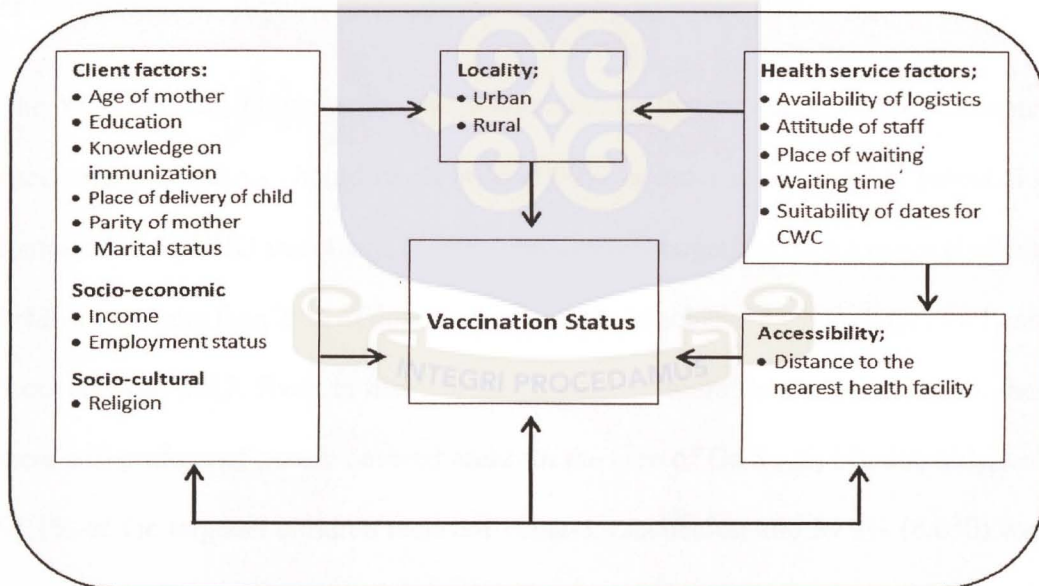
A myriad of factors account for children being left out of vaccination. In some settings, client-related factors such as knowledge on immunization, socio-economic status, educational level, parity of mother, etc. are major determinants of vaccination status of infants. The health service delivery system itself possess major barriers to vaccinating children. Factors such as staff attitude, availability of logistics and geographical access have been cited as determinants of vaccination status of infants.

Studying the factors responsible for the low coverage and making recommendations for improvements is a public health priority, and more importantly because under-vaccination could result in increased and unnecessary illness, disability and death among children. Complete coverage by all EPI antigens reduces mortality between ages 9 and 59 months by 70 percent (Nyarko et al., 2001).

1.3 Conceptual Framework

According to Anderson and Newman’s concept (1973), the utilization of immunisation services is affected by client predisposing factors as well as health service factors (Andersen and Newman, 1973). The client predisposing factors, particularly maternal factors, include age of mother, mother’s education, and mother’s knowledge on immunization, parity of mother, income levels and belief system. The health service factors include the availability of logistics, attitude of staff, place of waiting at immunization centre, waiting time at immunization centre and suitability of dates for child welfare clinics (CWC). These factors as well as the interaction among them are important determinant of the vaccination status of infants.

Figure 4: Conceptual framework



Concept adopted from: Anderson and Newman (1973) predisposing-enabling-need (PEN) explanatory model

The extent of the impact of the client related factors and the health service factors is influenced by the locality in which they live (i.e. whether rural or urban) as well as the accessibility to an immunization centre. Vaccination status of infants are therefore influenced by these factors as depicted in the figure above.

1.4 Justification

Vaccination save lives and make it possible for people to live free of illnesses and disabilities associated with vaccine-preventable diseases. A high vaccination coverage is necessary to protect as many people as possible from many vaccine-preventable diseases. It is also essential because the higher the number of people who are protected against vaccine-preventable diseases, the greater the protection for everyone in the population. A high vaccination coverage is critical to achieve and increase herd immunity. However, a lot of children are missing out on basic vaccinations which make them susceptible to diseases. Children who are not vaccinated become susceptible to diseases and can spread the disease to other children who are too young to be vaccinated or whose medical condition prevents them from being vaccinated.

The World Health Organization (WHO) maintains that coverage rate for complete vaccination of infants should reach at least 90% in order to get the full potential of immunisation (WHO and others, 2009). Attaining this target has been a major challenge in Ghana as more than 20% of districts were unable to achieve the 80% target for Penta-3 coverage in 2012. Even in districts which attained more than 80% coverage, there were still pockets of poorly covered areas. In the case of Ga South Municipality, only 61.1% of the targeted children received Penta-3 vaccination and 39.9% (8,030) were not vaccinated.

The Ga South Municipality has only four (4) government health facilities; one (1) hospital, three (3) health centres and one (1) reproductive and child health centre with two (2) community-based health planning and services (CHPS) facilities (GSMHD,

2012). The other health facilities in the municipality are private facilities where health services are more expensive. The inadequate government health infrastructure, coupled with the deplorable water and sanitation conditions in the municipality (“Government institutes policies to improve sanitation,” n.d.; Municipal Assembly, 2012) which make children prone to diseases, means that immunization is the sure bet for survival of children.

It was therefore appropriate and very important that this study be conducted to find out the vaccination coverage of children in the Ga South Municipality and also identify the factors that influence the vaccination status of these children. Identifying and understanding these factors is a major step towards addressing the concern.

Unlike the conventional EPI coverage survey where the mother provides reasons for non-vaccination, this study assessed maternal characteristics, environmental and health service characteristics, as well as the interplay between these varied characteristics and the vaccination status of infants.

The results from this study and the recommendations will provide vital information to national, regional and district level vaccination managers and frontline health workers. This will enable them to put in place appropriate interventions to eliminate the barriers to the utilization of immunisation services as well as ensure that all eligible children are vaccinated.

1.5 Objectives of the study

The design of the study answered the following research questions and also addressed the under-listed general and specific objectives.

1.5.1 Research Questions

1. What is the vaccination coverage of children 12 – 23 months
2. What proportion of children 12 – 23 months are fully vaccinated
3. What reasons account for vaccination status of children

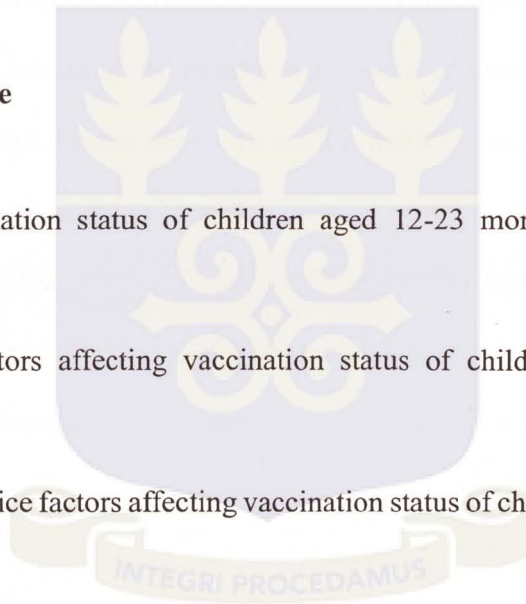
1.5.2 General Objective

To assess factors associated with vaccination status of children 12 – 23 months in Ga South Municipality

1.5.3 Specific Objective

These are to;

1. Determine vaccination status of children aged 12-23 months in Ga South Municipality
2. Assess client factors affecting vaccination status of children in Ga South Municipality
3. Assess health service factors affecting vaccination status of children in Ga South Municipality



CHAPTER TWO

LITERATURE REVIEW

2.1 Immunization

The WHO defines immunization as the process whereby a person builds resistance or becomes immune to an infectious disease (“WHO | Immunization,” n.d). Individuals acquire their mothers’ antibodies through the placenta and become immune. This type of immunity is referred to as passive immunity. Individuals may also build immunity in response to infection, vaccine or toxoid. This type of immunity is called active immunity. Whereas the protection conferred by passive immunity is temporary and wanes with time, active immunity is usually permanent. Whilst active immunity acquired by actually getting a disease and surviving it is riskier, vaccination is an easier and less risky way to become immune.

Vaccination is the administration of a vaccine into the human body to stimulate an individual’s immune system to protect him/her against an infection or disease. A vaccine is a biological preparation that improves immunity to a particular disease (“WHO | Vaccines,” n.d.).

2.2 Benefits of Immunisation

Preventing the occurrence of disease is always better than to treat it. This is the framework for public health practice. Vaccines protect those who receive them and even protect those who are not vaccinated when herd immunity in the population is high. Safe and efficacious vaccines have contributed to the control of many infectious diseases that were once very common in Ghana, the African Sub-region and the world including diphtheria, tetanus, polio, measles and whooping cough.

One of the most devastating diseases in the history of man – small pox – was eradicated through vaccination. As already indicated, according to the WHO, immunization prevents about 2 to 3 million deaths every year from vaccine preventable diseases (WHO, 2010). The development of vaccines for meningitis, influenza, hepatitis B and cancer (e.g. cervical and liver cancers) has expanded the benefits of immunization to adolescents and adults populations, providing protection against these life-threatening diseases. Immunization is especially important for the hardest to reach families as it also serve as a means for offering other life-saving interventions for mothers and children in isolated communities. Interventions such as child nutritional screening, distribution of insecticide treated nets, vitamin A supplementation and de-worming have all been delivered together with immunization.

As already indicated, the impact made by immunization to the global health landscape is matched by few interventions. Vaccination of infants, adolescents and mothers has become a foundational strategy for achieving the Millennium Development Goals (MDGs) in health (Andrus et al., 2008). Immunization indicators are being used to monitor and evaluate progress toward the achievement of child health indicators (MDG4) and maternal health (MDG5) targets, as well as the reduction in cancer (MDG6).

Immunisation has become a ‘victim of its own success’ in recent times. This is because it has made many infectious diseases rare and as a result some people are of the opinion that immunisations are no longer necessary. Since vaccination is such a common and memorable event, any illness following immunization may be attributed to the vaccine. While the vaccine may cause some of these reactions, many of them are unrelated

events that occur after vaccination by coincidence. This negative perception sometimes make people complacent in seeking immunization services.

2.3 Measuring Immunization Coverage

Immunization coverage is a key measure of immunization system performance. It is estimated either by the administrative method using reported routine immunization data or by immunization coverage surveys.

Administrative coverage is estimated by dividing the number of children vaccinated in the target population by the total number of people in the target population. This coverage can be biased due to inaccurate numerators or denominators (Burton et al., 2009). The number of children vaccinated may be underestimated due to incomplete reporting or overestimated due to over reporting from health facilities (EPI GHS, 2009). The target population may also be inaccurate as a result of population movement and/or inaccurate census estimations.

Immunization coverage surveys on the other hand are conducted to validate administrative coverage by providing coverage estimates for selected/all vaccines. It involves the assessment of the vaccination status from a sample of children using standardized questionnaires. Surveys provide other useful information such as reasons for non-immunization and proportion of children who received valid doses.

2.4 Global Immunization Performance

The global vaccination with the third dose of diphtheria-tetanus-pertussis (DTP) containing vaccine (DTP3) was 5% in 1974 when immunisation was first introduced. This increased remarkably to 83% in 2011 (Lee and Fang, 2012). Despite this

improvement almost one in every five children miss out on the third dose of the DTP (DTP-3) series in their first year of life (WHO, 2010). The Global Vaccine Action Plan (GVAP) was endorsed by the World Health Assembly in May 2012 to guide the implementation of the Decade of Vaccines' vision to expand the benefits of immunisation to other population groups including adult populations (CDC, 2013).

GVAP's key indicators include achieving and sustaining 90% DTP3 coverage at the national level and more than 80% DTP3 coverage in every district by 2015. In 2012, as was the case in the preceding year, an estimated 83% of infants worldwide received three (3) doses of DTP vaccine. Despite these improvements in global vaccine coverage, there continues to be regional and local disparities resulting from limited resources, competing health priorities, poor management of health systems and inadequate monitoring and supervision. An estimated 22.6 million children did not receive 3 doses of the DTP vaccine (CDC, 2013), a key indicator of immunisation programme performance. Strengthening national immunisation systems, especially in countries with the greatest number of under-vaccinated children, should be a global priority in order to reduce morbidity and mortality from vaccine-preventable diseases.

According to the WHO and UNICEF coverage estimates, the number of countries in Africa with national DTP-3 coverage of at least 80% increased from 1 (2%) in 1980, through 22 (42%) in 1990 to 17 (32%) in 2000 and 35 (67%) in 2010 (Machingaidze et al., 2013). Among 49 countries in Sub-Saharan Africa, 18 countries attained DTP-3 coverage levels of more than 90%.

2.5 Immunisation in Ghana

The Ghana Immunization Programme was established in June 1978 with six (6) antigens - BCG, measles, diphtheria-pertussis-tetanus (DPT) and oral polio vaccine for infants. Tetanus toxoid (TT) vaccination was also introduced to protect against maternal and neonatal tetanus. The establishment of the immunization programme was in response to the National Health Policy to reduce morbidity and mortality of vaccine preventable diseases which then contributed significantly to both infant and child mortality in the country.

Prior to this, scarification with concoctions, locally referred to as “mmoto”, was a common practice used in the past to protect against convulsion.

Ghana added yellow fever vaccine to the immunization schedule in 1992. Ten years later, hepatitis B and haemophilus influenza type b vaccines were introduced. These vaccines were combined with the already existing DPT into DPT-HepB+Hib (Pentavalent). In 2012, vaccines for pneumonia and diarrhoea were again added to the immunization schedule. In 2013, vaccination against rubella was introduced in a bivalent measles-rubella (MR) vaccine. The EPI Programme currently vaccinates against twelve (12) vaccine preventable diseases.

Ghana's Expanded Programme on Immunization (EPI) is implemented by the Ghana Health Service which is the largest public health service delivery agency of the Ministry of Health. The EPI Programme (GHS) is situated within the Diseases Control and Prevention Department (DCD) of the Public Health Division (PHD) of the Ghana Health Service (GHS). The mandate of the EPI Programme is to contribute to the overall poverty reduction goal of the government through the reduction in morbidity

and mortality by controlling, eliminating or eradicating vaccine preventable diseases (VPDs) through immunisation; as an essential component of Primary Health Care (PHC).

Ghana has a good legal framework backing immunisations in the country. The Children’s Act of 1998 (Act 560) provides for children’s right to education and well-being and explicitly mentions immunisation. “No person shall deprive a child access to education, immunisation, adequate diet, clothing, shelter, medical attention or any other thing required for his development.” The Public Health Act details the regulation framework for who can give vaccination, the responsibilities of the health professionals and the general public, and the sanctions to be applied for any infractions of this law.

Table 1: National Immunisation and Vitamin A Supplementation Schedule

	Vaccines	Doses	Route and Site of Injection
At birth	BCG OPV0	0.05ml 2drops	Intra-dermal, right upper arm Oral
6 weeks	DPT-HepB-Hib1 OPV1 Pneumo 1 Rota 1	0.5ml 2drops 0.5 ml 1.5 ml vial	Intra-muscular, lateral aspect of left thigh Oral Intra-muscular, lateral aspect of right thigh Oral
10 weeks	DPT-HepB-Hib2 OPV2 Pneumo 2 Rota 2	0.5ml 2drops 0.5 ml 1.5 ml vial	Intra-muscular, lateral aspect of left thigh Oral Intra-muscular, lateral aspect of right thigh Oral
14 weeks	DPT-HepB-Hib3 OPV3 Pneumo 3	0.5ml 2drops 0.5 ml	Intra-muscular, lateral aspect of left thigh Oral Intra-muscular, lateral aspect of right thigh
6 months	Vitamin A	100,000 IU	Oral
9 months	Measles Yellow Fever	0.5ml 0.5ml	Subcutaneous, left upper arm Subcutaneous, right upper arm
12 months	Vitamin A	200,000 IU	Oral
18 months	Measles	0.5ml	Subcutaneous, left upper arm
18 months	Vitamin A	200,000 IU	Oral
After 18 months Vitamin A will be given every 6 months till child is 5 years old 18 months – Give Long lasting Insecticide Treated Nets (LLINs) to the child			

The programme follows the 6, 10 and 14 weeks schedule beginning with a 'zero' dose of oral polio vaccine (OPV0) and Bacille Calmette Guerin (BCG) at birth and ending with measles second dose (MSD) at 18 months. The dose per vaccine and the route and site of administration is shown Table 1.

Immunization services in Ghana are integrated into the public health system and form part of overall child health care services at the regional, district and sub-district levels. The policy of decentralization allows for autonomy at these levels in planning and budgeting for service delivery including immunization services. Immunization performance is an integral part of the performance assessment of health managers at all levels.

Supplemental immunization activities (SIAs) are conducted periodically to accelerate the control, elimination and eradication of vaccine preventable diseases. There is increased efforts to eradicate polio in the country, as part of the Global Polio Eradication Initiative (GPEI). National Immunisation Days (NIDs) against polio are conducted periodically to maintain the gains made in the polio eradication efforts. Ghana has not reported any case of wild polio virus (WPV) since 2008. Ghana is also involved in accelerated measles control activities. Nationwide measles SIAs for children aged 9 months to 15 years are conducted regularly.

It is worthy of note that there has not been any documented death due to measles since 2003 in the country. Ghana has also been certified by the WHO to have eliminated neonatal tetanus in 2011 (EPI GHS, 2011).

2.6 Immunisation Performance in Ghana

The Ghana Health Service has a well-structured system at community level to deliver the majority of the public health interventions including immunisation services through the use of peripheral health workers and volunteers (CHPS). The challenge is that the structure does not operate at optimal capacity due to inadequate funding, inadequate integration of public health services and poor capacity to organize and plan these services (MoH and GHS, 2012).

Over the last ten years, significant improvements have been made in routine immunisation coverage in the country. The table below shows the immunisation coverage data for the country from 2009 to 2012;

Table 2: Trends in Immunisation Performance 2009 – 2012

Antigen	2009		2010		2011		2012	
	Perform	%	Perform	%	Perform	%	Perform	%
BCG	1,008,183	104	1,019,676	102	1,070,080	105	1,082,408	104
OPV 3	861,220	89	867,350	87	884,615	87	906,363	87
Penta 3	867,652	89	869,670	87	887,086	87	908,821	88
Measles	861,967	89	875,449	88	894,546	88	919,825	89
YF	865,472	89	873,904	88	888,802	87	910,272	88

The table above represents the performance of the immunisation programme by antigen from 2009 – 2012 for some key immunization indicators. The trend of vaccination shows steady increase throughout the period in absolute numbers. However, the coverage levels dropped by 1 – 3% in 2010 and 2011 and increased marginally in 2012. In spite of this, the programme is still close to the operational target of 90%.

Despite the progress made in vaccination coverage for these antigens, pockets of poorly covered areas exist across regions, districts and communities. Inadequate levels of immunisation against childhood diseases remain a significant public health problem.

The factors associated with low immunisation coverage and for that matter incomplete vaccination of infants are poorly understood and little data is available to explain the phenomenon that could support evidence-based approach to improve coverage (Abdulraheem et al., 2011), especially in areas with low vaccination coverage.

2.7 Factors associated with vaccination coverage of infants

Across the world and especially in the developing countries, there is a wide gap between the potential to reach all children with safe and efficacious vaccines and the actual number of children vaccinated each year. Factors affecting vaccination coverage of infants could be assessed from the client's perspective, the health care system and the environment. This indicates that a multilevel approach is required to improve the vaccination status of children and subsequently improve their health status.

2.7.1 Client related factors

A key factor affecting vaccination status of infants is the level of education of the mother. Closely related to this is the level of knowledge or perception about the importance of vaccines, the vaccination schedule and the diseases prevented by vaccines.

In a study by Sackou et al. (2012) the level of education and knowledge of the immunisation schedule were positively associated with complete vaccination of children (Sackou et al., 2012). Etana and Deresa (2012) also identified in a cross-sectional community-based study that complete immunisation is positively associated with mothers' knowledge about the age at which vaccination begins and the age at which vaccination completes (Etana and Deressa, 2012). A recent survey showed that

even if a mother is not educated, having a literate father with secondary education and above is statistically significant and positively correlated with the likelihood of a child being vaccinated (Rammohan et al., 2012).

Still on education, Scheops et al (2013) observed that mother's education does not only influence the vaccination status of children but also influence timely adherence to the vaccination schedule (Schoeps et al., 2013). In a related study, children of mothers with secondary education or more were found to be more likely to complete immunisation (Brown and Oluwatosin, 2012). These studies are consistent with a study in 24 countries in sub-Saharan Africa which identified that children born to illiterate mothers and illiterate fathers were more unlikely to be immunised than those born to parents with secondary or higher education. They also identified that mothers who have access to information on immunization significantly reduced the odds of having a child who is not fully immunised (Wiysonge et al., 2012). Understanding the effect of education on the vaccination status of infants is critical in improving the immunisation status of children as demonstrated by the above studies.

Place of delivery has also been found to be associated with immunisation status. Most studies that assessed the relationship of place of delivery with vaccination status show that mothers who deliver in a health facility are more likely to start immunisation. A recent hospital-based study in Ghana by Laryea et al (2014) revealed that children receiving immunisations services in health facilities, especially, the same facility as they were born were more likely to receive BCG vaccine on time (Laryea et al., 2014). A study in South-western Ethiopia also observed that delivery in a health facility as well as proximity to a health facility were significantly associated with vaccination coverage (Wado et al., 2014). In a multi-country study which used data from

Demographic and Health Surveys, being delivered in a public or private health facility compared with being delivered at home was associated with increased odds of complete vaccination status (Canavan et al., 2014). Another study by Moyer et al (2013) identified that facility delivery was significantly associated with increased probability of infant vaccination and increased probability of being fully immunized. According to the study, facility delivery was the strongest single factor associated with infants being immunized, doubling the odds of full immunisation (Moyer et al., 2013). Etana and Deresa (2012) also found that health facility delivery was significantly associated with complete vaccination (Etana and Deressa, 2012). Taking steps to encourage mothers to deliver in health facilities will not only help improve immunisation coverage but also increase the proportion of supervised delivery in the country.

Goldman et al (1998) maintains that having more children may cause resource constraints, which has a negative effect on healthcare utilization (Goldman et al., 1998). Wado et al (2014) found among demographic factors that, the number of under-five children in a family was significantly associated with completion of vaccination (Wado et al., 2014). It has also been found in a recent study by Calhoun et al (2014) that children of mothers of higher parity were less likely to be fully vaccinated (Calhoun et al., 2014). It has been found in a study in a southern district of Nigeria that having fewer than three children was positively associated with complete immunization (Fatiregun and Okoro, 2012). A study in Bangladesh observed that children of mothers with lower parity were more likely to be fully immunized. That is mothers with greater parity were less likely to vaccinate their children (Rahman and Obaida-Nasrin, 2010a). Other studies found no effect of household size to vaccination status of infants (Schoeps et al., 2013).

Parents may be fearful of the effect of vaccination on their children. They sometimes try to balance their fear of committing harm to the child through vaccination as against their fear of omitting care (Blumling et al., 2013). Parents thus fear the process of vaccination more than the threat of diseases. This is particularly the case in Ghana where as a result of the success of the EPI Programme, ravaging diseases like measles, diphtheria and whooping cough are no longer causing morbidity and mortality. Vaccines are therefore feared more than the diseases. Immunisation is therefore seen as a 'victim of its own success'.

A study by Wiysonge et al. (2012) reported that children from the poorest households were more likely to be unimmunised compared with children from the richest households (Wiysonge et al., 2012). This is consistent with a study in 2007 which identified that low socioeconomic status was associated with high rate of non-vaccination among infants (Kim et al., 2007). In a community-based cross-sectional study in Uganda, about half the children studied received all vaccines within the recommended time ranges. Vaccinations that were not received within the recommended age ranges were associated with being in the lowest wealth quintile (Babirye et al., 2012).

The association between place of residence and completion of childhood vaccination has been less consistent. In a cross-sectional survey on factors influencing immunisation coverage in Sudan, the authors found that children in urban and rural areas differed significantly in their reported vaccination coverage and their receipt of each vaccine. In urban areas, accessibility to immunisation centres is high compared to rural areas where amidst the few centres immunisation is schedule based (Ibnouf et al., 2007). Schoeps et al. (2013) noted that children living in rural areas were more likely

to fail timely vaccination with BCG than urban children (Schoeps et al., 2013). Brown and Oluwatosin (2012) also identified that children in urban area are more likely to complete immunisation (Brown and Oluwatosin, 2012). Contrary to these findings, Etana and Deresa (2012) found that area of residence and mother's socio-demographic characteristics were not significantly associated with full immunisation among children (Etana and Deressa, 2012).

In a related study by Blanford et al. (2012) the vaccination rates among infants were strongly correlated with distance. That is, children living in communities within 1-hour of a health facility had 1.88 times higher odds of complete vaccination by age 1 year compared to children living in communities further from a health centre (Blanford et al., 2012). A study in Mozambique found that incomplete vaccination were associated with accessibility to the vaccination centre (Jani et al., 2008). It is therefore not surprising that the Community-based Health Planning and Services (CHPS) concept in Ghana which aims at bringing healthcare to the doorstep of communities has contributed to an increase in the number of fully immunized children (MoH and GHS, 2012).

2.7.2 Health Service Factors

Poor interaction between staff and clients can seriously damage an immunisation programme. If the manner in which information is delivered to mothers is not appropriate, mothers are likely not to return to complete immunisation for their children. As noted by Jegede and Odumosu (2003), one of the major factors contributing to the low patronage of immunisation services in the past was the attitude of the clinic staff (Jegede and Odumosu, 2003). A study by Mabrouka (2008) observed

that positive attitude of staff was significantly associated with better immunisation status than negative attitude. Access to immunisation is influenced by the nature of the health care facility and service available.

Bosu et al (1997) found that the major factors influencing immunisation services were lack of suitable venues and furniture at outreach clinics, financial difficulty, long waiting times transport difficulties and poorly motivated service providers (Bosu et al., 1997). Maintaining appropriate levels of logistics will help reduce missed opportunities and improve immunisation status of infants.



CHAPTER THREE

METHODS

3.1 Study Design

The study was an analytical cross-sectional community-based survey among a sample of mothers of children aged between 12 – 23 months old from households in the Ga South Municipality of Greater Accra Region.

3.2 Profile of the Study Area

3.2.1 Location and size

Ga South Municipality is one of the sixteen (16) administrative districts in the Greater Accra Region of Ghana. It lies within latitude $5^{\circ} 48'$ north to $5^{\circ} 29'$ north and longitude $0^{\circ} 8'$ west and $0^{\circ} 30'$ west. The administrative capital of the municipality is Gbawe. The Municipality shares boundaries with Awutu-Senya-East District (in Central Region) to the west, Accra Metropolitan to the east, Ga West Municipality to the north and the southern part of the municipality borders the Gulf of Guinea. It occupies a land area of approximately 517.2 sq km with about 362 communities. The eastern and southern parts of the district are predominantly urban whereas the western and northern parts are peri-urban and rural respectively.

3.2.2 Demographic Characteristics

According to the 2010 Population and Housing Census, the population of Ga South Municipality is estimated to be 485,643 with the female population constituting 51.08% while males make up the remaining 48.92% (GSS, 2010). The population is mainly concentrated in the urban and peri-urban areas of the municipality particularly along

the border with the Accra Metropolis. The urban and peri-urban population constitutes 76.04% with the remaining 23.96% residing in the rural portion of the Municipality.

3.2.3 Economy

The structure of the local economy is predominantly agriculture, followed by the industrial sector and the service sector. The agricultural sector employs a very large proportion of the labour force. The main agricultural activities include fishing in the coastal and lake areas and farming in the inland areas. The majority of rural dwellers in the municipality are peasant farmers who grow maize, cassava, pepper, okro etc. There are large commercial farms which produce pineapple, water melon, pawpaw, mango, pepper and coconut for export.

The urban and peri-urban dwellers engage in varied activities which comprise artisans, distributive traders, handcrafters, civil servants and industrial workers. Cassava dough production and Gari making are processing activities in some areas. The Pambros salt industry is also operating in the free zone of the municipality.

3.2.4 Health Sector

Health service delivery at the municipality is divided into five (5) sub-municipalities and also incorporates a community-level health delivery system. Health services is provided principally by government health centres and a number of private clinics and maternity homes. The major issue of the health sector is the challenge of access to health care for the majority of the population. A significant number of the population lives in scattered rural settlements who have to commute long distances to access health care.

In order to reach such populations, outreach services are organized to these communities weekly, bi-weekly or monthly.

Table 3: Number of health facilities by sub-district and provider

Sub-municipal	Government				Private		
	Hosp/ polycl	HC	RCH	CHPS	Hosp	Clinic	Mat. Home
Weija	1	0	0	1	5	14	18
Amanfro	0	1	0	0	0	1	2
Kokrobite	0	1	0	0	1	0	2
Mallam	0	0	1	0	0	1	5
Obom	0	1	0	1	0	0	2
Total	1	3	1	2	6	16	29

3.3 Study Population

The study population was mothers of children aged 12 – 23 months old. Mothers of children within this age group were selected because, at this age, the children should have completed the schedule for infant immunizations. Thus, mothers of children who were born between 13th June 2012 and 12th June 2013 were eligible for the study.

3.3.1 Inclusion Criteria

A mother was included in the study if;

1. Her child was born between 13th June 2012 and 12th June 2013
2. She resided in a selected cluster
3. She consented or accented to participate in the study

3.3.2 Exclusion Criteria

A mother was excluded from the study if;

1. Her child was less than one (1) year or more than two (2) years
2. She did not reside in a selected cluster
3. She was seriously ill and could not respond to questions
4. She declined to participate in the study

3.4 Sampling

3.4.1 Sample Size

The minimum sample size was calculated using Cochran's single proportion population formula (Cochran, 2007) below;

$$N.min = deff \times \frac{Z^2 \hat{p}\hat{q}}{d^2}$$

Where;

- $N.min$; Minimum sample size required
- $deff$; Design effect (the ratio between the variance of the cluster design to the variance that would be obtained from a simple random sampling)
- Z ; desired confidence level (α).
- P ; expected coverage
- q ; 1 - expected coverage
- d ; precision (desired width of the confidence interval)

Using confidence level of 95% ($Z= 1.96$), expected proportion for children fully immunized of 60% (0.60), precision of 10% ($d= 0.10$) and assuming a design effect of 2, the minimum number of children required was calculated as follows;

$$n = 2 \times \frac{1.96^2 * 0.60(0.40)}{0.10^2}$$

$$n = 2 \times 92.2$$

$$n \approx 184.4$$

Assuming 10% non-response rate (18 persons), the estimated sample size for the study was approximately 203.

3.4.2 Determination of number of clusters

The WHO standard 30 x 7 cluster sampling approach was adopted as recommended by the WHO Immunization Coverage Cluster Survey Reference Manual (WHO and others, 2005). Therefore, a total number of 30 clusters were studied.

3.4.3 Sampling Method

A two-staged sampling method was employed for the study. In the first stage, clusters (enumeration areas), which represented the primary sampling units (PSU), were selected using probability proportional to size (PPS) sampling method. By this method, a list of all communities in Ga South Municipal (Column A) with their respective populations (Column B) was obtained from the Ghana Statistical Service (GSS). Cumulative population was then calculated (Column C). The sampling interval was obtained by dividing the total population by the desired number of clusters to be studied. A random number between 1 and the sampling interval was then chosen using a currency note.

The first community on the list whose cumulative population exceeded this random number was identified as the first cluster. Then, the random number was added to the sampling interval. The community whose cumulative population just exceeded this number (sum of random number and sampling) became the second cluster. Subsequent

clusters were located by adding the sampling interval to the number which identified the previous cluster. Cluster maps with description of the boundaries of each cluster were then obtained from the Ghana Statistical Service. The list of selected clusters is attached as Annex 3 and sample description of a cluster is attached as Annex 4.

In the second stage, households, which were the secondary sampling units (SSU) were randomly selected within each cluster. The first household was selected by spinning a pen at the approximate centre of a cluster. The households along the direction of the tip of the pen were labelled and counted. The first household was randomly selected from this list. This was done by listing household numbers on pieces of paper which were then folded. The folded numbers were shuffled and the household number of the first folded paper that was picked became the first household. Subsequent households were selected using the “nearest household door” criteria until the required sample size in a cluster were obtained.

3.5 Study variables

Table 4: Study variables

Study Variable	Operational Definition	Measurement Scale	Data Collection tools/ Technique
Vaccination status*	Completeness of the immunisation schedule	Ordinal 1. Fully vaccinated 2. Not fully vaccinated	Structured Questionnaire / statistical analysis
Age of mother	Age in years of the mother at last birthday	Continuous	Structured Questionnaire/ Interview
Marital status	The marital status of the mother	Categorical 1. Single 2. Married 3. Divorced 4. Co-habiting 5. Widowed	Structured Questionnaire/ Interview
Religion	The religious group of the mother	Categorical 1. Christian 2. Muslim	Structured Questionnaire/ Interview

Study Variable	Operational Definition	Measurement Scale	Data Collection tools/ Technique
		3. Traditional 4. None	
Education	The highest educational level attained by the mother	Ordinal 1. Tertiary 2. Secondary 3. Primary 4. None	Structured Questionnaire/ Interview
Knowledge	Mothers knowledge on vaccine preventable diseases	Ordinal 1. Good 2. Poor	Structured Questionnaire/ Interview
Mother's occupation	Economic status of mother/Income level	Ordinal 1. High 2. Medium 3. Low	Structured Questionnaire/ Interview
Parity	The number of children a mother has given birth to	Continuous	Structured Questionnaire/ Interview
Place of delivery	Child was delivered in a health facility or otherwise	Binary 1. Health Facility 2. Home 3. Other	Structured Questionnaire/ Interview
Locality	The status of the area of residence of the mother	Ordinal 1. Urban 2. Peri-urban 3. Rural	Literature/ Observation/ Interview
CWC dates	Suitability of dates for CWC	Binary 1. Appropriate 2. Inappropriate	Structured Questionnaire/ Interview
Attitude	Attitude of staff	Binary 1. Good 2. Poor	Observation/ Questionnaire/ Interview
Place of waiting	Convenience of place of waiting	Binary 1. Appropriate 2. Inappropriate	Observation/ Questionnaire/ Interview
Waiting time	Time between arrival at HF and provision of services	Binary 1. Short 2. Long	Structured Questionnaire/ Interview
Access	Walk time to the nearest health centre	Binary 1. < 30 min 2. > 30 min	Questionnaire/ Interview
Knowledge	Mothers knowledge on the immunization schedule	Binary 1. Appropriate 2. Inappropriate	Questionnaire/ Interview

* Dependent variable

3.6 Data Collection

In each cluster, door-to-door visits and face-to-face interviews were conducted with mothers who met the inclusion criteria. The data collection instrument that was used was adapted from the WHO Standard EPI cluster survey questionnaire to suit the study. Data on vaccination status, date of birth and sex of children aged 12 – 23 months were obtained from the child health records (CHR) book. Vaccination histories were obtained from mother's recall if child health records book was not available. The instrument captured demographic variables such as the age of the mother, place of residence, marital status, religion, parity and socio-economic indicators of the household. Other study variables such as access to immunization centre, attitude of nurses, suitability of vaccination days, mothers' knowledge on immunization etc. were also captured by the instrument.

3.7 Training of Data Collectors and Supervisors

Six (6) data collectors and one (1) supervisor were recruited for the study. They were thoroughly trained in order to make them familiar with the survey. The training covered the following key areas; objectives and justification of the study, data collection procedures, community entry, selection of first household and subsequent households, probing techniques, filling of questionnaires and ethical considerations including consent. Demonstrations and role plays were used throughout the training. A set of the training materials were printed, given to each of the data collectors and the supervisor for ease of reference.

3.8 Pre-test

Pretesting was done to enable the data collectors practice the data collection technique. It also helped in fine-tuning the data collection instrument as questions that were found to be unclear were modified and those found to be unnecessary were deleted. Lastly, the pretesting made it possible for the researcher to assess the presence of sensitive questions, appropriateness of categorization of variables and flow of questions. The pretesting was done at Sakaman, a community in Accra Metropolis, which borders Ga South Municipal.

3.9 Quality Control

Steps were taken to ensure quality control before, during and after data collection as well as at the analysis stage of the study. The data collection processes were standardized in order to achieve the highest level of uniformity of the data collection procedures in the entire study population. The researcher supervised the data collection process and ensured there were no protocol deviations.

The data entry template was designed to resemble the data collection instrument which facilitated data entry. Legal values (valid values) and check codes were incorporated in the data entry template which prevented data entry errors. All completed questionnaires were assigned a unique identification number which made it possible to trace each piece of information. Data from the study was password-protected and stored on an external storage device. The dataset was used only for the purposes of this study.

3.10 Statistical Method and Data Analysis

Vaccination status, which had a dichotomous response, was the outcome of the study. A child was classified as fully vaccinated if he/she had received one dose of BCG, three doses of OPV, DPT-HepB-Hib and PCV, two doses of rotavirus vaccine and one dose of measles and yellow fever at the time of the study. A child was classified as not fully vaccinated if he/she had not received any or none of the above mentioned vaccines at the time of the study. The explanatory variables included in the study were age of mother, highest level of education of mother, mothers' employment status, marital status of mother, mothers' religion, parity of mother, place of delivery of child, birth order of child, distance to nearest immunization centre, convenience of place of waiting at the immunization centre, waiting time at the immunization centre, attitude of service providers, suitability of days of immunization, residence of respondent, mothers' knowledge on immunization, sex of child and availability of vaccination card.

Mothers' knowledge on immunization was assessed based on a set of ten (10) questions which sought to establish if the mother knew the vaccines in the EPI Programme, the diseases prevented by vaccines in Ghana and the immunization schedule of infants. Each correct answer was given a score of '1', and an incorrect answer was given '0'. The scores were then totalled and mothers who had 5 points or more were considered to have high knowledge and those who had less than 5 points were classified as low knowledge. Access to immunization centre was studied by assessing the walking time needed to reach the nearest immunization centre.

Data entry and cleaning were done with EpiData 3.1 and data analysis was done with Stata 12.1. The data were inspected and sorted. There were no missing values. The variables age of mother and parity of mother were categorized into four (4) and three

(3) groups respectively. Age of mother was categorised into less than 25 years, 25 – 30 years, 30 – 35 years and above 35 years. Parity was categorised into primiparous, multiparous and grand-multiparous. The variable ‘mothers’ level of education’ was in four (4) ordered levels; none, primary, secondary, tertiary. The variable ‘residence’ was in three (3) categories; urban, peri-urban and rural. All other variables were dichotomised.

Bivariate analysis was done to evaluate the proportions of categorical variables with the outcome variables. Chi-square test was used to evaluate the association between the vaccination status and the explanatory variables. Interaction tests among the explanatory variables were done. Odds ratios at 95% confidence intervals were used to assess the measure of effect. As recommended by Hosmer et al (2013) all variables resulting in P-value <0.25 in the bivariate analysis were included in a multivariate analysis (Hosmer Jr et al., 2013) in order not to miss out on any potential confounder.

In the multivariate analysis, logistic regression model was used. Odds ratios at 95% confidence intervals were used to assess the measure of effect. P-values, calculated by Wald test, was considered significant at $p < 0.05$. To test the hypothesis that the data fits the model, Pearson goodness-of-fit test was used.

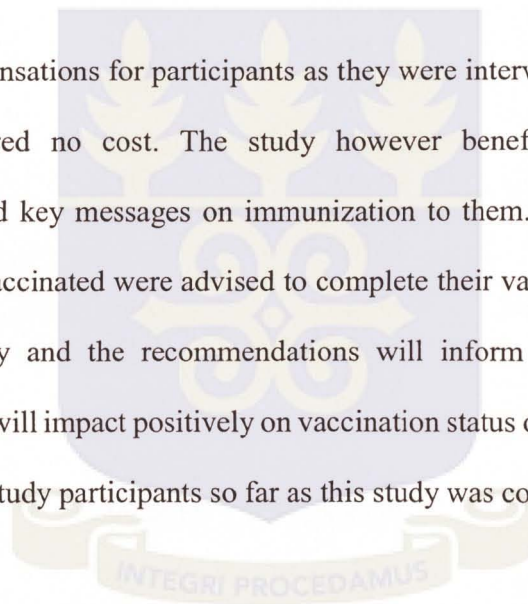
3.11 Ethical Considerations

Ethical clearance for the study was obtained from the Ethical Review Committee (ERC) of the Ghana Health Service. Approval to commence the study was also obtained from the Greater Accra Regional Health Directorate as well as the Ga South Municipal Health Directorate. Informed written consent were sought from mothers who were 18

years and above. For those who were less than 18 years old, their guardians accented before they were included in the study.

The respondents were adequately informed about all aspects of the study (objectives, interview procedures and potential benefits) before interviews were conducted. Interviewers informed respondents about the scope of the interview and its approximate length prior to the start of the interview and the fact that their participation was entirely voluntary. They were assured of their privacy and confidentiality of the interview. Also respondents were made to know that they had the right to withdraw from the interview at any time.

There were no compensations for participants as they were interviewed in their homes and therefore incurred no cost. The study however benefitted participants as interviewers delivered key messages on immunization to them. Mothers of children who were not fully vaccinated were advised to complete their vaccination. Again, the findings of the study and the recommendations will inform policy decisions on immunization which will impact positively on vaccination status of children. There was no risk to any of the study participants so far as this study was concerned.



CHAPTER FOUR

RESULTS

4.1 Socio demographic characteristics of study participants

A total of 210 mothers were interviewed and the vaccination records of 210 children were also reviewed from the 30 clusters in Ga South Municipality.

Table 5: Socio demographic characteristics of mothers by type of residence

	Urban n=128	Peri-urban n=61	Rural n=21	Total n=210
Age (years)				
< 25	31(24.2)	18(29.5)	8(38.1)	57(27.1)
25 - 30	39(30.5)	17(27.9)	3(14.3)	59(28.1)
30 - 35	36(28.1)	16(26.2)	5(23.8)	57(27.1)
>35	22(17.2)	10(16.4)	5(23.8)	37(17.6)
Level of Education				
Tertiary	14(10.9)	6(9.8)	0(0.0)	20(9.5)
Secondary	38(29.7)	21(34.4)	5(23.8)	64(30.5)
Primary	57(44.5)	19(31.2)	9(42.9)	85(40.5)
None	19(14.8)	15(33.6)	7(33.3)	41(19.5)
Income (GH¢)				
<200	104(81.3)	53(86.9)	21(100.0)	178(84.8)
200 - 500	13(10.2)	8(13.11)	0(0.0)	21(10.0)
500 - 1000	7(5.5)	0(0.0)	0(0.0)	7(3.3)
>1000	4(3.1)	0(0.0)	0(0.0)	4(1.9)
Employment Status				
Employed	92(71.9)	33(54.1)	14(66.7)	139(66.2)
Not employed	36(28.1)	28(45.9)	7(33.3)	71(33.8)
Marital status				
Married	76(59.4)	33(54.1)	15(71.4)	124(59.0)
Co-habiting	40(31.3)	22(36.1)	6(28.6)	68(32.4)
Divorce	2(1.6)	0(0.0)	0(0.0)	2(1.0)
Single	10(7.8)	6(9.8)	0(0.0)	16(7.6)
Religion				
Christianity	105(82.0)	53(86.9)	19(90.5)	177(84.3)
Islam	22(17.2)	6(9.8)	1(4.8)	29(13.8)
Traditional	0(0.0)	0(0.0)	1(4.8)	1(0.5)
None	1(0.8)	2(3.3)	0(0.0)	3(1.4)
Parity				
Primiparous	42(32.8)	25(41.0)	6(28.6)	73(34.8)
Multiparous	78(60.9)	27(44.3)	11(52.4)	116(55.2)
Grand-multi	8(6.3)	9(14.8)	4(19.0)	21(10.0)
Sex of child				
Male	66(51.6)	34(55.7)	7(33.3)	107(51.0)
Female	62(48.4)	27(44.3)	14(66.7)	103(49.0)

One hundred and twenty eight (60.9%) of the respondents were from urban areas, 61 (29.1%) from peri-urban areas and the remaining 21 (10.0%) were from rural areas.

Table 5 shows the demographic characteristics of study participants. From the table, 57 (27.1%) of the mothers were less than 25 years, 59 (28.1%) were between 25 – 30 years, another 57 (27.1%) were aged between 30 – 35 years and the remaining 37 (17.6%) were above 35 years. The mean age of the mothers who were interviewed was 29.01 years (min = 16, max = 49; SD = 6.3).

Forty one (19.5%) of the mothers had no formal education, 85 (40.5%) had primary education, 64 (30.5%) secondary education and the remaining 20 (9.5%) had tertiary level education. With regards to employment status, 139 (66.2%) of the mothers were employed. Majority of the mothers (59.0%) were married, 68 (32.4%) were co-habiting, 2 (1.0%) were divorced and the remaining 16 (7.6%) were single. Christians constituted 84.3% (177) compared to Moslems who constituted 13.8% (29) of the respondents. Three (1.4%) of the mothers had no religion. Seventy three (34.8%) of the mothers were primiparous, 116 (55.2%) were multiparous and the remaining 21 (10.0%) were grand-multiparous.

With regards to the children, 107 (51.0%) were males and 103 (49.0%) were females. The mean age of these children was 17.99 months (min = 12.2, max = 24.0; SD = 3.9).

4.2 Health service factors and other characteristics of study participants

Table 6 shows other characteristics of study participants as well as some systemic factors that affect vaccination status of infants. From the table, 179 (85.2%) of the children were delivered in a health facility. Two (1.0%) were delivered by a traditional birth attendant (TBA), 28 (13.3%) were delivered at home and one child (0.5%) was

delivered in a public transport. The mother delivered whilst she was being transported to a health facility. The child health records books of 200 (95.2%) out of the 210 children were available for assessment.

One hundred and twenty two (58.1%) mothers reported that they use less than 30 minutes to reach the nearest immunization centre by foot whereas 88 (41.9%) indicated that it would take them more than 30 minutes to walk to the nearest vaccination centre. Majority of 176 (83.8%) mothers reported that they were provided with a convenient place to sit and wait for their wards to be vaccinated any time they visited an immunization centre.

Table 6: Other characteristics of mothers

	Urban n=128	Peri-urban n=61	Rural n=21	Total n=210
Place of delivery				
Health Facility	117(91.4)	50(82.0)	12(57.1)	179(85.2)
TBA	0(0.0)	2(3.3)	0(0.0)	2(1.0)
Home	10(7.8)	9(14.8)	9(42.9)	28(13.3)
Other	1(0.8)	0(0.00)	0(0.00)	1(0.5)
Walk time to nearest immunization center				
< 30 minutes	73(57.0)	36(59.0)	13(61.9)	122(58.1)
> 30 minutes	55(43.0)	25(41.0)	8(38.1)	88(41.9)
Place of waiting at immunization center				
Convenient	103(80.5)	55(90.2)	18(88.7)	176(83.8)
Not convenient	25(19.5)	6(9.8)	3(14.3)	34(16.2)
Long waiting time				
No	99(77.3)	48(78.7)	18(85.7)	165(78.6)
Yes	29(22.7)	13(21.3)	3(14.3)	45(21.4)
Attitude of staff				
Good	116(90.6)	53(86.9)	18(85.7)	187(89.0)
Bad	12(9.4)	8(13.1)	3(14.3)	23(11.0)
Date of next visit				
Suitable	123(96.1)	55(90.2)	21(100.0)	199(94.8)
Not suitable	5(3.9)	6(9.8)	0(0.0)	11(5.2)
Knowledge on Immunization				
High	27(21.1)	16(26.2)	0(0.0)	43(20.5)
Low	101(78.9)	45(73.8)	21(100.0)	167(79.5)
Vaccination Card				
Available	119(93.0)	60(98.4)	21(100.0)	200(95.2)
Not available	9(7.0)	1(1.6)	0(0.0)	10(4.8)

One hundred and sixty five (78.6%) mothers reported that it takes less than 30 minutes for their wards to be provided with immunization services when they arrive at the immunization centre. One hundred and eighty seven (89.0%) mothers judged the attitude of service providers as good. A majority of 119 (94.8%) mothers indicated that the date for vaccination that were given to them were always suitable.

4.3 Mothers knowledge on vaccination and the immunization schedule

Assessment of mothers knowledge on immunization showed that, only 43 (20.5%) of mothers were considered to have high knowledge on immunization whilst 167 (79.5%) had low knowledge. The questions that were used to assess mothers' knowledge and the responses to these questions are presented in Table 7 below;

Table 7: Mothers knowledge on vaccination and the immunization schedule

	No. Correct (n=210)	% Correct
Aware of Vaccine given to mothers during pregnancy	90	42.9
Aware of at least five diseases prevented by vaccination	13	6.2
Knows age/period a child be given his/her first vaccination	130	61.9
Knows at least one vaccine administered orally (mouth)	66	31.4
Knows at least one vaccine administered in the thigh	19	9.1
Knows at least one vaccine which is administered in the upper arm	30	14.3
Aware of number of doses of a vaccine given in the thigh	76	36.2
Aware of the vaccination schedule for any vaccine given in the thigh	67	31.9
Knows at least a vaccine administered at 9 months	45	21.4
Knows at least one vaccine which was recently introduced	14	6.7

From the table above, 90 (42.9%) mothers were aware of the vaccine which is given to mothers during pregnancy. Only 13 (6.2%) mothers were able to mention at least five

(5) diseases that are prevented by vaccination in Ghana (Table 7). Details of the diseases that were mentioned by mothers and the frequencies are presented in Table 8. The table shows that 130 (61.9%) mothers were able to state the period within which a new born should receive his or her first vaccination. Sixty six (31.4%) mothers were able to mention at least one vaccine which is administered orally, 19 (9.1%) were able to mention at least one vaccine which is administered in the thigh and 30 (14.3%) knew at least one vaccine which is administered in the upper arm.

Seventy six (36.2%) mothers were aware of the number of doses of a vaccine given in the thigh (PCV and Pentavalent) that every child should receive and 67 (31.9%) were able to state the vaccination schedule for the said vaccine. Forty five (21.43%) mothers were able to mention at least one vaccine which is administered at 9 months. Only 14 (6.7%) of respondents were able to mention at least one vaccine which was recently introduced into the EPI Programme.

Table 8: Frequency of vaccine preventable diseases mentioned by mothers

	No. Correct (n=210)	% Correct
Measles	101	48.1
Polio	95	45.2
Yellow Fever	57	27.1
Tetanus	20	9.5
Tuberculosis	17	8.1
Diarrhoea	13	6.2
Hepatitis B	10	4.8
Pertussis	7	3.3
Diphtheria	4	1.9
Pneumonia	4	1.9
Haemophilus Influenza Type B	3	1.4

The vaccine preventable disease which was most common to the respondents was measles (48.1%) and the least common disease was haemophilus influenza type b (1.4%). Ninety five (45.2%) of the mothers were able to mention poliomyelitis as a disease prevented by vaccination in Ghana. Yellow Fever was mentioned by 57 (27.1%) respondents, tetanus was mentioned by 20 (9.5%) respondents, tuberculosis was mentioned by 17 (8.1%) respondents, diarrhoea was mentioned by 13 (6.2%) respondents, hepatitis B by 10 (4.8) respondents and pertussis by 7 (3.3%) respondents. Diphtheria and pneumonia were mentioned by 4 (1.9%) respondents each as presented in Table 8.

4.4 Vaccination coverage

Table 9 shows the vaccination coverage of children aged 12 – 23 months in Ga South Municipal. From the table, the coverage for fully vaccinated children by card and history was 88.6% (Card=90%, history=60%).

The coverage for BCG by card and history was 99.5% (209). The BCG coverage for children whose vaccination cards were available at the time of the survey was 100% (210) whilst that of those whose BCG coverage were established from mother's recall was 90% (9). The coverage for the third dose of polio (OPV-3) by card and history was 95.2% (200). For those with cards, 96.5% (193) received the third dose of polio whereas 70% (7) of those whose cards were not available received the third dose of polio. For the Pentavalent vaccine (DPT-HepB-Hib), 98.6% (207) received the first dose by card plus history. Among those with cards, 99% (198) were vaccinated compared to 90% (9) of those without cards. For the second dose, 97.14% (204) were vaccinated by card plus history. About 97.5% (195) were vaccinated by card alone and 90% (9) by history. For

the third dose, 95.24% (200) were vaccinated by card plus history. About 96.5% (193) were evidenced by card only whilst 70% (7) of those without vaccination cards received the third dose.

Table 9: Vaccination coverage of children aged 12 – 23 months by card and/or history

	History ONLY n=10	Card ONLY n=200	Card + History n=210
BCG	90.0	100.0	99.5
Polio – 1	90.0	99.5	99.1
Polio – 2	90.0	97.5	97.1
Polio – 3	70.0	96.5	95.2
DPT-HepB-Hib (Penta) -1	90.0	99.0	98.6
DPT-HepB-Hib (Penta) -2	90.0	97.5	97.1
DPT-HepB-Hib (Penta) -3	70.0	96.5	95.2
Pneumococcal Conjugate Vaccine- 1	90.0	99.0	98.6
Pneumococcal Conjugate Vaccine- 2	90.0	97.5	97.1
Pneumococcal Conjugate Vaccine- 3	70.0	96.5	95.2
Rotavirus Diarrhoea – 1	90.0	99.0	98.6
Rotavirus Diarrhoea – 2	90.0	97.5	97.1
Measles/Measles-Rubella	60.0	90.0	88.6
Yellow Fever	60.0	90.0	88.6
Fully vaccinated	60.0	90.0	88.6
Penta-1/Penta-3 drop-out rate			3.4

The results again showed that 98.6% (207) of children assessed were vaccinated with the first dose of Pneumococcal Conjugate Vaccine (PCV-1). For children whose vaccination cards were available, 99% (198) received PCV-1 and among those without vaccination cards, 90% (9) received PCV-1. About 97.1% (204) of the children received the second dose of PCV by cards plus history. Whereas 97.5% (195) of those with vaccination cards received PCV-2, 90% (9) of those without cards received PCV-2. With regards to the last dose of the PCV series, 95.2% (200) were vaccinated by card plus history, 96.5% (193) were vaccinated by card only and for those without vaccination cards, 70% (7) were confirmed to have been vaccinated through mothers' recall.

For rotavirus diarrhoea vaccination, 98.6% (207) were vaccinated with the first dose. For those with vaccination cards 99% (198) were vaccinated and for those without vaccination cards 90% (9) were said to have been vaccinated through mothers' recall. About 97.1% (204) received the second dose of rotavirus vaccine by card plus history. While 97.5% (195) of those with vaccination cards received the second dose of rotavirus vaccine, 90% (9) of those without cards had the second dose.

The results again shows that 88.6% of the children assessed received both measles and yellow fever vaccines by card plus history. About 90% (180) of those with vaccination cards received both vaccines. For those without vaccination cards, 60% (6) were established to have received the vaccine through mothers' recall.

One (0.5%) child did not receive any vaccine at all.

4.5 Socio-demographic factors associated with vaccination status

Table 10 shows bivariate analysis of socio-demographic characteristics of mothers and children associated with vaccination status (card plus history) of children aged 12 – 23 months of age. From the table, there was strong evidence of association between level of education of mother and vaccination status of children 12 – 23 months ($p < 0.05$). Level of education was found to be an absolute predictor of vaccination status of infants as children of mothers who have attained tertiary education were all fully vaccinated. The results also show that whether a mother is employed or not employed is statistically associated with vaccination status of children ($p < 0.05$). Again, parity of mother was found to be significant ($p < 0.05$). The proportion of fully vaccinated children among children whose vaccination cards were available is significantly higher than those whose vaccination cards were not available at the time of the study ($p < 0.05$).

Table 10: Bivariate analysis of socio-demographic characteristics of study population

	n	Vaccination Status		Chi square; (P-value)
		Fully	Not fully	
Age of mother (years)				
< 25	57	48(25.8)	9(37.5)	4.142; (p=0.247)
25 – 30	59	53(28.5)	6(25.0)	
30 – 35	57	54(29.0)	3(12.5)	
>35	37	31(16.7)	6(25.0)	
Level of Education				
Tertiary	20	20(10.8)	0(0.0)	12.451; (p<0.05)
Secondary	64	61(32.8)	3(12.5)	
Primary	85	74(39.8)	11(45.8)	
None	41	31(16.7)	10(41.7)	
Employment Status				
Employed	139	128(68.8)	11(45.8)	5.018; (p<0.05)
Not employed	71	58(31.2)	13(54.2)	
Income (GH¢)				
<200	178	156(87.6)	22(12.4)	1.647; (p=0.649)
200 - 500	21	19(90.5)	2(9.5)	
500 - 1000	7	7(100.0)	0(0.0)	
>1000	2	4(100.0)	0(0.0)	
Marital status				
Married	124	114(61.3)	10(41.7)	3.385; (p=0.066)
Not married	68	72(38.7)	14(58.3)	
Religion				
Christianity	177	159(85.5)	18(75.0)	1.764; (p=0.184)
Others	33	27(14.5)	6(25.0)	
Parity				
Primiparous	73	65(35.0)	8(33.3)	7.016; (p<0.05)
Multiparous	116	106(57.0)	10(41.7)	
Grand-multiparous	21	15(8.1)	6(25.0)	
Residence				
Urban	128	119(64.0)	9(37.5)	9.208; (p<0.05)
Peri-urban	61	52(28.0)	9(37.5)	
Rural	21	15(8.1)	6(25.0)	
Place of delivery of child				
Health Facility	179	161(86.6)	18(75.0)	2.257; (p=0.133)
Not Health Facility	31	25(13.4)	6(25.0)	
Sex of child				
Male	107	95(51.1)	12(50.0)	0.0098; (p=0.921)
Female	103	91(48.9)	12(50.0)	
Vaccination Card				
Present	197	180(96.8)	20(83.3)	8.468; (p<0.05)
Absent	13	6(3.2)	4(16.7)	

The type of residence of the mother was also found to be statistically significant ($p < 0.05$).

There was no significant difference in the vaccination status of children 12 – 23 months among the variables; age of mother, marital status, income of mother, religion, place of delivery of child and sex of child as shown in the table 10.

In the multivariate logistic regression analysis (table 12) which shows crude and adjusted odds ratios for the study variables, mothers of children aged 12 – 23 months whose level of education is primary and below were 5.24 times more likely to have a child who was not fully vaccinated compared with mothers whose level of education was secondary and above after adjusting for the effect of other variables (AOR 5.24, 95% CI: 1.30; 21.08). For every unit increase in the number of children a mother had, there was a corresponding increase in the odds of having a child who was not fully vaccinated by 1.5 times (95% CI: 1.03; 2.18) after adjusting for the effect of other variables. The multivariate analysis again showed that there was strong association between the availability of vaccination card and vaccination status of children (AOR 22.69, 95% CI: 4.13; 124.76). Mothers in rural areas were 8.41 times more likely to have a child who was not fully vaccinated compared with mothers in urban areas (AOR 8.41, 2.12; 33.32) when all other variables are held constant.

Though age was not statistically significant in the bivariate analysis it was included in the logistic regression model as an 'a priori' variable. However, there wasn't sufficient evidence to demonstrate that the proportion of children who are not fully vaccinated differs by age of mother (AOR 0.91, 95% CI: 0.81; 1.01).

4.6 Health service factors and other factors associated with vaccination status

The study also examined the association between some health service factors as well as other factors of the study participants with vaccination of children. This is presented in Table 11;

Table 11: Bivariate analysis of health service factors and other factors of study participants

	n	Vaccination Status		Chi square; (P-value)
		Fully	Not fully	
Distance to nearest HF				
< 30 minutes	122	112(60.2)	10(41.7)	3.004; (p=0.083)
> 30 minutes	88	74(39.3)	14(58.3)	
Place of waiting at HF				
Convenient	176	156(83.9)	20(83.3)	0.005; (p=0.946)
Not convenient	34	30(16.1)	4(16.7)	
Long waiting time				
No	165	146(78.5)	19(79.2)	0.006; (p=0.940)
Yes	45	40(21.5)	5(20.8)	
Attitude of staff				
Good	187	167(89.8)	20(83.3)	0.907; (p=0.341)
Bad	23	19(10.2)	4(16.7)	
Date of next visit				
Suitable	199	179(96.2)	20(83.3)	7.130; (p<0.05)
Not suitable	11	7(3.8)	4(16.7)	
Knowledge on Immunization				
High	43	39(21.0)	4(16.7)	0.242; (p=0.623)
Low	167	147(79.0)	20(83.3)	

From the table, there was evidence of strong association between suitability of date for next child welfare clinic (CWC) visit and vaccination status of children aged 12 – 23 months ($p < 0.05$). The variables distance to the nearest immunization centre, place of waiting at the immunization centre, attitude of service providers, waiting time at immunization centre, as well as knowledge of mothers on immunization were not significantly associated with vaccination status of children as shown in the table.

In the multivariate logistics regression analysis, mothers who found the dates for CWC to be unsuitable were 8.54 times more likely to have a child who was not fully vaccinated compared with mothers who found CWC dates to be suitable after adjusting for the effect of other variables (AOR 8.54, 95% CI: 2.12; 33.32) as presented in table 12.

The variables; level of education of mother, parity of mother, availability of vaccination cards, suitability of dates for CWC visits and area of residence which were significantly associated with vaccination status of children in the bivariate analysis were all found to be significant predictors of vaccination status of children after adjusting for the effect of other variables in the multiple logistics regression model. Availability of vaccination card was the strongest single factor associated with infants being fully vaccinated.

There was no interaction among any of the study variables.

For the logistic regression model, an insignificant p-value ($p=0.98$) for Pearson goodness-of-fit test (χ^2) suggests that the model fits the data well.

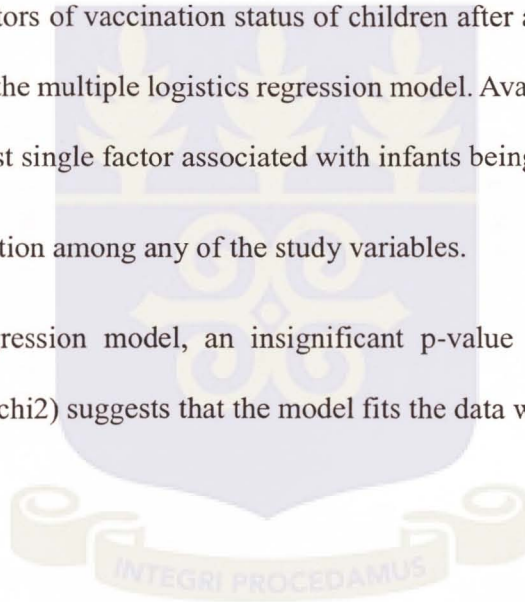


Table 12: Multiple logistic regression of factors associated with vaccination status of children

	Unadjusted			Adjusted		
	OR	95% CI	P-value	OR	95% CI	P-value
Age in years of mother (continuous)	0.964	(0.90, 1.04)	p=0.320	0.91	(0.81, 1.01)	p=0.087
Education (Primary & below vs secondary & above)	5.4	(1.56, 18.73)	p<0.05	5.24	(1.30, 21.08)	p<0.05
Employment Status (unemployed vs employed)	2.61	(1.10, 6.17)	p<0.05	2.90	(0.98, 8.62)	p=0.055
Date of next visit (unsuitable vs suitable)	5.11	(1.38, 19.00)	p<0.05	8.54	(1.67, 43.57)	p<0.05
Vaccination Card (absent vs present)	6.00	(1.56, 23.07)	p<0.05	22.69	(4.13, 124.76)	p<0.0001
Parity (Continuous)	1.27	(1.00, 1.61)	p<0.05	1.50	(1.03; 2.18)	p<0.05
Residence						
Urban	1			1		
Peri-urban	2.29	(0.86, 6.10)	p=0.100	1.82	(0.53, 6.27)	p=0.346
Rural	5.29	(1.65, 16.94)	p<0.05	8.41	(2.12, 33.32)	p<0.05
Marital status (others vs married)	2.2	(0.94, 5.26)	p=0.207			
Religion (others vs Christianity)	1.49	(0.55, 3.99)	p=0.071			
Place of waiting (not convenient vs convenient)	1.04	(0.24, 3.42)	p=0.946			
Place of delivery of child (others vs health facility)	2.15	(0.78, 5.93)	p=0.140			
Walk time to immunization center (> 30 min vs < 30 min)	2.12	(0.89, 5.02)	p=0.09			
Long waiting time (yes vs no)	0.96	(0.34, 2.73)	p=0.940			
Attitude of service providers (bad vs good)	1.76	(0.54, 5.69)	p=0.346			
Knowledge on Immunization (low vs high)	1.32	(0.43, 4.11)	p=0.624			
Sex of child (female vs male)	1.04	(0.45, 2.44)	p=0.921			
Pearson goodness-of-fit test (chi2)				0.9801		

Pseudo R² = 0.2849

Prob > chi2 = 0.0000

LR chi2 (8) = 42.

CHAPTER FIVE

DISCUSSION

The aim of the study was to assess the factors associated with vaccination status of children 12 – 23 months in Ga South Municipal. The study also determined the vaccination status of children aged 12-23 months.

The variables that significantly associate with vaccination status of children aged 12 – 23 months in Ga South Municipal are level of education of mother, parity of mother, residence, availability of vaccination cards and suitability of date for child welfare clinic visit.

The coverage for fully vaccinated children evidenced by card plus history is 88.6%. One (0.5%) child did not receive any vaccine at all. Vaccination coverage rates are higher for vaccines received earlier in life. For example, BCG recorded the highest coverage of 99.5% while measles and yellow fever recorded the lowest coverage of 88.6%. This is consistent with a study in Ethiopia by Etana and Deressa (2012) which showed lower vaccination coverage rates among vaccines received later in life compared to those received earlier in life (Etana and Deressa, 2012).

In 2012, the Ga South Municipal Health Directorate reported administrative routine vaccination coverage rates of 68.1% for BCG, 61.1% for penta-3 and 73.6% for measles. These coverages are low compared with the results of this study. The low coverage rates reported by the municipal may be due to poor data management and or unreasonably high target population. A bulletin of the World Health Organization maintains that vaccination coverages based on administrative data can be biased by an inaccurate denominator, especially when outdated censuses and poor population

projections are used (Burton et al., 2009). This statement is justified by the vaccination coverage estimates of this study.

The vaccination coverage of this study is lower than the results of a recent immunization coverage survey commissioned by the Ghana Health Service which reported an estimated coverage of 93.7% for fully vaccinated children (EPI Cluster Survey, 2013). Though, the sample size for the two studies and the methodology are similar, the EPI Cluster Survey covered the entire country whereas this study was limited to Ga South Municipal. This may account for the difference in coverage.

Similar vaccination coverage rates have been reported in other studies in Ghana. The 2011 Multiple Indicator Cluster Survey of Ghana reported a national coverage of 84.4% for fully vaccinated children and 0.5% for unvaccinated children (MICS, 2011). Another study conducted in Ghana in 2010 reported coverage for fully immunized children of 85.5% which is also similar to the results of this study. It also reported penta-1 and penta-3 drop-out rate of 6.8% (Badu, 2010) which is higher than the 3.4% reported by this study. The study by Badu (2010) employed the WHO '30 x 7' cluster survey method and was also conducted in a similar setting.

Comparable vaccination coverage rates have been reported in studies in other parts of Africa. A cross-sectional community based study in Kenya reported full vaccination coverage rate evidenced by vaccination card plus maternal recall of 79.4% (Kawakatsu and Honda, 2012). A study in Nigeria found that the proportion of children fully vaccinated at Glaxo Smith Kline supported health centres was 82.3% though the vaccination rates observed in government and private facilities reported in the same study was low (Oduanya et al., 2008).

Contrary to this study, a study conducted by Antai (2009) on childhood immunization uptake in Nigeria reported coverage for fully vaccination children of 13.5% (Antai, 2009). The study was conducted in communities in the northern part of Nigeria which are noted for refusing vaccinations (Jheeta and Newell, 2008). Low vaccination rates have also been reported in other studies (Wado et al., 2014; Calhoun et al., 2014; Ibnouf et al., 2007).

Of the client related factors examined in this study, level of education of mother, availability of vaccination cards, parity of mother and residence are significantly associated with vaccination status of children aged 12 – 23 months.

Mothers with educational level of primary and below has an increased odds of 5.24 times of having a child who is not fully vaccinated compared with mothers with educational level of secondary and above after adjusting for the effect of other variables (95% CI: 1.30, 21.08). The level of education of mothers who participated in this survey is low. This is not expected as most of the respondents were from urban (60.95%) and peri-urban (29.05%) areas where there are considerable number of educational facilities. Similarly, Wado et al (2014) reported that children whose mothers have at least completed secondary education were 1.77 times more likely to be fully vaccinated compared with children whose mothers had no formal education (Wado et al., 2014). In a multilevel logistic regression analysis of Demographic and Health Survey data from 24 countries in sub-Saharan Africa, the researchers found that children born to mothers (OR 1.35, 95% CI: 1.18; 1.53) and fathers (OR 1.13, 95% CI: 1.12; 1.40) with no formal education were more likely to be unimmunised than those born to parents with secondary or higher education (Wiysonge et al., 2012). Again, a study with participants drawn from the Health and Demographic Surveillance System in Burkina Faso reported that mother's education (OR 1.42, 95% CI: 1.06; 1.89) is positively

associated with vaccination coverage and influenced timely adherence to the vaccination schedule (Schoeps et al., 2013). Odusanya (2008) highlighted in his study that mother's educational level reflects mother's knowledge about vaccination and subsequent compliance to the immunization schedule (Odusanya et al., 2008). The significant association between maternal education and vaccination status of children has been confirmed by other studies (Calhoun et al., 2014; Sackou et al., 2012; Torun and Bakırcı, 2006).

Contrary to the results of this study, a study in Ethiopia showed no association between education and vaccination status of infants (Etana and Deressa, 2012). This may be explained by the fact that the educational level for most (85.4%) of the mothers in the study by Etana and Deressa were primary and below. Also, Canavan et al (2014) did not find this association in a study that used data from Demographic and Health Survey from six (6) countries in East Africa (Canavan et al., 2014).

Availability of vaccination card is strongly associated with vaccination status of children. The card retention rate of this study (95.2%) is consistent with the 95.7% reported in the EPI Cluster Survey conducted in 2013. Children whose vaccination cards are available are 22.69 times (95% CI: 4.13, 124.76) more likely be to fully vaccinated compared with children whose vaccination cards are not available after adjusting for the effect of other variables. This association has been confirmed by other researchers. A study in a southern district in Nigeria reported that children with an immunization card were 7.72 times (95% CI: 4.43, 13.44) more likely to be fully vaccinated (Fatiregun and Okoro, 2012). Also, Chhabra et al (2007) found retention of vaccination card to be significantly associated with vaccination coverage ($p < 0.05$) in urbanised villages of Delhi in India (Chhabra et al., 2007). Another study in a rural community in Nigeria found retention of immunization cards on bivariate analysis to

be associated with completion of vaccination ($p < 0.05$). However, after the effects of other variables were adjusted for, there was no evidence of association (Odusanya et al., 2008). In the Nigeria study, respondents administered the questionnaires themselves which differs from the direct face-to-face approach employed in this study.

It must be stated however that, the statistically significant difference in the vaccination status of children and the availability of vaccination cards introduces recall bias in this study.

This study finds that the number of children a mother has is significantly associated with vaccination status of children (AOR 1.50, 95% CI: 1.03; 2.18). Thus, a unit increase in the number of children a mother has results in an increase in the odds of having a child who is not fully vaccinated by 1.5 times when all other variables are held constant. As noted by Goldman et al (1998), having more children may cause resource constraints, which has a negative effect on healthcare utilization (Goldman et al., 1998). In a study on factors affecting immunisation behaviour in Kampala, Uganda, Babirye et al (2011) found significant association between the number of children a mother has ($p < 0.05$) and vaccination status (Babirye et al., 2011). This finding is consistent with a study in Bangladesh which observed that children of mothers with lower parity were more likely to be fully immunized ($p < 0.001$) and that mothers with greater parity were less likely to vaccinate their children (Rahman and Obaida-Nasrin, 2010).

Contrary to this study, a recent study by Schoeps et al (2013) found no effect of household size to vaccination status of infants (Schoeps et al., 2013). This could be explained by the fact that the study by Schoeps et al assessed factors associated with fully vaccinated children with valid doses in the multivariable logistic regression analysis whereas this study did not assess valid doses.

This study establishes that mothers who reside in rural communities has an increased odds of 5.29 times of having a child who is not fully vaccinated compared to a mothers in urban communities (95% CI: 1.65, 16.94). Similar results have been reported in Africa. A recent study in Nigeria established that immunization coverage rates differed among urban and rural residents, favouring residents in urban areas ($p < 0.001$) compared to those in rural areas (Okafor et al., 2014). Also, Moyer et al (2013) found in a study in Ethiopia that the odds of having a completely vaccinated child is increased by 7.3 times (95% CI: 3.7, 14.2) among urban residents compared to rural residents (Moyer et al., 2013). Again, Schoeps et al. (2013) also noted that children living in urban areas in north-western part of Burkina Faso were more likely to complete vaccination with BCG (OR 1.79, 95% CI: 1.24; 2.58) than children in rural areas (Schoeps et al., 2013). Another study in Gambia which used data from health and demographic surveillance system and recruited children born within the surveillance area between January 2000 and December 2010 identified that children born in urban areas (AOR 0.74, 95% CI: 0.64; 0.87) were less likely to be partially vaccinated compared with those in rural areas (Payne et al., 2013). Brown and Oluwatosin (2012) identified in Oyo State in Nigeria that children in urban areas (OR 3.89, 95% CI: 2.24; 6.74) are more likely to be fully vaccinated compared to children in rural areas (Brown and Oluwatosin, 2012). A study in Sudan also established that vaccination status of children in urban and rural areas differed substantially and that the odds of children in urban areas being fully vaccinated is increased by 7.4 times (95% CI: 3.41, 16.07) compared to children in rural areas (Ibnouf et al., 2007).

Contrary to these findings, Etana and Deresa (2012) found that area of residence was not significantly associated with full immunisation among children in their multivariate analysis, though place of residence was found to be significant in the bivariate analysis

(Etana and Deressa, 2012). The method used for Etana and Deressa study is similar to this study, however, 80% of the communities they surveyed were from rural areas while only 20% were from urban areas. In this study, most of the communities surveyed were either urban or peri-urban. Also, a study in Pakistan did not find this association (Bugvi et al., 2014).

Of the health service factors assessed in this study, only suitability of date for next child welfare clinic visit is significantly associated with vaccination status of children. Unsuitable dates for child welfare clinic increases the odds of having a child who is not fully vaccinated by 8.54 times (95% CI: 1.67; 43.57). Other studies have confirmed this association. In a qualitative study on factors affecting immunisation behaviours in Kampala, Uganda, Babirye et al (2011) found that inconvenient schedules and time constraints are associated with incomplete vaccination of children (Babirye et al., 2011). Similarly, a study in western Kenya reported that frequent visitation to households by community health workers (CHW) to offer immunization services makes the timing for vaccination of children more suitable and was independently associated with completion of vaccinations (Kawakatsu and Honda, 2012).

This study did not find any evidence of association between mothers' knowledge on immunization and vaccination coverage ($p=0.624$). The knowledge of mothers on immunization and vaccine preventable diseases is generally low as only 20.5% of mothers possessed a satisfactory level of knowledge. This low level of knowledge may be attributable to low social mobilization and education on routine immunization in the municipality. It may also be attributable to lack of information delivery to mothers during child welfare clinic. Similarly, a study on knowledge and childhood health-seeking behaviour in Nigeria noted that though awareness of immunization was high, knowledge of vaccine preventable diseases was poor (Okafor et al., 2014). Also, a

bulletin by the World Health Organization indicated that parents' knowledge about vaccinations is poor, and the knowledge they do have is often wrong (Jheeta and Newell, 2008).

In line with the findings of this study, Siddiqi et al (2010) reported that mothers' knowledge about EPI vaccination in peri-urban Karachi was quite low and not associated ($p=0.22$) with the vaccination status of children (Siddiqi et al., 2010).

The low level of knowledge among participants in this study contrasts with the high level of knowledge on immunization (87.0%) reported in a study in rural Nigeria (Odusanya et al., 2008) and another study in India, where 70.1% of the survey participants had considerable knowledge on immunization (Jose et al., 2013).

Contrary to the evidence provided by this study, a study in Nigeria identified that satisfactory knowledge on immunization of the mother ($p<0.001$) is a significant predictor of complete vaccination of children (Odusanya et al., 2008). Again, Etana and Deresa (2012) also identified in a cross-sectional community-based study that complete immunisation is positively associated with mothers' knowledge about the age at which vaccination begins and the age at which vaccination completes (Etana and Deressa, 2012).

The reason why this study did not establish any significant association between mothers knowledge on immunization and vaccination status may be explained by the fact that mothers trust and embrace immunization even with little or no knowledge about vaccinations as reported by a recent Knowledge, Attitude and Practices study conducted by the Research and Development Division of the Ghana Health Service (EPI Annual Report, 2012). The successes chalked by the immunization programme, especially, in

reducing morbidities and mortalities associated with vaccine preventable diseases may have contributed to the acceptance of immunization services.

Though, employment status of mother was found to be significant in the bivariate analysis ($p < 0.05$), there was no evidence of association after adjusting for the effects of other variables ($p = 0.55$). This may be explained by the fact that a mother who is not working may receive financial support from the father to ensure their child(ren) is/are vaccinated. Other studies (Babirye et al., 2011; Kim et al., 2007; Wiysonge et al., 2012) have found significant association between employment status and vaccination status of children.

This study finds no evidence of association between sex of child and vaccination status ($p = 0.921$) as the vaccination status for males and females were similar. This finding is in agreement with the results of the 2011 Multiple Indicator Cluster Survey which reported coverage for complete immunization of 83.2% for males and 85.7% for females (MICS, 2011). This is consistent with other studies by Bugvi et al (2014), Antai (2009) and Koller et al (2009) which also found no association between child immunization with sex (Antai, 2009; Bugvi et al., 2014; Koller and Mielck, 2009). However, contrasting results have been reported in other parts of the world (Pande, 2003; Rahman and Obaida-Nasrin, 2010b).

This study did not also find any association between income levels and vaccination status. This finding is consistent with other studies in Africa (Canavan et al., 2014; Wado et al., 2014). On the contrary, many studies found significant association between income levels and vaccination status of children in Africa (Antai, 2009; Kawakatsu and Honda, 2012; Moyer et al., 2013) and other parts of the world (Bugvi et al., 2014; Rahman and Obaida-Nasrin, 2010b).

Why this study could not establish any association between income and vaccination status of children may be explained by the fact that some respondents probably did not disclose their real income.

This study did not find any evidence of association between religion and vaccination status of infants. Similarly, Odusanya et al (2008) did not report any significant difference between vaccinations and the religious beliefs in a study in Nigeria (Odusanya et al., 2008). A study in India however found strong evidence of association between religion and vaccination status (Mathew, 2012). This could be attributed to the setting where this study was conducted.

Age of mother, which was not associated with vaccination coverage in the bivariate analysis, was however included in the multivariate analysis as an 'a priori' variable. No significant relationship was observed ($p=0.087$).

Delivery in health facilities have been found to be a significant predictor of vaccination status of children in several studies (Antai, 2009; Bugvi et al., 2014; Etana and Deressa, 2012). However, this study did not find any association. A recent study by Wado (2014) also did not establish this association (Wado et al., 2014).

5.1 Limitations

The cross-sectional design meant that the temporal relationship between the significant factors and vaccination status of children could not be inferred.

Full evaluation of all the factors known to be associated with vaccination status of children could not be done in this study. These factors include family and paternal characteristics that may have significant association with vaccination status of children. Also the cultural beliefs, beliefs about side effects of vaccines and availability of

logistics from the health sector perspective were not assessed. This is not only due to financial and human resource constraints but time constraint as well.

Immunization histories established through mothers recall may introduce bias (non-differential misclassification) to the study. Poor recall of mothers who could not produce the vaccination cards may either over-estimate or under-estimate the vaccination coverage. However, it is accepted practice to estimate immunization coverage by maternal history in both developing (Langsten and Hill, 1998) and developed nations (AbdelSalam and Sokal, 2004).



CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The vaccination coverage for children aged 12 – 23 months in Ga South Municipality is high. It however fell short of the recommended target of 90%. Maternal factors significantly associated with vaccination status of children are level of education, parity of mother, area of residence and availability of vaccination card. Of the health service factors, only suitability of date for child welfare clinic is significantly associated with vaccination status of children.

The availability of vaccination card is the strongest predictor of vaccination status of children. Knowledge on immunization among mothers is low, especially, information on diseases prevented by vaccination in Ghana. Level of education is also low.

6.2 Recommendations

6.2.1 Operational

- The Ga South Municipal Health Directorate should intensify information, education and communication (IEC) activities in the municipal to heighten awareness on routine immunization. This should focus on the importance of immunization as well as information on diseases prevented by vaccination in Ghana. Communication should also focus on the vaccination schedule and the doses required for each vaccine. IEC packages should target individuals, families and communities. Regular health education sessions at child welfare clinics and prenatal clinics should be encouraged.
- Service providers should encourage mothers to keep the vaccination cards of their children safely. Mothers should however be made to know that, in the event

that they misplace their vaccination cards, they shall be provided with a new one.

- The municipality must open more outreach points especially in rural areas in order to bring immunization services closer to the people in these areas.
- The municipality must encourage service providers/health facilities to continuously dialogue with communities to know when vaccination sessions could be conveniently organized.

6.2.2 Policy

- Policies geared at improving access to education (such as free education, provision of sanitary pads to females, school feeding programme etc.) should be encouraged and sustained. People who are educated are conscious of the need to have the wards immunized.
- As an essential component of primary health care, the Ministry of Health must collaborate with the Ministry of Education to ensure that immunization against vaccine preventable diseases is included/updated in the curriculum of primary education. Primary school pupil could serve as ambassadors for immunization in their homes and would be more likely to ensure complete vaccination of their children in adulthood

6.2.3 Research

- Regular but targeted studies on vaccination coverage should be encourage in regions and districts with low vaccination coverage to inform policy and programme implementation.

- Electronic registration of children with their vaccination records as well as records on uptake on other health interventions should be piloted. This will ensure accurate data on vaccinations.
- Future studies should assess demographic characteristics of mothers and fathers as well as health service factors including availability of logistics. Validity of doses administered should also be assessed in future studies.



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ANNEX 1: CONSENT FORM FOR STUDY PARTICIPANTS

Project title

Factors associated with vaccination status of children in Ga South Municipal

Institution of affiliation

School of Public Health, University of Ghana, Legon, Accra

Background of interviewer

My name is from..... I am helping a student to collect data purely for academic work for Masters in Public Health Degree

Procedure

Information required from in this study includes background characteristics, knowledge about immunization, attitude of health workers, and distance to health facility. Data collection technique is through the administration of structured questionnaire.

Risks and benefits

You may feel uncomfortable with some of the questions I will be asking you; however, they will be helpful to me, other researches and providers of healthcare in particular.

Right to refuse

Your consent to participate in this study is voluntary, you are not under any obligation to do so, and you are at liberty to withdraw from this study. However, I will appreciate if you can complete it.

Anonymity and Confidentiality

Be assured that any information given will be used purely for the purpose of research. Any information given will be treated with utmost confidentiality.

Before taking consent

Do you have any questions to ask me? (If yes, note questions below)

.....
.....
.....

If you require further details on the study, you may contact the Researcher, Mr Fred Osei-Sarpong, on phone number 024-4716379. You may also contact the Administrator of the Ghana Health Service Ethical Review Committee, Hannah Frimpong, on 0243235225

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

Print Name of Participant _____

Signature of Participant _____

Date _____
(Day/month/year)

If illiterate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness participant _____ Thumb print of

Signature of witness _____

Date _____
(Day/month/year)

Statement by the researcher/person taking consent

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher/person taking the consent _____

Signature of Researcher /person taking the consent _____

Date _____
(Day/month/year)

ANNEX 2: QUESTIONNAIRE

FACTORS ASSOCIATED WITH VACCINATION STATUS OF CHILDREN IN GA SOUTH MUNICIPAL

IDENTIFICATION

QUESTIONNAIRE NUMBER: NAME OF COMMUNITY:

CLUSTER NUMBER: HOUSEHOLD NUMBER:

INTRODUCTION AND CONSENT

Hello. My name is _____. I am a member of a team from the University of Ghana conducting a survey on immunization. The survey is being conducted in Ga South Municipal. The information we collect will help the Ministry of Health to improve immunization services in this district. Your household was selected for the survey. The questions take about 15 to 20 minutes. Your responses to all questions will be treated confidentially and will not be shared with anyone other than members of our survey team. Participation in the survey is voluntary, but I hope you will agree to answer the questions since your views are important. If I ask you any question that you do not want to answer, just let me know and I will go on to the next question. You can stop the interview at any time.

In case you need more information about the survey, you may contact the person listed on the card that has already been given to your household.

Do you have any questions? May I begin the interview now?

SIGNATURE OF INTERVIEWER: DATE: .../...../.....

NAME OF FIELD SUPERVISORS: DATE: .../...../.....

RESPONDENT AGREES TO BE INTERVIEWED...1 RESPONDENT DOES NOT AGREE 2 End →



SECTION A: CLIENT’S BACKGROUND AND OTHER CHARACTERISTICS

NO.	QUESTIONS	RESPONSES	CODE	SKIP
1.	How old are you (age at last birthday)	<input type="text"/>		
2.	Have you ever attended school	Yes No	1 2	→ 4
3.	What is your highest level of education	Primary Secondary Tertiary	1 2 3	
4.	What is your employment status	Employed Unemployed	1 2	
5.	How much do you make at the end of the month	Below GHC 200 Btm GHC 200 – 500 Btm GHC 500 – 1000 Above GHC 1000	1 2 3 4	
6.	What is your marital status	Single Married Co-habiting Divorced Widow	1 2 3 4 5	→ 9 → 9 → 9
7.	What is the highest level of education of child’s father	None Primary Secondary Tertiary	1 2 3 4	
8.	How much does child’s father make at the end of the month	Below GHC 200 Btm GHC 200 – 500 Btm GHC 500 – 1000 Above GHC 1000	1 2 3 4	
9.	What is your religion	Christian Moslem Traditional None	1 2 3 4	
10.	How many children do you have in addition to child	<input type="text"/>		
11.	Birth order of child	<input type="text"/>		
12.	Place of delivery	Health facility TBA Center Home	1 2 3	
13.	Distance to the nearest health facility or immunization center	Near (< 1km) Far away (> 1 km)	1 2	
14.	Is the place of waiting at the health facility convenient	Yes No	1 2	
15.	Does it take a long time for your child to be vaccinated at the health facility	Yes No	1 2	
16.	How do you rate the attitude of nurses/vaccinators	Good Poor	1 2	
17.	Is time of immunization convenient?	Yes No	1 2	
18.	Residence (Verify from Municipal Assembly)	Urban Peri-urban Rural	1 2 3	

SECTION B: MOTHER’S KNOWLEDGE ON IMMUNIZATION

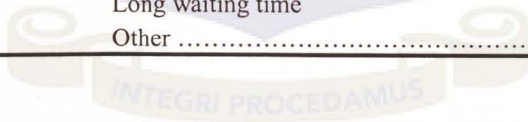
NO.	QUESTIONS	RESPONSES	SCORE
19.	What vaccine is given to mothers during pregnancy	Tetanus Toxoid (TT) Other	1 0
20.	Mention at least five (5) diseases that can be prevented by vaccination in Ghana? Attention: tick as mentioned Polio <input type="checkbox"/> Tuberculosis <input type="checkbox"/> Diphtheria <input type="checkbox"/> Tetanus <input type="checkbox"/> Pertussis <input type="checkbox"/> Hepatitis B <input type="checkbox"/> H. Influenza B <input type="checkbox"/> Pneumonia <input type="checkbox"/> Diarrhoea <input type="checkbox"/> Measles <input type="checkbox"/> Yellow Fever <input type="checkbox"/> NB: Tick as correct if mother mentions more than 5 diseases	At least 5 diseases Less than 5 diseases	1 0
21.	At what age should a child be given his/her first vaccination?	Within 2 weeks Others	1 0
22.	Mention one vaccine which is administered orally (mouth)	Polio or rotavirus Other	1 0
23.	Mention one vaccine which is administered in the thigh	Penta or PCV Other	1 0
24.	Mention one vaccine which is administered in the upper arm	Measles or Yellow Fever Other	1 0
25.	How many doses of the vaccine given in the thigh (PCV or Penta) should a child receive?	Three (3) doses Other	1 0
26.	What is the vaccination schedule for the vaccine given in the thigh (PCV or DPT/Hep/BHib)	6, 10 and 14 weeks Other	1 0
27.	Which vaccine is administered at 9 months	Measles or Yellow Fever Other	1 0
28.	Which vaccine(s) were recently introduced? Mention at least one	PCV or Rota (or diseases) Other	1 0

SECTION C: CHILD'S IMMUNIZATIONS

NO.	QUESTIONS	RESPONSES	CODE	SKIP																																																												
29.	What is the date of birth of child? (dd/mm/yyyy)/...../.....																																																														
30.	Sex of child	Male Female	1 2																																																													
31.	Do you have a card where child's vaccinations are written down? If YES, may I see it please (verify date of birth)	Yes No	1 2	32																																																												
<p>1. Copy dates from the Card 2. Write '44' in 'day' column if card shows that a dose was given, but no date is recorded</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>DD</th> <th>MM</th> <th>YYYY</th> </tr> </thead> <tbody> <tr><td>BCG</td><td></td><td></td><td></td></tr> <tr><td>Polio 1</td><td></td><td></td><td></td></tr> <tr><td>Polio 2</td><td></td><td></td><td></td></tr> <tr><td>Polio 3</td><td></td><td></td><td></td></tr> <tr><td>DPTHePBHib 1</td><td></td><td></td><td></td></tr> <tr><td>DPTHePBHib 2</td><td></td><td></td><td></td></tr> <tr><td>DPTHePBHib 3</td><td></td><td></td><td></td></tr> <tr><td>PCV 1</td><td></td><td></td><td></td></tr> <tr><td>PCV 2</td><td></td><td></td><td></td></tr> <tr><td>PCV 3</td><td></td><td></td><td></td></tr> <tr><td>Rota 1</td><td></td><td></td><td></td></tr> <tr><td>Rota 2</td><td></td><td></td><td></td></tr> <tr><td>Measles</td><td></td><td></td><td></td></tr> <tr><td>Yellow Fever</td><td></td><td></td><td></td></tr> </tbody> </table>						DD	MM	YYYY	BCG				Polio 1				Polio 2				Polio 3				DPTHePBHib 1				DPTHePBHib 2				DPTHePBHib 3				PCV 1				PCV 2				PCV 3				Rota 1				Rota 2				Measles				Yellow Fever			
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Rota 1																																																																
Rota 2																																																																
Measles																																																																
Yellow Fever																																																																
32.	Did child ever have any vaccinations to prevent him/her from getting diseases?	Yes No Don't know	1 2 3	End																																																												
33.	Has child received vaccination against tuberculosis (BCG), that is, an injection in the right upper arm that usually causes a scar?	Yes No	1 2																																																													
34.	Has child received polio vaccine, that is, drops in the mouth?	Yes No Don't know	1 2 3	36																																																												
35.	How many times was the polio vaccine given?	Number of times <input style="width: 50px;" type="text"/>																																																														
36.	Has child received DPTHePBHib vaccination, that is, an injection given in the left thigh?	Yes No Don't know	1 2 3	38																																																												
37.	How many times was the DPTHePBHib vaccination given?	Number of times <input style="width: 50px;" type="text"/>																																																														
38.	Has child received a vaccine for pneumonia (PCV), that is, an injection given in the right thigh?	Yes No Don't know	1 2 3	40																																																												
39.	How many times was the PCV vaccination given?	Number of times <input style="width: 50px;" type="text"/>																																																														
40.	Has child received a vaccine for diarrhoea (Rotavirus), that is, drops in	Yes No	1 2	42																																																												

	the mouth, where child was given the whole content of the vial?	Don't know 8	
41.	How many times was the Rotavirus vaccine given?	Number of times <input type="text"/>	
42.	Has child received measles/MMR injection - that is, a shot in the left upper arm at the age of 9 months or older - to prevent him/her from getting measles?	Yes 1 No 2 Don't know 8	
43.	Has child received yellow fever injection - that is, a shot in the right upper arm at the age of 9 months or older - usually given at the same time as measles?	Yes 1 No 2 Don't know 8	
44.	Vaccination status of child	Fully vaccinated 1 Partially vaccinated 2 Not vaccinated 3	End

45.	Lack of information	Unaware of need for immunization	
		Unaware of need to return for 2nd or 3rd dose	
		Place and time of immunization unknown	
		Fear of side reaction	
		Wrong ideas about contraindications	
	Other		
	Lack of motivation	Postponed until another time	
		Cultural/religious reasons	
		Rumours	
Other			
Obstacles	Place of immunization too far		
	Time of immunization inconvenient		
	Vaccination not available		
	Mother too busy		
	Family problem including illness of mother		
	Child ill - brought but not given vaccination		
	Long waiting time		
Other			



ANNEX 3: LIST OF SELECTED ENUMERATION AREAS

PSU Number	Names (or abbreviations) of your primary sampling units	Estimated size of sampling units	probability of inclusion
1	TUBAKROM	562	0.042350447
2	BORTIANOR	788	0.059381054
3	BORTIANOR	613	0.046193637
4	BORTIANOR	1066	0.080330208
5	MENDESKROM	2138	0.161112556
6	SAMPA VALLEY	680	0.051242534
7	NEW APLAKU	970	0.073095968
8	NGLESHIE AMANFRO	547	0.041220097
9	NGLESHIE AMANFRO	651	0.049057191
10	NGLESHIE AMANFRO	639	0.048152911
11	NGLESHIE AMANFRO	399	0.030067311
12	NGLESHIE AMANFRO	833	0.062772104
13	NGLESHIE AMANFRO	926	0.069780275
14	NGLESHIE AMANFRO	426	0.032101941
15	MANDELA-WEIJA	740	0.055763934
16	MANDELA-WEIJA	1163	0.087639805
17	MANDELA-WEIJA	1017	0.076637731
18	MANDELA-WEIJA	395	0.029765884
19	OBLOGO	706	0.053201808
20	WEIJA	1093	0.082364838
21	GBAWE	368	0.027731254
22	MALLAM	986	0.074301675
23	GBAWE	1178	0.088770155
24	GBAWE	665	0.050112184
25	GBAWE	813	0.061264971
26	GBAWE	1596	0.120269242
27	GBAWE	744	0.056065361
28	DOMEABRA	1237	0.093216198
29	AMMUAMAN	476	0.035869774
30	OBOM	727	0.054784298

GHANA STATISTICAL SERVICE
REPUBLIC OF GHANA



PHC2

Current EA Number 0301200141

2010 POPULATION AND HOUSING CENSUS

GHANA AUTOMATED ENUMERATION AREA INFORMATION SYSTEM (GAEA-INFO)

Selected EA Code : 0301200141

1a. Region:	Greater Accra	1b. Region Number:	03
2a District:	Weija (Ga South)	2b. District Number:	01
3b. District Type:	Municipal	3b. District Type Number:	2
4a. Sub District Type:	Municipal	4b. Sub District Number:	00
5a. 2000 EA Code:	0302019002	5b. 2010 EA Number (Prov.):	141
6a. EA Type	One to many (EAs)	6b. EA Type Number:	2
7a Locality Name:	AMANFROM	7b. Base Locality Number:	012
8a. EA Base	JUBILEE SCHOOL		
8b. EA Base Coord:			

2010 EA Code	0301200141
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9. Localities and EA Population Information

Locality Number	Locality/ies in EA	EA Population Information		
		2000 PHC	2010 PHC	2010 PHC
		Enumerated	Estimated (Field)	Enumerated
012	AMANFROM	0	510	0
		0	510	0

10. Enumeration Area (EA) Boundary Description:

Start from Mysterious Hair Clinic (incl) and Washing Bay (excl), follow the road to God Dey Fitting Shop (incl) and Lube Bay (excl). Turn left and walk past Fraginjoy Pharmacy (excl) and Jubilee School (incl) to Kwame Sarpei's house (incl). Turn left and follow the road to Alheji Malik's house (incl) and DK H/32 (excl). Turn left again and follow the Okurudu stream to meet the Cape Coast Accra road. Finally, turn left and walk on the road to Mysterious Hair Clinic (incl), your starting point.

11. Accessibility Remarks:

Enumerator's Name:..... Phone Number:.....
Supervisor's Name:..... Phone Number:.....

Report Details: Reports: PHC EA Population Information

GHANA HEALTH SERVICE ETHICAL REVIEW COMMITTEE

*In case of reply the
number and date of this
Letter should be quoted.*



Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: Hannah.frimpong@ghsmail.org

My Ref. :GHS-ERC: 3
Your Ref. No.

2nd July, 2014

Fred Osei Sarpong,
School of Public Health
University of Ghana
Legon

ETHICAL APPROVAL - ID NO: GHS-ERC 51/04/14

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol titled:

“Factors Associated with Vaccination Status of Children in Ga South Municipal”

This approval requires that you inform the Ethical Review Committee (ERC) when the study begins and provide Mid-term reports of the study to the Ethical Review Committee (ERC) for continuous review. The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Please note that any modification without ERC approval is rendered invalid.

You are also required to report all serious adverse events related to this study to the ERC within seven days verbally and fourteen days in writing.

You are requested to submit a final report on the study to assure the ERC that the project was implemented as per approved protocol. You are also to inform the ERC and your sponsor before any publication of the research findings.

Please always quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....

DR. CYNTHIA BANNERMAN
(GHS-ERC VICE-CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

**ANNEX 6: LETTER OF INTRODUCTION FROM REGIONAL
HEALTH DIRECTORATE**

Dec 4/6/14

In case of the reply the number and
the date of this letter should be
quoted



GHANA HEALTH SERVICE
REGIONAL HEALTH
DIRECTORATE
GREATER ACCRA REGION
P. O BOX 184
ACCRA

Tel: 0302-226203

My Ref. No. CA188/275/02

5th June, 2014

Your Ref No.

THE MDHS
GA SOUTH MUNICIPAL HEALTH DIRECTORATE
WEIIA

LETTER OF INTRODUCTION
MR. FRED OSEI-SARPONG

This is to introduce to you the above named final year student, who offers Master of Public Health (MPH) from the University of Ghana, School of Public Health.

As part of the requirement for the completion of the program, he is required to do a project work.

The topic chosen to research into is: "Factors Associated with Vaccination Status of Children aged 12-23 months in Ga South Municipal".

I would be very grateful if you could give him the necessary assistance.

Thank you.

MR. PETER MENSAH
DEPUTY DIRECTOR (ADMINISTRATION)
FOR: REGIONAL DIRECTOR OF HEALTH SERVICES
GREATER ACCRA REGION

ANNEX 7: LETTER OF INTRODUCTION FROM GA SOUTH MUNICIPAL

In case of a reply, the number and the date of this letter should be quoted

My Ref. No: **GHS/GSMHD/ADM-18**
Your Ref. No.



GA SOUTH MUNICIPAL HEALTH
DIRECTORATE
GHANA HEALTH SERVICE
P. O. BOX KN5358
KANESHIE - ACCRA

12th JUNE, 2014

All Facilities
Ga South

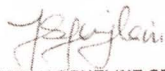
Letter of Introduction
Mr. Fred Osei-Sarpong

I introduce to you the above-named final year student from the University of Ghana, School of Public Health who offers Master of Public Health (MPH).

He has been granted permission to conduct a project work in your facility on the on topic "Factors Associated with Vaccination Status of Children age 12 – 23 months in Ga South Municipal", as part of the requirement for the completion of his program.

Kindly accord him the needed assistance.

Thank you.



MS. JACQUELINE SFARIJLANI
AG. MUNICIPAL DIR. OF HEALTH
GA SOUTH

