EVALUATION OF THE EFFECTIVENESS OF THE *PARTNERSHIP FOR REVIVING ROUTINE IMMUNIZATION IN NORTHERN NIGERIA PROGRAMME* IN JIGAWA STATE, NIGERIA

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- Routine Immunization
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- Partnership For Reviving Routine Immunization In Northern Nigeria (PRRINN)
- Cluster Technique
- Quasi-Experimental
- Jigawa State, Nigeria
- Before and After study
- Vaccine Preventable Disease

Acronyms

BCG	Bacille Calmette-Guerin
CDC	Center for Disease Control and Prevention
CMR	Childhood Mortality Rate
COSAS	Coverage Survey and Analysis Software
DFID	UK Department for International Development
DPT	Diphtheria, Pertusis, Tetanus
EPI	Expanded Programme on Immunization
FGN	Federal Government of Nigeria
FIC	Fully Immunized Children
FMOH	Federal ministry of Health
GAVI	Global Alliance on Vaccine and Immunization
GSHB	Gunduma Health System Board
HB	Hepatitis B
HBV	Hepatitis B Vaccine
HepB	Hepatitis B
IPDs	Immunization Plus Days
ISS	Immunization Service Support
LGAs	Local Government Area
MNCH	Maternal, Newborn and Child Health
NHREC	National Health Research ethics Committee of Nigeria
NICS	National Immunization Coverage Survey
NIDs	National Immunization Days
NPHCDA	National Primary Health Care Development Agency
NPI	National Programme Immunization
NPI	National Programme on Immunization
NWC	National Working Committee

OND	Ordinary National Diploma
OPV	Oral Polio Vaccine
PATH	Partnership for Transforming Health
PDO	Project Development Objectives
PHC	Primary Health Care
PHCUOR	PHC Under One Roof
PHFs	Primary Health Facilities
PPS	Probability Proportionate to Size
PRRINN	Partnership for Reviving Routine Immunization in Northern Nigeria
RI	Routine Immunization
RIA	Rapid Immunization Assessment
SHC	Secondary Health Centers (Facilities)
SIA	Supplementary Immunization Activities
SMOH	State Ministry of Health
SPSS	Statistical Package for Social Sciences
TT	Tetanus Toxoid
UCI	Universal Childhood Immunization
UNICEF	United Nations Children's Fund
UWC	University of the Western Cape
VPDs	Vaccine Preventable Diseases
WHO	World Health Organization
WPV	Wild Polio Virus

Abstract

The weak routine immunization activities in Nigeria have led to an upsurge of vaccine preventable diseases such as poliomyelitis in the northern parts of the country. This made the federal government to intensify efforts to improve routine immunization activities with various intervention programmes over the years. This commitment of the federal government towards improving routine immunization as a way to promote infant and child survival led to the partnership between the UK Department for International Development (DFID) to support the launching of Partnership for Reviving Routine Immunization in Northern Nigeria (PRRINN) programme in 2006. The programme, implemented in the northern states of Jigawa, Katsina, Yobe, and Zamfara was intended to augment other federal government immunization intervention efforts in improving routine immunizations services. After five years of programme implementation, assessment of the effectiveness of PRRINN had not be undertaken using a survey based immunization coverage to establish how well the primary objectives of the programme are being met in terms of improving routine immunization.

This study was designed to evaluate the performance of the PRRINN programme in improving routine immunization coverage in Jigawa State using coverage data from the National Immunization Coverage Survey (NICS) of 2010.

A quasi-experimental 'before and after' study design was used to evaluate the effectiveness of PPRINN in Jigawa State in respect to its primary objective of improving immunization coverage in the State. The study used secondary data sets from the National Immunization Coverage Survey (NICS) of 2006 and 2010, and routine immunization data collected at selected primary health facilities in the State. Key Informants' Interviews (KII) were also conducted to complement the information gathered from the surveys and record reviews. The current status of immunization coverage for Jigawa State was determined and compared with the immunization coverage of the State in 2006. The immunization access and continuity was determined using the drop-out rates of DPT antigen. Status of the routine immunization in the health facilities was determined.

The data extracted from the NICS of 2006 and 2010 were analyzed using the customized coverage survey and analysis software (COSAS) and EpiInfo analysis software. COSAS was employed for analyzing the data on infant immunization and a statistical analysis programme was developed in FOXPRO to analyze the TT immunization in women. The standard report by COSAS provided an automatic standard analysis that generated the main indicators for infant immunization: coverage summary tables for crude and valid coverage by doses of each antigen (BCG, OPV, DPT and Measles) and also for full immunization. Results were disaggregated into 'card only' and 'card plus history'. The FOXPRO generated the indicators for TT

immunization: mother protection, child protection, TT immunization service utilization, TT immunization follow-up (Drop-out rates), missed opportunities in TT immunization and card retention. Comparative analysis using the absolute differences in coverage rates and paired samples t-test analysis was done to compare immunization data from NICS and health facilities before and after the commencement of PRRINN activities in Jigawa State in order to determine the improvement or otherwise of routine immunization performance in the State.

Current immunization coverage status for Jigawa State was ascertained and compared with immunization coverage for 2006 which is taken as baseline before the commencement of PRRINN. The drop-out rates was also determined.

BCG immunization which is used to measure contact to immunization delivery system was 92.9% for 2010, it went up by about 61.6% over the four year period during the implementation of the PRRINN and immunization partners programme in the State. DPT 3 (88.7% for 2010) used to measure the strength of the immunization programme increased by 59.8% over the 2006 coverage. OPV3 coverage rate reported for 2010 in Jigawa State which is 88.1% for all children, gave almost 43.3% increment in the coverage over the four year period. It shows an improvement in the ability of the immunization service delivery system to give valid doses of vaccines to infants. Measles vaccine, used as an indicator to assess the ability of the delivery system to reach children before their first birthday and the last antigen to be given to a child showed that 85% of children were reached before their first birthday in the State. Hepatitis B3 Vaccine Coverage was encouraging at 87.5% which indicates that over 80% of the children were immunized with the vaccine. The mother and child protection against tetanus toxoid measured by administration of at least two doses of TT was also evidently increased from 9% coverage in 2006 to over 64% coverage in 2010, an over 55% increment over the four year period. This is an indication of an improved immunization systeme and increased demand for the immunization services.

This evaluation has revealed that there is an increase in immunization coverage in Jigawa State. The paired samples t-test analysis conducted showed a significance value of .000 which indicates that there is significance difference between the means of the coverage rates for 2006 and 2010. Hence, a conclusion that PRRINN and other partners immunization programmes was responsible for the increase in immunization coverage in the State. It shows that the concerted effort of the immunization partners in the State in strengthening the PHC system and improving routine immunization in the State has been successful in respect to access to immunization services and reduction of immunization drop-out rates.

Although the study started with the intention of measuring the performance of routine immunization in Jigawa State on the backdrop of the involvement of PRRINN, it can only be said that the improvements noticed in routine immunization in the State reflects the collaborative efforts of all partners (State Ministry of Health, Gunduma Health Board, World Health Organization, United Nations Children Fund, Partnership for Transforming Health Systems and PRRINN). Hence, contribution rather than exclusive attribution was what the study deduced for the role PRRINN played in reviving routine immunization in Jigawa State.

The significance of this study is shown in using survey based data to measure performance and effectiveness of intervention programmes targeted at improving immunization activities

Some recommendations that arose from this study include:

- The State should commission more health facility and community based surveys to ascertain the State of routine immunization in the State in order to monitor actual progress
- The Department of policy, planning and resource mobilization under the State Ministry of Health should ensure prompt approval for research studies in the State
- The Jigawa State Ministry of Health under the auspices of the State government and partnership it has enjoyed must ensure continuity of the routine immunization revitalization programme and sustained the gains of the programmes
- The State government should be prepared to take over full responsibility for most of the partners funded activities under immunization should the tenure of the partners expires in the State.
- The other neighboring States should emulate Jigawa State model by implementing similar programmes to improve routine immunization in their States

Declaration

I declare that *Evaluation of the Effectiveness of the Partnership for Reviving Routine Immunization in Northern Nigeria Programme in Jigawa State, Nigeria* is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Adegbenga O. Adedayo 27th August, 2012

Signature: 

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Definitions

Child/Childhood/Infant: Child is generally a human between the stages of birth and puberty. Childhood is the period covering the span between births and puberty. However, for immunization purposes a 'child' is defined as a human between the age of 11 to 59 months (1 to 5 years of age) while infants is a child aged 0 - 11 months.

Crude Coverage: Crude coverage as immunization given, evidences by card where applicable or by history from mothers/guardians.

Drop-out rates: Drop-out rates (between the first and last doses of a vaccine) are used to measure program continuity: drop-out rates between DPT 1 and DPT 3 are the best indicator of program continuity and follow-up of children in immunization.

Fully Immunized Child (FIC): This is a child who has received doses of the 'standard six' antigens – BCG, diphtheria- pertussis-tetanus (DPT) (3 doses), polio (3 doses), and measles vaccines. However in Nigeria, FIC also captures the additional indicators for Yellow Fever and hepatitis B vaccines.

Fully Immunized Children (FIC) is an indicator which measures the number of children who have received the complete dosage of the following four antigens: BCG, 3 doses of DPT, 3 doses of Polio and Measles.

OPV 3: is the third dose of the polio vaccine expected to be given to a child at 14 weeks according to the national immunization schedule

Valid Coverage: this is the immunization given as evidenced by card. The validity is based on the presence of a card with a date when the vaccine was given.

Vaccine Preventable Diseases (VPD): this is an infectious disease for which an effective preventive vaccine exists. Some of the VPD include anthrax, cervical cancer, diphtheria, hepatitis A & B, *haemophilus influenza* type B (Hib), human papillomavirus (HPV), influenza (flu), measles, meningococcal, mumps, pertusis, pneumococcal, polio e.t.c.

CHAPTER ONE

1. Introduction

1.1 Background

In Nigeria, it is estimated that one child out of five dies before its fifth birthday of vaccine-preventable diseases (VPDs); this accounted for about 872,000 (22% of) childhood deaths in 2002[1]. The childhood mortality rate (CMR) was 97 per 1,000 live births in 2003 and 88 in 2008[2]. This follows the global trend which recorded a fall from 12.4 million in 1990 to about 8.1 million in 2009[3]. It is disturbing to note that just three countries accounted for 40% of the 8.1million global child deaths. These countries include Nigeria accounting for about 10% of global deaths second to India which accounted for 21.1% and Democratic Republic of Congo (6.4%).

Immunization has been accepted worldwide as the proving tool for the control and prevention of life threatening infectious diseases, especially VPD in children and this holds true in the developing countries. Immunization has been proven to be the most cost-effective and equitable intervention strategies in primary healthcare delivery and is estimated to avert between 2 and 3 million deaths each year[4,5].

Immunization activities started in Nigeria in 1956 prior to the small pox eradication campaign. However, the Expanded Programme on Immunization (EPI) routine immunization (RI) against Diphtheria, Pertusis, Tetanus (DPT), measles, poliomyelitis and tuberculosis began in Nigeria in 1979 and the coverage increased steadily until 1990. The national BCG coverage during the period (1979 – 1990) rose steadily to reach 80% and 48% for measles. However in the 1990s the coverage started reducing alarmingly that BCG coverage went down to 34% and measles to 30% [6]. Though there was significant variation in the immunization coverage between the States and Federal Capital Territory during this period as detailed in the regional coverage rates in Nigeria Demographic and Health Survey of 1990 (see Table 1)[7]. The decline in immunization coverage has been attributed to weak RI services due to inadequate financial planning and funding; stock-outs of immunization consumables; lack of government commitment in human resources development and poor immunization uptake among other challenges.

Prior to the 1990s, the coverage of RI services was reportedly as high as 81.5% of newborns[8]. This good performance was not sustained in the years that followed as the introduction of National Programme on Immunization (NPI) in 1996 which replaced the EPI and mainly focused on polio eradication weakened the routine services in the country[1]. For example the nurses carrying out Supplementary Immunization

Activities (SIA), National Immunization Days (NIDs) and Immunization Plus Days (IPDs) were not available at the health centers and clinics to provide routine care as there were numerous campaigns targeted at eradicating polio every year[1]. In terms of funds, routine immunization services did not receive the same attention that polio eradication programmes alone received. Recently the Bill Gates and Melinda Foundation declared that it had spent about $750m on polio eradication in Nigeria alone [9], while the 2011 total budget for National Primary Health Care Development Agency (NPHCDA) which oversees immunization services is N7.6 billion (approximately $48m)[10]. The effect is that routine immunization services have consistently been weakened consistently since the 1990s[8].

Table 1: Percentage of children 12-23 months who had received specific vaccines by the time of the NDHS in 1990

	Percentage of children who received:								
Background Characteristics	**BCG**	**DPT**			**Polio**			**Measles**	**Number of Children**
		1	**2**	**3+**	**1**	**2**	**3+**		
Sex									
Male	59.7	57.9	45.9	33.7	58.2	46.1	33.8	45.7	683
Female	61.7	60.5	47.6	32.9	61.1	47.9	32.9	46.4	697
Region									
Northeast	41.2	40.8	32.1	17.3	42.6	32.7	17.3	31.6	359
Northwest	52.6	51.7	35.1	18.7	51.7	35.1	18.7	39.7	373
Southeast	73.0	70.2	58.8	50.4	70.2	59.0	50.4	53.9	408
Southwest	81.6	79.8	66.5	51.0	79.8	66.5	51.3	64.0	240
All children	60.7	59.2	46.8	33.3	59.7	47.0	33.4	46.0	1,380

Extracted from Table 8.7 (vaccinations by background characteristics) of the Nigeria Demographic and Health Survey 1990.

The Federal Government of Nigeria (FGN) acknowledged the importance of immunization as a means of controlling diseases, reducing deaths of infants/children and also as the most cost-effective health intervention[8, 11]. Therefore the UK Department for International Development (DFID) pledged resources to assist the Federal Ministry of Health to strengthen routine immunization services[8]. This partnership between DFID and the FGN finally led to the launch of the Partnership for Reviving Routine Immunization in Northern Nigeria (PRRINN) in 2006. PRRINN was designed to be implemented by a consortium of three organizations (Health Partners International, Save the Children UK, and GRID Consulting) and involves

working with stakeholders at all levels to ensure the improvement of immunization coverage in a sustainable manner, with routine immunization system strengthening as an entry point for strengthening the PHC system. Some of the project development objectives (PDO) are:

- To improve the capacity of the States and LGAs to plan, implement and monitor routine immunization activities within the context of integrated primary healthcare.
- Increased access to the uptake of immunization
- Strengthened community ownership of immunization activities

The programme was originally designed to run from 2006 to 2011 and focused on the northern States with the lowest immunization coverage rates. These are Jigawa, Katsina, Yobe, and Zamfara States which all have immunization coverage rates of less than 22% respectively[6]. The PRRINN programme was valued at £27.2 million. Following a favourable programme review and demonstration of value for money in 2010, the programme was extended till 2013. The reviews that have been done on the programme before now are summarized in table 2 below:

Table 2: Previous reviews of PRRINN

Type of Review	Year	Approach	Output
PRRINN Annual Review and MNCH Inception Review	2009	review of key documents and reports, interviews with PRRINN staff, key stakeholders at national, regional, State and LGA levels	Report[12]
PRRINN-MNCH Annual Review	2010	review of key documents and reports, interviews with PRRINN staff, key stakeholders at national, regional, State and LGA levels	Report[13]
Rapid Immunization Assessment	2010	the assessment of the cold chain, vaccine distribution systems and vaccine management at the State level and in 4 LGAs and 8 health facilities in each State	Report[14]

The infusion of additional financial resources from the Norwegian government in 2008 enabled the scope of the PRRINN programme to be expanded beyond improving immunization to improving the health of

mothers and children in the same States. Hence the new PRRINN-MNCH programme is two projects combined in one (DFID-funded PRRINN which began in 2006 and the Norwegian-funded Maternal, Neonatal and Child Health (MNCH) project which began in 2008).

This study assessed the performance of routine immunization in Jigawa State to demonstrate the effectiveness of the DFID funded PRRINN component of PRRINN-MNCH activities in the State by comparing the immunization coverage and routine immunization data from the health facilities before the commencement of the programme to date.

1.2 Research Setting

Jigawa State is situated in the northwestern part of Nigeria. Kano State and Katsina State border Jigawa to the west, Bauchi State to the east and Yobe State to the northeast (Map 1). To the north, Jigawa shares an international border with Zinder Region in The Republic of Niger.

The State has a total land area of approximately 22,410 square kilometers. Its topography is characterized by undulating land, with sand dunes of various sizes spanning several kilometers in parts of the State. The socio-cultural composition in Jigawa State could be described as homogeneous: Hausa/Fulani, who can be found in all parts of the State, mostly populates it. Kanuri are largely found in Hadejia Emirate, with some traces of Badawa mainly in its Northeastern parts. Even though each of the three dominant tribes continue to maintain their ethnic identity, a shared religion (Islam) and a long history of inter-marriages have continued to bind them together.

Although population of the State is predominantly rural (90%), the distribution in terms of sex is almost equal between male (50.8%) and female (49.2%). This sex distribution pattern in the population is same across various constituencies in the State and between urban and rural areas.

Jigawa State comprises 27 Local Government Area (LGAs), which are divided into 30 State Constituencies, grouped into 11 Federal Constituencies and 3 Senatorial Districts. These 27 LGAs are further subdivided into 77 Development Areas per law No. 5 of 2004 of the State House of Assembly.

The State Ministry of Health (SMOH) comprises of five (5) departments and one parastatal – Gunduma Health System Board (GHSB). The primary and secondary healthcare systems are integrated and administered through 9 *Gundumas* (districts). As the supervising and coordinating authority on health matters within the State, the SMOH takes initiatives and ensures political support from the Government

towards achieving its laudable objectives.

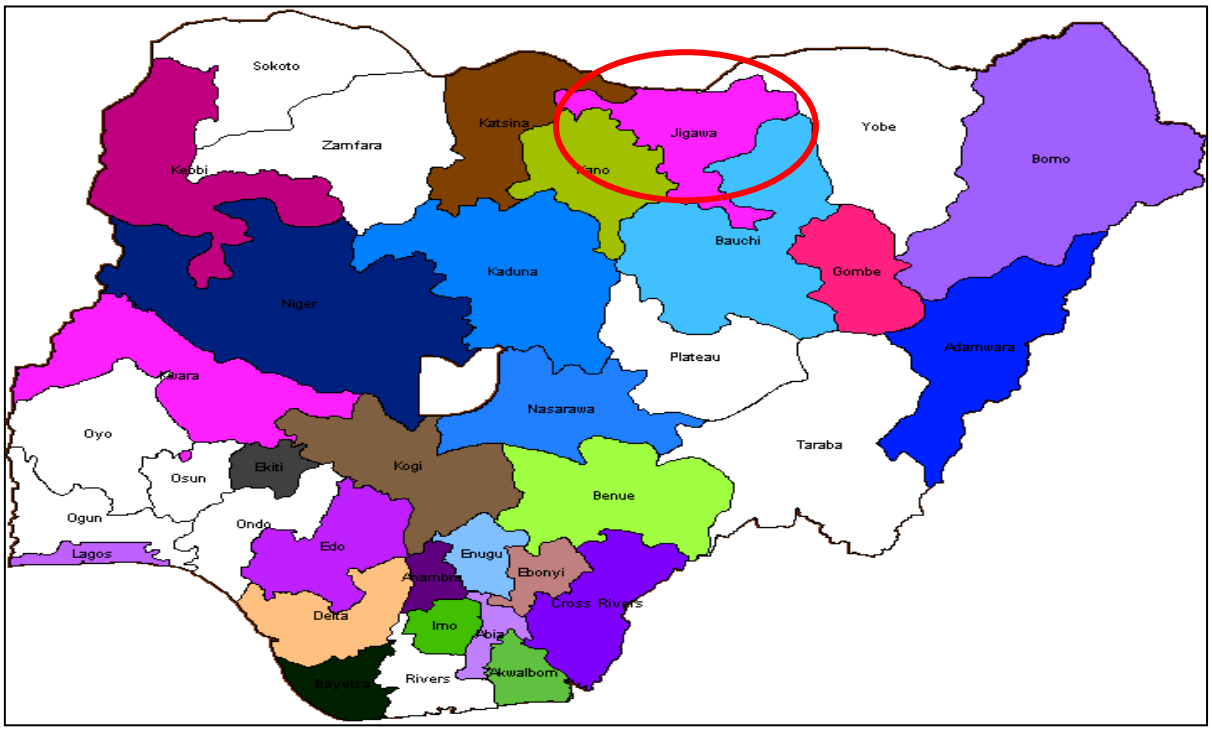
There are 13 Secondary Health Facilities (SHCs) managed by the SMOH and a tertiary health facility, Federal Medical Center (FMC) which is managed by Federal Ministry of Health (FMOH). There are 623 primary healthcare facilities in the State; these are categorized into Health Posts (337), Health Clinics (134), Primary Healthcare Centers (61) and Dispensaries etc (91).

Each of the *Gundumas* has three departments, headed by the Deputy Directors and the departments include the following:

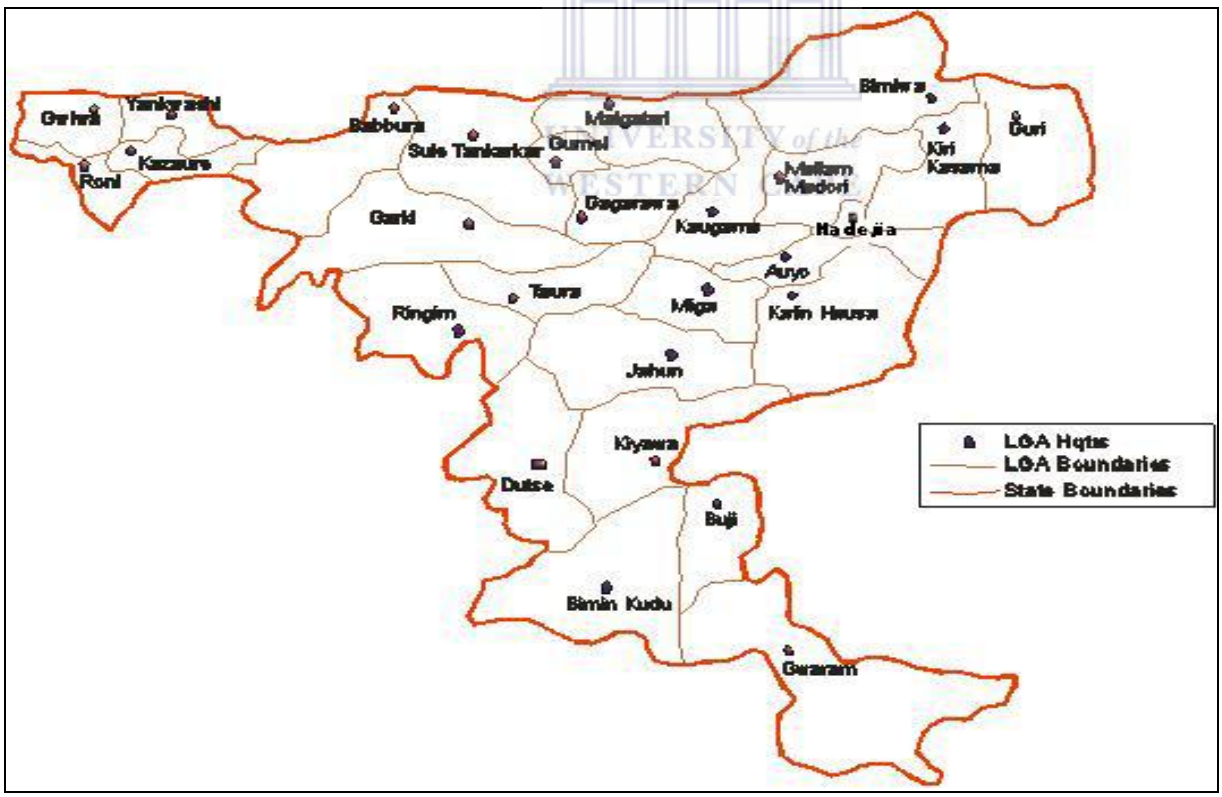
- Primary Health Care Department (reproductive health; nutritional promotion; immunization IMCI; disease, surveillance and control; health promotion and equity; monitoring, evaluation and operational research)
- Hospital Department (clinical services and quality assurance)
- Administration and Support Services Department (finance and accounts; drugs and logistics; human resources)

The primary health care department is in charge of the immunization services within each district and due to integration of the health system under the GHS, immunization was provided at all level of care. The analysis of the findings from the Jigawa State listing survey revealed that a total of 4,906,029 people access health care services from the 623 primary health facilities across the 27 LGAs of jigawa State. It gives an average of one primary health facility servicing an estimated 7,875 people in 2011 [15].

Map 1: Administrative Map of Nigeria showing Jigawa State (red ringed)



Map 2: Administrative Map of Jigawa State showing the 27 LGAs



1.3 Problem Statement

A major health system challenge in Jigawa State is the weak immunization service delivery with almost non existing routine services. Even with the focus on polio eradication programmes, and the reporting of high coverage after each round of immunization activities, the complete eradication of polio in northern Nigeria is still a challenge. It is believed that the upsurge of WPV-3 predominantly in the northern parts of the country is associated with poor routine immunization. Though it could be addressed through good quality immunization rounds, a sound routine immunization system could have handled the WPV3 and various VPD that we have as a problem in the country now (especially in the North). A demographic and health survey in 2008 showed that States like Sokoto, Zamfara, Jigawa, Yobe and Borno have less than 10% of their infants fully immunized at the age of one[2]. Low routine immunization coverage has been linked to low proportion of infants of one year old fully immunized as demonstrated in the northern states of Sokoto, Zamfara, Jigawa, Yobe, Borno, Gombe, Bauchi, Kano, Kaduna and Kebbi. This is a pointer that routine immunization system is not operating well in this part of the country.

So the initiative of PRRINN and other immunization intervention programmes to revive routine immunization activities is believed to be logical. After five years of programme implementation, there has been no substantive evaluation of the programme, except for the annual reviews (done twice so far) but which did not include survey based data and made cursory attempt to track performance of PRRINN in respect of immunization coverage. Hence, a thorough and systematic assessment of the performance of routine immunization in Jigawa State before and after PRRINN had not been conducted.

1.4 Rationale for the study

The assessment of routine immunization performance in Jigawa State based on the status of immunization coverage and routine immunization activities in the State will help in understanding if the public health programme activities being implemented in the State are achieving the objectives of improving routine immunization in the State.

More so, the independent assessment of new public health intervention programmes like PRRINN is necessary to appraise the performance of the programme against key outcome indicators. Knowing the effectiveness of the PRRINN intervention programme will inform future actions; for example, if the assessment is positive, then the replication of the programme in other States will be evidenced-based. The assessment is also good for the monitoring and evaluation component of such programmes.

This research study will provide assessment for the performance of routine immunization in the State since

the inception of the renewed efforts of the government to improve routine immunization and the creation of the PRRINN intervention programme in this setting. This is expected to contribute significantly to the general assessment of PRRINN efforts at improving routine immunization in Jigawa State. Comparing the current survey based immunization coverage of the State with the coverage figures from national survey based coverage in 2006 will reveal the status of routine immunization in the State. The analysis of the survey based data is expected to give an unbiased assessment of RI in Jigawa State.

1.5 Aim of the Research Study

The aim of this study was to evaluate the performance of the 'Partnership for Reviving Routine Immunization in Northern Nigeria' (PRRINN) in improving routine immunization coverage in Jigawa State.

1.6 Objectives of the Research Study

- To determine the current status of immunization coverage for Jigawa State, after five years of PRRINN programme implementation.
- To measure and compare the drop-out between first and third dose of DPT, the proportion of full immunized children over the five year period, and determine the factors affecting immunization.
- To ascertain the status of routine immunization in the primary health facilities spread across the 27 LGAs of Jigawa State.

CHAPTER TWO

2. Literature Review

2.1 Immunization Services

Routine immunization is the corner stone of public health intervention to VPDs, as it is the most cost-effective clinical preventive service for children, saving both lives and money[16]. Immunization against VPDs has greatly improved globally. It was reported that the number of children immunized against VPDs has gone up from 20% in 1980 to about 80% in 1996[17]. It is further estimated that as many as 2.8 million child deaths have been prevented annually as a result of immunization for VPDs[18]. Studies by the World Health Organization (WHO) have shown that the number of children saved from death from VPDs has increased steadily over the years with figures of 800,000 lives saved in 1988[19] and increasing to over 2 million in 2006[16].

However the performance of immunization programmes in developing countries remains dismal. In 2006, over 1.4 million children died from VPDs. This observation is in tandem with the reported low immunization coverage in 2006: of 157 member countries of the WHO only 47 had DPT coverage greater than 80% in all districts or states[16]. Only five countries accounted for about half of global child deaths in 2009, notably among these are India, Nigeria, and Democratic Republic of the Congo. This poor performance may be attributed to weak health systems characterized by inadequate funding, staffing and poor cold chain at health facilities and limited public awareness to mention but a few [19].

In his review, Joanne Embree stated that "there is a need to assess the long term effect of the introduction of any immunisation programmes"[20] and the sophisticated modelling techniques available have greatly improved our ability to predict the effect of public health interventions. It is imperative that the early or long term effect of the introduction of intervention programmes is assessed[20]. It is also important to actively monitor or evaluate the programmes in order to prepare for the eventualities of their effect on the health problems[20].

2.2 Immunization Schedule in Nigeria

The immunization schedule for Nigeria and by extension for Jigawa State indicates that a child should be immunized against Tuberculosis and Hepatitis at birth with the BCG vaccine and first dosage of Hepatitis B Vaccine respectively. Thereafter, the child is administered DPT 1, OPV 1 and the second dose of the HB (HBV2) vaccines at 6 weeks; then the second dosage of both DPT (DPT 2) and OPV (OPV2) at 10 weeks.

The third dosage of DPT (DPT 3), OPV (OPV 3) and HB (HBV3) vaccines are given at 14 weeks while measles vaccine is given at 9 months.

The schedule for Tetanus Toxoid in Nigeria indicates the second dosage of TT(TT2) vaccine should be given 4 weeks after the first contact with TT1 while TT3 should be given 6 months after TT2; TT4 given at least a year after TT3 or during subsequent pregnancy while TT5 is given at least a year after TT4 or during subsequent pregnancy [21].

Data were therefore collected on the immunization indicators (antigens) as specified in the national immunization schedule above during immunization coverage survey and routinely at the health facilities. Infant immunization was reported in NICS 2006 under the following; as crude, valid and valid by 52 weeks of age. Each of these is reported under 'card + history' and 'card only'. However, the NICS 2010 reported the immunization coverage as crude coverage ('card + history' and 'card only') and valid coverage ('card + history' and 'card only') [21].

Crude Coverage: this is immunization given, evidences by card where applicable or by history from mothers/guardians. There is no emphasis on timing and or time-interval as required by the schedule. This actually measures the ability of a delivery system in administering doses at the right time in line with the national immunization schedule.

Valid Coverage: this is the immunization given as evidenced by card. The validity is based on the presence of a card with a date when the vaccine was given. This is immunization given at the specified minimum age and interval in line with the national schedule. Valid coverage can either be either valid immunization given under one year of age or valid immunization given beyond one year of age. This indicator is used to measure the ability of a delivery system to reach children in their first year of age and also beyond the age of 1 year and vaccinate them at appropriate dose interval.

The following vaccine immunization coverage given in Nigeria are used as indices to measure immunization delivery system performance among other things:

BCG

BCG is the first vaccine to be given to an infant at birth if he/she is born in a health facility. This is an indicator used in measuring the access to immunization services because the vaccine is given to the infant at his/her first contact with the immunization system.

OPV 3

OPV 3 is the third dose of the polio vaccine expected to be given to a child at 14 weeks according to the national immunization schedule. It is relevant to note that polio virus is still a huge challenge to the immunization service delivery system in Nigeria and it was pointed out in the NICS 2006 report[4] that a sound routine immunization is key to eradicating polio scourge in the northern part of the country. It is an indicator also used to measure the ability of the immunization service delivery system to give valid doses of vaccines to infants.

DPT 3

DPT 3 is the third dose of the DPT vaccine expected to be given to a child at 14 weeks according to the national immunization schedule. It is a globally accepted indicator to assess immunization coverage trends. A child who was recorded as having been given DPT 3 is expected to have gone through the complete cycle of routine immunization and he/she is expected to have received the other vaccines (BCG, OPV 1 – 3 and DPT 1 – 3). In some instances, across the immunization offices in Nigeria, DPT 3 is usually used routinely to report FIC since the factual FIC coverage can only be gotten during surveys which are not done yearly.

Measles

In Nigeria, measles vaccine is given to a child at 9 months (39 weeks) according to the national immunization schedule. Measles vaccine which is administered as a single dose is the last antigen to be given to a child. It is used as an indicator to assess the ability of the delivery system to reach children before their first birthday. In some cases measles vaccine coverage sometimes is used to signify FIC in the absence of the survey generated FIC that considers all antigens.

Drop-out rates

Drop-out from DPT1 to DPT3: The proportion of the children who received DPT 1 but did not receive DPT3 vaccine. This proportion reflects the deliberate contact with the immunization services and the last dose in multi-dose vaccinations. The period between the first dose of DPT 1 and DPT 3 is when most of all immunization is given to the child, so this DPT1 to DPT3 drop-out rate is a good indicator to assess continuity and compliance of the population with the immunization programme.

Drop-out from BCG to DPT3 measures the difference between the first opportunity with immunization services and the last dose in multi-dose vaccinations.

2.3 Evaluation Studies

In an evaluation study used in assessing the efficacy of non modest non-financial incentives and non-incentives in improving immunization rates in children aged 1-3 years, a clustered randomized controlled study design was used[22]. The study was conducted in the rural setting of Rajasthan, India and the design was based on randomizing 134 villages into one of three groups. These groups include: a once-monthly reliable immunization camp (intervention A; 30 villages); a once-monthly reliable immunization camp with small incentives (intervention B; 30 villages), or control (no intervention, 74 villages). The study investigated the impact of a reliable supply of free immunization services and non-financial incentives on the demand for immunization services. The non-financial incentives given to group B included lentils and metal plates for completed immunization. The study showed that offering families small, non-financial incentives in addition to reliable services and education had large impacts on the uptake of immunization services in resource poor areas and are more cost effective than just improving supply. The study was conducted in areas where the initial immunization rates were extremely low as found in Jigawa State. The generalizability of the survey can be assured only in the rural areas of Jigawa State, as similar interventions in the urban areas may not give remarkable result. The cost of giving incentives in the present setting may not be feasible except there are funding partners for such intervention. The report also reported confounding factors of villagers who might have been motivated to attend the camp for other motives, such as to prevent the cancellation of the programme.

In another evaluation study done in 2008 to assess the progress towards universal childhood immunization (UCI) and the impact of global initiatives, the researchers hinged their findings on the survey-based DPT3 immunization coverage as against the countries official reports or WHO and UNICEF estimates[23]. The study sought to address the issue of over-reporting of childhood immunization coverage rates which may be encouraged by target-oriented and performance-oriented initiatives like Universal Childhood Immunization (UCI) campaign and Global Alliance on Vaccines and Immunization (GAVI). The researchers used all available data to systematically assess the survey-based trend in DPT3 crude coverage during 1986 to 2006; and checked if global health initiatives such as UCI and GAVI ISS, led to over-reporting of DPT3 coverage. DPT3 coverage was estimated by analyzing unit record data from surveys and reported coverage from administrative data based on health service provider registries. The researchers then used bidirectional distance-dependent regression to estimate trends in survey based coverage in 193 countries between 1986 to 2006. They further investigate any association in the difference between countries' official reports and survey based coverage using standard time-series cross-sectional analysis.

The result of the systematic analysis in the study depicted that the crude coverage of DPT3 immunization based on surveys varied when compared to the level suggested by countries' official reports or the WHO

and UNICEF estimates[23]. The improvement in immunization coverage as revealed by data from surveys is more gradual than suggested by the official or administrative reports. The evaluation study done to assess the progress towards UCI and the impact of global initiatives shows the efficacy of using survey based data in evaluating the immunization based intervention programmes or initiatives. The researchers argued that "monitoring and evaluation systems need to be based on rigorous, empirical measurements that are robust to these effects". The study design used appropriate statistical methods for the study and the researchers carefully controlled for the period they need to get backcasting or forecasting survey-based coverage using sensitivity analysis (multiple imputation).

Another independent assessment done by researchers in 2006 to evaluate the effect of the GAVI on immunization coverage used the DPT 3 coverage. The researchers "examined the relation between DPT3 coverage for GAVI recipient countries from 1995 to 2004 and immunization services support (ISS) and non-ISS expenditure per surviving child, controlling for income per head and local political governance variable". Two different dependent variables were used to study the relationship between DTP3 coverage for GAVI recipient countries from 1995 to 2004. The dependent variables used were DPT3 coverage reported by government and DPT3 coverage estimates from WHO/UNICEF reports. The study concluded that the effect of GAVI on DPT3 coverage depicted that GAVI has contributed to increase of DPT3 coverage in countries with baseline coverage of 65% or less[24]. It can be concluded from the study that similar GAVI interventions can only be effective with countries that have DPT3 coverage of less than 65% at baseline. The study did not specify the type of DPT3 coverage used for the study; it was not clear if the crude coverage (card plus maternal-self report) or card only was used.

Within Nigeria, the EPI was evaluated in Port Harcourt, Rivers State[25]. For this evaluation, the immunization status of children 9 months to 3 years who attended the children's outpatient clinic of the University Teaching Hospital, Port Harcourt was compared before the commencement of the EPI programmes and 18 months after the commencement. The study showed an increase in the percentage of fully immunized children from 5% to 43% over a two year period (1984 – 1986). The study also demonstrated that the proportion of children with no vaccination dropped from 56% to 19% over the same period and called for an intensification of the immunization campaign in order to achieve full immunization coverage of 80%[25].

The trend in the evaluation of immunization programmes has been to measure performance in terms of the coverage rate of antigens or coverage rate of all antigens as a whole (full immunization) [16]. We could begin to question if the only way to measure effectiveness of the different routine immunization programmes should be based on coverage rate for the antigens or the eradication of the diseases which the vaccines are

targeted at. The argument here is that if these vaccines are truly potent and they possess the presumed potential 'herd effect', then the yardstick for measurement of RI intervention programme could ultimately be the disappearance of the VPDs. Though the scope of the present study is also to measure performance of PRRINN in Jigawa State in terms of coverage rate, subsequent assessment studies should be based on disease incidence.

2.4 Study Designs for Evaluating Immunization Intervention Programmes

In a review[16] of studies that evaluated intervention programmes to improve RI programmes in developing countries, various strategies were identified as having been used in different settings. These include observational studies, quasi experimental before and after evaluation studies, and studies with comparison group[9].

Twenty five evaluation studies that were selected in the review were on programmes that have reported success in improving routine immunization programmes through community and facility based interventions over a period of 38 years[16]. No strategy could be adjudged to be the best as some of the strategies were applied in the setting with high baseline coverage while others were in settings with low baseline coverage [16].

The review showed that of the 25 studies reviewed, 8 used the before and after study design to carry out the evaluation of the intervention programmes. The before and after study design was able to report change in coverage compared to the other designs where immunization coverage were not reported. However, the review reported that the generalizability of the evaluation studies could not be determined as most of the studies failed to discuss the comparison of the findings with other similar studies[16].

2.5 Partnership for Reviving Routine Immunization in Northern Nigeria (PRRINN) Intervention Programme

The programme Partnership for Reviving Routine Immunization in Northern Nigeria (PRRINN) was originally designed by FBA Health Systems Analyst in 2005 for the UK Department for International Development DFID[26]. The project is a partnership between the following agencies; Health Partners International, Save the Children - UK, GRID Consulting, Health Reform Foundation of Nigeria, John Hopkins University Center for Communications Programs and Institute of Development, Partnership for Transforming Health PATH and Transaid[26].

In view of the lowest immunization coverage rates in the northern Nigeria, this DFID supported programme was started in November 2006 in four Northern States of the country; Jigawa, Katsina, Yobe and Zamfara States and the programme was billed to run for a five year period.

The key goal of PRRINN is to improve immunization coverage in a sustainable manner, with routine immunization system strengthening as an entry point for strengthening the PHC system.

Some of the project development objectives (PDO) are:

- to improve the capacity of the States and LGAs to plan, implement and monitor routine immunization activities within the context of integrated primary healthcare.
- to increase access to the uptake of immunization
- to strengthen community ownership of immunization activities

The factors responsible for the failure of routine immunization in the country are multifaceted and can be placed under broad headings as 'supply side issues' and 'demand side issues'. The supply side issues include: the unavailability of vaccines, absence of vaccinators, and distance to the routine immunization facilities[27, 28]. The development partners also reported six other major factors which include; insufficient ownership by States, LGAs and communities, lack of commitment by all tiers of Government, lack of year-round availability of all vaccines at health facility level, lack of monthly financial support to operational costs, lack of proper supervision and feedback, lack of data driven monitoring and low staff motivation (especially the outreach staff) [29].

On the demand-side, the factors responsible for the poor uptake of immunizations as revealed by the theory based research conducted in six northern States include: psychological factors which showed the role myths and rumors played in obstructing immunization uptake, for example the belief that foreign country promote immunization with a hidden agenda, there is also misinformation about the number of vaccines to be taken and the side effects of these vaccines; community and systemic factors, for example the people are discouraged because of the lack of skill from immunization service providers and long waiting time at the service delivery points; and socio demographic and media factors, for example limited media exposure and access to public health facilities among the low income earners[26]. Comparing these aforementioned factors with what was reported by Centre for Disease Control and Prevention (CDC) on the factors that influence immunization rates, they also stated poverty / access to care issues, cultural approaches to health care, and missed opportunities[30].

PRRINN immunization activities started in the various States at different time and the programme was designed to address the above factors responsible for the failure of routine immunization in the four States of Yobe, Jigawa, Katsina and Zamfara where the programme is being implemented.

Before the PRRINN programme started in Jigawa state in October 2006, the following challenges were a common place in the State: PHC service budgets were inadequate to support staff supervision and training, drug supply, facility maintenance and health promotion[1].

However, after the commencement of PRRINN, the health systems strengthening objectives under listed are being implemented through various activities to address the challenges aforementioned:

1. Advocacy and technical assistance to the state and local governments, political, traditional and religious leaders as well as support to communities to demand services.
2. PRRINN support has been laying the foundation for well-funded and managed PHC services by providing technical assistance for quality services and by working with Federal, state and local government authorities to plan, budget and monitor funds and activities effectively.
3. Technical support to state government to ensure the regular supply of vaccines at the health facilities.
4. Improving the cold chain and related transportation system.
5. Provision of technical assistance on training of health facilities staff on all aspects of routine immunization.

It has been reported[31] that the advocacy and technical assistance to government, political, traditional and religious leaders, also the support to communities to demand the immunization service are already yielding positive results. PRRINN support was also reported to be laying the foundation for well-funded and managed PHC services by providing technical assistance for quality services and by working with the three tiers of government to plan, budget and monitor funds and activities effectively.

Other positive results reported include increase in regular vaccine supply to several health facilities and repairs to all solar panel installations which provide alternate electrical power source and ensured that the hot climate in the northern state does not destroy the vaccines. Transport policies have been developed, health facilities staff have been trained and empowered to carry out a peer review of their PHC service delivery and the State Ministry of Health has begun regular supportive supervisory visits. The report also revealed that communities are beginning to be empowered to learn about and discuss the benefits of utilizing modern health services and many mothers and children are beginning to go to health facilities for the first time in their lives. The state is now said to have costed health plan and the 27 LGAs in the state now use detailed health plans and budgets to advocate for adequate funds release to the PHC.

In 2008, the PRRINN programme extended its scope to cover health care for mothers and children under the MNCH programme in order to add to the existing programme on improving routine immunization. The new PRRINN programme is now referred to as PRRINN-MNCH; this is made possible by the new fund from the Norwegian government. The purpose of the new PRRINN-MNCH programme is to improve the quality and availability of all maternal, neonatal and child health services[32]. The services cover the following: antenatal and postnatal care, safer deliveries, care for newborn and young children, better nutrition and routine immunization. Also in 2010, the PRRINN programme tenure was extended for an additional two years; the programme will now run for 7 years instead of the previous five years. The extension was based on the programme review.

The original DFID funded PRRINN was borne to revive routine immunization and its mandate was to strengthen the RI system. It focused on:

- building the cold chain through repair of solar fridges
- strengthening the capacity of health facilities to deliver RI services through training of mid-level managers
- developing and implementing micro-plans
- supporting the development of transport policies and so on
- development of the State plans for RI

The detailed aim and output of the PRRINN programme and phases of implementation is detailed in the annual report for 2008 [31].

Some of the contributions of PRRINN and the other immunization partners in Jigawa State are detailed below under the following headings [31, 32, 33].

Strengthening RI systems and services

The government was assisted by PRRINN in repairing faulty solar systems across the State, facilitated the development of a multiyear immunization strategy for the State. Three hundred and thirty three motorcycles were purchased and distributed to Ward Focal Persons (WFPs) by State Government through the ministry of health. Technical support was provided by PRRINN to strengthen the management of the motorcycles that were distributed to WFPs for the monitoring and measuring the key performance indicators (KPI) to increase availability of vaccines for health facilities and outreach services in all the 288 wards and

communities in the State.

The State shifted focus from IPD driven immunization programme to actual RI services. This was done through advocacy and support. The government released funds and other resources for immunization and RI services, made vaccine available in the health facilities, advocacy was increased to increase demand for immunization services in the State, and they also increased number of outreach immunization services. Significant improvement was noticed in this regards as early as in 2009 when the percentage of LGAs with stockout of vaccines was greatly reduced when compared with was happening in 2007.

Increasing Budget Commitment

The State Governor in 2008 released N45 million for RI activities, this also was followed with increased budgetary allocation from across LGAs toward RI activities. Jigawa State with the support of PRRINN accounted for the money spent under GAVI which enabled GAVI to release more funds for immunization activities. Generally fund were released effectively for immunization activities over the years and the immunization partners have been supporting the State government financially.

Strengthening PHC System

Priority was given to proper planning in the State. This led to the development of yearly operational plans for both the SMOH and the 9 Gundumas. Other planning tools that were developed with support from partners include HHR operational plan (norms), transport policy, the implementation of Integrated Supportive Supervision (ISS) system and operational HMIS meeting at the Gunduma level.

The PHC system in Jigawa State was strengthened by the initiative of the National Primary Health Care Development Agency (NPHCDA) that was sold to the northern States, which was to bring PHC Under One Roof (PHCUOR). The PHCUOR concept has the following advantages:

- It has a single management body with adequate capacity that has control over services and resources
- Enabling legislation and concomitant regulations (inclusive of the key elements)
- Decentralized authority, responsibility and accountability with appropriate span of control. Roles and responsibilities of the different levels will need to be clearly defined.
- Principle of three ones (one management, one plan and one M&E system).
- An integrated supportive supervisory system managed from a single source.
- Integration of all PHC services under one authority – at a minimum consisting of health education and promotion, MCH/FP, immunization, disease control, essential drugs, nutrition and treatment of common ailments.
- Effective referral system between/across the different levels of care.

A concept note was developed for PHCUOR implementation in 2009. A policy document and implementation guide was also drafted. This PHCUOR strengthened the PHC system by reducing the fragmentation of PHC service delivery.

Strengthening Advocacy for Immunisation

PRRINN and other partners play a significant role through HERFON to develop state level advocacy plans. In Jigawa State, the Informal Eminent Persons' Group (EPG) was formed. The group is made up of mostly retired key senior officials who can advocate behind the scenes on key issues premised on immunization activities in the State.

The partners working on immunization in Jigawa State also intensified advocacy by coming together to attend the Emirates Council to solicit support for RI and to reduce non-compliance in 2009. The partners include State Ministry of Health, GHB, WHO, UNICEF, PATHS2 and PRRINN.

Some other activities and intervention in the State include:

- Free MNCH
- Kangaroo mother care was initiated in the State
- Community case management and IMCI

On the emergence of the PRRINN-MNCH programme which is a combination of the DFID funded PRRINN and the Norwegian government funded MNCH projects in 2008, the focus changed to achieving the following seven main outputs[32]:

- strengthen State and LGA governance of PHC systems geared to MNCH
- improved human resource policies and practices for PHC
- improved delivery of MNCH services via the PHC system
- operational research providing evidence for PHC stewardship, MNCH policy and planning, service delivery and effective demand
- improved information generation with knowledge being used in policy and practice
- increased demand for MNCH services
- improved capacity of Federal Ministry level to enable States' routine immunization activities.

The focus of this study is only on the objective of the original DFID funded PRRINN programme at improving routine immunization in Jigawa State.

2.6 Partnership for Reviving Routine Immunization in Northern Nigeria (PRRINN) Reviews and Peer and Participatory Rapid Health Appraisal for Action (PPRHAA)

The review of PRRINN and MNCH was carried out in 2009 by representatives from several agencies and government departments (for multisectoral representation). The review consisted of a review of key documents and reports, interviews with PRRINN staff, key stakeholders at national, regional, State and LGA levels. After this review a scoring of the assessment was done, and the conclusion was that the output of the programme can achieve results in the shortest possible time[12]. A similar review was done in the following year and the programme successes were itemized in the review report [13].

In 2009, PPRHAA exercise was carried out in Jigawa State and it involved 114 primary health facilities, 9 general and cottage hospitals, and in the 9 GHB [34]. The PPRHAA is a simple and rapid way of assessing performance at health facilities, identifying problems and achievements, from which managers and staffs prepare plans based on their needs, community priorities and within available resources. The appraisal usually involves building the capacity of managers and staff of the health facilities in appraising, analysing, understanding and implementing key aspects of health management. PPRHAA also involves strengthening the relationship between communities and health service providers' [34].

The PPRHAA revealed that 99% of health facilities in Jigawa State now provide RI on a weekly basis. It also revealed the availability of registers and other data collection tools in these health facilities; these have led to the improvement in data collection process. Some of the other findings of the PPRHAA include the improvement of the Drug Revolving Fund (DRF), the improvement of infection control system and improvement in waste management and general sanitation in the health facilities [34]. The PPRHAA was seen as a tool for strengthening the primary health system and was going to be institutionalized in the State.

CHAPTER THREE

3. Methodology

3.1 Study Design

This evaluation applies a before and after quasi experimental study design based on analysis of secondary data from the National Immunization Coverage Surveys (2006 & 2010) supplemented with primary data on routine immunization collected at the primary health facilities and also information from primary healthcare stakeholders in Jigawa State via key informant interviews. The stakeholders included the key Directors at the State Ministry of Health, key officers at PRRINN, Directors of PHC at the LGA level, key officials of Gunduma Health Board (GHB)[1], Heads of health facilities, selected Heads of households and mothers of children aged 12 to 23 months.

The quasi-experimental study design will allow for the evaluation of the intervention programme and will help to answer the third level research questions which deals with problems that seek to generate information about relationships, the 'WHAT' questions ('what is the effect of a particular intervention or strategy'). This is the question that this research study seeks to answer.

Quasi-experimental studies are used in the evaluation of the effectiveness of new programmes, or when a manager is evaluating an existing intervention programme or when development partners / agencies funding a programme wants to evaluate a programme for which no parallel control group exists[35, 38]. Quasi experimental study designs is appropriate to measure the impact of the public health intervention on a particular health outcome in the same populations[37]. Repeating survey data collection can allow comparison across time which is often crucial for watching the progression of diseases and the effectiveness of preventive measures. Surveys are also widely used to evaluate public health interventions. They can be an effective evaluation tool and provide useful overviews of disease patterns or of an intervention[38].

3.2 Study Population

All immunization data collected for children aged between 12 months to 23 months and mothers of children bearing age during the National Immunization Coverage Survey in Jigawa State and routine immunization data from selected primary health facilities in the State based on sample size determination for this study. The study population for the key informant interviews included the immunization stakeholders; key Directors at the State Ministry of Health, key officers at PRRINN national and Jigawa State offices, Directors of PHC at the LGA level, key officials of GHB, Heads of health facilities, selected Heads of

[1] Gunduma Health System is synonymous to District Health System in Jigawa State.

households and mothers of children aged 12 to 23 months

3.3 Sample size

The sample size included all the secondary data set from the randomly selected 7 LGAs covered during the immunization coverage survey in the State in 2006 and 2010. The sample size was achieved using two stages cluster sampling technique: at first stage, 7 LGAs were randomly selected to achieve 25% of the total LGAs and during second stage, random sampling was used to select clusters in communities using current community listings and population. The 7 LGAs covered were randomly selected using the tables made for cluster techniques (see Appendix 1). The total Sample Size for the State was calculated using the formula below:

Total sample size = Number of children per cluster **x** number of clusters

The sample size for the primary data that was collected from the primary health facilities was estimated based on simple random sampling. The confidence level of 95% was chosen at the confidence interval of 0.05. The study population is 623 (total number of public primary health facilities in Jigawa State); the overall sample size that was calculated using the simple random calculator is 238[39]. The sample size was calculated for each of the 27 LGAs and the total sample size arrived at is 236 PHFs (please see Table 3).

Table 3: Sample Size for primary data collection at primary health facilities

S/No	LGA	Number of PHFs (Sample Population)	Number of PHFs Sampled (Sample size)
1	Auyo	23	**9**
2	Babura	16	**6**
3	Birnin Kudu	35	**13**
4	Birniwa	20	**8**
5	Buji	28	**11**
6	Dutse	39	**15**
7	Gagarawa	17	**6**
8	Garki	22	**8**
9	Gumel	13	**5**
10	Guri	15	**6**
11	Gwaram	60	**23**
12	Gwiwa	18	**7**
13	Hadejia	5	**2**
14	Jahun	33	**13**
15	Kafin Hausa	27	**10**
16	Kaugama	17	**6**
17	Kazaure	17	**6**
18	Kiri Kasamma	21	**8**
19	Kiyawa	37	**14**
20	Maigatari	18	**7**
21	Mallam Madori	23	**9**
22	Miga	22	**8**
23	Ringim	25	**10**
24	Roni	13	**5**
25	Sule-Tankarkar	22	**8**
26	Taura	23	**9**
27	Yankwashi	14	**5**
	Total	623	**237**

3.4 Sampling Procedure

The sampling done for the collection of NICS data was based on the WHO developed 30 x 7 cluster sampling technique. A two stage sampling was done; during the first stage, 25% of the total number of LGAs in the State was randomly selected; at the second stage, thirty clusters in each selected LGA were

selected randomly. The selection of the LGAs was done using random sampling formula based on Probability Proportionate to Size (PPS). The technique allows a small sample (number) of the study population to be sampled thus providing statistically valid data that can be extrapolated to the whole study population[35]. Applying the technique, the study population was first divided into clusters (collection of communities / households within each LGA). The LGAs selected were divided along the line of communities (24 communities were selected in all). Twenty six clusters were randomly selected from the 24 selected communities and a total of 780 households were visited to administer questionnaires (see table 4).

Table 4: Selected Clusters and Communities for NICS 2010 in Jigawa State

LGA Name	No. of communities in the LGA	No. of communities selected	No of Clusters selected	No. of questionnaires administered
Birnin Kudu	**48**	**3**	**3**	**90**
Dutse	**50**	**4**	**4**	**120**
Gumel	**39**	**3**	**3**	**90**
Jalum	**66**	**4**	**4**	**120**
Kazaure	**148**	**3**	**4**	**120**
Miga	**104**	**4**	**4**	**120**
Taura	**34**	**3**	**4**	**120**
Total	**489**	**24**	**26**	**780**

The first house visited in each cluster (e.g Yalwan-Damai community in Birnin Kudu LGA) was selected at random using existing list of household names in the community. In Kazaure community with more than one clusters selected, the community was divided geographically into non-overlapping areas with clear boundaries. After which the first cluster was randomly selected, eligible individuals were then sampled from within the cluster and subsequent clusters[36]. The eligible individuals from the clusters were mothers of children aged 12-23 months (for the information on BCG, OPV and DPT vaccines immunization) and women of childbearing age (between 15 and 44 years old) for the TT vaccine.

3.5 Selection of Survey Personnel

The survey personnel used for data collection of the routine immunization data from the primary health facilities were trained data collectors, most of which are the malaria focal persons in each of the selected LGAs. They know the objectives and the sensitivity involve in conducting research. The selection of the survey personnel was based on academic background (health / social sciences with at least national diploma degree OND), maturity, relevant survey experience, human relation ability and understanding of the culture /

norms of the communities in which the primary health facilities are located.

3.6 Data Collection

The following immunization indicators were extracted from NICS data for 2006 and 2010:

- BCG Coverage (Bacille Calmette-Guerin, existing TB vaccine)
- OPV 0-3 Coverage (Oral Polio Vaccine)
- DPT 1-3 Coverage (Diphtheria, Pertusis and Tetanus)
- Hepatitis B (HepB) Coverage
- Measles
- Tetanus Toxoid Vaccine Coverage

The findings from the in-depth interviews carried out using semi structured questionnaires collated and analyzed to complement the finding from the analysis of the secondary data on immunization and the primary data.

Selected PHFs were visited and the health facility data collection instruments were administered to capture information about routine immunization from the health facilities across the 27 LGAs. This field data collection phase involved two data collectors per LGA and nine Supervisors for the whole State (one Supervisor supervised data collection in three LGAs). This was to ensure proper management and coordination and to minimize errors.

3.6.1 Data Collection Instruments

For the secondary childhood immunization data used for this study, a structured questionnaires (see appendix 2 & 3) was developed to collect information on a child's date of birth and immunization history for BCG, DPT (1 – 3), OPV (OPV 0 – 3), Hep B (HBV 1 – 3), Yellow fever, and Measles vaccines. The structured questionnaires for TT collect information on number of pregnancies, number of TT doses received in prior to and during the last pregnancy. The sources of immunization were also captured in the questionnaires.

For the selected PHFs a structured questionnaires (see appendix 4) was developed, pre-tested and modified to collect information on availability of RI equipment, personnel, records keeping, RI records over 3 years, RI consumable (stock) and training on RI. The interview guide was also developed (see appendix 5).

3.6.2 Pre-testing of data collection instruments

To ensure validity, the data collection instrument (see appendix 4) was pre-tested in another northern State (Kano) from which Jigawa State was created. The pre-testing of the draft instruments was done in order to determine the lucidness of the questions. The pre-testing pointed out the weakness of the draft instruments was pointed out as lacking the ability to compare data over the period of interest (2005 to 2011). Some of the questions that were rephrased include the following:

Question 3b: Were the cold chain equipment in 2005 and 2006 adequate?

This was introduced after the pre-testing.

Question 8: How many children were immunized in the last three months?

This question was rephrased to accommodate the period for comparison:

How many children were immunized in this health facility in?

	2005	**2006**	**2011**
Number of children immunized?			

Similar tables were introduced for questions 9 and 11 to allow for comparison of data over the period.

Hence the data collection instrument was redesigned based on the lapses noticed and the advice of the immunization expert who doubles as the co-supervisor for this study.

For the data collection instruments used to collect the secondary immunization data, we are aware that the Survey instrument was standardized by the World Health Organization (WHO) for the purpose of immunization coverage.

3.7 Validity and Reliability

Validity: questions if the study is measuring what it says it is measuring. The components that could question the validity of the study include bias (selection bias and measurement bias) and confounders and these have been minimized by the sampling technique used for this study. The sampling technique used during the original data collection process for the secondary childhood immunization data set allows for the control of bias via randomization of the sample for the immunization coverage survey. The validity is also strengthened by the standardization of questionnaires used in the survey to include previously validated

questions described by the WHO.

Reliability**:** this questions if the study is measuring things consistently. The reliability of the immunization coverage survey data will be assumed to be assured based on the design that allowed for repeating the process of data collection in selected clusters by a different set of data collectors. The Supervisors for the fresh routine data collection at the primary health facilities also repeated data collection at selected health facilities to ensure reliability.

3.8 Data Management and Analysis

3.8.1 Quality Assurance and Control

Data entry tasks and management was handled by the lead researcher and the data entry personnel. Data cleaning was done in two stages. First, the field coordinator confirmed the completeness and thoroughness of records each day the filled data collection instruments were submitted. Secondly, checks for consistency of responses were carried out on data files via double entry technique. The raw data were referred to before corrections were made on any identified error.

The field coordinator also paid unscheduled visits to three selected facilities for back-checking and data validation using the same questionnaires earlier used.

3.8.2 Data Analysis

Data Processing

The data collected from the field and extracted from the NICS data set was cross checked by the field team supervisors' and by the data management personnel before data entry and analysis. The raw data was then entered into the software by the trained data clerks for the analysis to be done. The data extracted from the immunization coverage was analyzed using a specialized software design for coverage survey, Coverage Survey and Analysis Software (COSAS). The data files were then converted to the format which Epi Info analytical Software can process. After the analysis by Epi Info, the files were merged and exported to the COSAS software for final analysis. The COSAS software then provided standard reports after it has automatically analyse the data. The standard reports from COSAS show the main indicators for child immunization. These include:

- Coverage summary table: crude and valid coverage by dose;
- Detailed dose status table: valid and invalid dose result;
- ''Missed opportunities'' summary table;
- Coverage analysis for measles;

- Date distribution table for the first dose of Oral Polio Vaccine (OPV1);
- Date distribution table for measles;
- Age distribution table for measles and TT immunization;
- Coverage summary table: crude and valid immunization;
- Detailed dose status table: valid and invalid dose result, and
- A line list of results by cluster

Comparative analysis using paired samples t-test was done between the routine data from the health facilities before and after the implementation of PRRINN activities in Jigawa State.

3.9 Ethical Considerations

All ethical codes of behavior guiding research programmes were applied in the course of this research study. We respected the autonomy of the participants; the consent of the health care providers was sought as an introductory letter was given to them and a consent form was also presented and signed by them before the health facility questionnaires were administered on them. All the people interviewed during this research study were told they have the right to decline to the interview if they so wish. Above all, the research ethics committee under the department of Policy, Planning and Resource Mobilization in the Jigawa State Ministry of Health gave their approval before data were collected at the selected primary health facilities. Also ethics approval was granted by the UWC Senate Research and Ethics Committee and also the National Health Research Ethics Committee of Nigeria (NHREC) (See appendix 6).

CHAPTER FOUR

4. Results

The findings from this research study are presented in this chapter under the following sub-headings in line with the study objectives:

- Current Status coverage for Jigawa State
- Immunization drop-out rate in Jigawa State
- Comparison of RI over time in Jigawa State
- Comparison of routine data with survey data

4.1 Current Status of Immunization Coverage for Jigawa State

4.1.1 Fully Immunized Children

Jigawa State FIC performance is presented in the table 5. The crude coverage for FIC is 76.8% in the State for 2010 but the valid coverage 16.4%.

4.1.2 Immunized Children against Tuberculosis

Based on the NICS 2010 survey, BCG coverage showed high percentage coverage for Jigawa at over 75% for crude coverage with 66% of the children having the BCG scar to show for it (see table 5).

4.1.3 Immunized Children with DPT 3

The NICS survey report indicates that Jigawa State recorded a seemingly high DPT 3 coverage at over 80% for crude coverage (card + history). When all the DPT figures are considered for Jigawa State, there is a drop-out of about 6% between DPT 1 and DPT 3. It confirms a generally strong routine immunization system where the immunization access and service uptake have greatly improved (please see section on drop-out rates).

4.1.4 Immunized Children with OPV 3

Jigawa State recorded OPV3 coverage well above the national average for crude coverage at 88% compared to the national coverage of 74%.

4.1.5 Immunized Children with Measles Vaccine

Jigawa State recorded measles vaccine coverage of 85.1% in 2010.

4.1.6 Immunized Children with Hepatitis B3 Vaccine

The coverage reported for Jigawa State is over 85%.

Table 5: Current Status of Immunization Coverage for Jigawa State

Proportion of fully immunized children (12 – 23months) in 2010 (extracted from NICS 2010 data)	Crude Coverage	Percent (%) fully immunized by card or history	76.8
		Percent (%) fully immunized by card	63.1
	Valid Coverage by 52 weeks	Percent (%) fully immunized by card or history	16.4
Proportion of children immunized against Tuberculosis (BCG) in 2010	Crude Coverage	Percent (%) fully immunized by card or history	92.9
		Percent (%) fully immunized by card	76.2
	Children with BCG Scar	Percent (%)	66.1
Proportion of children immunized with DPT3 in 2010	Crude Coverage	Percent (%) DPT3 immunization by card or history	88.7
		Percent (%) DPT3 immunization by card	68.5
	Valid Coverage	Percent (%) DPT3 immunization by card or history	58.4
Proportion of children (12-23 months) immunized with OPV3	Crude Coverage	Percent (%) immunized with OPV3 by card or history	88.1
		Percent (%) immunized with OPV3 by card	69.1
Proportion of children (12-23 months) immunized with Measles Vaccine in 2010	Crude Coverage	Percent (%) immunized with measles vaccine card or history	85.1
		Percent (%) immunized with measles vaccine by card	66.7
	Valid Coverage at 9 months	Percent (%) immunized with measles vaccine by card	14.3
Proportion of children (12-23 months) immunized with Hepatitis B3 Vaccine in 2010	Crude Coverage	Percent (%) immunized with HB3 by card or history	87.5
		Percent (%) immunized with HB3 by card	68.5

4.1.7 Tetanus Toxoid Vaccine Coverage

The percentage of women with at least 2 doses of TT received during their lifetime in Jigawa State is 64.3%. The drop-out rate of TT for between TT1 to TT5 is also on the high side at 58.1%.

4.2 Immunization drop-out rate in Jigawa State

The continuity or the follow-up of immunization programme is measured by the drop-out rates between doses of antigens. For the purpose of this study, two drop-out rates considered:

- Drop-out from DPT1 to DPT3

The drop-out rates for Jigawa State for DPT1 – DPT3 is 6.0%.

4.3 Comparison of routine immunization over time in Jigawa State

Table 6 compares the 2006 and 2010 coverage data.

Table 6: Comparison of immunization coverage between 2006 and 2010

ANTIGEN/ INDICATOR	CRUDE COVERAGE %						VALID COVERAGE %		
	CARD + HISTORY			CARD			CARD + HISTORY		
	2006	2010	Change	2006	2010	Change	2006	2010	Change
FIC	15.5	76.8	**61.3**	5.8	63.1	**57.3**	4.4	16.4	**12.0**
DPT3	28.9	88.7	**59.8**	15.9	68.5	**52.6**	15.6	58.4	**42.8**
OPV3	44.8	88.1	**43.3**	14.7	69.1	**54.4**	-	-	-
Hepatitis B3	17.3	87.5	**70.2**	5.1	68.5	**63.4**	-	-	-
BCG	31.3	92.9	**61.6**	25.4	76.2	**50.8**	**Children with BCG Scar**		
							24.0	66.1	**42.1**
Measles vaccine	47.9	85.1	**37.2**	23.1	66.7	**43.6**	**Valid Coverage at 9 Months**		
							16.0	14.3	**-1.7**

4.4 Paired samples t-test for the immunization coverage between 2006 and 2010

Paired samples t-test analysis was carried out for the crude coverage rates of FIC, DPT3, OPV3, Hepatitis B3, BCG and Measles vaccines.

Assumption

Null hypothesis: there is no significant difference between the means of the coverage rates for 2006 and 2010

Alternate hypothesis: there is significant difference between the means of the coverage rates for 2006 and 2010.

The SPSS output of the paired samples t-test is displayed in tables 7 and 8 below.

Table 7: Paired samples correlations

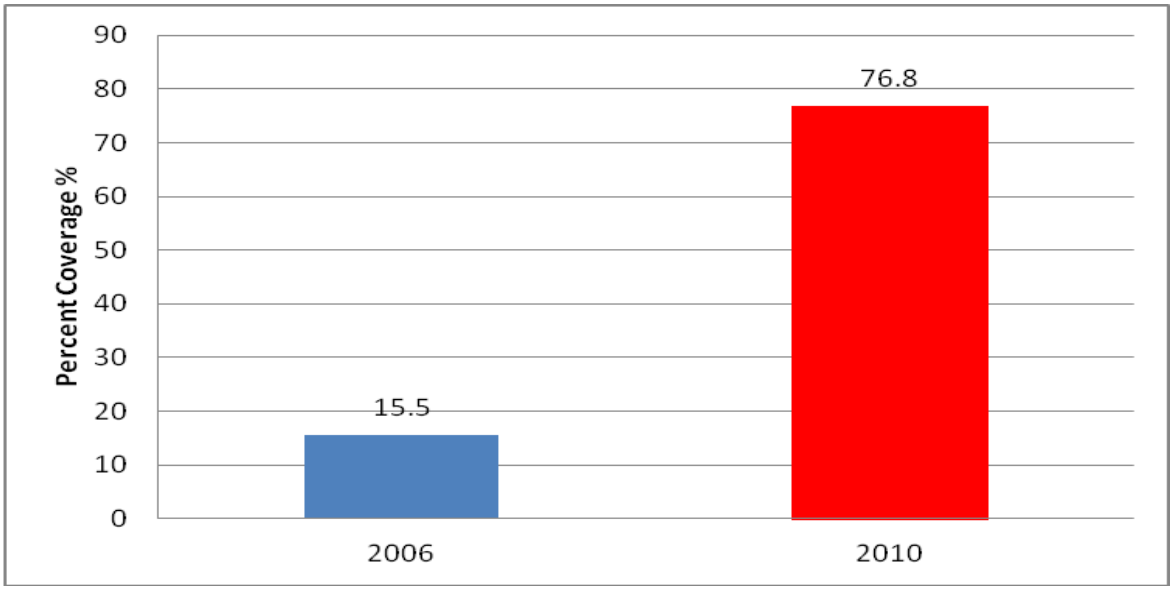
	N	Correlation	Sig.
Pair before & after	6	0.364	0.478

Table 8: Paired samples test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 before – after	-55.5667	12.5629	5.1288	-68.7506	-42.3827	-10.834	5	.000

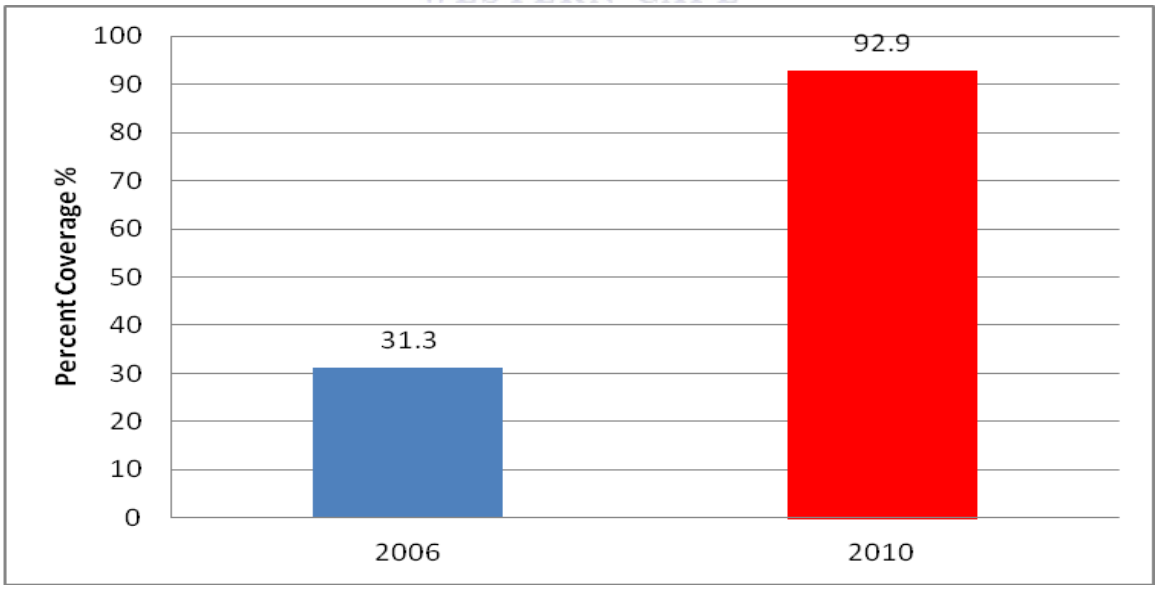
@ 95% Confidence Interval

Figure 1: Comparison of Crude Coverage of fully immunized children (12-23 months) between 2006 and 2010



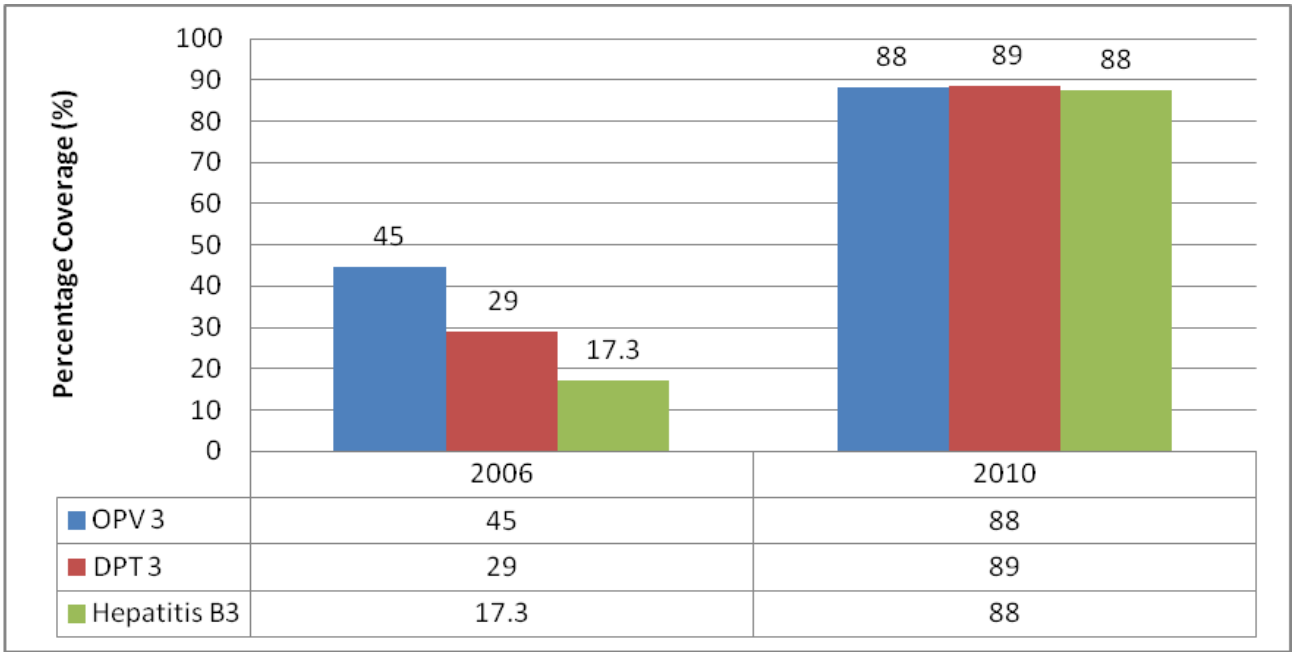
The graph shows that there was an obvious change in the crude coverage rate for fully immunized children in Jigawa State with 76.8% coverage rate recorded in 2010 compared with the 15.5% coverage in previous survey in 2006.

Figure 2: Comparison of crude coverage of children (12-23 months) immunized against BCG between 2006 and 2010



The findings showed that the crude coverage for BCG in 2006 was 31.3% in Jigawa State while it grew up to 92.9% in 2010.

Figure 3: Comparison of proportion of children (12-23 months) immunized against OPV 3, DPT 3 and HBV 3 between 2006 and 2010

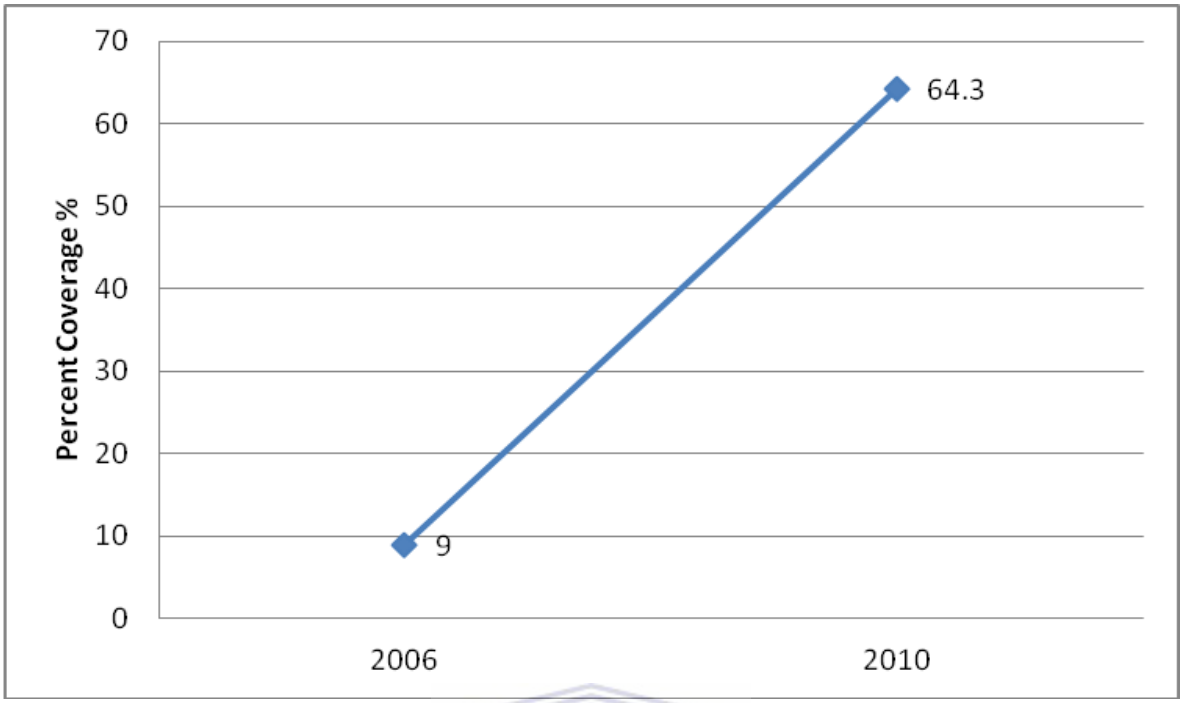


When the trivalent vaccines and hepatitis vaccine coverage rate were compared for 2006 and 2010, the findings showed that the coverage rate increased from 45% to 88% and from 29% to 89% for the trvivalent OPV3 and DPT3 respectively. The Hepatitis B3 vaccine coverage also increased from 17.3% to 88% coverage rate.

Table 9: Comparison of children immunized with Tetanus Toxoid Vaccine between 2006 and 2010

COVERAGE FOR AT LEAST 2 DOSES OF TT		
CARD		
2006	2010	Change
9.0	64.3	**55.3**

Figure 4: Comparison of children immunized with Tetanus Toxoid Vaccine between 2006 and 2010



Findings revealed that the coverage of women who received atleast two doses of tetanus toxoid before child delivery increased from 9% in 2006 to 64.3% in 2010.

4.5 Comparison of routine data with survey data

Comparison between survey and routine data showed that there are differences between reported coverage rates. The routine data extracted from the 2009 Annual report of PRRINN [31] gave different coverage rates when converted using the population figures estimates as reported in the State profile[2].

Table 10: Comparison of routine immunization data and the survey based immunization data

Data Element	2009 (end Sept)	2009 (predicted)	2009 (Routine Data Immunization Coverage)	2010 (Survey Data Immunization Coverage)		
				Crude (Card + History)	Crude (Card)	Valid Coverage (Card + History)
DPT < 1 year	34,138	58,522	31.6%	87.7%	68.5%	58.4%
Fully Immunised child < 1 year	29,690	50,897	27.5%	76.8%	63.1%	16.4%
Tetanus Toxoid2 or booster to pregnant women	17,939	30,753	13.3%			

The noticed differences could be attributed to unreliable population estimates, compromising the calculation of catchment areas for immunization services and also the routine data used is for 2009 while the survey data is for 2010.

4.6 Health facilities routine data and other immunization information in the State

The research study also probed into the immunization services supply side issues by asking for available data on vaccine availability across the service delivery points in the State, vaccine management, and availability of microplans in the health facility and LGA. The extracted data on the Rapid Immunization Assessment (RIA) carried out in the State is presented below. The data compared the situation in 2007 to that of 2009 when the RIA was done.

[2] Total population = 4,631,416; population of 0 – 59 months = 926,283; population of Under 1 year = 185,217;

Table 11: Immunization Supply Side Assessment

Description	2007	2009
LGA Stores with stock outs of BCG vaccine (percentage reporting **yes**)	38%	25%
LGA Stores with stock outs of TT vaccine (percentage reporting **yes**)	100%	25%
Health Facilities with stock outs of BCG vaccine (percentage reporting **yes**)	74%	50%
Health Facilities with stock outs of BCG vaccine (percentage reporting **yes**)	61%	13%

The findings showed that there was reduction in the frequency of vaccines stock outs in the LGA stores and health facilities across the State. Tetanus Toxoid vaccine that was completely out of stock in 2007 is now readily available across the State and the number of LGA stores reporting stock outs have reduced drastically.

4.7 Counterfactual analysis of Immunization coverage in Jigawa and two other northern States

The intensed immunization programme has implemented by PRRINN and other partners in Jigawa, Katsina, Yobe and Zamfara was not done in some other States with similar poor immunization indicators prior to the year 2006. This study extracted a few immunization indicators from the NICS reports (2006 and 2010) and compared over similar period has done for Jigawa State. The immunization coverage for Sokoto State which is located in the same geopolitical zone with Jigawa State and Bauchi State which shares border with Jigawa State was compared for FIC, BCG, DPT3 and DPT1 – DPT3 drop-out rate.

Table 12: Comparison of coverage of fully immunized children (12-23 months) between 2006 and 2010 for Jigawa, Sokoto and Bauchi States

STATE	CRUDE COVERAGE						VALID COVERAGE BY 52 WEEKS		
	CARD + HISTORY			CARD			CARD + HISTORY		
	2006	2010	Change	2006	2010	Change	2006	2010	Change
Jigawa	15.5	76.8	**61.3**	5.8	63.1	**57.3**	4.4	16.4	**12.0**
Bauchi	29.8	25.6	**-4.2**	13.6	21.9	**8.3**	11.0	4.2	**6.8**
Sokoto	5.4	31.8	**26.4**	1.5	6.9	**5.4**	0.0	16.3	**16.3**

From the comparison made on FIC in the States chosen where no intense PRRINN and partners activities was not present, the changes noticed was small when compared with the changes noticed in Jigawa State under the same period.

Table 13: Comparison of children immunized against Tuberculosis (BCG) between 2006 and 2010

STATE	CRUDE COVERAGE					
	CARD + HISTORY			CARD		
	2006	2010	Change	2006	2010	Change
Jigawa	31.3	92.9	**61.6**	25.4	76.2	**50.8**
Bauchi	63.1	35.4	**-27.7**	9.2	51.3	**42.1**
Sokoto	14.4	57.0	**42.6**	9.8	18.8	**9.0**

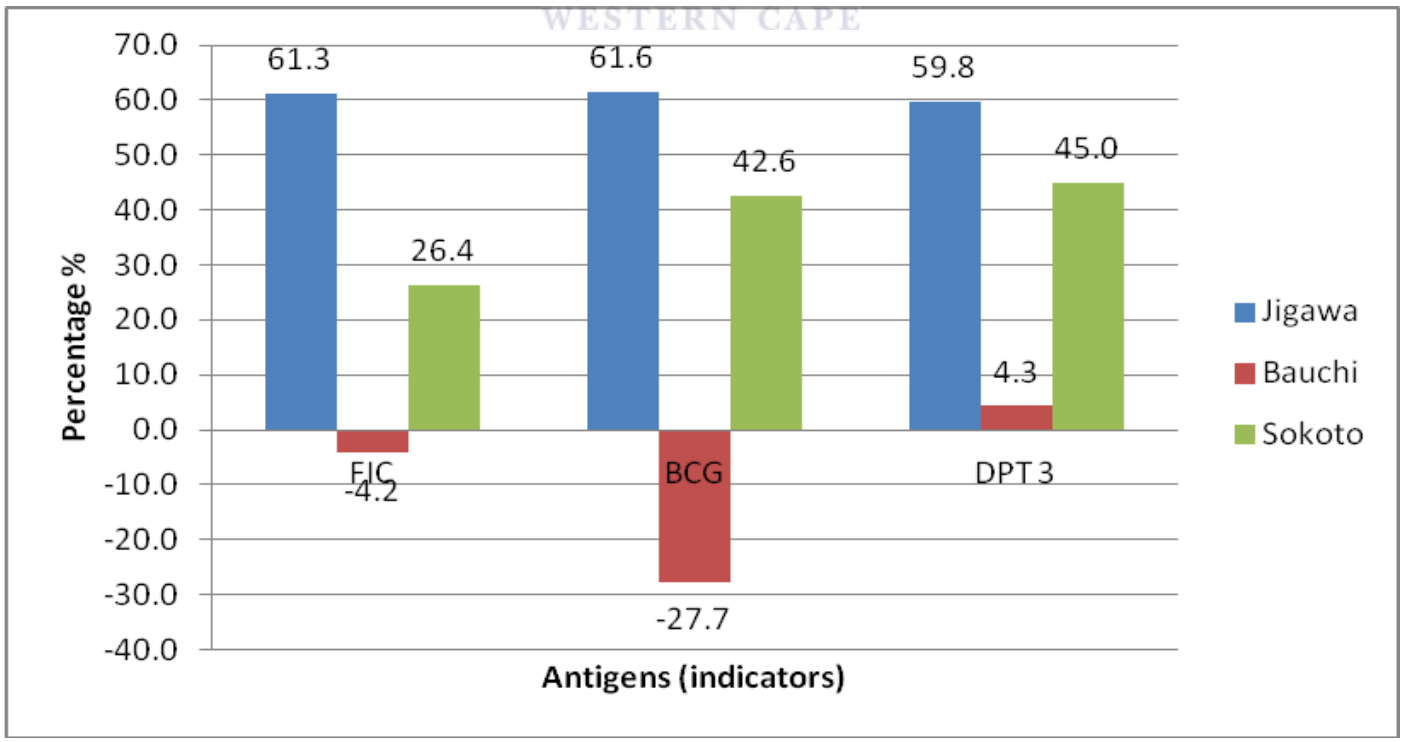
The difference noticed in the BCG coverage across the other two States was not as high as for Jigawa State where the immunization intervention program of the PRRINN and other partners took place.

Table 14: Comparison of proportion of children (12-23 months) immunized with DPT 3 between 2006 and 2010 for Jigawa, Sokoto and Bauchi States

STATE	CRUDE COVERAGE						VALID COVERAGE		
	CARD + HISTORY			CARD			CARD + HISTORY		
	2006	2010	Change	2006	2010	Change	2006	2010	Change
Jigawa	28.9	88.7	**59.8**	15.9	68.5	**52.6**	15.6	58.4	**42.8**
Bauchi	37.7	42.0	**4.3**	17.8	31.2	**13.4**	25.1	74.2	**49.1**
Sokoto	9.2	54.2	**45**	2.8	10.3	**7.5**	5.3	18.0	**12.7**

The comparison made on the proportion of children immunized with DPT 3 vaccine in the three States also showed a marked difference in the changes noticed in the percentage coverage for DPT 3 between the implementing year of the immunization intervention programme.

Fig 5: Counterfactual analysis of the differences noticed in immunization coverages between Jigawa State and two other States (Bauchi and Sokoto) where there were no PRRINN immunization revitalization programmes.



CHAPTER FIVE

5. Discussion

The discussion and interpretation of the findings is discussed in this chapter. The discussion is structured to describe the main objectives of the study and the approach to the analysis. The findings were then interpreted in line with the objectives of the study under similar sub-headings used in presenting the analyses of the findings in the previous chapter.

This study assessed the performance of routine immunization in Jigawa State to demonstrate the effectiveness of the DFID funded PRRINN component of PRRINN-MNCH activities in the State by comparing the immunization coverage before the commencement of the programme to date. The main objectives of this study were to ascertain the current status of immunization coverage for Jigawa State and compared this with the immunization coverage of the State in 2006; determination of immunization access and continuity using the drop-out rates of DPT antigen and determination of the current status of routine immunization in the health facilities.

This study was able to ascertain the immunization coverage status for Jigawa State and compared it with coverage for 2006 which is taken as baseline before the commencement of PRRINN. The drop-out rates was determined, however, due to circumstances relating to the State research ethics, fresh routine data from selected health facilities could not be used in this study. Hence, the study depended on previous health facilities routine immunization data collected in 2009.

From the different data presented under the findings, it was evident that there is an increase in immunization coverage in Jigawa State. This assertion is in line with the report of NICS 2010 which reported increases in the national coverage for fully immunized children and other vaccines with varying degree of coverage rate [21]. The trend of the reported data in this study is also affirmed by the figures in the National Demographic Health Survey of 2008 for the national and zonal coverage rates [41]. The findings in this study shows that the concerted effort of the immunization partners in the State in strengthening the PHC system and improving routine immunization in the State seem to have yielded fruits with the findings reported in this study. This is an indication of an improved immunization system and increased demand for the immunization services [33]. There is however paucity of comparable pertinent information in the literature to discuss the findings of this study.

Overall Improvement in Routine Immunization

Looking at the data gathered and presented in this study, it is clear that there is improvement in the immunization coverage and performance of the immunization system in Jigawa State. The over 60% increment in the percentage of fully immunized children from the 2006 coverage rate evidences this improvement. There has been over 300% increase in the number of children that received full complements of the required 6 antigens in the State since the creation of PRRINN.

The crude coverage for FIC, which is not dependent on specified age, timing and or dosage intervals as prescribed in the national schedule, is 76.8% in the State. However, the FIC figure for crude coverage dropped from 76.8% to 16.4% when the validity of the vaccine immunization is considered. The quality of immunization services which is measure by the reported figure for FIC with valid doses before 52 weeks of age showed that only 16% of children were immunized as required by the schedule. This is just a pointer to an immunization service system that is on the way to recovery.

The first contact to immunization delivery system is measured by the number of children immunized with BCG and this gone up by about 61.6% over the four year period during the implementation of the PRRINN and immunization partners programme in the State. The reported figure in the NICS 2010 survey showed high percentage coverage for Jigawa at 92.9% for crude coverage with 66.1% of the children having the BCG scar to show for it. It shows that access to immunization services in the State has greatly increased.

DPT 3

DPT 3 is the third dose of the DPT vaccine which according to the national schedule is expected to be given at 14 weeks. It is a globally accepted indicator to assess immunization coverage trends. A child who was recorded as having been given DPT 3 is expected to have gone through the complete cycle of routine immunization and he/she is expected to have received the other vaccines (BCG, OPV 1 – 3 and DPT 1 – 3). In some instances, across the immunization offices in Nigeria, DPT 3 is usually used routinely to report FIC since the factual FIC coverage can only be gotten during surveys which are not done yearly.

Hence, the DPT 3 coverage is usually used to measure the strength of the immunization programme in Nigeria [4]. Looking at the DPT3 coverage for Jigawa State (88.7) which increased by about 59.8% over the 2006 coverage, it is obvious that the immunization intervention programme has contributed positively to improving the immunization programme in the State.

OPV3

OPV 3 is the third dose of the polio vaccine expected to be given to a child at 14 weeks according to the national immunization schedule. Polio which has been reported to be endemic in the northern part of the country[1] witnessed an effective combating mechanism through routine immunization services and IPDs activities. This is evident in the oral polio vaccine coverage rate reported for 2010 in Jigawa State which is slightly above 88% for all children; this gave 43.3% increment over four year period. It shows an improvement in the ability of the immunization service delivery system to give valid doses of vaccines to infants.

Measles vaccine coverage

Measles vaccine which is administered as a single dose is the last antigen to be given to a child is used as an indicator to assess the ability of the delivery system to reach children before their first birthday. The performance of Jigawa State according to the NICS 2010 report showed an encouraging coverage when the crude figure was considered. It is shows that 85% of children were reached before their first birthday in the State. This is a pointer to an improved routine immunization system.

Hepatitis B3 Vaccine Coverage

This is the third dose of hepatitis vaccine administered at 14 weeks. The vaccine is known to be one of the most expensive vaccines in the world. The reported hepatitis B3 coverage for Jigawa was encouraging at 87.5% which indicates that over 80% of the children were immunized with the vaccine.

Tetanus Toxoid Coverage

Tetanus is known to be a major contributor to high infant morbidity and mortality in the neonatal phase, therefore Tetanus Toxoid vaccine administration to pregnant women causes the formation of antibodies which provide protection to the neonates against neonatal tetanus. The administration of two doses of TT within a four week interval period in pregnancy is essential as this will produce enough antibodies to last the mother against Tetanus for 3 years while it is sufficient for the infant protection just before the administration of DPT at 6 weeks of age. This is best measured in two ways:

- Mother protection: mothers that have received at least two doses
- Child protection: children born to an eligible mother that have received at least two doses of TT before the child's delivery

TT immunization coverage is dependent on entries by immunization card only because of the strict time restrictions which is applied to administration of the two doses.

The mother and child protection against tetanus toxoid measured by administration of at least two doses of

TT was also evidently increased from 9% coverage in 2006 to over 64% coverage in 2010. This is over 55% increment over the four year period. This shows that more mothers and infant are protected from morbidity and mortality associated with tetanus which is known to cause high mortality rate.

Immunization Access and Utilization

The immunization access and functionality was shown to have improved. The improvement noticed is due to increased in demand for immunization service which is met with a better system quality and utilization which is shown in the observed reduction in the drop-out rates. This shows that the effort of the various immunization programmes in the State (including PRRINN) on advocacy has yielded positive results, as more people access the immunization services and continuity is sustained. Some of the factors that were found to be responsible for immunization drop-out rates (like availability of vaccines, lack of information on the immunization schedule, distance to PHC providing RI, time and/awareness of need to return for subsequent doses, fear of vaccine side reactions etc) were all addressed effectively in the implementation of the immunization intervention programme in the State.

The findings reported in this study confirm the report of the Peer and Participatory Rapid Health Appraisal for Action (PPRHAA) exercise that was conducted in 2009 in 114 primary health care facilities, 9 general and cottage hospitals and in 9 Gunduma Council of Jigawa State [34]. The PPRHAA reported that there is improvement in PHC system and RI services in the health facilities as it was recorded that about 99% of all primary health facilities provides routine immunization services on weekly basis[34]. Improvement in the availability of registers and other data collection tools in the health facilities was also reported while the PHC system via the Drug Revolving Fund (DRF) scheme was sustained, infection control system are now integrated into the PHCs across the State.

Paired T-Test

The hypothesis test conducted for the immunization coverage rates difference between 2006 and 2010 to test the null hypothesis that the PRRINN and other partners' immunization programme in the State led to an increase in immunization coverage in Jigawa State. The crude coverage rates of FIC, DPT3, OPV3, Hepatitis B3, BCG and Measles vaccines were used.

Null hypothesis: there is no significant difference between the means of the coverage rates for 2006 and 2010 i.e. PRRINN and other partners immunization programmes was not responsible for the increase in immunization coverage in the State.

Alternate hypothesis: there is significant difference between the means of the coverage rates for 2006 and 2010 i.e. PRRINN and other partners immunization programmes was not responsible for the increase in immunization coverage in the State.

The paired samples correlation showed a weak positive correlation at 0.364.

The T value = -10.834

We have 5 degrees of freedom

Our significance is .000

Since the significance value is less than .05, it means there is significant difference, hence the rejection of null hypothesis set is not accepted. It then means that the PRRINN and other partners programmes on improving immunization in Jigawa State was responsible for the increased immunization coverage noticed in the State in 2010.

Limitations*:* The effect of other partners such as WHO, UNICEF and government effort on the status of routine immunization is a limitation that this study was faced with. Though the study aim was linked to the assessment of the effectiveness of PRRINN in Jigawa State, the study found out that other partners and government programmes in the State also contributed to the improvement of routine immunization. Hence, this became a confounding factor that could not be separated from the direct effect of the PRRINN programme on routine immunization.

The other limitation experienced was the inability of the study to use the fresh routine data from selected health facilities to validate the other source of data got during the study. This was due to the inability of the research ethics committee under the auspices of the department of policy, planning and resource mobilization in the State ministry of health to grant the approval to use the routine data as at the time of this study. Hence, the study depended on previous health facilities routine immunization data collected in 2009.

CHAPTER SIX

6.1 Conclusion

The research study started with the intention of measuring the performance of routine immunization in Jigawa State on the backdrop of the involvement of PRRINN in reviving routine immunization as the name suggests. The study however, soon discovered that it can only be said that the improvement noticed in RI in the State is a collaborative efforts of all partners (State Ministry of Health, Gunduma Health Board, World Health Organization, United Nations Children Fund, Partnership for Transforming Health Systems and PRRINN). Hence, contribution rather than exclusive attribution was what the study deduced for the role PRRINN played in reviving routine immunization in Jigawa State. The collaborative efforts of all partners in improving routine immunization yielded a very positive result which is obvious in the State performance as regards immunization coverage rates and the presence of sound primary health healthcare structure and system in the State.

To validate the above conclusion on linking the improvement in immunization performance in Jigawa State to the intervention from PRRINN and other partners that worked in the State to improve immunization activities, we used a hypothetical counterfactual analysis of the immunization data for States within the region that PRRINN was not active. The immunization data for these States (Bauchi and Sokoto) were compared for 2006 and 2010 (see table 12 to 14 & figure 5). What the study found out was that there was a marked difference in immunization coverage performance for Jigawa State compared to the coverage difference noticed in the other two States.

We can draw the conclusion that the PRRINN and other immunization intervention programmes have been effective as evident by the positive improvement noticed in the immunization coverage performance of the State. This improvement and effectiveness displayed by the activities of PRRINN and other immunization intervention programmes in Jigawa State is similar to the success of the EPI programme in Port Harcourt as reported by Oruamabo and okoji in 1987 [25]. Just like the EPI program by design provided parents with information and making immunization available at times and places convenient to mothers and children, the PRRINN and partners programmes strengthened the RI systems and services across the States and make all the immunization services in all health centers functional. It further ensures proper advocacy and information sharing that increased immunization access in the State.

Significance of the study

The significance of this study is shown in using survey based data to measure performance and effectiveness of intervention programmes targeted at improving immunization activities. Like it was reported by Stephen Lim and colleagues in 2008[23] that survey based immunization coverage are a better indicator to monitoring progress of an intervention as it is not within the control of the managers of such programmes; hence issues such as over-reporting of data will be minimal.

6.2 Recommendations

Some recommendations arise from this study:

- The State should commission more health facility and community based surveys to ascertain the State of routine immunization in the State in order to monitor actual progress
- The department of policy, planning and resource mobilization under the State ministry of health should ensure prompt approval for research studies in the State
- The Jigawa State Ministry of Health under the auspices of the State government and partnership it has enjoyed must ensure continuity of the routine immunization revitalization programme and sustained the gains of the programmes
- The State government should be prepared to take over full responsibility for most of the partners funded activities under immunization should the tenure of the partners expires in the State.
- The other neighboring States should emulate Jigawa State model by implementing similar programmes to improve routine immunization in their States

References

1. FBA Analysts (2005). *The State of Routine Immunization services in Nigeria and Reasons for Current Problems*. Commissioned by DFID. Revised Version, Abuja, DFID

2. Population Commission (NPC) [Nigeria] and ICF Macro. (2009). *Nigeria Demographic and Health Survey 2008.* Abuja, Nigeria*:* NPC and ICF Macro

3. UNICEF/WHO/the World Bank/UN DESA Population Division. (2010). *'Levels & trends in Child Mortality – Report 2010. Estimates developed by the UN Inter-agency Group for Child Mortality Estimation*. New York

4. National Programme on Immunization (2007). National Immunization Coverage Survey, 2006. Abuja, Nigeria: NPHCDA.

5. Health topics (immunization): www.who.int/topics/immunization/en/

6. Battersby A. & Feilden R. (2005). *Project to Revitalize Routine Immunization: Design of Routine Immunization Initiative*. FBA Health System Analysts.

7. Nigerian Demographic and Health Survey (1990). Demographic and Health Surveys. Federal Office of Statistics, Lagos, Nigeria, 1992

8. Battersby A. (2001). *Aspects of Immunisation in Nigeria.* Abuja: Early Start Initiative/DFID.

9. www.naijapals.com/modules/naijapals/nigeria/topic.39198.0.htm

10. Budget Office of the Federation. (2011). *Federal Government of Nigeria Budget for 2011*. Abuja: Federal Ministry of Finance. [Online], Available: http://www.budgetoffice.gov.ng/2011_budget/proposal_2011/change/16.%20Summary_Health.pdf

11. Mavimbe J. C., Braa J. & Bjune G. (2005). Assessing immunization data quality from routine reports in Mozambique. *BMC Public Health, 108 (5): 632 - 639.* [Online]. Available: www.pubmedcentral.nih.gov/articlerender.fcgi?artid=pmc1266378 [Downloaded 21/March/2009].

12. Jack Eldon and Carol Bradford (2009): *PRRINN-MNCH Report – Incorporating PRRINN Annual Review and MNCH Inception Review Narrative Report*.

13. Carol Bradford and Maisha Strozier (2010): *PRRINN-MNCH Report – PRRINN-MNCH Annual Review: Executive Narrative Report*. London: DFID Health Resource Center

14. Obute Joseph and Anne McArthur (2010): *Executive Summary - Rapid immunization assessment (Jigawa, Katsina, Yobe and Zamfara)*. London: DFID Health Resource Center.

15. Jigawa State Malaria Control Booster Project (2011). *Report of the listing of primary health facilities, communities/kindred, patent medicine vendors and community laboratories in Jigawa State.* Jigawa: SMOH

16. Ryman T. K., Dietz V. & Cairns K. L. (2008). Too little but not too late: Results of a literature review to improve routine immunization programs in developing countries. *BMC Public Health, 134 (8)* doi: 10.1186/1472-6963-8-134. [PMC free article] [PubMed]. [Online]. Available: www.biomedcentral.com/1472-6963/8/134 [Downloaded 01/May/2009].

17. World Health Organization, United Nations Children's Fund. (1991). *The state of the world's children*. Geneva: UNICEF: p. 14.

18. UNICEF (2010). "Progress for Children – Achieving the MDGs with Equity. New York.

19. Zwanenberg T. D. V. & Hull C. (1988). Improving immunisation: coverage in a province in Papua New Guinea. *British Medical Journal, 296:1654 – 1656.*

20. Embree J. (2002). Assessing Immunization Programs. *Can J Infect Dis, 13(4):224 – 225.*

21. National Primary Health Care Development Agency (2011). National Immunization Coverage Survey, 2010. Abuja, Nigeria: NPHCDA.

22. Banerjee A. V., Duflo E., Jameel A. L., Glennerster R.& Kothari, Dhruva (). Improving immunisation coverage in rural India: clustered randomised controlled evaluation of immunisation campaigns with and without incentives. *BMJ(Online first) pg 1 to 9.*

23. Lim S.S., Stein D.B., Charrow A. & Murray C. J.L. (2008). Tracking progress towards universal

childhood immunisation and the impact of global initiatives: a systematic analysis of three-dose diphtheria, tetanus, and pertussis immunisation coverage. *Lancet, 372: 2031-2046.*

24. Lu C., Michaud C. M., Gakidou E., Khan K. & Murray C. J. L. (2006). Effect of the Global Alliance for Vaccines and immunization on diphtheria, tetanus and pertussis vaccine coverage: an independent assessment. *Lancet, 368: 1088-1092.*

25. Oruamabo R. S. & Okoji G. O. (1987). Immunisation status of children in Port Harcourt before and after commencing the Expanded Programme on Immunisation. *Public Health* 1987, 101(6): 447-452

26. Health Partners International: *Peer Participatory Rapid Health Appraisal for Action*. [Online], Available: www.healthpartners.int.co.uk

27. National Programme on Immunization (2003). National Immunization Coverage Survey, 2003. Abuja, Nigeria: NPI

28. Babalola S. (2007). *Household Baseline Survey on the Factors Affecting Routine Immunization in Northern Nigeria, July/August 2007: Report of Pertinent Findings*. Report Submitted to the Programme on Reviving Routine Immunization in northern Nigeria (PRRINN). Abuja: PATHS

29. Babalola S & Adewuyi A. (2005): *Factors Influencing Immunization Uptake in Nigeria: A Theory-based Research in Six States*. Abuja: PATHS

30. Center for Disease Control and Prevention (CDC). (2009). *Measuring what matters to Virginians: Virginia performs (health and family).* Atlanta: CDC. [Online], Available www.cdc.gov/vaccines/stats-surv/imz-coverage.htm#nis]

31. Partnership for Reviving Routine Immunization in Northern Nigeria; Maternal Newborn and Child Health Initiative (PRRINN-MNCH): *2009 Annual Report*

32. Partnership for Reviving Routine Immunization in Northern Nigeria; Maternal Newborn and Child Health Initiative (PRRINN-MNCH): *2008 Annual Report*

33. Partnership for Reviving Routine Immunization in Northern Nigeria; Maternal Newborn and Child Health Initiative (PRRINN-MNCH): *2010 Annual Report*

34. Haddon B., Adogboba K.,Sokpo E., Aliakpajiak S., Anyebe W., Mckenzie A., & HughesC. (2009). *PPRHAA Hospital Manual – PRRINN-MNCH Programme , Nigeria*

35. Beaglehole R., Bonita R., & Kjellström T. (1993). *Basic Epidemiology*. Geneva: World Health Organization: 39 – 62.

36. Shefer A., Briss P., Rodewald L, Bernier R., Strikas R., Yusuf H., Ndiaye S., Williams S., Pappaioanou, M. & Hinmana R. (1999). Improving Immunization Coverage Rates: An Evidence Based Review of the Literature. *Epidemiology Reviews 1999; 21(1):*96-142

37. Brownson R. C., Baker E. A., Leet, T. L. & Gillespie K. N. (2003). *Evidence-Based Public Health*. US: Oxford University Press: 3 – 23.

38. Baum, F. (1995). Researching Public Health: behind the Qualitative-Quantitative Methodological Debate. *Soc. Sci. Med.* 40(4): 459 – 468

39. National Statistical Service: Sample Size Calculator. [Online], Available http://www.nss.gov.au/nss/home.nsf/pages/Sample+size+calculator?OpenDocument

40. Partnership for Reviving Routine Immunization in Northern Nigeria; Maternal Newborn and Child Health Initiative (PRRINN-MNCH): *2009 Annual Peer, Participatory Rapid Health Appraisal for Action (PPRHAA)in Jigawa State.*

41. Revised Logical Frame Work for Strengthening Routine Immunization in Jigawa State.

41. National Population Commission (NPC) [Nigeria] and ICF MAcro (2009). *Nigeria Demographic and Health Survey 2008.*Abuja, Nigeria: National Population Commission and ICF Macro.

Appendices

Appendix 1

Table C-3: Number of children per cluster if desired precision is ±10%

Desired precision ±10%	Expected coverage									
	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
20	10	10	10	9	9	8	7	7	7	7
21	10	10	9	9	8	7	7	7	7	7
22	9	9	9	8	8	7	7	7	7	7
23	9	9	9	8	8	7	7	7	7	7
24	9	8	8	8	7	7	7	7	7	7
25	8	8	8	8	7	7	7	7	7	7
26	8	8	8	7	7	7	7	7	7	7
27	8	8	7	7	7	7	7	7	7	7
28	7	7	7	7	7	7	7	7	7	7
29	7	7	7	7	7	7	7	7	7	7
30	7	7	7	7	7	7	7	7	7	7
31	7	7	7	7	7	7	7	7	7	7
32	7	7	7	7	7	7	7	7	7	7
33	7	7	7	7	7	7	7	7	7	7
34	7	7	7	7	7	7	7	7	7	7
35	7	7	7	7	7	7	7	7	7	7
36	7	7	7	7	7	7	7	7	7	7
37	7	7	7	7	7	7	7	7	7	7
38	7	7	7	7	7	7	7	7	7	7
39	7	7	7	7	7	7	7	7	7	7
40	7	7	7	7	7	7	7	7	7	7
41	7	7	7	7	7	7	7	7	7	7
42	7	7	7	7	7	7	7	7	7	7
43	7	7	7	7	7	7	7	7	7	7
44	7	7	7	7	7	7	7	7	7	7
45	7	7	7	7	7	7	7	7	7	7
46	7	7	7	7	7	7	7	7	7	7
47	7	7	7	7	7	7	7	7	7	7
48	7	7	7	7	7	7	7	7	7	7
49	7	7	7	7	7	7	7	7	7	7
50	7	7	7	7	7	7	7	7	7	7
51	7	7	7	7	7	7	7	7	7	7
52	7	7	7	7	7	7	7	7	7	7
53	7	7	7	7	7	7	7	7	7	7
54	7	7	7	7	7	7	7	7	7	7
55	7	7	7	7	7	7	7	7	7	7
56	7	7	7	7	7	7	7	7	7	7
57	7	7	7	7	7	7	7	7	7	7
58	7	7	7	7	7	7	7	7	7	7
59	7	7	7	7	7	7	7	7	7	7
60	7	7	7	7	7	7	7	7	7	7
61	7	7	7	7	7	7	7	7	7	7
62	7	7	7	7	7	7	7	7	7	7
63	7	7	7	7	7	7	7	7	7	7
64	7	7	7	7	7	7	7	7	7	7
65	7	7	7	7	7	7	7	7	7	7
66	7	7	7	7	7	7	7	7	7	7
67	7	7	7	7	7	7	7	7	7	7
68	7	7	7	7	7	7	7	7	7	7
69	7	7	7	7	7	7	7	7	7	7
70	7	7	7	7	7	7	7	7	7	7

Number of clusters

Appendix 2

Form G.1: Infant Immunization Cluster Form

State:- **L.G.A:-**

(1) Cluster number:			**(5) Name of the child**								**Total**	
(2) Date:												
(3) Community:												
(4) Range of birth dates: From…… Until……											**Card**	**Card plus history**
Child number in the cluster			1	2	3	4	5	6	7	8		
(6) Birth date												
(7) Sex (M,F)												
(8) Immunization Card		**Yes/No**										
(9) BCG		**Date/+/0**										
		Scar: Yes/No										
		Source										
(10)	**DPT 1**	**Date/+/0**										
		Source										
	DPT2	**Date/+/0**										
		Source										
	DPT 3	**Date/+/0**										
		Source										
(11)	**OPV 0**	**Date/+/0**										
		Source										
	OPV 1	**Date/+/0**										
		Source										
	OPV 2	**Date/+/0**										
		Source										
	OPV 3	**Date/+/0**										
		Source										
(12)	**HBV 1**	**Date/+/0**										
		Source										
	HBV 2	**Date/+/0**										
		Source										
	HBV 3	**Date/+/0**										
		Source										
(13) Yellow Fever		**Date/+/0**										
		Source										
(14) Measles		**Date/+/0**										
		Source										
(15) Immunization Status		**Not Imm.**										
		Partially										
		Fully										
(16) Fully Immunized before 1 year of age		**Yes/No**										

(17) Tally of households visited_____

(18) Names of Interviewers 1_____2_____ Signature: Interviewers 1…… 2……

(19) Name of Field Supervisor_____ Signature ……..

Key:
Date/+/0:
Date = Copy date of immunization from card, if available
\+ = Mother reports immunization was given
0 = Immunization not given

Source of immunization
OUT = Outreach
HOS = Hospital
HC = Health centre
PRIV = Private
NGO = Non-governmental organization
SIA = Supplementary immunization activity

Appendix 3
Form G.3: Tetanus Toxoid Immunization Cluster Form **State:-** **LGA:-**

(1) Cluster number:		(5) Name of the mother										
(2) Date:												
(3) Community:												
(4) Range of birth dates: From…… Until…….										Totals (to be completed by supervisor)		
Woman's number in the cluster		1	2	3	4	5	6	7	8			
(6) Birth date of child												
(7) Total number of lifetime pregnancies												
(8) History of TT Immunization in last Pregnancy	a) Number of TT doses received prior to last pregnancy									Dose LAST Pregnancy TTO= TT1 = TT2 = TT3 = TT4 = TT5 or more=		
	b) Number of TT doses received in last pregnancy											
	c) Card available for TT received in last pregnancy? Y/N									Yes =	No =	
	d) Whether or not Card is available: was a card ever received? Y/N									Yes =	No =	
										Card	Card+ Hist	Tally source
(9)	TT1 Date/Y/N											OUT=
	TT1 Source											HOS=
	TT2 Date/Y/N											HC=
	TT2 Source											PRIV=
	TT3 Date/Y/N											WCV=
	TT3 Source											OTH=
	TT4 Date/Y/N											NGO=
	TT4 Source											
	TT5 Date/Y/N											
	TT5 Source											
(10) Antenatal care	Number of visits in Last pregnancy										**One visit = Two or more visits=**	
(11) Other visits to Health facility	Number of visits in Last pregnancy										One visit = Two or more visits=	
(12) Delivery of baby	Where: Home										Home =	
	Where: Hospital/HC										Hospital/HC=	
	Where: Other										Other =	
	By who: Health staff										Health staff=	
	By who: TBA										TBA=	
	By who: Other										Other=	
	By who: Nobody										Nobody=	
(13) Woman protected against tetanus	Yes by card (Y)										Yes by card (Y)	
	Yes by card + history										Yes by card + history	
	Not protected											
(14) Tally of households visited_____												

(15) Names of Interviewers 1_____ 2_____ Signature: Interviewers 1…… 2……

(16) Name of Field Supervisor_____ Signature ……..

Note: Data related to last pregnancy refers to pregnancy that led to a child now aged 0-11months

Key:
Date/+/0:
Date = Copy date of immunization from card, if available
+ (Y) = Woman reports immunization was given
0 (N) = Immunization not given

Source of immunization
OUT = Outreach
HOS = Hospital
HC = Health centre
PRIV = Private
WCV = Well-child-visit
OTH = others e.g. TT received due to injury
NGO = Non-governmental organization

Appendix 4a:

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 3520, Fax: 27 21-959 2872

E-mail:

INFORMATION SHEET

Dear Participant,

Thank you for your acceptance to hear about this research study. This research study is being conducted for a mini-thesis which is a requirement for the Masters in Public Health degree at the University of the Western Cape, South Africa.

I am a researcher from the School of Public Health, University of the Western Cape, South Africa. I am executing a research study on the status of routine immunization in Jigawa State. What I want to find out is information on routine immunization. You were chosen as a respondent for this interview because you are a stakeholder in the primary health care systems in Jigawa State.

The title of the research: Evaluation of the effectiveness of the ***Partnership for Reviving Routine Immunization in Northern Nigeria*** Programme in Jigawa State, Nigeria.

The purpose of the study: The aim of the proposed study is to evaluate the performance of the PRRINN programme in improving routine immunization coverage in Jigawa State. After five years of programme implementation, it will be essential to have an independent assessment of the effectiveness of PRRINN and assess how well the primary objectives of the programme are being met.

You will be asked to respond to some questions on routine immunization activities in Jigawa State. The questions will cut across your knowledge of routine immunization activities from 2006 till date and the involvement of PRRINN. Questions on challenges of immunization will also be asked and your recommendations on certain immunization issues.

Confidentiality: I will do my best to keep your personal information confidential. To help protect your confidentiality, the records of your participation shall be kept locked away and will be destroyed at the end of the research study. You will be asked to sign a consent form should you agree to participate in this research study.

There are no known risks that may result from your participating in this survey. We also understand your time is valuable to you, so we do not intend to take your time more than necessary.

This survey is not designed to help you personally, but the information and data we gather will help us understand the performance of the routine immunization in the State. This will help the government to better plan and implement their immunization intervention programmes.

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

This research is being conducted by **Adedayo Adegbenga** of **School of Public Health** at the University of the Western Cape. If you have any questions about the research study itself, please contact:

Adedayo Adegbenga
Student Number: 2816271
P.O. BOX 14811, Wuse GPO.
2816271@uwc.ac.za
omindav@yahoo.com

This research has been approved by the University of the Western Cape's Senate Research Committee and Ethics Committee (UWC SRCEC) and also the National Health Research Ethics Committee (NHREC) of Nigeria. If you have any questions regarding your rights as a research participant or have concern that your rights have been violated in the course of your participation in this study, or if you wish to report any problems you have experienced related

to the study, please contact the UWC SRCEC and NHREC using the following:

Head of Department: Uta Lehman
Dean of the Faculty of Community and Health Sciences:
University of the Western Cape
Private Bag X17
Bellville 7535
+27-21-959-2809

And

National Health Research Ethics Committee (NHREC)
Department of Health Planning, Research & Statistics
Federal Ministry of Health, Abuja
e-mail: chairman@nhrec.net, deskofficer@nhrec.net

Appendix 4b:

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 3520, Fax: 27 21-959

INFORMED CONSENT

IRB Research Approval Number:

Title of Research Project:

Evaluation of the effectiveness of the ***Partnership for Reviving Routine Immunization in Northern Nigeria*** Programme in Jigawa State, Nigeria.

This research study has been described to me in the language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may chose not to participate in the study without giving a reason and this will not negatively affect me in any way.

My signature says that I am willing to participate in this study.

Participant's Name :……..

Participant's Signature :……..

Consent Date : ……..

Researcher's Name :……..

Researcher's Signature :……..

Date : ……..

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact my Research Supervisor for this study:

Research Supervisor's Name: Dr Ehimario Igumbor

University of the Western Cape

Private Bag X17, Belville 7535

Telephone: Office +27(021) 9593520

Cell: +27 82 920 0613

Fax: (021) 959 2872

Email: ehi.igumbor@gmail.com

Appendix 4c: Draft Facility Questionnaire (before field pre-testing)

UNIVERSITY OF THE WESTERN CAPE
SCHOOL OF PUBLIC HEALTH
QUESTIONNAIRE TO ASSESS ROUTINE IMMUNIZATION SERVICES IN JIGAWA STATE

NAME OF HEALTH FACILITY……
LGA……..…..
DATE……..
INTERVIEWEE…… PHONE NO…….

No	OUT PATIENT DEPARTMENT / COLD CHAIN	
1	Name of Officer in charge……	
2	Do you have space for routine immunization services (OPD)?	YES/NO
3	a) Do you have necessary equipment and furniture for routine immunization services? b) What type do you have? Cold chain equipment ☐ Electrical backup ☐ Benches ☐ Board or flip chart ☐ Teaching Aids ☐ Others (specific) ……..	YES/NO
4	a)Number of health workers in the health facility (especially the ones that carry out the RI services) …….. b) List their cadre …….. …….. …….. ……..	
5	Do you keep records of RI services? ……. **If yes, ask to see the Routine Immunization register**	YES/NO
6	Who do you report to? ……	
7	What is your reporting period?	Weekly……1 Monthly……..2
	ROUTINE IMMUNIZATION RECORDS	
8	How many children were immunized in the last three months?	…….
9	How many pregnant women were immunized against TT in the last three months?	
10	Which of these vaccines do you offer in the health facility? OPV DPT BCG TT	

11	How many doses of the following antigens were given in the last three months in the health facility? OPV DPT BCG TT	
12	Has the attendance for RI services improved in the last two years? …… …….. …… …… …… ……	
	ROUTINE IMMUNIZATION CONSUMABLES (STOCK)	
13	What is the stock out of BCG in the last 3 months (prior to the day of the assessment):	
14	What is the stock of polio vaccine in the last 3 months (prior to the day of the assessment):	
15	What is the stock out of hepatitis B in the last 3 months (prior to the day of the assessment):	
16	What is the stock out of DPT in the last 3 months (prior to the day of the assessment):	
17	What is the stock out of measles vaccine in the last 3 months (prior to the day of the assessment):	
18	What is the stock out of yellow fever vaccine in the last 3 months (prior to the day of the assessment):	
19	What is the stock out of TT in the last 3 months (prior to the day of the assessment):	
	TRAINING	
20	a) In the last two years how many times have you gone for training? b)List them …… …….. …… …….. …… ……..	…….
21	Have you gone for training on the use of routine immunization services?.	YES/NO
	CHALLENGES AND RECOMMENDATIONS	
22	What are your challenges as it concerns routine immunization? …… ……. …… ……. …… …….	
23	What are your recommendations for improving routine immunization in the State? …… ……. …… ……	

Researcher's Name…… Signature…… Phone No…….

Appendix 4d: Facility Questionnaire (after field pre-testing)

UNIVERSITY OF THE WESTERN CAPE
SCHOOL OF PUBLIC HEALTH

QUESTIONNAIRE TO ASSESS ROUTINE IMMUNIZATION SERVICES IN JIGAWA STATE

NAME OF HEALTH FACILITY…… LGA……..…..

DATE……..

INTERVIEWEE…… PHONE

NO…….

No	OUT PATIENT DEPARTMENT / COLD CHAIN	
1	Name and Phone Number of Officer in charge **OR** Officer in charge of RI in this facility:	**This is strictly for control just in case of clarification of information: Totally Optional.**
2	Who is the officer in charge of RI in this facility?	
2	Do you have space for routine immunization services (OPD)?	YES/NO
3	a) Do you have necessary equipment and furniture for routine immunization services? b) What type do you have? Cold chain equipment ☐ Electrical backup ☐ Benches ☐ Board or flip chart ☐ Teaching Aids ☐ Others (specific) ……..	YES/NO
	Were the cold chain equipment in 2005 and 2006 adequate? Any extra comment? …….	YES/NO
4	a)Number of health workers in the health facility (especially the ones that carry out the RI services) : b) List their cadre :	
5	Do you keep records of RI services? **If yes, ask to see the Routine Immunization register**	YES/NO
6	Who do you report to?	
7	What is your reporting period?	Weekly……1 Monthly……..2

	ROUTINE IMMUNIZATION RECORDS	
8	How many children were immunized in this health facility in?	…….

	2005	2006	2011
Number of children immunized?			

9	How many pregnant women were immunized against TT in the last three months?	

	2005	2006	2011
Number of women immunized?			

10	Which of these vaccines do you offer in the health facility? OPV DPT BCG TT	
11	How many doses of the following antigens were given in this health facility?	

Antigen	2005 (Annual)	2006 (Annual)	2011 (Annual)
BCG			
OPV1			
DPT1			
TT			
Yellow Fever			

	RI vaccinations given for the following antigens from the register?	

Antigen	2005 (Annual)	2006 (Annual)	2011 (Annual)
BCG			
OPV1			
OPV3			
OPV3			
DPT1			
DPT2			
DPT3			
TT			
Yellow Fever			

12	Has the attendance for RI services improved in the last two years?	

	ROUTINE IMMUNIZATION CONSUMABLES (STOCK)	
13	What is the stock out of BCG in the last 3 months (prior to the day of the assessment):	
14	What is the stock of polio vaccine in the last 3 months (prior to the day of the assessment):	
15	What is the stock out of hepatitis B in the last 3 months (prior to the day of the assessment):	
16	What is the stock out of DPT in the last 3 months (prior to the day of the assessment):	
17	What is the stock out of measles vaccine in the last 3 months (prior to the day of the assessment):	
18	What is the stock out of yellow fever vaccine in the last 3 months (prior to the day of the assessment):	
19	What is the stock out of TT in the last 3 months (prior to the day of the assessment):	
	TRAINING	
20	a) In the last two years how many times have you gone for training? b)List them	……
21	Have you gone for training on the use of routine immunization services?.	YES/NO
	CHALLENGES AND RECOMMENDATIONS	
22	What are your challenges as it concerns routine immunization?	
23	What are your recommendations for improving routine immunization in the State?	

Researcher's Name……

Signature……

Phone No…….

Appendix 5:

UNIVERSITY OF THE WESTERN CAPE
SCHOOL OF PUBLIC HEALTH

KEY INFORMANTS' INTERVIEW GUIDE

1. Introduction of study and administration of Consent form
2. Name, Organization and Designation of Interviewee
3. How do you rate routine immunization services in the State
4. What can you say about the PRRINN programme in the State
5. What can you say are the challenges facing routine immunization before 2006
6. Has the challenges been addressed now
7. What are the current challenges of routine immunization in the State
8. What are your recommendations
9. Any other information that you may want to share on routine immunization in the State

N.B: some pertinent questions were asked depending on the interviewee's organization.

Appendix 6a: UWC Senate Research and Ethics Committee approval

UNIVERSITY of the
WESTERN CAPE

OFFICE OF THE DEAN
DEPARTMENT OF RESEARCH DEVELOPMENT

14 December 2011

To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape has approved the methodology and ethics of the following research project by:
Mr AO Adedayo (School of Public Health)

Research Project: Evaluation of the effectiveness of the Partnership for Reviving Routine Immunization in Northern Nigeria Programme in Jigawa State, Nigeria

Registration no: 11/10/45

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

Private Bag X17, Bellville 7535, South Africa
Tel: +27 21 959-2948/9
Fax: +27 21 959 3170
Website: www.uwc.ac.za

Appendix 6b: National Health Research Ethics committee of Nigeria (NHREC) approval

National Health Research Ethics Committee of Nigeria (NHREC)

Promoting Highest Ethical and Scientific Standards for Health Research in Nigeria

Federal Ministry of Health

NHREC Protocol Number NHREC/01/01/2007-14/11/2011
NHREC Approval Number NHREC/01/01/2007-23/11/2011
Date: November 24, 2011

Re: Evaluation of the effectiveness of the Partnership for Reviving Routine Immunization in Northern Nigeria Programme in Jigawa State, Nigeria

Health Research Ethics Committee (HREC) assigned number: NHREC/01/01/2007

Name of Co-Principal Investigator: Gbenga Adedayo

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Date of receipt of valid application: 14-11-2011
Date when final determination of research was made: 23-11-2011

Notice of Full Committee Review and Approval

With reference to the previous approval(s) for this study including the protocol amendment approved in May, 2011; and with due consideration to the progress reports you submitted with this application, I wish to inform you that the study has been given full committee approval by the National Health Research Ethics Committee to proceed for the next one year.

This approval dates from 23/11/2011 to 22/11/2012. If there is delay in starting the research, please inform the HREC so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study.* In multiyear research, endeavour to submit your annual report to the HREC early in order to obtain renewal of your approval and avoid disruption of your research.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the HREC. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification.

Signed

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Honorary Consultant Surgeon, Director, West African Center for Bioethics and
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