LINKING POLICY WITH TECHNOLOGY: ROLE OF MOBILE COMMUNICATIONS TECHNOLOGY IN POLIO ERADICATION INITIATIVE IN NORTHERN NIGERIA

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Source: RUTGERS

LINKING POLICY WITH TECHNOLOGY; ROLE OF MOBILE COMMUNICATIONS TECHNOLOGY IN POLIO ERADICATION INITIATIVE IN NORTHERN NIGERIA

A thesis submitted in partial fulfilment of the requirement for the degree of Master of International Health.

By

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Declaration:
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I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong, neither yet bread to the wise, nor yet riches to men of understanding, nor yet favour to men of skill; but time and chance happens to them all (**Ecclesiastes 9:11).... Thank God Almighty.**

I dedicate this thesis with love to;

Lydia, Anthonio and Porsha

I should thank my parents; Sir and lady A. Adoghe for their wonderful support, my wonderful twin sister; Mrs Anthonia Obi and family. My very special brothers and sisters I can't help but mention; Chief Alex Adoghe and family, Mrs Franca Okaifo and family, Mr Thomas Adoghe and family, Mr Emmanuel Adoghe and family, Mr Leo-Adoghe and family, Barr. (Mrs) Ekama and family, and Monica Adoghe and family. I thank you all immensely for your support.

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I consider myself highly honoured to have worked with my supervisor and back stopper. Thank you.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACPE	Advisory committee on poliomyelitis eradication
AED	Academy for Education Development
AFP	Acute Flaccid Paralysis
BCC	Behaviour Change Communication
CCP	Centre for Communication Program
CDMA	Code Division Multiple Access
COMPASS	Community Participation for Action in the Social Sector
cVDPV2	Circulating type 2 vaccine-derived polioviruses
FOMWAN	Federation of Muslim Women Association of Nigeria
GPEI	Global Polio Eradication Initiative
GPS	Global Positioning System
ICC	Inter-Agency Coordinating Committee
ICT	Information and communications technology
IPDs	Immunisation plus days
JHU/PCS	John Hopkins University/Population Communication Services
LGAs	Local Government areas
mHealth	Mobile health
MSH	Management Sciences for Health
NCC	Nigeria Communications Commission
NDHS	Nigeria demographic and health survey
NEPAD	New Partnership for Africa´s Development
NiCE	Nigerian Community Engagement Model
MICS	Multiple Indicator Cluster Survey
NIDs	National immunization days
NITEL	Nigeria Telecommunications Limited
NPC	National population commission
NPI	National Program on Immunization
NPHCDA	National Health Care Development Agency
NSMWG	The National Social Mobilization Working Group
OPV	Oral Polio Vaccine
PEI	Polio eradication initiative
SCSN	Supreme Council for Sharia in Nigeria
SMC	Social Mobilization Committees
SNIDs	Supplementary national immunization days
WHA	World Health Assembly
WHO	World health organisation
WPV	Wild Polio Virus

ABSTRACT

The polio virus is a highly infectious agent that invades the nervous system and can cause Acute Flaccid Paralysis (AFP) or in some cases, death in mostly children under 5 years. As at 1988, over 350,000 children were being paralyzed annually by polio infection worldwide. The introduction of the Global Polio Eradication Initiative (GPEI) in 1988 reduced the annual polio cases by 99% worldwide the following year through immunization by polio vaccines. Nigeria is one of the four polio endemic countries, with the north serving as main reservoir of the virus.

This literature review examines the factors that influence the polio eradication in northern Nigeria and ongoing communication interventions. It also examines the role of mobile telecommunications in health in developing countries including northern Nigeria.

Findings show that communication strategies in northern Nigeria have helped to improve vaccination coverage, by mobilizing religious and cultural leaders, improving political will, individual and community-level demand, increasing knowledge and reaching out to the poorest and marginalized population. There is however a need to strengthen current communication strategies at the community and individual levels in order to sustain demand for OPV in underserved communities.

Analysis of mobile communication in developing countries including Nigeria revealed that there is rapid penetration of the technology even in hard-to-reach areas. However, available evidence linking the technology to health and disease prevention is still anecdotal and limited.

It is hoped that findings from this study will provide perspectives for the Nigeria government and organizations involved in polio eradication in partnership with mobile telecommunication providers to research innovative application of mobile communications technology in polio eradication.

Key Words: Polio in northern Nigeria, polio communication strategies, Behaviour Change Communication, social mobilization, interpersonal communication, advocacy, Information and communications technology Mobile Communications Technology, and mobile communication.

Word Count: 13,003

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CHAPTER 1: INTRODUCTION AND BACKGROUND OF NIGERIA

INTRODUCTION

The polio virus is a highly infectious agent that is spread from person to person by close (fecal) contact in mostly densely populated areas with poor sanitation. The virus invades the nervous system and can cause Acute Flaccid Paralysis[1] (AFP) or in some cases, death. It affects all ages, but children under 5 years of age constitute over 95% of cases, most especially in developed countries (GPEI, 2011Pg. 111). Most persons infected with poliovirus have no signs of illness; the infection can spread widely before cases of paralysis are seen. There is no cure for polio infection and prevention is by vaccination of individuals at risk.

As at 1988, over 350,000 children were being paralyzed annually by polio infection worldwide. The introduction of the Global Polio Eradication Initiative (GPEI) that same year reduced the annual polio cases by 99% worldwide the following year through immunization by polio vaccines. Four countries namely Afghanistan, India, Pakistan and Nigeria have never stopped indigenous transmission of the Wild Polio Virus[2] (WPV). Although cases of polio have been down more than 99% worldwide since the campaign began, getting rid of the last 1% have become a cumbersome task, with global expenditure of over $6 billion (United States Dollars) from 1988 to 2008 (WHO/UNICEF, 2009).

In mid 2003, the PEI campaign was brought to a standstill by Political and Islamic leaders in northern Nigeria, due to fears and rumours about the efficacy of the vaccine and intentions of the west (Obadare, 2005). This led to a national epidemic in Nigeria and confirmed reports of spread of WPV into neighbouring countries that were previously free from polio (CDC, 2006). The fifth meeting of the Advisory committee on Poliomyelitis Eradication (ACPE) convened in Geneva, Switzerland, in November 2008, concluded thus; *"Nigeria poses a high risk to international health until new political commitment is translated into field-level improvements in campaign quality (>30% of children remain unvaccinated in Kano)"* (Mohammed *et a,* 2009).

Literature shows that communication interventions are critical to the success of the GPEI (UNICEF, 2009). There also evidence of growing access to Information and communication Technology (ICT) in developing countries in form of mobile communication technology, (UN|DESA, 2007) and its potentials for improving public health (McNab, 2009). This thesis therefore aims to explore the factors influencing polio eradication and communication interventions, and the potential role of mobile communication technology in polio eradication in northern Nigeria.

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[1] Acute Flaccid Paralysis rapid onset of focal weakness in a child less than 15 years, characterised by reduced tone without other obvious cause.
[2] Wild Polio Virus refers to naturally circulating polio that is not caused by the oral polio vaccine.

Findings from the study shall be used to formulate recommendations aimed at improving activities of the GPEI in Northern Nigeria.

1.2 BACKGROUND OF NIGERIA WITH FOCUS ON NORTHERN NIGERIA

1.2.1 Geography, Demography and population overview

Nigeria is located in West Africa bounded by Niger, Chad, Cameroun, Republic of Benin, and Atlantic Ocean in the north, northeast, east, west and south respectively. Has a total surface area of 923,768 square kilometres. The country has an estimated population of over 140 million people (north consists of an estimated total population of 75 million [54%] of total population) and annual growth rate of 3.2% (NPC, 2008).

Nigeria is made up of 36 states and the federal capital territory (FCT) Abuja. North Nigeria accounts for over 60% of the total land mass comprises of 19 states including the FCT. It is split into 3 geopolitical zones; northeast, northwest and north central.

1.2.2 Social and educational background

Nigeria is multicultural and multi-religious. The main ethnic groups in the north are the Hausas and Fulani who are mostly farmers and nomads respectively. The main religions practised in the country are Christianity mainly in the south, Islam in the

Fig 1.1: % of Men and women with no education in Nigeria

Source: NPC, 2008

north and African traditional religion in some rural areas. According to the Nigeria Demographic and Health Survey (NDHS), large numbers of northern Nigerians have no formal education, compared to those in the south (see Fig. 1.1) (NPC, 2008).The effort of the federal government of Nigeria to provide universal basic education lacks the requisite quality as regards delivery of education services, most especially in northern Nigeria (USAID, 2011).

1.2.3 Health System and immunisation overview

The World Health Organization (WHO) ranked Nigeria's overall health system performance 187th among the 191 Member States (WHO, 2002a).This report prompted health sector reforms and development of national health policies including options for increasing health financing at all levels of government (Table 1.1), and funding to the Primary Health Centers (PHC) through creation of the Primary Health Care Development Fund (WHO, 2009).

According to the Nigeria federal ministry of health (FMOH), the overall health system of Nigeria and its indicators are weak; Under-five mortality
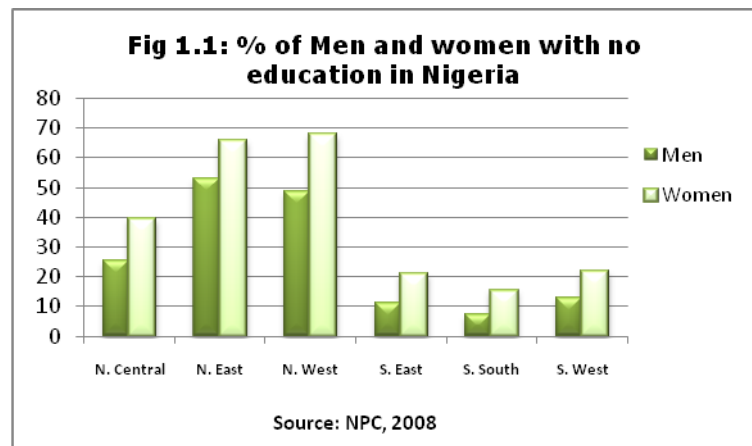
rate estimate for Nigeria is 157 deaths per 1,000 children aged 12- 59 months) between 2003 and 2008. The WHO defines a fully vaccinated child as one that has received a Bacillus Calmette Guerin (BCG) vaccination, three doses of Diphteria-Pertussis-Tetanus (DPT) vaccine, and at least three doses of polio vaccine. However, The NDHS report puts immunisation coverage of children between the ages of 12-23 months that had received all recommended vaccines in Nigeria at 23% (Fig. 1.2). Vaccine coverage was also found to vary markedly by residence and zone with the northwest having values as low as 6% (NPC, 2008).

Table 1.1: Nigeria Allocation to Health to Health in Naira

	2004	2005	2006	2007
Personnel costs	30 983 689 139	43 304 805 361	62 711 850 776	64 204 337 904
Overheads	2 393 687 372	3 589 580 000	5 030 358 565	7 182 496 670
Capital	26 410 000 000	31 671 999 123	39 122 800 001	52 536 005 425
TOTAL appropriations	59 787 376 511	78 566 384 484	106 865 009 343	123 922 839 999
Annual Federal budget		1,800 000 000 000	1 900 660 623 804	1 700 000 000 000
Health sector allocation as % of budget		4.4%	5.6%	7.28%
% increase in sector allocation		31.4%	36.0%	86.2%

Source: WHO, 2009

Fig. 1.2 shows percentage of children 12-23 months who have received all basic vaccinations in northern Nigeria.
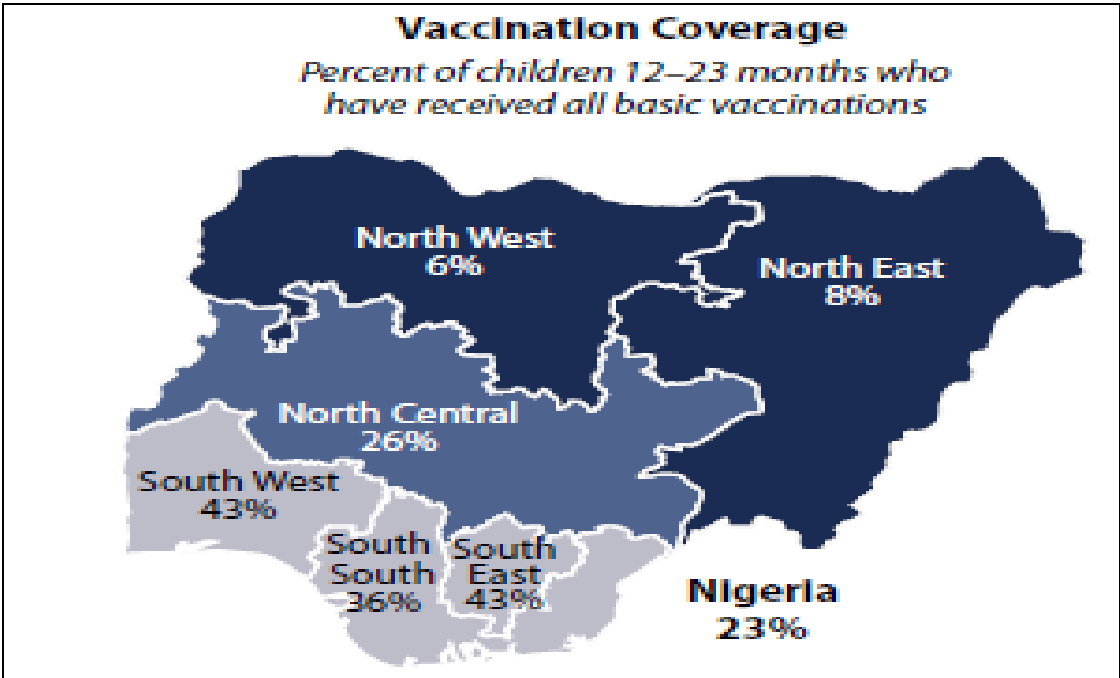
Source: NPC, 2008.

CHAPTER 2: PROBLEM STATEMENT, JUSTIFICATION FOR THE STUDY, OBJECTIVES AND METHODOLOGY.

2.1 PROBLEM STATEMENT

In mid 2003, the PEI campaign was brought to a standstill by Political and Islamic leaders in northern Nigeria, due to fears and rumours about the efficacy of the vaccine and intentions of the west (Obadare, 2005). Since then, Nigeria has continued to serve as a reservoir for polio virus and source of spread to neighbouring countries. In 2008, indigenous WPV 1 re-infected six neighbouring West African countries namely Benin, Burkina Faso, Ghana, Mali, Niger and Togo, while WPV 3 from the northern Nigeria re-infected Benin, Chad and Niger. According to WHO/UNICEF (2009), more than 60% of children in high risk states; Kano, Kaduna, Katsina and Zamfara,[3] remain under-immunized[4] with Kano state particularly affected and accounting for nearly 30% of the worldwide type 1 polio burden. The fact remains that children in all countries are at risk of poliomyelitis as long as a single child remains infected (WHO, 2010a).

An independent evaluation of barriers to polio vaccine showed that there is poor demand for polio vaccine in northern Nigeria (Mohammed *et al*, 2009) As we move towards the final phase of polio eradication, one of the key challenges confronting the government, UNICEF and other partners involved in social mobilization is how to tackle resistance to Oral Polio Vaccine (OPV) by mobilizing the unreached, underserved communities while still motivating the majority already reached to participate in polio vaccination (Obregon *et al*, 2009).

2.2 JUSTIFICATION FOR THIS STUDY

2.2.1 Growing ICT in sub-Saharan Africa including Nigeria

The GPEI Strategic Plan for 2010-2012 set the following two goals for outbreak control: 1) end outbreaks occurring in 2009 by mid-2010 and 2) end outbreaks occurring during 2010 to mid-2012 within 6 months of confirmation (WHO, 2010b). To achieve these goals, there is need for new methods of informing and strengthening community participation. According to Waisbord and Shimp (2010), all communication means necessary should be harnessed in informing, locating and monitoring persons across large geographic area with the aim of ensuring full immunisation and maintenance of simultaneous immunity. Mobile communications technology show potential in strengthening public health in developing countries (Mechael, 2008) and Nigeria has a rapid penetration rate driven by low-cost handsets, rapid expansion of mobile networks to different parts of the country and intense competition by

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[3] Kano, Kaduna, Katsina and Zamfara, are four states in northern Nigeria.
[4] Polio requires at least 3 doses, but evidence show that children in these states have not had complete doses.

service providers among other factors (Pyramid, 2010). However, its role in public health in general and PEI in particular, is still very limited.

2.2.2 Search for cost-effective and cost-beneficial strategies in PE

There has been debate about possible economic benefit of effective control as against the ongoing eradication campaign but according to Thompson and Tebbens (2007), *"effective control would actually result in much higher burden of disease and at costs that would exceed by billions of dollars over a 20-year period, those of completing eradication"*. This comes amidst fear of growing donor fatigue in the near future as initiative continues to come under strong criticism. In 2010, the significant risk posed by large funding gaps to the successful implementation of the GPEI strategic plan (Figure 2.1) became evident when it was forced to scale back and cancel planned activities in many developing countries; Burundi, Rwanda, Kenya, Uganda, Djibouti, Eritrea, Yemen, Congo, D.R Congo and Ethiopia (WHO, 2011).

In view of the above, there is need for further research on potential cost-effective and cost-beneficial strategies to strengthen polio campaign activities in northern Nigeria.

2.2.3 Potential learning platform for other infectious disease

The success of polio eradication will potentially serve as a model for control and subsequent eradication of other infectious diseases, including measles, influenza etc. According to Miyamura (2009), *"to share the passion to eradicate miserable infectious disease, poliomyelitis is the key"*.

Figure 2.1 shows Polio finance base from 1988 – 2009 and 2010 – 2011 funding gap and recent trend of decline in polio GPEI donors.
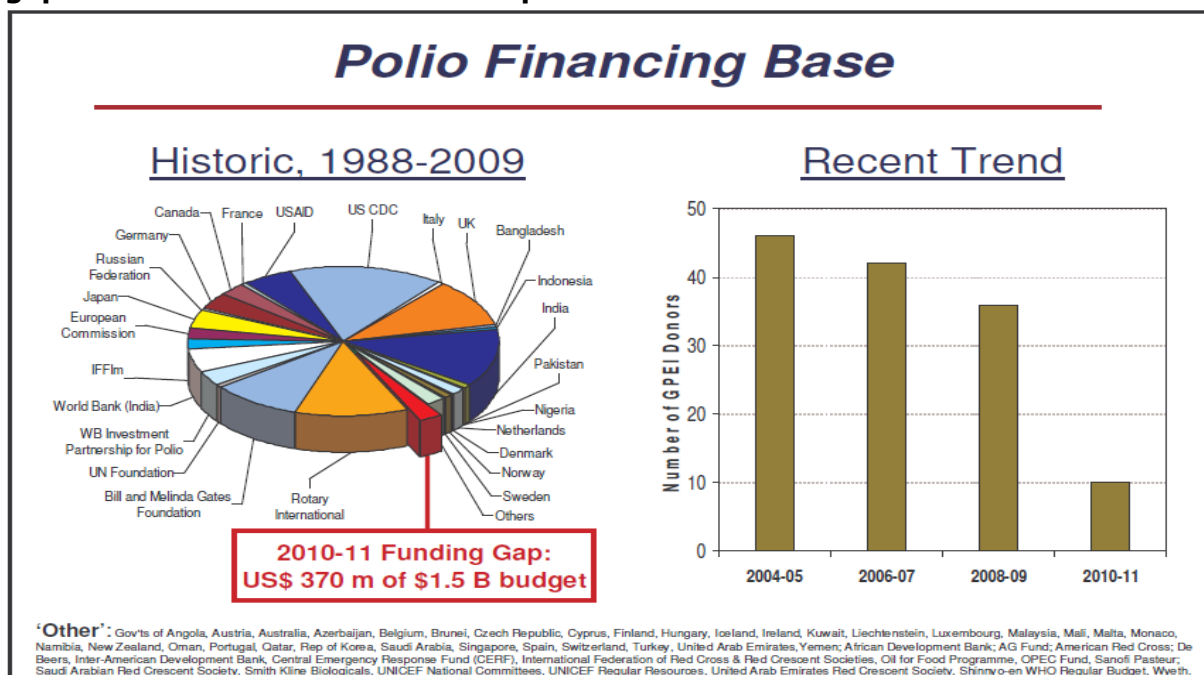
Source: WHO polio database; 2009.

2.3 OBJECTIVES

2.3.1 General objectives

The objective of this paper is to assess the factors that influence polio eradication in northern Nigeria, and explore potential role of mobile communications in improving the outcome of polio eradication.

2.3.2 Specific objectives

Specifically, this paper aims;

i. To describe and analyze factors that influence polio eradication in northern Nigeria,

ii. To review the different communication interventions in northern Nigeria,

iii. To explore the emerging and available evidence on the role of mobile communications technology in public health in low income countries,

iv. To discuss how mobile communication technology can help in improving the outcome of the PEI in northern Nigeria,

v. To make relevant recommendations to government and organizations involved in PEI in northern Nigeria in order to strengthen polio eradication communication activities.

2.4 METHODOLOGY

This study is a literature review of the association between polio eradication initiative, communication and mobile communications technology in PEI in northern Nigeria. For the purpose of this thesis, the term "Communication" includes advocacy, social mobilization, and program communication (including behaviour change activities). Available studies from Nigeria and selected low income countries will be used in this study and analysis of the findings shall serve as the basis for formulation of recommendations.

2.4.1 Literature search

A three-part search strategy was used; (1) Electronic bibliographic databases for published work on polio eradication, public health communication interventions, and mobile communication, using the following keywords; polio, Nigeria, social mobilization, behaviour change models, behaviour change communication, interpersonal communication, advocacy, Information and communication technology, mobile communication, voice calling, short message service, and GPEI (2) Library (KIT) search for Published books and journals, (3) Online discussion groups and online seminar on mobile communication which accorded me with the opportunity to interact with those currently working in the field of mobile communication.

2.4.2 Electronic bibliographic databases, websites and search engines

Some of the bibliographic databases consulted include; Pubmed, Sciencedirect now SciVerse scopus, and The Cochrane Library. Websites and search engines include; WHO, NPC, Lancet, CDC, UN and Google scholar.

2.4.3 Limitations

Some recent literature about polio eradication relevant and within the scope of this study, were not available on the KIT library catalogue, and expensive online. Recent immunisation reports from Nigeria were also not available for review as they are yet to be published at the time of this study.

2.4.4 Inclusion and exclusion criteria

For the purpose of this study, literature from developing countries, published from the year 1988 till date shall be used. The term mobile communication technology shall include; Low-end (feature phones) mobile phones that are easily accessible to underserved and marginalised people in rural areas, but shall exclude Personal digital assistant phones, Smartphone (e.g. Nokia E-series, BlackBerry and iPhones) and small storage devices (e.g. flash drives and memory cards).

2.5 Conceptual Framework for Public Health Communication in Polio Eradication in Northern Nigeria

The conceptual framework for this study is adapted from "The Pathways model" of behaviour and behaviour change theory developed by John's Hopkins Bloomberg School of Public Health Center for Communication Program (JHU/CCP) for a health competent society. It recognizes the fact that an individual who is health competent and continuously acts thus in concert with other members of the society, will produce consistently positive health outcomes (Storey, *et al* 2008). Health competence encompasses a "change" that encourages people to change individually, and also makes health decisions by building healthy, participatory communities, supported by well-informed health policy (Ratzan, 2009).

The framework has been chosen for this thesis because it describes a process of social change influenced by communication interventions at environmental, service delivery, community and individual levels in order to achieve a designed health outcome, in this case polio eradication. Parents and caregivers are not the recipients of polio vaccine but as health competent individuals can participate in polio vaccination and ensure that their children are vaccinated.

The conceptual framework has been adapted to retain its original five columns (see Figure 2.2). The first column split into two boxes, explores the factors influencing PEI under two headings; supply and demand to OPV in northern Nigeria, while the second column explores the various

communication strategies. The third and forth columns represent varieties of expected health competent and behaviour outcomes, resulting from communication strategies in column two. These outcomes usually take place in stages that reinforce each other in the context of an enabling environment, resulting in improved participation and ownership at the community and individual levels, eventually culminating in the GPEI 2010-2012 strategic plans represented by the fifth column. , This thesis shall however place more emphasis on the factors at the community and individual levels at the bottom (Factors in the green boxes).

Fig. 2.2 Shows Conceptual Framework for Public Health Communication in Polio Eradication in Northern Nigeria

Underlying factors

Health competent outcomes

Health competent Behaviours

Domains of Communication

SUPPLY

*PHC
*Vaccines
*Political
*Environmental

Socio-Political Environment

Environ-ment

Service systems

Supportive environ-ment

Sustainable health

Improved service

GPEI 2010-2012 strategic plan

*End polio outbreaks in 2009 by mid 2010

* End polio outbreaks in 2010 to mid 2012

DEMAND
*Health Sys.

 *Vaccine S/effects/S-fety

*Knowledge /Awareness

*Literacy level/Gender

*Social economic
*Health-seeking behaviour
*Religious

Service Delivery System

Community &Individual

*Advocacy
*Social Mob.
*BCC

Community and Individual

*Improved

Awareness knowledge Attitudes Policies Leadership

Communication Capacity

Community & Individual

*Improved participation in Vaccination & demand for OPV

[Adapted from John Hopkins Bloomberg School of Public Health Center for Communications Programs (CCP)]

CHAPTER 3: FACTORS INFLUENCING GPEI IN NIGERIA WITH EMPHASIS ON NORTHERN NIGERIA.

3.1 Overview of GPEI

3.1.1 The formulation of the Polio Eradication Initiative

In 1988, the world health assembly[5] (WHA) made a policy statement to eradicate polio by the year 2000 (WHA, 1988) hence the birth of the GPEI. This was encouraged by the global eradication of smallpox (Henderson, 1999), which according to Yahya (2006) exemplified the enormous potential of a well-designed immunization campaign. Global health discourse and policies define immunization as "the most powerful of all preventive health methods for children and a provision central to human rights and poverty reduction" (WHO, 2002). Yahya (2006) describes immunization as the most globally recognised effective and affordable ways of promoting health in communities, most especially in Africa where there is high childhood mortality rates.

3.1.2 Problems of GPEI

Since inception in 1988 when over 350,000 children were being paralyzed annually in more than 125 endemic countries, the GPEI has helped to reduce the annual global polio cases by 99%, (WHO, 2010a). However, the GPEI continues to face challenges 11 years beyond its initial set goal of the year 2000. According to Fine (2009), the problems are clearly vaccine failure in India, failure to vaccinate in Afghanistan and Pakistan due to political and security problems interfering with immunisation program, and failure to vaccinate in Nigeria due to low coverage from poor public confidence and lack of political will. According to Miyamura (2009), these problems faced by the initiative, are responsible for type 1 and 3 WPV still circulating in endemic and previously polio-free countries (Fig.3.1) despite the introduction and use of monovalent Oral Polio Vaccine (mOPV), thereby stagnating the end stage of the program (see magnified section of Fig. 3.2 which shows cases of WPV from 2000 - 2009).

Nigeria is a member of the WHA and has pledge her commitment towards achieving the Millennium Development Goals (MDGs) among which is reducing childhood mortality by two-thirds by 2015, and polio eradication is part of this global commitment. However, northern Nigeria continues to serve as a reservoir for WPV1 and WPV3 circulating in West Africa and Central Africa (CDC, 2009). Over the past years, WPV infection originating in Nigerian led to re-established transmission (>12 months) in 26 countries in Africa including Chad, the Middle East, and Asia. It has been described as arguably the most difficult country to eradicate the polio virus due to its dense population among other factors (Clements *et al*

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[5] World Health Assembly is the decision making body of the WHO comprising of delegations from member states.

2006). With a population of 140 million people, the country varies social-culturally, geographically, linguistically and in patterns of infection.

Figure 3.1: Polio endemic countries and exportation of the infection to previously polio-free countries
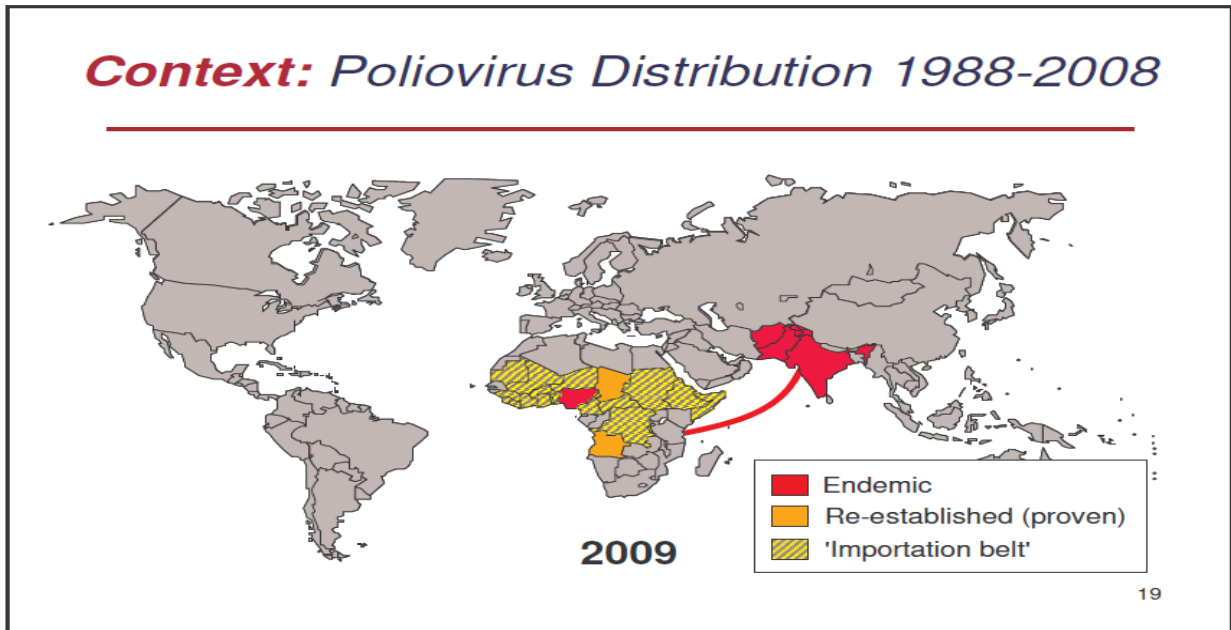
Source: WHO polio database; Dec. 2009.

Figure 3.2: Diagram showing polio cases since WHA resolution

Source: WHO: Dec. 2009.

3.1.3 GPEI in Northern Nigeria

In 2003, the hopeful target of eradicating polio was brought to a halt under the auspices of the Supreme Council for Sharia in Nigeria[6] (SCSN). This was in response to concerns that the vaccines were tainted with the Human immunodeficiency virus (HIV) and anti-fertility agents as part of a scheme by the western nations to reduce Islamic population by significant numbers worldwide (Yahya, 2006). There have been different interpretations to the problems of anti-vaccination rumours; while some po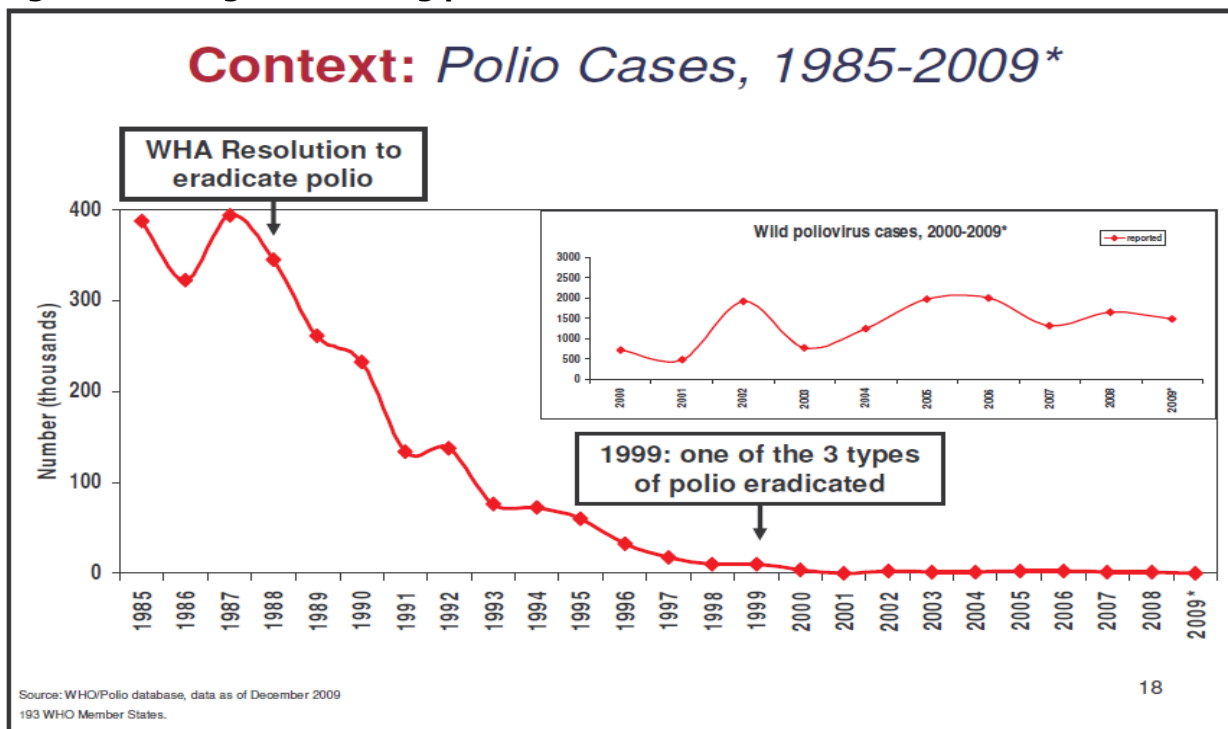licy makers and social scientist see these rumours as collective resistance based on religion or spread of conspiracy-type theories in a rather unreflective African society, media commentators and others interpret them as ill-founded rumours and misinformation spread by a few misguided intents which can be corrected through education (Streefland, 2001).

Whatever the interpretation, the PEI continues to face challenges in eradicating polio from northern Nigeria for reasons blamed on interplay of supply and demand barriers. Supply side barriers includes Health system factors, immunization technical components, such as quality of service; cold chain and logistics; surveillance, reporting, and data management, training, supervision, and monitoring, environmental and Political factors. While demand side barriers involve factors affecting knowledge, attitudes, Religion, beliefs or health-seeking behaviours, literacy levels etc.

3.2 Factors influencing GPEI in northern Nigeria

3.2.1 Supply side barrier to polio immunization
Nigeria Primary Health Care system limitations

Historically, the Nigeria health sector like other Primary Healthcare systems across Africa started deteriorating in the 1970s and 80s and could not serve the needs of the people as indicated by the decline in immunisation coverage rates and maternal health (NEPAD, 2003a). Therefore, the GPEI's main role of the eradicating polio through immunization with polio vaccines and reducing childhood mortality by two-thirds by 2015 represented an ambitious goal for Nigeria because of health systems and services that were too weak to support such targets (NEPAD, 2003b).

Vaccine management logistics

In an attempt to strengthen the PHC system, The National Program on Immunisation (NPI) was re-established in 1996 (FBA, 2005) as a sister arm of the ministry of health and given the mandate and key responsibility to work closely with communities in supporting immunisation programmes by timely supply of vaccines and equipments to states and LGAs (Renne, 2006; NPI, 1997).

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[6] Supreme Council of Sharia in Nigeria refers to Islamic leaders that promote the welfare of Muslims in Nigeria.

Table 2.1: Trends in basic health indices

Indicator	2000	2001	2002	2003	2004	2005	2006	2007
Infant Mortality Rate (per 1000 livebirths)	81.38	80.09	78.80	100.00	100.00	110.00	110.00	86
Under-five Mortality Rate (per 1000 livebirths)	183.75	189.50	195.25	201.00	197.00	201.00	201.00	138
Percentage of one-year-olds fully immunized against measles	32.80	41.10	61.80	31.40	50.00	60.00	60.00	60.00
Maternal mortality ratio (per 100 000)	704	704	704	800	800	800	800	800
Proportion of births attended by skilled health personnel (%)	42	42	37.3	36.3	36.3	36.3	36.3	36.3

Source: MICS 1999, 2007; DHS 1999, 2003.

However some of the main complains are lack of vaccines in communities and families travelling through long distances to reach nearest vaccination centres for routine immunisation (Dunn 2005). Regarding international safety standards, the NPI has been accused of not abiding to international best practices in the handling and storage of vaccines. It has also been accused of inefficient resourcing and misuse of vaccine materials like syringes, safety boxes and other equipments (Yahya, 2006). In 2003 UNICEF took over the job of international procurement and now there are adequate vaccines in the country (FBA, 2005).

Poor Monitoring and evaluation
One of the problems of PEI in Nigeria is poor quality data. Described as not ideal at all levels but very weak at community levels; disputed census figures, coverage figures that are far from reality and about families who are hard to locate (Cheng 2008). However, there have been recent improvements. According to the CDC (2010), non-polio AFP detection rates were achieved in all 37 states in 2009, and all but plateau state during January - march 2010. This was done in accordance with WHO target. The WHO adequate stool specimen target was also reached in all the states and most LGAs during the same period (CDC, 2009). Genomic sequencing[7] however showed possibility of surveillance gaps occurring among specific population such as migrants who have limited access to health-care providers and immunization activities (CDC, 2010).

Environmental
Indeed immunisation services have been inaccessible to a significant

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[7] Genomic Sequencing is a laboratory surveillance process for identifying type of polio viruses and recognizes their origin.

proportion of rural communities where 80 per cent of Nigeria's population resides. Jummai, a mother of four, walked for two hours with her baby on her back from Goda village to Minjibir local government to attend the weekly immunisation session only to find that the measles vaccine was unavailable. This occurred during a severe measles outbreak in the region (Yahya, 2006). Cheng (2008) attests to the fact that some children do not immunized because vaccinators do not bother to find them.

Political

The commitment of the LGAs and timely allocation of funds and resources are vital to the quality and successful implementation of Planned SIAs. This should be coupled with the leadership and supervision of the LGAs with close monitoring of performance indicators at all levels of government; LGAs, state and federal (CDC 2010).

Though Nigeria budgets and spends double the amount of money ($56.38 per fully immunised child), spent by other developing countries, reports show its immunization Coverage to be one of the lowest in Africa and indeed in the world; as low as 4% for the North West Zone (NPI and NDHS, 2003, NDHS, 2008). It can thus be argued that the problem is poor resource management and not lack.

The independent polio evaluation team after meeting with key officials at various levels of the Federal, State, and Local governments and Emirs[8], felt assured that political, religious, and traditional leaders are now very supportive of the immunization campaign and no longer held misconceptions about safety of the vaccine (Mohammed *et al*, 2009). Findings also suggest on the need to focus on demand side barriers as parents and caregivers who are well informed will make efforts to participate in vaccination even when supply barriers such as unavailability of vaccine and/or syringes persist (FBA, 2005).

3.2.2 Demand side barrier to polio vaccination

Fear of side effects and vaccine safety

For many parents in northern Nigeria, concerns about OPV were shaped out of fear and suspicion as to why a lot of resources were being spent on polio intervention by the federal government in collaboration with the international community when basic medicines for treatment of minor ailments were not made accessible by the weak health system (Mohammed *et al*, 2009). Between February and May 2001, there was a national outbreak of measles with over 100,000 cases recorded nationally and 8 deaths daily in a hospital in Kano, yet focus on polio remained and vaccinators went from house to house administering vaccines while parents mourned their dead children ((Bettersby & Gruber, 2003; Yahya, 2006).

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[8] Emirs are religious-traditional rulers in northern Nigeria

Also, parents related OPV to memories from 1996, when an American pharmaceutical company Pfizer, carried out trial of a meningitis vaccine Trovan[9] on 200 children from unsuspecting communities in Kano without ethical approval. Death of 11 children who took part in the trial was blamed on side effects of the vaccine (Wise, 2001; Olusanya, 2004).

The paralysis of some children due to emergence of circulating type 2 vaccine-derived polioviruses[10] (cVDPV2) further compounded the fear and suspicion of parents in northern Nigeria. Which according to Shimizu (2010) raised concerns about the low level of immunity against type 2 poliovirus in endemic countries like India and Nigeria. Data from the 2006 desert report identifies fear of side effects and vaccine safety as the most important reason for the refusal of the OPV in northern Nigeria Table 3.1.

Table 3.1 Showing reasons for refusal of OPV in northern Nigeria

Table 3.1 Reasons for refusal of OPV in northern Nigeria	%
Fear of side effects/ Vaccine not safe	49
No Confidence in Vaccinators	20
Religious conviction	23
Don't know	14
No reason	09
Political issues	08
Poverty	01
Don't know much about OPV	04
Causes infertility	03

Source; UNICEF, 2008

Knowledge and awareness about OPV

There is still confusion, misconceptions and varying knowledge among parents in northern Nigeria about immunization availability, dosage and frequency. According to Caroline Akosile a UNICEF Social Mobilization Officer, one of the challenges of polio immunization rounds, is the fact that people are asking why there are so many polio vaccination rounds being carried out (Jaulmes, 2006). Most of these families have poor access to information about polio immunization. A pilot community research done in Kastina state in 2005 among a number of immunization decision-makers and caregivers showed that they held the believe that OPV drops protected children against all childhood ailments including those for which there are no vaccines (Breiger, 2004).

More than 200 families from 12 out of 17 LGAs in Yobe state were reported to have missed polio immunization exercise. The state chairman of the immunization committee blamed the problem on poor publicity;

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[9] Trovan (Trovafloxacin) is a broad spectrum antibiotics produced by Pfizer.
[10] cVDPV2 refers to strain of polio virus caused by mutation of the that used in making the vaccine

some families simply said they were not aware of the exercise due to poor awareness campaign (PM news, 2011).

Level of literacy and gender factors

Wilder *et al*, (2008) observes that in predominantly Islamic northern Nigeria, girls receive little education and women are generally confined to their compounds, making them difficult to reach. Literature shows that there is a direct link between mothers' education and the fully immunised child: nationally 31.1% of children of mothers with secondary education are fully immunised; the figure for children of mothers with no education is 3.9%. Children in rural areas, especially in the north, are particularly disadvantaged (NPC, 2008).

Inequity

There are widespread inequities in immunisation coverage in Nigeria as children of parents in the lowest socio-economic quintile is nearly 12 times less likely to be immunised than children of parents in the highest (NPI, 2003; FBA 2005). Majority of polio cases are found among underserved populations in countries where such communities are large, cut off and neglected by both mainstream society and national politics, and are distrustful of government services (Waisbord, 2004). While this holds true for majority of rural communities in northern Nigeria, there are however those among the underserved who are not able to bring their children for polio vaccination due to the need to earn daily living or are unaware of the date and time or need for more doses (UNICEF, 2008). The northern Hausa population consists of seasonal farmers who shuttle between Nigeria and neighbouring Niger seasonally to farm and large number of Fulani nomads whose migration patterns are poorly understood (Cheng, 2008).

Health-seeking behaviours

According to Cheng (2008), Unvaccinated children (up to 30% in heavily infected areas) exist for 3 main reasons; either missed because the vaccinators did not go to their homes, because the children are not home during vaccination (known as playground children in Nigeria) or because their parents refuse to participate in vaccination. The third factor accounts for the bulk of missed children. Understanding the reasons why parents refuse to present their children for vaccination is vital to improving response to OPV. Literature shows that 80-85 per cent of Nigerians living in rural areas, like most of their African counterparts, seek healthcare and education from traditional healers (WHO, 2002b). They are often the only health practitioners patronised by those residing in rural areas, though a significant number of Nigerians depending on a number of factors like religion and level of literacy, may employ combination of both western and traditional methods of healing (Yahya, 2006). Also, the Hausa culture does not perceive polio as a disease but as an affliction by the goddess "Shan Inna" (who the disease is named after) on those believed to have offended the gods (Renne, 2010). Since polio is perceived to be the

victims fault, they are stigmatized, marginalised and made invisible and as such, the urgency to address the infection is not felt by the community and society at large (Wilder et al, 2008).

Religious factors
In 2003, the Supreme Council for Sharia in Nigeria (SCSN) called for suspension of polio immunization activities in response to concerns that the vaccines were tainted with the Human immunodeficiency virus (HIV) and anti-fertility agents as part of a scheme by the western nations to reduce Islamic population by significant numbers worldwide (Yahya, 2006). This resulted in rapid infection of unvaccinated zero-dose children by polio virus. Children paralysed by poliovirus went from 56 in 2001 to 355 in 2003, climbing to 782 in 2004, 830 in 2005, and reaching a climax in 2006 with 1122 cases. By 2004, Nigeria was reported to account for about 40% of the world's total burden of poliomyelitis with large numbers of immunisation non-compliant families (Cheng, 2008). Although immunization was resumed 8 months later, the effects of the rumours can be blamed for some families not allowing their children to be vaccinated to date (Wilder *et al*, 2008).

Some Catholics who believe that the polio vaccine contains family planning medication that may result in birth control also refused the OPV, while members of The Faith Tabernacle church refused because they believed that it was not necessary to receive any type of medication (Asije *et al* 1999). Social mobilization committees later helped to provide the religious leaders with correct information about benefits of polio immunization. The religious-political divide also helped to strengthen the propaganda about the OPV vaccines. Study by Obadare (2005, p.279) showed that northern Nigerians believe that the northern Hausa-Fulani politicians and Islamic religious leaders who criticized western medicine were genuinely trying to protect their interest which were being ignored by the then President; Olusegun Obasanjo who is a Christian and Yoruba from the south-west.

Nigeria's director of public health Abdulsalem Nasidi while commenting on reasons why families refuse the OPV said "It was a communication gap. It wasn't a religious gap", (Cheng, 2008). Lessons from East Africa have emphasized the need for sustained social mobilization and creation of knowledge and awareness otherwise face the risk of the information gap being filled with false allegations, which could even be sensible (UNICEF 2004).

SUMMARY OF CHAPTER 3

As at 1988, 350,000 children were being paralysed annually worldwide. This prompted the WHA to enact the GPEI with the goal to eradicate polio

infections by the year 2000 through effective community immunization. More than a decade beyond the initial set goal, the GPEI still faces challenges eradicating poliomyelitis from 4 endemic countries; Afghanistan, Pakistan, Indian and Nigeria.

According to Fine (2009), the problem of the PEI in Nigeria is clearly failure to vaccinate due to low coverage from poor public confidence and lack of political will. The factors influencing polio coverage in northern Nigeria has been explored from the supple barrier and demand barrier perspectives. Literature reviewed in chapter three shows that factors that influence supply side barrier of OPV include political will and commitment, vaccine delivery logistics and Primary healthcare infrastructure. Positive improvements have been made and attempts are being made at scaling up and sustaining the progress already made.

Analysis of the demand side barriers responsible for low community interest and participation in polio eradication campaign activities in northern Nigeria identifies two main groups;

1. Those resistant to OPV because of fear or side safety and side effects, confusion due to rumours about intentions of the international communities to reduce Muslim population, or religious and cultural believes.
2. Those who are apathetic towards the activities of the PEI, either because they prioritize earning daily living due to their social economic status or simply because they are not aware of the, time date and need for the vaccine.

Cheng (2008) concludes that the resistance to OPV is actually due to communication gap. The next chapter shall explore communication interventions in northern Nigeria.

CHAPTER 4: COMMUNICATION INTERVENTIONS IN POLIO ERADICATION

4.1 Overview of communication interventions

"Communication is a critical component in assuring that children are fully immunized and that simultaneous immunity is attained and maintained across large geographic areas for disease eradication --- will assist in raising awareness, creating and sustaining demand, preventing or dispelling misinformation and doubts, encouraging acceptance of and participation in vaccination services, more rapid reporting of disease cases and outbreaks, and mobilizing financial resources to support immunization efforts" (Waisbord *et al* 2010). Various immunization interventions and strategies are discussed under two broad headings; "communication" and

"social mobilization." For this thesis, "Communication" includes advocacy, social mobilization, and program communication (including behavior change activities).

Communication interventions in Nigeria have proven to be a vital part of the polio eradication effort (UNICEF, 2009) and there is evidence of 12% to 20% or more increases in the absolute level of immunization coverage and 33% to 100% increases in relative coverage compared to baseline figures in the four polio endemic countries (Waisbord *et al,* 2010). According to Lahariya (2007), evidences from global campaigns showed that wherever there is poor community involvement, vaccination coverage is also low with a direct bearing on Polio eradication campaign. Findings from a community pilot research supported by the Adamawa State ministry of health (SMoH) in 2005, showed that, there is potential for greater engagement with immunisation when information dissemination is tailored to community members' needs (FBA, 2005). The question therefore is not whether community involvement is beneficial, but how to implement relevant strategies.

4.1.1 Who is involved in Communication in GPEI in northern Nigeria?

Since inception of GPEI, UNICEF has worked with relevant partners in motivating families to vaccinate their children by applying various ways of communication strategies, ranging from mass media to interpersonal communication, advocacy to social mobilization, in order to galvanize public support for the immunization drive (UNICEF, 2003). Although agencies such as UNICEF are central to Nigeria's polio eradication efforts, the federal government is the key player (Cheng, 2008). The National Social Mobilization Working Group (NSMWG) chaired by UNICEF is responsible for Polio communication activities and has representatives from Rotary Nigeria and The National Orientation Agency (UNICEF, 2009). There are contributions to the Social mobilization committees from FMOH Health education unit, Federal Ministry of Education, Women affairs, Local Government and information, NPI, National Primary Health Care Agency (NPHCDA), UNICEF, Rotary Polio Plus, USIAD, WHO, John Hopkins University/Population Communication Services (JHU/PCS), the Red Cross and others at the national level. In some states, SMCs have membership drawn from the state ministries of health and education and relevant NGOs while at the LGAs, members include Primary Healthcare coordinators (PHCs), information officers and traditional rulers (Asije *et al* 1999). The Inter-Agency Coordinating Committee (ICC) has the responsibility of coordinating national, state and donor efforts for PEI; (FBA, 2005).

4.2 Communication strategies in PEI in northern Nigeria

Communication in public health is defined as the strategic design, application and evaluation of communication interventions (i.e. social mobilization, interpersonal communication, mass or local media and advocacy) to achieve public health objectives (Haidar, 2005. Hornik, 2002. Salmon and Murray-Johnson, 2003). In combination with other immunization components, it plays an important role in achieving the goals of improving coverage and reducing drop-outs (Shimp, 2004).

4.2.1 Advocacy: defined as a range of strategies designed to make people participate in decision making at the organizational, local, national, and international levels, usually involving strategic planning, community mobilization, capacity development, coalition building, and the promotion of policy and environmental change. Effective advocacy is aimed at creating an environment for cumulative change beyond the individual level, with a community-defined objective (AED, 2011).

4.2.2 Social Mobilization: According to UNICEF (2005a), social mobilization is defined as "a broad-scale movement to engage people's participation in achieving a specific development goal through self-reliant efforts. It involves all relevant segments of society: decision and policy-makers, opinion leaders --- communities and individuals" The broad-based support garnered is grounded in local concerns and energy meant to empower and ensure local ownership, leading to greater sustainability and impact.

4.2.3 Behaviour change communication (BCC): is an interactive process with communities that uses various communication channels to develop tailored messages and approaches meant to build positive behaviours, promote and sustain individual, community and societal behaviour change, and maintain appropriate behaviours" (FHI, 2002 pg.5). Behaviour change strategies tend to focus on the individual as the locus of change. It involves use of persuasive techniques in evoking demand for health rights and ensuring availability and accessibility of public sector health services to the neediest. It also involves the integration of new and innovative measures into longstanding social cultural and communication methods (Nandita Kapadia-Kundu, 2008).

4.3 Communication approaches in PEI in Northern Nigeria

4.3.1 Mass media: Communication for PEI in northern Nigeria is done mainly through mass media campaigns using a variety of publicity materials and paraphernalia which are both aimed at creating a festive and enabling atmosphere meant to boost morale of community members and raise awareness about immunization (Waisbord, 2004).
Print and Electronic: A private advertising agency Prima Garnet was contracted through JHU/PCS to assist with design and production of pro-vaccination and NIDs messages in the major Nigeria languages (Hausa, Yoruba, Ibo, English and Pidgin English) to be aired on private and state

television and radio stations. These activities are meant to create and raise awareness about polio vaccination through visibility. The company also helped in developing press releases, posters, stickers, billboards etc. Banners, smocks and t-shirts were also produced and funded by the ICC through Rotary and UNICEF at the national levels and distributed to states and LGAs. There were however complains that the materials often arrived late (Asije *et al*, 1999).

The greatest medium for news in northern Nigeria is the radio and it is a luxury in very poor rural communities (Yahya, 2006).

Challenge cup initiative: Another awareness building initiative was the PEI Challenge cup introduced by (JHU/PCS) into 1998 NIDS as a strategy to get Nigerian men, especially fathers to appreciate their responsibilities in polio vaccination. The fanfares and flag-off ceremonies, Rallies using local music and dancers to mobilize communities, television and radio jingles featuring role models (Goodwill Ambassadors) all provided essential information such as dates and immunization schedules. Use of t-shirts, vests, caps and banners meant to identify vaccine workers, while stickers, billboards, flags, caps etc were meant to improve public awareness (Asije *et al,* 1999)

Traditional mass media, however far-reaching, has limited reach when it came to communities that were marginalized, and where radio, TV and printed words figured little in daily life. Waisbord (2004) opines that communication sources vary in urban and rural settings/ while broadcast media religious organization and leaders are better sources in urban areas, IPC between caretakers with health workers and local leaders are crucial sources in villages.

4.3.2 Interpersonal Communication and Social Mobilization

According to *Asije et al*, (1999), word of mouth or IPC through traditional and religious leaders, neighbours and town criers have proved more effective in reaching the population than posters and other print media. Interpersonal communication and counselling, is defined by AED (2011) as person-to-person or small group interaction and exchange, which may be both verbal and non-verbal communication, negotiation, and classic counselling techniques aimed at influencing decisions and improve skills of target audience. It a critical quality for health care providers, hotline call respondents, and others who have direct contact with the target audience.

Analysis of UNICEF developed ACADA framework for communication, showed that there is a relationship between application of the ACADA model and a positive response of mothers
to polio immunization in four selected states. It further showed that the decision of mothers exposed to ACADA-related messages from the mass media on polio immunization, were largely influenced by family members, See Figure 4.1.(Ajibade, 2010).
According the NDHS, a small percentage of women in northern Nigeria

have access to mass media on weekly basis compared to men (NPC, 2008), (Figure 4.2).

Fig. 4.1 ACADA- Source of message that influenced mothers

Use of Town criers is a traditional practice of interpersonal communication used to attract attention and participation of community members in communal activities. The crier goes throughout the community by foot or vehicle to inform community members about NID and SID dates. Some have been equipped with megaphones provided by the ICC and Rotary.

Pie chart values: Mass Media 12.3, Family members 43.9, Friends 11.9, Village/comm. Leaders 8.7, Religious leaders 6.2, Traditional rulers 3.5
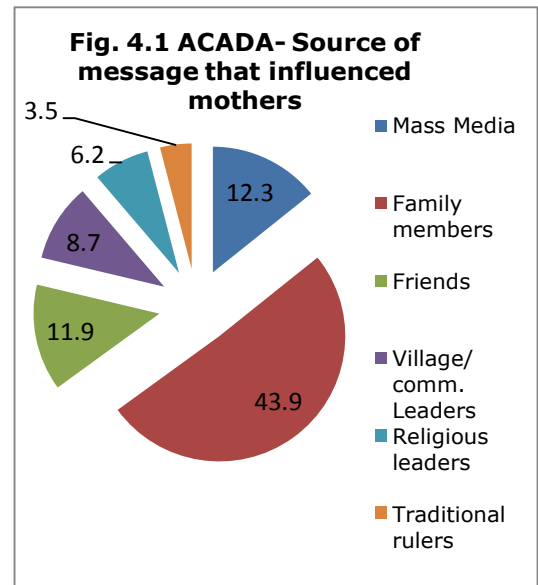
Fig. 4.2 Show weekly access to mass media in northern Nigeria

Bar chart (Women / Men):
- North Central: Women 8%, Men 19%
- North East: Women 2%, Men 8%
- North West: Women 3%, Men 12%
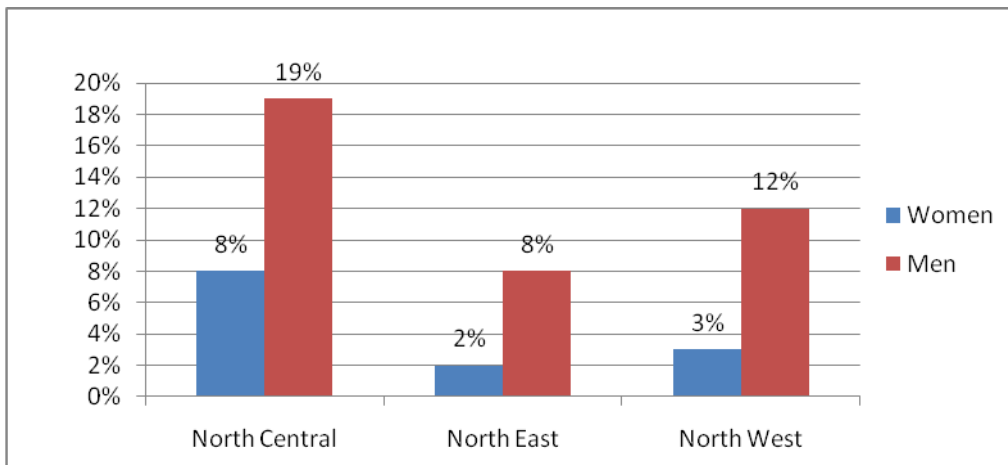
Source: NPC 2008

Also, well informed neighbours, family or friends can help to influence parents as observed by Yahya (2006) in an interview in kano; *"My two youngest sons have been taking immunisation. They are much healthier than the other five when they were young … two of them died when they were babies. It is Hauwa who persuaded me to start immunising my children"* (Interview, Kano, 29 June 2005). Table 4.1 shows potential areas to focus education efforts on, according to the 2006 desert reports.

Table 4.1: Potential Places to focus education efforts		
Influencers	**Borno state**	**Adamawa state**
Personal	29%	18%
Husband	37%	49%
Traditional leader	17%	01%
Religious leader	06%	32%
Radio TV	03%	0%
Healthcare worker	07%	0%
Others	01%	0%

Source: UNICEF 2008

The Federation of Muslim Women Association of Nigeria (FOMWAN) made up of women at ward levels, help to inform communities of the need to present their children for immunization, and accompany vaccinator teams during immunization rounds to help access women and children in their private huts (UNICEF, 2009). They also help in ensuring that thousands of children are mobilized and vaccinated in the child-child and youth outreach participation programmes.

Film show: Majigi film shows, a local audio-visual communication and social mobilization strategy empowers local leaders to show locally produced films about polio and what parents can do to protect their children and offers parents a chance to ask questions and openly discuss their concerns about immunization (WHO, 2011). However, the "majigi" programmes is said to reach primarily men (GPEI, 2010).

Social Mobilization groups: In 2004 the United States Agency for USAID launched and funded Community Participation for Action in the Social Sector (COMPASS) project to be led by Pathfinder international in coalition with other partner organisations (Wilder and Adamou, 2008). The project has recorded success in integrating health and education programs through community-based approach in challenging environments. Under the technical leadership of Management Sciences for Health (MSH), COMPASS has joined the government to expand polio immunisation in eight northern states classified as high-risk. In order to reach zero-dose children, COMPASS is said to have blanketed communities with information (Wilder and Adamou, 2008).

 Social mobilization and communication committees (SMCCs) however face challenges of limited staff and resources particularly at the state and LG levels and most SMCCs are active only a short time before NIDs. Consequently, plans are put together haphazardly and the quality is uneven (Waisbord, 2004). Similarly NPI polio awareness campaign done using influential and political leaders, face recurring complaints by local

governments that they lack resources for vital outreach awareness campaigns (Yahya, 2006).

4.3.3 Integrated Strategy

One of the most important lessons about the impact of communication programs is the need for integrated media strategies, most especially when communities are filled with negative rumours or resist polio vaccination (Waisbord, 2004). Under the leadership of the NPI and the national SMC, a five year (1999 – 2003) integrated advocacy and communication plan for polio eradication in Nigeria was approved by the ICC in 1999 to be funded by it members. Jointly designed by NPI, FMOH and ICC, it got input from some state and LGAs and had the objective to implement social mobilization, programme communication and advocacy for immunization at national, state and LGA levels (Asije *et al*, 1999). UNICEF (2005a) describes integrated strategy as "*Programme Communication*" or Behaviour Change Communication (BCC); a research-based, consultative process of addressing knowledge, attitudes and practices through identifying, analyzing and segmenting audiences and participants in programmes, and providing them with relevant information and motivation through well-defined strategies, using an appropriate mix of inter-personal, group and mass media channels, including participatory methods (Mckee et al, 2000). The strategic and synergistic polio eradication communication strategy has helped to improve access to unreached communities, but there remains the challenge of reaching those marginalised in polio endemic countries (Obregon, 2009).

4.4 Outcomes of PEI communication strategies

4.4.1 Improved Awareness: The monitoring of NIDs campaigns is planned and executed at all levels. Campaign education and promotional materials produced at federal levels are distributed through the Central facilitators at different levels who monitor the distribution, utilization and effectiveness of the promotional materials through use of forms. JHU/PCS contracted a private company called Research and Marketing Services to evaluate the impact of social mobilization among 5000 respondents from all the states including the FCT, findings showed a 25% increase in NIDS awareness (females by 38 per cent, compared with 15 per cent among males) and by geographic locations (rural by 31 per cent, compared with 20 percent among urban dwellers) (Waisbord, 2004).

4.4.2 Improved Knowledge Attitude and Practice: A review of polio communication activities was conducted in March 2009 to ensure that communication interventions are informed by data on knowledge, behaviour, attitudes and practices of key target groups. Findings identified the following areas of strategic focus: advocacy, media, training, materials development and social mobilization. KAP study supported by UNICEF with focus on knowledge and information gaps, sources of information, perception, traditional beliefs and community influencers was done in

2008 in the northern States of Nigeria where the burden of polio eradication and other child diseases are greatest. A KBAP survey targeting the six geo-political zones of the country was planned for 2009 (UNICEF, 2009 pg. 2). Efforts to retrieve results of both studies for this review were not successful.

4.4.3 Formulation of improved Communication policies: Five interpersonal communication modules were developed and deployed beginning in July, 2007 and by end November three hundred ward focal persons and over 1500 vaccinators from the 30 highest risk LGAs in the six highest risk states had improved inter-personal communication skills to counsel non-compliant families (UNICEF, 2007). The Nigerian Community Engagement Model, (NiCE Model) a strategic vision for communication and social mobilization framework was developed to, identify four key players that are critical to the establishment of quality service delivery, demand creation and reaching every child under five years with immunization. It is meant to guide the implementation of all immunization communication activities (UNICEF, 2009).

4.4.4 Committed leaders: The independent polio evaluation team haven met with key officials at various levels of the Federal, State, and Local governments and Emirs, felt assured that political, religious, and traditional leaders are now very supportive of the immunization campaign and no longer held misconceptions about safety of the vaccine (Mohammed *et al*, 2009). A community dialogue audit was conducted between June and September 2007 to assess the quality of the process, content of discussions, impact and perception of communities of the approach. The audit showed that community dialogues for polio eradication were facilitated by traditional and religious leaders, including ward heads at least 50% of the time, and Imams facilitated 10% of the observed activities. The provision of interpersonal skills for ward focal persons helped improve their participation in facilitating dialogues as opposed to previous times when their roles were restricted to logistics (UNICEF, 2010).

4.4.5 Capacity building: The mobilization and facilitation of training of zonal polio representatives by UNICEF resulted in the adoption of 92 high risk LGAs for sustained communication interventions (UNICEF, 2009 pg.2). Similarly, COMPASS trained and engaged members of Fulani community as vaccinators, and is committed to the continuity of the program and ensuring its application in other states (Wilder and Adamou, 2008).

As we move towards the final phase of polio eradication, some of the challenges confronting the government, UNICEF and other partners involved in social mobilization are how to tackle resistance to Oral Polio Vaccine (OPV) by mobilizing the unreached, underserved communities and continue motivating the majority already reached to participate in OPV vaccination (Obregon *et al*, 2009). Communication strategies need

constant reformatting and adaptation to the elusiveness of the virus and dynamics of the human behaviour. The next chapter shall explore technological perspective in form of mobile communication and its potential contribution to the need for better communication and social mobilization in GPEI.

SUMMARY OF CHAPTER 4

Literatures show that communication is critical in ensuring that children are fully immunized. Polio communication activities include advocating making immunization a priority among decision-makers, mobilizing communities to participate in immunization services, educating caregivers about the importance of immunization and influencing them to have their children completely vaccinated according to schedule.

UNICEF in collaboration with all levels of government, local and international organisations (Public, private and NGOs), make up the National Social Mobilization working Group (NSMWG) that is responsible for polio communication activities in northern Nigeria.

With contributions from the national, states and LGs, polio communication activities aimed at raising awareness are being done through Mass media campaigns, advocacy and Interpersonal communication. While mass media communication has the benefit of reaching a large population, it however has limitations when it concerns underserved and marginalised communities. Interpersonal communication and social mobilization activities which involves face-face, individual and community focused strategy proved to be more beneficial Waisbord (2004).

There is evidence that advocacy and other social mobilization approaches; mass media and interpersonal communication efforts, have been able to improve commitment of political, religious and traditional leaders, immunization coverage, but both communication approaches; mass media and interpersonal communication have varied advantages and limited reach. While mass media is more effective in urban population, interpersonal communication proved more effective in towns and villages. This has led to research and current implementation of an integrated strategy that combines all approaches and targeted towards hard to reach population.

Outcomes and effectiveness of the various communication strategies are monitored and evaluated through KAP studies, policy formulation and reforms, capacity building, etc; however addressing the challenge of reaching the underserved requires continuous adaptation and reformatting of communication strategies. The next chapter shall explore technological perspective in form of mobile communication and its potential role in communication polio readication in northern Nigeria.

CHAPTER 5: MOBILE COMMUNICATIONS TECHNOLOGY AND GPEI

5.1 Overview of mobile communication technology

Mobile communication is the fastest growing aspect of Information and Communications Technology (ICT) worldwide. In communication industries in developing countries, it has been described as the fastest growing sector (ITU, 2003, Orbicom-ITU, 2005), "leap-frogging" over fixed-line communication networks to narrow the global digital divide in the last two decades (Orbicon-ITU, 2005, Banks & Burge, 2004, Hamilton, 2003).

Though majority of reported mobile communication interventions are in high income countries, there is however emerging literature on its role in developing countries (Blaya, 2010, Leach-Lemens, 2009, Curioso,2010, Vital Wave Consulting , 2009 & Mechael et al, 2010). Literatures show potentials for use of mobile communication technology in improving public health (McNab, 2009) and healthcare delivery in developing countries (Chatley 2005). Despite its rapid growth worldwide, its role in health, according to available literature is under-researched and most evidence remain fragmented and anecdotal (Chatterjee et al, 2009).

5.2 Information Communication Technology and Mobile Communication

ICT is a broad term used to describe the combination of mobile communication and modern information technology. In other words, ICT is a combination of IT as well as telephony, broadcast media, all types of audio and video processing and transmission and network based control and monitoring functions. To fulfil information processing and communications functions, ICT uses technologies such as desktop and laptop computers, mobile communication devices, software, peripherals and connections to the Internet. There is growing access to ICT worldwide and it has quickly become one of the basic building blocks of a modern society (UNESCO 2003). The catalytic role of ICT in facilitating development for the world's poor and marginalized people is widely recognized (SDC 2005).

Mobile communication is an aspect of ICT that provides a portable platform for improved quality and efficiency of communication and facilitates increased rapidity of transfer of data or information (Visvanathan, 2011). It has continued to experience transformation and evolved over recent years from communication tool for a privileged few, to essentially a mainstream technology (Castells, 2004). With high penetration rate and emergence of low-cost handsets globally, tens of millions of citizens that never had access to computer or fixed-line telephones now use mobile device and 64%of these people reside in developing countries (United Nations, 2007).

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There have also been transformations from just "Low-end" (feature phones) mobile phones with basic telephony functions (voice calls, text messaging, etc), to include Personal digital assistants (PDAs) and Smartphones (e.g. Nokia E-series, BlackBerry and iPhones) which have more advanced computing and internet capabilities. The functions of mobile communication devices range from voice calls, voice mails, text messaging or Short messaging services (SMS) and Multi-media messaging (MMS), Bluetooth capability, ringtones and games, WAP, video, camera and camcorder features, to more complex computing, organisational tools and applications such as Global Positioning System (GPS), video streaming, etc, in the case of smart phones. key attributes of wireless communication capability which include portability, low weight and rechargeable, long-life battery power coupled with computing capability gives it advantage over other ICT tools in healthcare and public health (Free et al, 2010). For the purpose of this thesis, I shall focus on Low-end (feature phones) that are easily accessible to underserved and marginalised people in rural areas in developing countries and their role in health.

The main features or applications of Low-feature phones include voice call and SMS. Some concepts in voice Calling and SMS include;

5.2.1 Voice calls: Push voicemail is an adaptation of traditional telephony feature of mobile phones used to send voicemail message directly to a recipient's mobile telephone without the phone ringing. It is used for mass distribution of information. It is helpful as it does not require the recipient to be literate but the drawback however is the fact that some users do not know how to access their voicemail boxes and network providers charge to access voicemail.

5.2.2 Beeping or Missed Call (Flashing): This is an innovative and interesting widespread phenomenon in the use of mobile communication in the developing world. It is simply the practise of intentionally placing a call to a telephone number, and then hanging up before the recipient on the other side can pick up the call. It is intended to pass a message (most times "call me back") or signal to the recipient without saying a word or typing a character at almost no cost to the caller (Donner, 2007). A study by Donner J. (2007) identifies three kinds of beeps;

- Callback; simple request for recipient to call the beeper.

- Pre-negotiated instrumental; a pre-planned arrangement between beeper and recipient.

- Relational; signals sent by beeper to recipient to show affection.

The callback and pre-negotiated instrumental subsets of beeping have been researched, and observed to be analogous to text messaging (Harper, Palen, & Taylor, 2005; Ling, 2004, Pertierra et al., 2002). Beeps

however differ from text messages because they are free and have no unique content; simply X called Y (Donna, 2007). Though under-studied, a Kenyan GSM provider estimated that its network carried four million flashes per day (Mutung'u & Gakuru, 2006).

5.2.3 SMS (Text Messaging): SMS is one of the most easy, cheap, confidential and widely used communication features of mobile phones (Vodafone, 2006). It includes;

Broadcast SMSs: which are mass SMS messages that are sent out to many people simultaneously. This method allows for creation of databases of individuals and broadcast lists depending on the individual circumstances. Thus messages can be tailor-made for specific groups. The service is free for the recipient and the sender may receive discounts from the service provider. There is also little human resource involved and recipients have opt-in and opt-out options.

Interactive SMS: Also bulk text messaging but on the other hand requires a response to the message sent; which could be in form of a question answer format. The method is more personalised and direct as it requires a human to either analyse the response or answer a question. There is therefore a cost to both the patient and the health service provider.

Table 5.1 compares advantages of voice calling and text messaging with other communication systems (de Jongh, 2005).

Table 5.1 Showing Advantages of different communication systems

Immediacy	Slow	Slow	Immediate	Immediate	Immediate or stored	Immediate or stored
Privacy / Confidentiality	High	High	Moderate	High	High	High
Likelihood of mis-interpretation	Low	Moderate	Low	Low	Moderate	Moderate
Delivery confirmation	N/A	No	N/A	N/A	Yes	Yes
Cost	High	Moderate	Low	Moderate	Low	Low

Source: de Jongh, 2009

5.3 The Role of ICT and Mobile communication in Health

The role of ICT in health is termed eHealth, defined by DeLuca & Enmark (2000) as embryonic convergence of wide-reaching technologies (wireless

communication, computer telephony, internet etc) and direct access to healthcare providers, care management, education and wellness. Brommey (2003) defines eHealth as use of ICTs to provide and support participants of healthcare wherever they are located. Both definitions are however healthcare focused and there has been a more recent definition of eHealth by Leach-Lemens (2009) as the use of ICT for health services and health information.

Mobile communication based health (mHealth) a subset of ICT is a rapidly growing area of research and practice, defined as the use of mobile computing and communications technology in health care and public health and a rapidly growing area of research and practice. It involves use of Medical Electronic Devices (MEDs) such as mobile phones for a range of functions, from clinical decision support for healthcare professionals, to behaviour change in communities (Blaya, 2010, Cole-lewis, 2010).

Mobile communication was not initially considered to be the tool to reduce the digital divide in health, but its rapid penetration of low and middle income countries over the past decade has increased its potential in health services (Mechael, 2008). Literature show mHealth as a viable solution to addressing pressing health needs through its high reach and low cost mechanism thereby increasing health accessibility, effectiveness and affordability across developing world (UN|Foundation, 2009).

However, available literature also reveal that there are concerns about mHealth services such as lack of reliability and efficiency of the service delivery platform, knowledge and competence of providers, privacy and security of information and, their effects on satisfaction, future use intentions and quality of life (Kaplan & Litwka 2008, Angst & Agarwal 2009, Ahuwalia & Vershney 2009, Varshney 2005, Norris et al. 2008, Mechael 2009, Ivatury et al 2009, UN foundation & Vodafone foundation 2009). Mechael (2009) is optimistic and concludes in a recent study that direct two-way mHelath communication can better improve health care in rural settings.

5.4 Growth of Mobile Communication Technology and Mobile Health in Developing Countries

The use of Mobile communication technology continues to grow worldwide, most especially in the developing countries where mobile subscription has grown rapidly (Figure 5.1) (ITU, 2010), even surpassing other components of information technology and health infrastructures (VWC, 2009) see figure 5.2. In Africa the penetration rate also grew rapidly from 87 to over 360 million subscribers between the years 2000 and 2010 (ITU, 2010) compared to other aspects of ICT like fixed telephone lines, internet access and mobile broad band subscription.

Fig. 5.1 Showing Mobile comm. Subscription growth worldwide

Mobile cellular subscriptions per 100
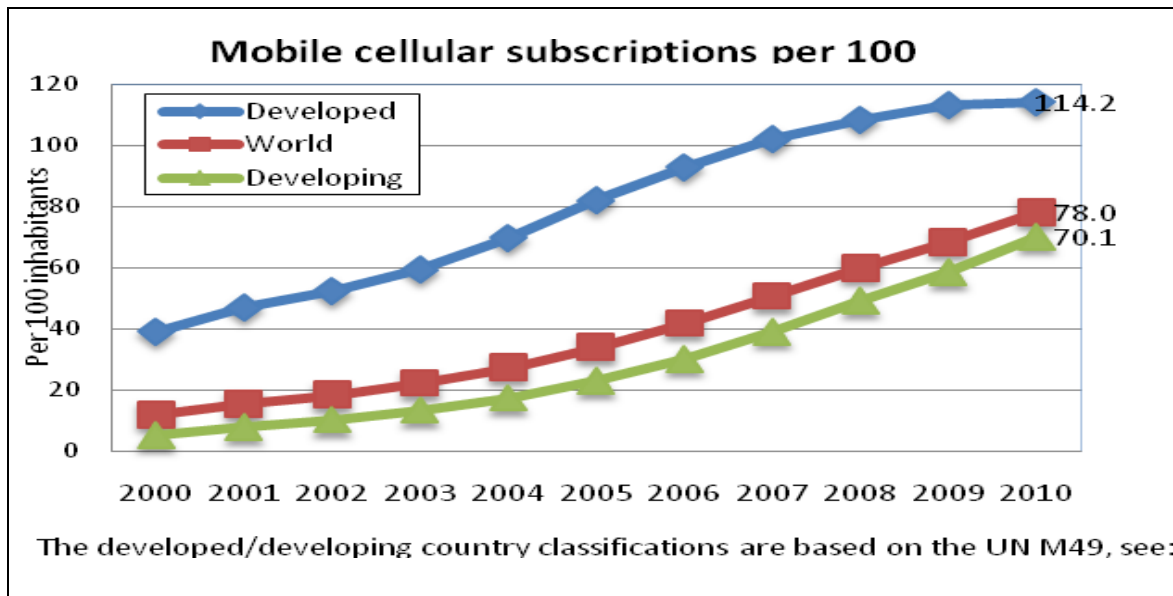
Source: ITU, 2010

Figure 5.2: Technology and health-related statistics for developing countries (Millions)
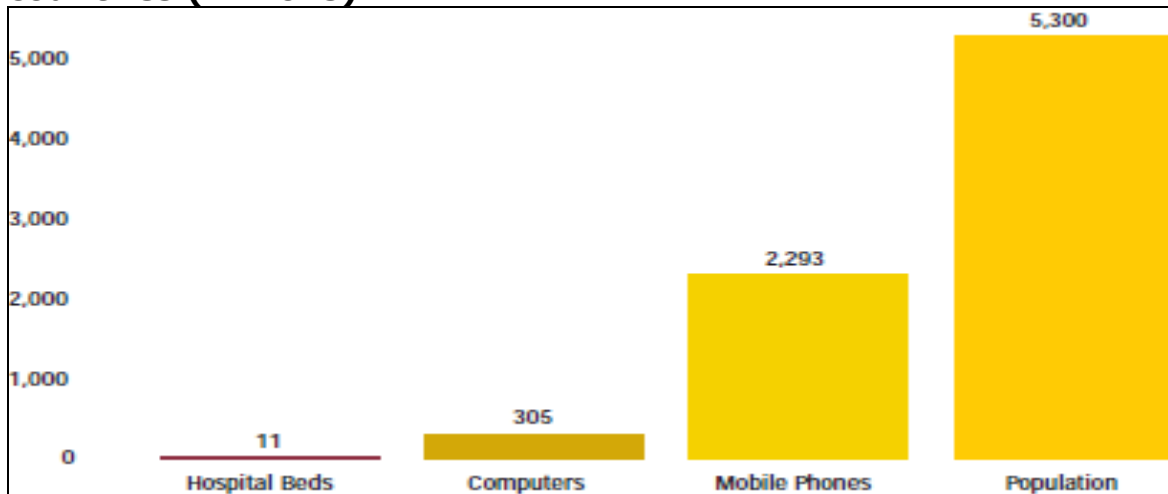
Source: Vital wave consulting, 2009

The ease of penetration of mobile communication technology in developing countries is attributed to factors like mobility, ease of use and low cost maintenance. With the emergence of PDAs and Smartphone, Low-end mobile phones have become more improved and affordable to those in developing countries. The ITU (2010) estimates show that the global access to mobile networks is 90% of world population with 80% living in rural areas. There is growing evidence that shows that mobile communications potentially improves healthcare services even in remote and resource-poor environments, thereby improving access to healthcare and health-related information, particularly for hard-to-reach populations (VWC, 2009).

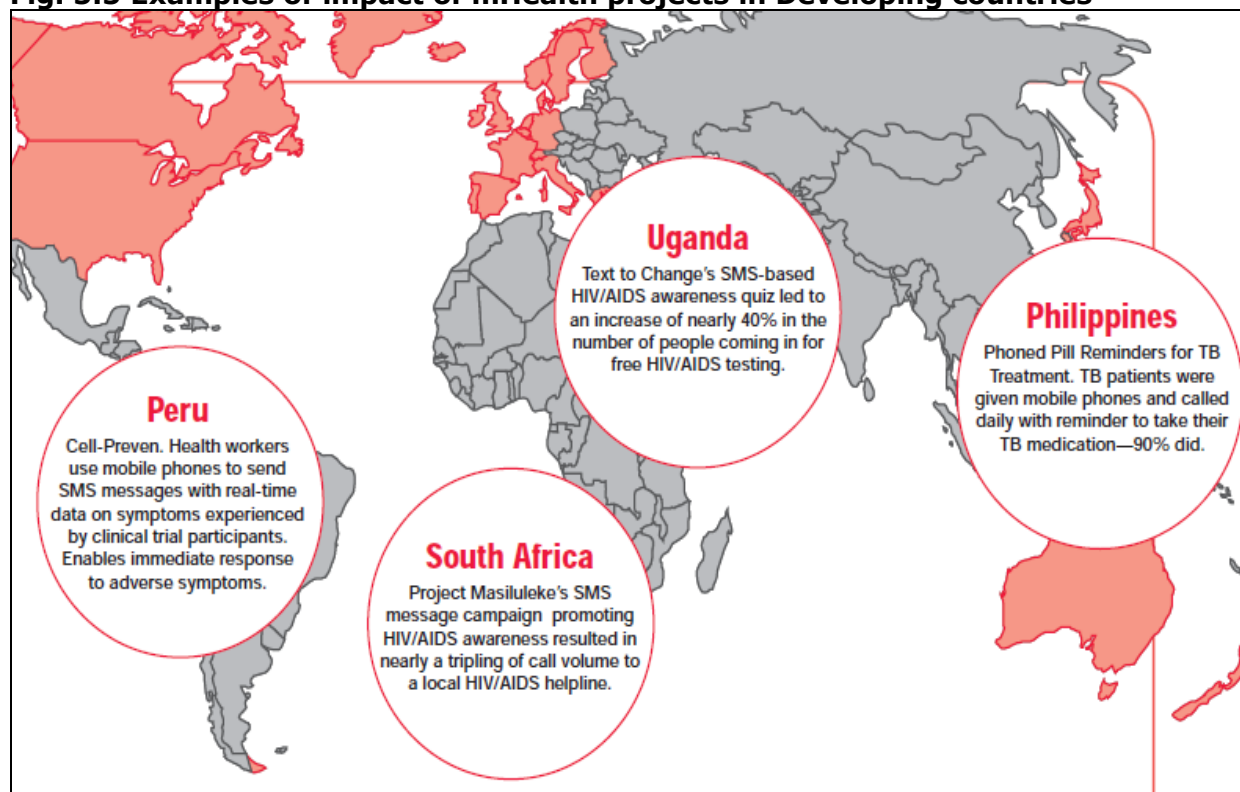### 5.4.1 Examples of Mobile health projects in developing countries

Mobile health (mHealth) programs are rapidly gaining momentum in developing countries with over 50 projects that have long-term goals to make healthcare more effective and impact positively on health outcomes (VWC, 2009). Some of the projects are listed below;

Project Masiluleke: This project which promotes HIV/AIDS hotline through SMS messages is sponsored by MTN and takes advantage of the popularity of 'Please Call Me' (PCM) services, which are widely used in South Africa and throughout Africa. These free text messages contain the phone number of the sender and words like 'Please Call Me, a feature is mainly used by individuals without phone credit to prompt recipients to call them. The remaining 120-character spaces can be filled with advertising, but Project Masiluleke sponsor MTN is donating the space in one million messages each day to be used for HIV/AIDS and Tuberculosis-related information. Messages are written in local languages, and are used to direct recipients to the National AIDS Helpline. Once patients have called, representatives of the hotline provide information about testing services and test locations. This has resulted in a 350% increase in phone calls to the hotline (VWC, 2009).

Txtalert and Socialtxt: both are programmes run by Praekelt Foundation a non-profit organization established in 2007 that facilitates exchange of information between clinics and HIV positive patients. Txtalert is aimed at, helping HIV positive individuals manage their clinic appointments, while Socialtxt uses the "please call me" (PCM) messages by attaching a short, health-related message to the bottom. This is similar to the Masiluleke project, except for the fact that the messages are aimed at creating awareness about women abuse and children with cleft lip.

SimPill: Refers to a Medicine Adherence Device which relies on mobile phone technology designed to remind patients to take their medication. It consists of a pill box programmed with the patient's medication regime, and SMS is sent timely to remind patient to take their medication or to the caregiver about patients compliance. The pilot which was done in South Africa showed that 90% of patients complied with their medication regime, compared with the typical 22 to 60% compliance rate without the system (VWC, 2009). Figure 5.5 below shows some examples of impact of mHealth projects in developing countries.

**Fig. 5.5 Examples of impact of mHealth projects in Developing countries**

Peru
Cell-Preven. Health workers use mobile phones to send SMS messages with real-time data on symptoms experienced by clinical trial participants. Enables immediate response to adverse symptoms.

Uganda
Text to Change's SMS-based HIV/AIDS awareness quiz led to an increase of nearly 40% in the number of people coming in for free HIV/AIDS testing.

South Africa
Project Masiluleke's SMS message campaign promoting HIV/AIDS awareness resulted in nearly a tripling of call volume to a local HIV/AIDS helpline.

Philippines
Phoned Pill Reminders for TB Treatment. TB patients were given mobile phones and called daily with reminder to take their TB medication—90% did.

Source: Vital Wave Consulting: 2009

5.5 Mobile communication in Northern Nigeria

Nigeria has one of Africa's fastest growing mobile telephone subscriber bases. The licensing and launch of GSM (Global System for Mobile Communication) mobile operators in Nigeria in 2001 represented a significant liberalization compared to the previous domination of telecommunications provision by the government-owned monopoly, NITEL (Smith-Hillman & Braithwaite, 2004). Since 2001 there has been a growth in mobile phones subscriber numbers and reach, along with falls in prices and improvements in service quality. According to the Nigeria Communications Commission (NCC) (2011), the number of mobile telephone subscription in this country continue to grow rapidly; from less than 260,000 to over 96 million mobile telephone lines (see Figure 5.6 below). Other forms of communication like fix telephone lines and broadband internet however lag behind in growth (ITU, 2010)

The exponential penetration of mobile communication in Nigeria has been attributed to proliferation of prepaid plans by licensed providers, low-cost handsets, rapid expansion of mobile networks to different parts of the country and intense competition by service providers among other factors (Pyramid, 2010).

Evolution of mobile subscriptions Nigeria, 2001-2009
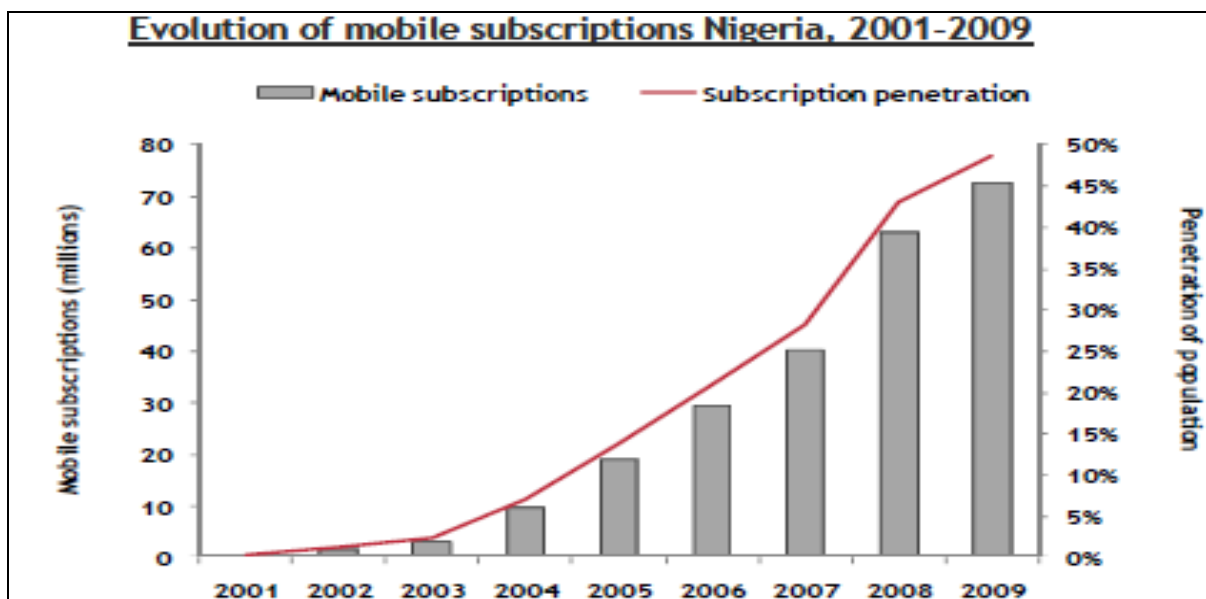
Source: Pyramid research/NCC, 2009

An impact survey by Pyramid research (2010) showed that mobile communication services positively influenced every aspect of the lives of Nigerians; access to information, improved business opportunities, enhanced social interaction etc. People living in rural and hard to reach areas in Nigeria have also benefited as they have better services due to increased competition by service providers and subsequent lowering of service price resulting from expansion of coverage by smaller Code Division Multiple Access (CDMA) operators (Pyramid research, 2009).

A strong oral culture, low literacy level coupled with absence of digitization of the numerous languages, have been identified as part of the reasons for the rapid growth of mobile communication in Nigeria (Gardener 1994; UNICEF 2005). In view of the above, the Fantsuam Foundation is working on making five minority languages of the Kafanchan area, in northern Nigeria available in digital format that will make them effective for text messaging.

There are various initiatives by service mobile service providers to address challenges like cost of starter packs, constant electricity supply for charging batteries being faced by mobile telephone users in Nigeria, most especially those who live in rural areas. An example is the rural telephony project by MTN (see Figure 5.7 pg.34). There are other initiatives by network providers in partnership with other private organisations that are aimed at improvement of services and reaching the underserved in rural Nigeria. Some of the initiatives are shown in table 5.3 (Page 35), see annex for initiatives in other sectors).

Rural Telephony Project startup package and a phone lady on the outskirts of Suleja, a city of 105,000 inhabitants north of Abuja

Key Aspects of the Rural Telephony Project in Nigeria

The program is a cooperation between the Growing Businesses Foundation (GBF), a Nigerian NGO, MTN Foundation (MTNF), which is the CSR arm of MTN Nigeria, the International Finance Corporation (IFC) and a group of small communal microfinance institutions (MFIs).

A startup package, provided by MTNF, includes loans that range between N14,200 and N21,400 ($95 and $140), depending on optional material in the package, payable over a six-month period, and carry a 15% annual interest rate.

The startup packages include a Nokia phone, an MTN SIM card, an optional antenna to boost the wireless signal, a solar charger, subsidized MTN airtime, promotional material. The promotional material is comprised of a table, an umbrella, chairs, banners showcasing call rates, a hat and a T-shirt.

To date, the program has benefited 1,500 Phone Ladies in rural and semirural Nigeria. These beneficiaries operate in 21 of the country's 36 states.

Source: Pyramid Research, 2009

The Labarinku A Tafinku (Your News in Your Palms) initiative pioneered by the BBC team, gave mobile phones to six villages in northern Nigeria so that they can send in reports and pictures about their communities (BBC, 2010). The role of mobile communication in health in Nigeria is however still very limited. There are a few programs which are at their pilot stages, examples include;

5.5.1 Learning about Living: a collaborative Education and Awareness pilot program that provide young Nigerians with an anonymous forum to learn about health, AIDS, sex, relationships, personal development, and living skills. The program uses an interactive eLearning tool based on the Nigerian Family Life and HIV/AIDS Education (FLHE) curriculum, as well as the mobile phone-based programs MyQuestion and MyAnswer (See Table 5.2). My Question allows Nigerian youths to submit questions via text message, a telephone hotline, or online, while My Answer uses trained volunteers to answer these questions and also send out questions every month and select winners based on responses submitted via the web or text message. The two-year project, launched in February 2007, was piloted in three locations in Nigeria, and saw early success receiving more than 2,500 questions in the first five days and 10,000 questions in the first month (pyramid, 2010)
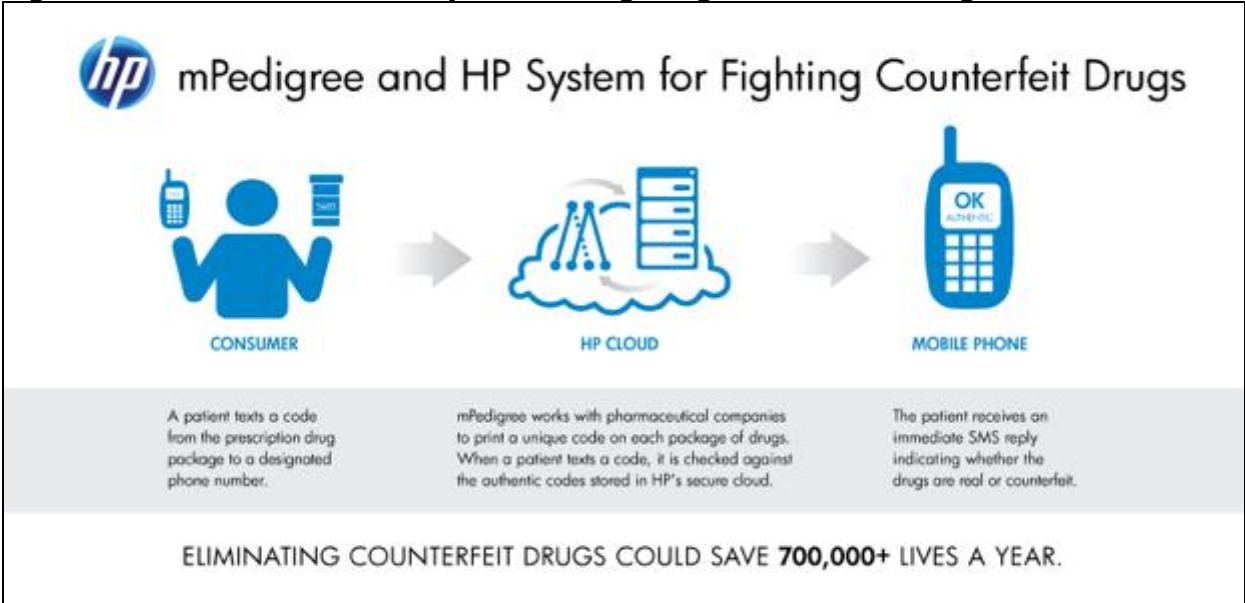
Table 5.2 Mobile communication technology projects in Nigeria

Vertical		Nigeria	International
Rural Connectivity		Millennium Village Pampaida- extend telephony services to hard to reach rural areas	India: Gramjioti Pilot Program- provide mobile broadband connectivity to villages and towns around Chennai in India
Rural Connectivity		Rural Telephony Program- train and support local villagers to provide mobile based pay-phone services	Uganda: Village Phone- train and support local villagers to provide mobile based pay-phone services
Education		Ladybird Mobile Reading Program- support classroom activities through mobile based educational exercises	South Africa: Dr. Math- leverage the MXit mobile social platform to provide tutoring services
Health		My Question, My Answer- SMS and phone operator based educational and counseling program covering the HIV/AIDS topic	Uganda: Text to Change- SMS based interactive quiz and educational tool covering the HIV/AIDS topic

Source: Pyramid research, 2009.

5.5.2 mPedigree project: This pilot project in Nigeria and Ghana is a partnership between mPedigree and Hewlett Packard aimed at fighting fake and counterfeit drugs (see figure 5. 8). It makes use of an SMS-based system that allows users to text for free from their phone, single-use numeric code on drugs revealed by scratch card method. The user then gets an instant response if the drug is genuine or counterfeit (Zax, 2010).

Figure 5.8 mPediree and HP system for fighting counterfeit drugs

mPedigree and HP System for Fighting Counterfeit Drugs

CONSUMER — HP CLOUD — MOBILE PHONE

A patient texts a code from the prescription drug package to a designated phone number.

mPedigree works with pharmaceutical companies to print a unique code on each package of drugs. When a patient texts a code, it is checked against the authentic codes stored in HP's secure cloud.

The patient receives an immediate SMS reply indicating whether the drugs are real or counterfeit.

ELIMINATING COUNTERFEIT DRUGS COULD SAVE **700,000+** LIVES A YEAR.

Source: Fast company, 2010.

5.6 Linking mobile communication with polio eradication

The role of mobile communication is already being evaluated in polio eradication in northern Nigeria in form of easy to use data collection software named Episurveyor. It is designed for "low-end" mobile phones and is an open software requiring low-technical expertise (GPEI, 2010). Mobile telephones have the advantage of real-time transfer of data and easing the burden of manual data entry. It has been successfully utilised to stop an outbreak in Kenyan following the importation of polio (BBC, 2008). The success of the interventions included the re-distribution of the vaccines where field stocks were running out, dispatch of supervisors for problem-solving, staff and transport redeployment, immediate investigation of suspected cases, and re-enforcement of radio messages from communities, enabled campaign supervisors to make real-time evidenced based decisions (GPEI, 2010).

In the year 2000, India vaccinated over 151 million children during one NID round; the highest recorded yet (UNICEF, 2003). A special arrangement was made with India's national telecoms authority to replace the ring tone with a recorded message that reminded the public of the NID date whenever a call was dialled. This was done alongside regular mass media using electronic and print advertisements to announce the date in 18 national local language dailies explaining the need for polio drops (UNICEF, 2003).

There seems to be an anecdotal connection between the use of mobile telephone and improved immunization rounds

Summary of chapter 5

Mobile communication is the fastest growing aspect of Information and Communications Technology (ICT) worldwide most especially in developing countries. It is estimated by the ITU that there are over 5 billion mobile communications subscribers and over 64% reside in developing countries. Evidence showing its contribution to health in developing countries is however anecdotal, with most programs in Africa still in their pilot stages.

A few examples were reviewed in this chapter. Projects Masiluleke and Txtalert and Socialtxt both used text messaging and voice services in form of hotlines to reach HIV/AIDS patients, abused women and children with cleft lip respectively, with the aim of improving their awareness at little or no cost to the user.

Nigeria has one of Africa's fastest growing mobile communication subscriber base; with over 96million subscribers in 2011 compared to internet users. Literature shows that there is increasing access even in rural areas, driven by competition between network providers and partnership initiatives between network providers and cooperate

organisations aimed at advancing benefits of mobile phone to those in rural areas. There are however very few literature and evidence linking mobile telephone to health in northern Nigeria.

Episurveyor is an easy to use data collection and management software which has helped to stop outbreak of polio in Kenyan and is currently being evaluated in Nigeria. There is however no study available linking the use of mobile communication in the polio eradication communication strategy.

CHAPTER 6: DISCUSSION AND RECOMMENDATIONS

6.1 DISCUSSION

Polio virus is a highly infectious agent that affects mostly children under 5 years of age and may cause Acute Flaccid Paralysis and in some cases death. With over 350,000 children were being paralysed annually worldwide, the WHA made a policy statement to eradicate polio by the year 2000 -- GPEI. More than a decade beyond the initial set goal, the GPEI still faces challenges eradicating poliomyelitis from 4 endemic countries; Afghanistan, Pakistan, Indian and Nigeria.
This thesis examines potential role of mobile communications technology in the PEI in northern Nigeria.

Chapter 3 examined available literature on the factors that influence the PEI in northern Nigeria. According to Fine (2009), the problem of it is clearly failure to vaccinate due to low coverage from poor public confidence and lack of political will. Both factors were explored from supple side barriers; health system factors, immunization technical components, such as quality of service; cold chain and logistics; surveillance, reporting, and data management, training, supervision, and monitoring, environmental and Political factors and demand side barriers namely factors affecting knowledge, attitudes, Religion, beliefs or health-seeking behaviours, literacy levels etc.
Further analysis of supply side barriers showed that positive improvements have been made in vaccine supply and leadership commitment, and ongoing attempts at scaling up and sustaining the progress already made.

However, analysis of the demand side barriers identified two main groups, who are either resistant to oral polio vaccine because of fear of safety and side effects, confusion due to rumours about intentions

of the international communities to reduce Muslim population, or those who are apathetic towards the activities of the PEI, either because they prioritize earning daily living due to their social economic status or simply because they are not aware of the, time date and need for the vaccine. Cheng (2008) however concluded that the resistance was actually due to communication gap.

Analysis of communication interventions in chapter 4 shows that an integrated communication strategy which includes Advocacy, social mobilization and Program communication (BCC) is critical in ensuring that every child is fully immunized.

6.1.1 Mobile communications in northern Nigeria

Coverage: Nigeria has experienced rapid penetration of mobile communications technology in the last decade. Continued proliferation of and competition among network providers coupled with emergence of low-cost mobile phone devices have helped to ensure coverage and spread to rural areas, including those in northern Nigeria. The ITU (2010) estimates show that the global access to mobile networks is 90% of world population with 80% living in rural areas. The rural connectivity projects in Nigeria are initiatives aimed at providing telephone access to those in hard to reach areas.

Acceptance: Mobile communication devices are widely accepted communication tools in northern Nigeria; cutting across political, religious, cultural and social economic and gender divides. They have the advantage of mobility, portability, low cost maintenance when compared with other ICT tools like laptop computers. According to Gardener and UNICEF (1994; 2005), a strong oral culture, low literacy level coupled with absence of digitization of the numerous languages, have been identified as part of the reasons for the rapid growth of mobile communication in Nigeria. Those this holds true for those who rely on voice call function of mobile phones which unfortunately is more expensive compared to text messaging which is relatively cheaper and more widely used.

However, private foundations like Fantsuam Foundation is working to make some minority languages in northern Nigeria available in digital format that will make them effective for text messaging.

The concept of mobile phone boots (umbrella boots) where those without mobile phones can makes calls at low rates and receive calls for almost free also help to improve access to hard-to-reach and poor people in rural northern Nigeria.

Efficiency: Mobile communications technology due to its multi-modal and ubiquitous nature has the ability to reach a larger audience as a mass media campaign tool and also targeted or segmented audience. It also has the added advantage of being instant and real-time and has the quality of

being direct and private for those who own their own mobile device. With MMS capability in some low-end mobile phones, pictures and posters can be sent directly to parents and caregivers who are illiterate and cannot read text messages even in their own languages.

Voice calls: Voice calls are traditional telephony feature of mobile devices that allow for conversation but are however expensive most especially for the poor and those in rural areas. The "Push voicemail" which does not require the recipient to be literate could be used to send pre-recorded voicemail message (which could be a personalised message from a political, traditional or religious leader) directly to parents and caretakers about polio immunization and reminders. However, some users do not know how to access their voicemail boxes. Such individuals may benefit from application of pre-recorded messages to their ringtones which can be heard when they make or receive calls, as exemplified by the pilot in India (UNICEF, 2003).

SMS (text messaging): SMS applications for health purpose could be done either passively, an example being appointment reminders, where the patient only has to provide their mobile phone number and he or she is sent a text message but does not have to respond, or actively, which involves two-way messaging which enables citizens to have an interactive access to health information on demand. Compared to other communication media like voice-based information hotlines, radio and television, SMS has several advantages including cost-effectiveness, scalability, convenience, and broad reach.

These features can be modified and integrated into polio eradication program in northern Nigeria to educate parents and care-givers about polio, remind them of up-coming immunization days, and provide a platform for addressing questions related to polio vaccines on demand.

Cost effectiveness: The United Nations Foundation (2008) gives credit to m-Health as a viable solution to addressing pressing health needs through its high reach and low cost mechanism thereby increasing health accessibility, effectiveness and affordability across developing world. Literature search however revealed no quantifiable evidence of m-Health interventions as most pilots are fragmented and sporadic.

In chapter 4 above, Waisbord (2004) reports that social mobilization and communication committees (SMCCs) have limited staff and resources particularly at the state and LG levels which makes most SMCCs active only a short time before NIDs, with plans put together haphazardly. There is therefore need for research on the human resource requirement and cost-effectiveness of mobile communication in polio eradication campaign, compared to other communication media and strategies.

6.1.2 Role of organizations involved in PEI in northern Nigeria

Most literature reviewed for this study show that pilot programs and advances in m-Health are pioneered by NGO's and private cooperation with support from International organizations. There are however very few

of such pilot programs and literature linking mobile telephone to health in northern Nigeria.

Building on ready-made projects: Organizations working on polio eradication in northern Nigeria should partner with network providers and other relevant organizations in order to explore beneficial strategies. A good example is the Labarinku A Tafinku (Your News in Your Palms) initiative pioneered by the BBC team, which has empowered six villages in northern Nigeria with mobile phone devices so they can send in reports and pictures about their communities (BBC, 2010). This can serve as a model or platform for communication of polio eradication messages.

6.1.3 Role of various levels of governments: Like most developing countries, the role of various levels of government in Nigeria in the development of m-Health is not yet documented. Federal, state and LGs should formulate policies that promote and encourage Public-Private Partnership (PPP) in the research and implementation of mobile communication in polio eradication.

Human and financial investment should be made by government (both federal and states) in order to ensure sustainability of the m-health initiatives alongside other polio communication efforts.

6.1.4 Future of expectations mHealth: The past decade has seen growing improvement in the application of low-feature mobile phone devices. The advent of Smartphones and PDAs that have data and internet capability, coupled with "Social network" applications like Facebook and Twitter, have revolutionised communication and even facilitated the overthrow and removal of long-term dictators across developing countries.

6.2 Recommendations

This thesis after careful examination of factors influencing the polio eradication and review of communication interventions concludes that mobile communications technology has the potentials of strengthening polio eradication communication efforts. While not suggesting replacement of present communication strategies, it lends voice to the need for research-driven, strategic and integrated communication effort in the fight to eradicate polio from northern Nigeria and other polio endemic countries. It is hoped that this will be achieved through commitment from Nigeria government and organizations involved in the global fight against polio.

The findings from have lead to the following recommendations

1. There should be unrelenting and continuous search and application

of new and innovative communication strategies to reach underserved communities.

2. There should be continuous research aimed at exploring concrete evidence about the effectiveness of mobile communication in the PEI in terms of efficiency and cost/effectiveness.

3. The federal and state government in northern Nigeria should invest human and financial resources in research and development of m-health and also create policies that promote and enabling environment for formidable and sustainable public-private partnership between organizations working in polio eradication and mobile communication network providers in Nigeria.

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ANNEX

Source: NPC, 2008.

Source: Pyramid research/NCC 2009