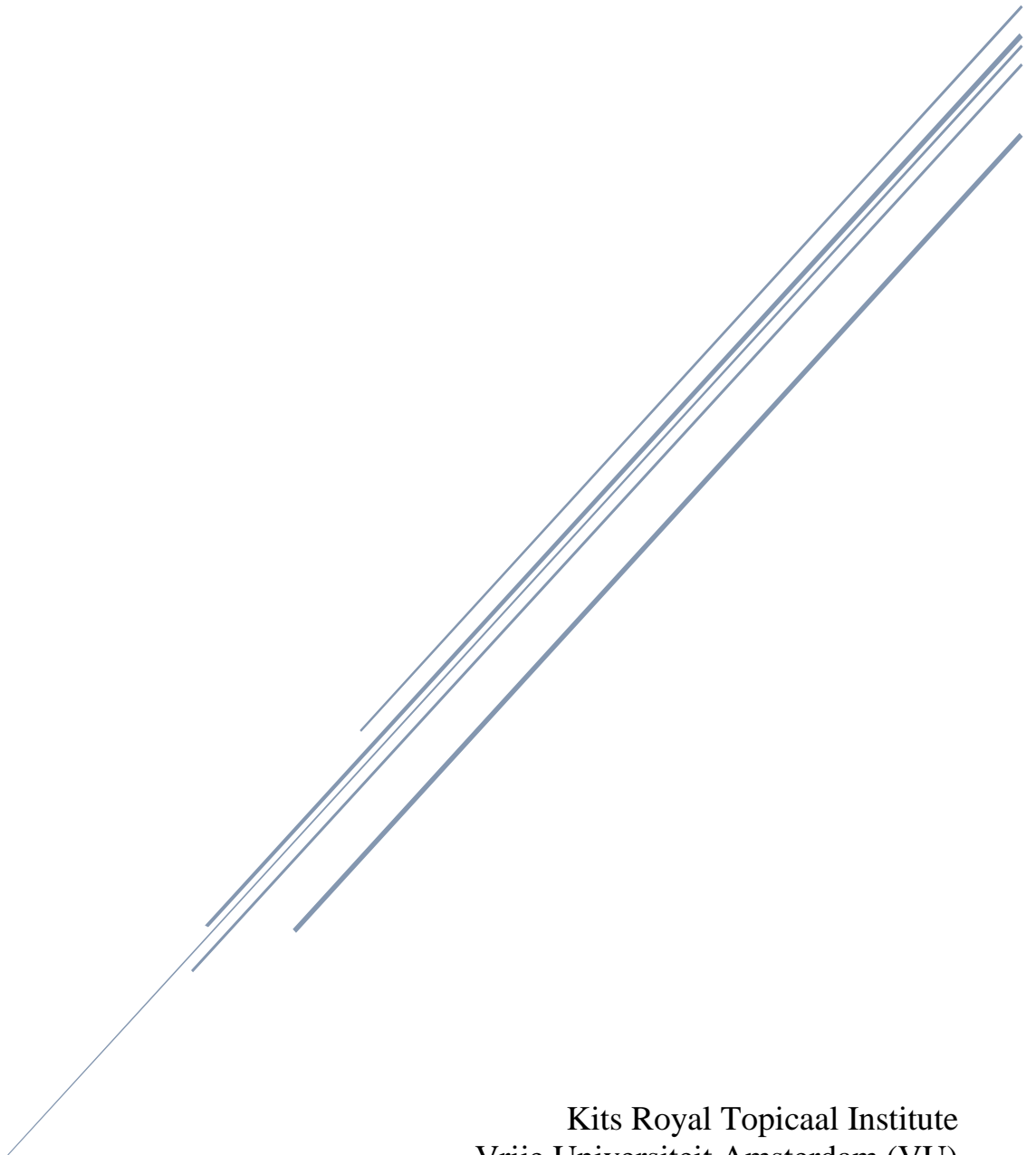


FACTORS INFLUENCING CHILDHOOD IMMUNISATION UPTAKE AMONG UNDER-FIVE CHILDREN IN NIGERIA: A MIXED METHODS STUDY

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A thesis submitted in partial fulfilment of the requirement for the degree of Master of Science in
Public Health

By

Inyang Iniofon Ekan

Nigeria

Declaration: Where the work of other people from a printed source, the internet, or any other
source has been used, it has been dutifully acknowledged and referenced in accordance with
departmental standards.

The thesis, **Factors Influencing childhood immunization uptake Among Under-Five
Children in Nigeria: A mixed methods study** is my own work



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LIST OF ABBREVIATIONS

AEFI	Adverse Effects following immunization
BCG	Bacillus Calmette–Guérin
DALYs	Disability – Adjusted life year
DPT+Hb+Hib	Diphtheria, Pertussis, Tetanus, Hepatitis B, and Haemophilus
EPI	Expanded Immunisation Program
EU	European union
FCT	Federal Capital Territory
FMOH	Federal Ministry of Health
GDP	Gross domestic Products
HIV	Human Immuno deficiency virus
LGAs	Local Government Areas
LGAs	Local Government Areas
LMIC	Low middle income countries
NDHS	Nigerian Demographic Health Survey
NPHCDA	National Primary Health Care Development Agency
NPI:	National Program on Immunisation
OPV	Oral Polio Vaccine ,
PCV	pneumococcal conjugate vaccines.
PHC	Primary Health Care
REW	Reach Every Ward Strategy
RI:	Routine Immunisation
SAGE	WG Strategy Advisory Group of Experts working
SAGE	Strategy Advisory Group of Experts
SDGs:	Sustainable Development Goals
SIAs:	Supplementary immunisation activities
TRLs	Traditional and Religious leaders
U5M	Under five mortalities
UHC	Universal Health Coverage

UNICEF United Nations International Children's Emergency Fund

VPDs Vaccine Preventable Diseases

WHO World Health Organization

DEFINITION OF TERMS

Immunisation- Immunisation according to World Health Organisation (WHO) is defined as the process whereby an individual is made immune or resistant to an infectious disease, through the administration of a vaccine..

Immunisation coverage- Immunisation Coverage (IC) is the percentage of under five children protected against the six- killer EPI related diseases measles, poliomyelitis, diphtheria, pertussis (whooping cough), tetanus and tuberculosis.

Vaccination- is a an effective way of preventing individuals from infectious diseases before they are exposed to them.

Vaccines- A medication that is used to boost the body's immune response to diseases.

Immunization Drop out rate- is defined by comparing the number of infants who start the immunization schedule with the number who complete it. Pentavalent vaccine is always use to measure this.

Under five mortality- is the likelihood that a child born in a given year or period will die before reaching his 5th birthday.

Vaccine Preventable diseases (VPDs) - are infectious illnesses caused by viruses or bacteria that can be avoided through vaccination.

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ABSTRACT

Background: Under- five mortality rate remains high in Nigeria at 113.8 per 1000 live births. About 25% of these deaths could be avoided with interventions such as immunisation yet in Nigeria, only 31% of children aged 12-23 months are fully immunised. This study aimed to identify factors influencing the uptake of immunization services in Nigeria in order to proffer recommendations to improve immunization uptake in Nigeria, using Sokoto and Anambra as focal states.

Methodology The study used mixed methods consisting of secondary analyses of cross-sectional data from the 2018 Nigeria Demographic and Health Survey and a literature review. The factors influencing immunization were analysed using the SAGE Working Group Vaccine Hesitancy model.

Results: Factors such as religion and low level of mother's education were significantly associated with reduced uptake of immunization in both states. Mothers who were Muslims were less likely to have their children fully immunized. Factors significant only in Sokoto was the child's place of delivery while mother's marital status was significant only in Anambra. Literature showed in addition to other factors, that low maternal education and religion were directly linked to uptake of immunisation in both states but more prominently in Sokoto.

Conclusion: Immunization programmes targeting the states should be better contextualised to address the identified issues. Ensuring meaningful involvement of religious leaders as well as policies that strengthen maternal knowledge on immunisation services is critical for the uptake of immunisation in both states.

Key words: Childhood Immunisation, Under- five children, Vaccine Preventable Diseases, Drop-out rate, Nigeria

Word Count- 237 words

CHAPTER ONE

INTRODUCTION

Childhood infectious diseases remain one of the major causes of under-5 morbidity and mortality worldwide. In 2018, the total number of children less than five years of age was about 679 million globally.(1) Approximately 5.3 million of these children died of all causes in 2018, out of which 700,000 died from vaccine-preventable infectious diseases. Notably, about 99% of these children lived in low- and middle-income countries (LMIC).(1)

Studies have shown that 25% of deaths in children under-5 years of age could be prevented by the childhood vaccination. (2) It is in this regard that the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) developed the Global Immunisation Vision and Strategy (GIVS) with the objective of increasing the number of children immunised against preventable diseases globally. Strategies such as a routine immunisation (RI) for eligible individuals and episodic supplementary immunisation activities (SIAs) were employed to ensure high immunisation coverage.(2)

WHO defines immunisation as the process whereby an individual is made immune or resistant to an infectious disease, through the administration of a vaccine.(3) .(4)

The Expanded Programme on Immunisation (EPI) was launched by World Health Organization (WHO) in 1974 to tackle infectious childhood diseases such as measles, poliomyelitis, whooping cough, pertussis, Tetanus, Diphtheria and Tuberculosis . It was adopted in Nigeria in 1979 and in 1997, the programme was restructured and renamed the National Programme on Immunisation (NPI) which became a parastatal of the Federal Ministry of Health (FMOH).(2)

According to the NPI in Nigeria, recommended vaccines for children under 5 years include Bacillus Calmette–Guérin (BCG), oral polio vaccine (OPV), Diphtheria, Pertussis, Tetanus (DPT), Hepatitis B (Hb) and Haemophilus Influenza type B (Hib) vaccines also known as Pentavalent vaccine, Measles and Yellow fever vaccines, and these are provided at no cost.(4) For a child to have said to fully vaccinated , that child must receive at least:

- One dose of BCG vaccine, which protects against tuberculosis given at birth or during the first contact with the health care provider.
- Three doses of Pentavalent((DPT+Hb+Hib) vaccine, -containing vaccine, which protects against diphtheria, pertussis (whooping cough), tetanus, Hepatitis B, and Haemophilus Influenza type B given at 6, 10, and 14 weeks of age.
- Three doses of OPV at 6, 10, and 14 weeks of age (excluding polio vaccine given at birth).
- One dose of Measles vaccine given at 9 months of age to prevent measles disease.(5,6)

These vaccines are recommended to be taken before the first birthday of the child according to the National Immunisation Schedule, over the course of five visits, including the doses delivered at birth. Nigeria's immunisation schedule allows children who didn't receive their regular vaccinations during the first year of life to receive them between the ages of 12 - 23 months and 24 - 35 months which is the first and second important indicators of immunisation

coverage respectively based on age-appropriate immunisations. In alignment with the NPI schedule, a child aged 24-35 months is said to have received all age appropriate vaccinations after collecting second measles dose at 18 months in addition to all age-appropriate vaccinations for 12-23 months old child.(4,7)(8)

Global vaccination continued to decline in 2021, with 25 million children missing out on lifesaving vaccines, a two million increase over 2020 and a six million increase over 2019.(9) 60% of the 25 million children who were either unvaccinated or had incomplete vaccination, lived in 10 countries including Nigeria.(10)

If the global immunisation coverage targets are achieved, it is estimated that immunisation will avert almost six million deaths annually, saving 386 million life-years and 96 million disability-adjusted life years (DALYs) globally. (11)

In most Sub-Saharan African countries including Nigeria, the number of children receiving routine immunisation has been very low over the last ten years. More than 60% of African children miss out on RI annually.(12)In Nigeria, over four million children missed out on one or more vaccination yearly between 2017 and 2018, thus making it the country with the highest number of unvaccinated children in the world and one of the highest contributors of under-5 mortality (U5M) in 2019.(13)

Immunisation remains one of the most cost-effective means of attaining the Sustainable Development Goals (SDGs), particularly SDG 3, “Ensure healthy lives and promote well-being for all at all ages”. It also aligns with the Universal Health Coverage mandate in terms of coverage and equities when the uptake of the services is increased and distributed to all children.(14)(15)

Significantly, Immunisation reduces childhood illness and death, impairment of children’s growth, cognitive function and also economically reduces families’ expenditure on health care thereby reducing the catastrophic impact on household income.(16)

Background

Country Profile

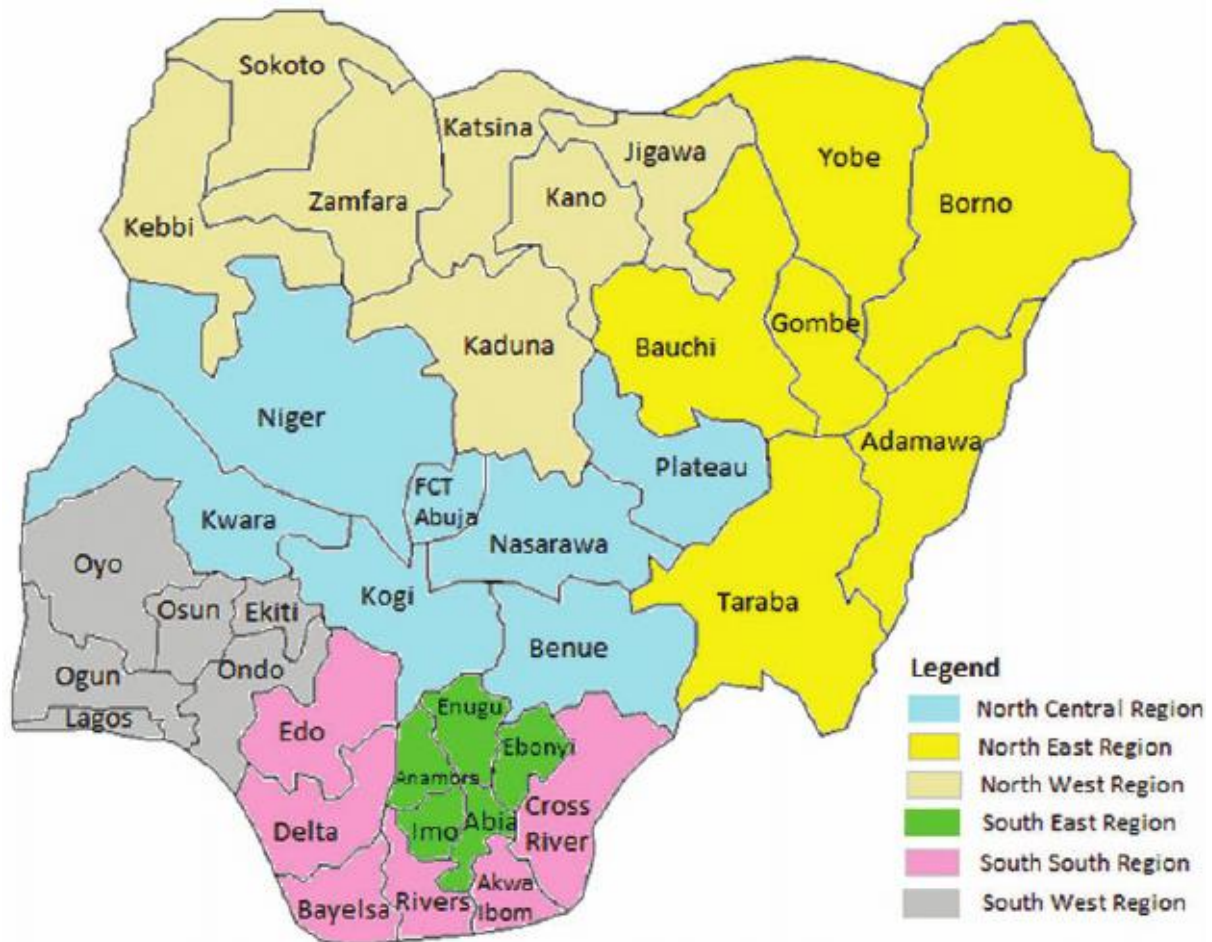
Nigeria is the most 7th most populous country in the world and 1st in Africa with an estimated population of about 217 million people (projected from 2021) at 2.6 percent annual growth rate. It is surrounded by Benin Republic, Niger, Cameroon and Chad.(17,4)

While the country has a high annual birth rate, it also has a high infant and U5M rates of 58 and 115 deaths per 1000 live births, respectively in 2020 with the highest percentage of child mortality reported in the northern Nigeria.(8) More than 40% of this mortality is attributed to Vaccine Preventable diseases (VPDs).(19)(20)

The country consists of 36 states and the Federal Capital Territory (FCT). The states are categorized into six geopolitical zones namely the North-Central, North-West, South-West, South-East and South-South. There are 774 Local Government Areas (LGAs) across all the states.(21)Nigeria has approximately 250 ethnic groups and each of these groups are led by traditional rulers that serves as role models to the communities.(22)

About 52.0% of the Nigerian population practice Islam, 48% practice Christianity while 10% are traditional worshippers. The Muslims predominate in the northern states while Christians predominate in the south.(23)(24)Although the country has over 500 different dialects, Yoruba, Hausa, and Igbo are the main languages spoken in the country with English serving as the official language. (25)Nigeria currently has the largest economy in Africa, with oil and gas exports, financial services and telecommunications as its primary economic sectors.(26) About 46% of the Nigerian population reside in the urban area .

Figure 1: displays the map of Nigeria showing the 36 states and Federal capital territory with six geopolitical zones.



Source- ResearchGatehttps://www.researchgate.net/figure/Map-of-Nigeria-showing-the-36-states-and-Federal-Capital-Territory-FCT-Abuja_fig1_260023562

Figure 1: Map of Nigeria showing the 36 states and Federal capital territory with six geopolitical zones

Nigerian Health Sector

Nigerian's health system is a decentralized system engrafted in the country's 1999 constitution. It operates under three levels of care, primary, secondary and tertiary regulated by the three tiers of government (federal, state and local). (27) Nigeria's gross domestic product is the highest in Africa, yet its per-capita income is low - around 770 000 Naira (US\$2000) -and its income, wealth, and consequently health are all distributed inequitably. (28)The nation has a gross national income per person of \$5,360 and spends roughly 6% of its Gross Domestic Product GDP on health.(27)

As of 2017, the country had over 30,000 Primary Health Care (PHC) facilities which are designated to be the first entry point to health care for all individuals, yet about 60-90% bypass the PHC facilities to the secondary and tertiary facilities.(29) 60% of care in the country is provided by the private sector while 40% is provided by the public sector. About 40% of Nigerians are poor, have unhealthy social environments that causes ill health, and constantly run the risk of incurring catastrophic costs due to significant out-of-pocket health expenses. More than two-thirds (77 %) of health care in Nigeria is funded by out-of-pocket. (30)

The FMOH is responsible for formulating policies as well as overseeing the affairs of the tertiary and referral hospitals in the country. Immunisation service is one of the key components embedded in the PHC integrated service package which is regulated and managed by the National primary Health Care Development agency (NPHCDA).(31) The NPHCDA is a parastatal under the FMOH. As one of its roles, the NPHCDA in collaboration with UNICEF procures all childhood vaccines in the country and manages all essential services in the PHC including immunization.(32)(33)

Nigeria’s Childhood Vaccination Schedule

Based on the WHO schedule, a child is expected to receive one dose each of BCG, hepatitis B, and oral polio vaccines at birth or within the first two weeks of delivery. At six, ten, and 14 weeks of age, a child is expected to have three doses of oral polio, pentavalent and pneumococcal conjugate (PCV) vaccines. Also administered at 14 weeks of age is inactivated polio vaccine (IPV) while Rotavirus vaccine is scheduled at 6 and 10 weeks but is yet to be introduced in Nigeria and most low-income countries. Lastly, Measles vaccine is to be administered at nine months while Human Papilloma vaccine is scheduled at nine years but is also yet to be introduced in the country.(34) The routine immunisation schedule according to the NPI is detailed in Table 1. (50,51)

Table 1: Immunisation schedule in Nigeria

Recommended Vaccines	Time schedule for administration of vaccine
BCG (Bacille Calmette-Guerin)	birth or as soon as possible first contact with health care provider
OPV (Oral Polio Vaccine)	6, 10, and 14 weeks of age
Pentavalent vaccine (Diphtheria, Pertussis, Tetanus, Hepatitis B and Hib)	6, 10, and 14 weeks of age
Inactivated polio vaccine (IPV) and Pneumococcal Conjugate vaccine (PCV)	14weeks
Measles vaccine, yellow fever vaccine and Vitamin A,	9 months of age

CHAPTER TWO

Problem statement

Immunisation is one of the most effective public health interventions that significantly contribute to the reduction of childhood morbidity and mortality which has been a major public health challenge in Nigeria. Unfortunately, immunisation coverage has remained tremendously low in Nigeria despite efforts put in place to increase the utilization of immunisation services.(35)

Consecutively, for the last five years (2017-2021), Nigeria has remained the country with the highest rate of U5M. (36)For instance, in 2019, Nigeria contributed over 0.9 million deaths to the 5.8million global under-5 mortality which made the country the highest contributor to global U5M. (37) As of 2020, the global (U5MR) fell to 37 deaths per 1000 live births, yet children in Sub-Saharan Africa still rank the highest at 74 deaths per 1000 live births in the world which is 14 times higher than the risk for children in Europe. In that same year, Nigeria had 114 deaths per 1000 live births.(36,38) A large proportion of these infections attributed death can be prevented if all the children were immunised.(39)

The Nigeria Demographic Health Survey (NDHS) 2018 reported that only 31% of Nigerian children aged 12-23 months had completed a full course of routine immunisation. This implies that only 3 out of every 10 age children 12-23months were fully vaccinated, 7 out of 10 children had not received full vaccination with some receiving as low as just one vaccine. The data also shows that 19% of Nigerian children had not received any form of vaccination. (14,40)

The immunization uptake in the country shows a wide disparity across the six geopolitical zone ranging from 76% in the South-East to 5% in the North-West.(10) In 2018 according to the NDHS, immunisation coverage was highest in the South-East (Anambra) at 76% and lowest in the North-West (Sokoto) with 5%. (14)Sokoto State has consistently had the lowest immunisation coverage in Nigerian surveys over the last decade.(41)

Figure 2 shows the trend of childhood vaccination in Nigeria aged 12-23months in the past 15 years, indicating that there have been some improvement in the uptake of vaccine with increased percentage of vaccinated children from 13% in 2003 to 31% in 2018 and also percentage of children that did not take vaccination reduced from 27% in 2003 to 19% in 2018. (14,42)

Childhood Vaccination Trend of Children age 12-23 months in Nigeria

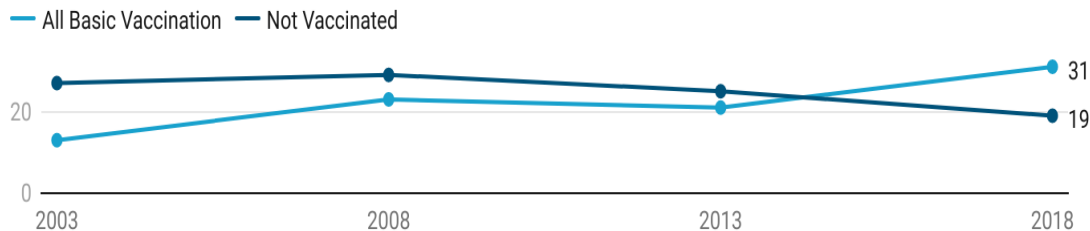


Chart: Dataphyte • Source: Nigeria Demographic Health Survey • Created with Datawrapper

Figure 2; Childhood vaccination trend of children age 12-23 months in Nigeria, Source: NDHS

While this trend is positive, Nigeria still has a long way to go to meet SDG 3's target of achieving more than 90% coverage of all basic vaccinations among children aged 12-23 months. Nigeria's childhood vaccination coverage also falls short of the Global Vaccine Action Plan (GVAP) targets, (43) putting a large number of children at risk of death and vaccine-preventable diseases in the future.(40,42)

Sokoto State has the lowest immunisation coverage of the 36 Nigerian states and is also one of the states with high maternal deaths.(44)(45) For instance, in 2012, the country contributed about 95% of the total burden of polio cases in Africa and 50% in the world. (39) It is also one of the northern states in the country where Muslim religious leaders asserted vehemently that the polio vaccines were tainted with anti-fertility agents (oestradiol hormone), HIV, and cancerous agents and was seen as part of a scheme by western governments to drastically reduce the Muslim populations in the world. These claims were made under the auspices of the Supreme Council for Sharia in Nigeria (SCSN) in 2003.(46) Although unfounded and merely speculative, these allegations sparked a 16-month debate that had major repercussions, including the spread of Circulating Vaccine-Derived Polioviruses (cVDVP) specific to northern Nigeria and re-infection of southern Nigeria and eleven other countries in western and central Africa (Ghana, Togo, Benin, Burkina Faso, Chad, Côte d'Ivoire, Cameroon, Sudan and Botswana).(23,47) Sokoto state was also found to have the highest burden of Measles virus disease in 2016.

Furthermore, the ongoing armed insurgency and armed banditry noticed predominantly in the northern part of the country has disrupted health services delivery including routine immunisation which has led to many children not receiving all of their recommended vaccination.(48)(49) This has translated into Nigeria being ranked as the country with the highest number of unvaccinated children impacted by conflict. (50,51)

The immunisation coverage in the country has further been worsened by the Covid-19 pandemic. The mitigation measures to address the pandemic interrupted the delivery of essential services including immunisation which led to a 15% drop in immunisation coverage in the country in 2020. Recent studies show that in 2021, the northern states had the highest record of U5M in Nigeria. In that same year, Anambra was one of the states with the lowest U5M. (52)(53)

On a population level, the added benefit of vaccination is the ability to create herd immunity. Transmission of the infectious agent is reduced or stopped when a sufficiently large percentage

of the population is immunized, protecting those who aren't immunized. As such, herd immunity will be very low in states where immunisation coverage is low.(54)(55)(56).

Low immunisation coverage poses serious health threats to the child, families, community and the country as a whole in terms of increased risk of disability which reduces cognitive ability, school enrolment, productivity in life, catastrophic spending on medical cost; and cost to the economy in terms of outbreak of disease and greater national expenditure on health care.(57)

Justification

Attaining good immunisation coverage is a key indicator in the achievement of the SDG 3 as well as a core component of Universal Health Coverage (UHC).(58)

Despite the scale up of various interventions such as mass campaigns, house-to-house and door-to-door immunisation, training of health care workers on counselling and educating families on the importance of immunisation, immunisation uptake in Sokoto state is still very low.(59,60)

Several studies have reported on factors associated with low coverage of childhood vaccination as well as low completion rate in different parts of Nigeria and even in the north-west zone but unfortunately hardly any study have identified the factors associated with the persistent low uptake of childhood vaccination in Sokoto state, hence the need for this study.(57)

Over the years, the south-eastern part of the country has consistently been the top states with the highest uptake of immunisation services in Nigeria . In 2018, Anambra state had the highest coverage at 76%. This specifically highlights the reason why Anambra is a focus state for this study - to gain insight into factors contributing to the relatively high uptake of immunisation in the state and compare with factors influencing uptake of immunisation in Sokoto in order to make recommendations aimed specifically at increasing immunisation utilisation and coverage.

It is also important to note that though Anambra is at 76% coverage, this is still below the national and global targets of more than 90%, so there is still the need to increase the coverage in Anambra state as well.(14,40)

This study will explore the factors influencing the uptake of immunisation among under-5 children in Sokoto and Anambra states in Nigeria. It will generate evidence to support policymakers to generate context specific interventions that will lead to increased uptake of immunisation services..

Research questions

1. What is the uptake and drop-out rates of childhood immunisation in Sokoto and Anambra states?
2. What are the factors influencing the uptake of immunisation among children in Nigeria and specifically in Sokoto and Anambra states?
3. What are the differences in factors associated with immunisation uptake in Sokoto and Anambra states?

Broad objectives

To explore the factors influencing the uptake of immunisation among under-5 children in Sokoto and Anambra states in Nigeria in order to proffer recommendations to policy makers for future interventions on immunisation programmes in the country.

Specific objectives

- 1- To describe the immunisation uptake and drop-out rates among under-5 children in Sokoto and Anambra states.
- 2- To examine factors influencing the uptake of immunisation among children in Nigeria, and specifically in Sokoto and Anambra states.
- 3- To identify differences in factors associated with the uptake of immunization among children in Sokoto and Anambra states.
- 4- To provide specific recommendations to policy makers on interventions to increase uptake of immunisation services in Sokoto and Anambra states.

CHAPTER THREE

Methodology

This chapter describes the methodology and conceptual framework used to address this study's research questions.

Research Design

This study employed a cross-sectional study design using mixed methods. The quantitative analysis was achieved through a secondary data analysis of the 2018 NDHS. Review of literature was used to achieve the qualitative aspect. Table 2 shows the methods used to achieve the study objectives.

Data Sources

This study was carried out using data from the **2018 NDHS**. The NDHS is a national survey that provides information on demographic and health indicators at the national and subnational levels.

The NDHS is conducted every five years by the National Population Commission in collaboration with other partners. The datasets were downloaded from the DHS electronic data management system <https://dhsprogramme.com/data/availabledatasets.cfm> on the 1st of April 2022, for the purpose of this research.

Literature and article search was carried out electronically Google and Google Scholar search engines and through Vrije University (VU) online library, MEDLINE and PUBMED databases. Identified keywords were used for the search using Boolean operators OR/AND. The keywords used are in annex 1.

Websites of relevant international and local health organizations such as WHO, Save the Children, UNICEF were consulted. Similarly, the website of relevant government agencies such as Ministry of Health, National Primary Health Agency were checked for policy papers, programmatic reports and other technical documents. The Snowballing technique, that is checking the reference list of articles for other relevant materials for this study was also carried out.

Inclusion criteria

The literature search was limited to only articles in English language from year 2007 to 2022. Relevant peer-reviewed and grey articles were identified selected for review.

Exclusion criteria

Studies reporting other child health indicators but without reference to immunization were excluded from the review. Studies conducted prior year 2007 and studies not in English were also excluded.

Table 2: Coordination matrix between research questions and methods

Research Questions	Research Methods	Data source
Overall objective: To explore the factors influencing the uptake of immunisation among under-five children in Sokoto and Anambra states in Nigeria in order to proffer recommendations to policymakers for future interventions on immunisation programmes in the country.		

1.	What is the uptake and drop-out rate of childhood immunisation in Sokoto and Anambra states?	Quantitative	Secondary data analysis of 2018 NDHS dataset
2.	What are the factors influencing the uptake of immunisation among under-five children in Nigeria?	Qualitative	Literature review
3.	What are the differences in factors associated with immunisation uptake among children in the focus states?	Quantitative	Secondary data analysis of 2018 NDHS dataset

Study Area

Sokoto State Profile

Sokoto state is situated in Nigeria's far north-western region. It shares its boundaries with the Niger Republic to the north, Kebbi State to the southwest, and Zamfara State to the east.(61)The population of the state is estimated to be about 3.7 million projected from 2022 population with a birth rate estimated at 7.0%.(62)(63). It has a land mass of 25,973 km²,

The residents of the state are majority Muslim and from the Hausa - Fulani ethnic group. There are 23 Local Government Areas (LGAs) in the state, with five being urban and 18 being rural.(61)Additionally, the state is split into four health zones with 586 operational health institutions (3 tertiary, 18 secondary and 565 primary health facilities). (64)

As a result of the ongoing Boko Haram insurgency and armed banditry in Nigeria predominantly in the north, health services delivery including routine immunisation services have been disrupted which has led to more children not receiving all their recommended vaccination.(48,65)

In 2019, the state had the highest number of residents (88%) living below poverty line.(66) and also ranked number one with the highest level of illiteracy. About 80% of females from Sokoto state between the ages of 15-24 years are illiterate.(67)

Anambra State Profile

Anambra state lies in the south-eastern part of the country. It is the eighth most populous state in Nigeria with a population of 4,2 million (projection from 2022) and a land mass of 4,710 km² area. The state has about 21 LGAs, 236 wards, and 177communities.(68)

Majority of the residents practice Christianity and speak the Igbo language. Agriculture, transport and manufacturing are the main occupations of the people. As of 2019, the poverty rate in Anambra state was below 15% less than the national rate of 64%. About 62% of the population in the state live in the urban area. (66)

The state has about 1,569 health facilities, of which 71% are private facilities. As of 2018, a total of 15 general hospitals and 65 PHCs were rehabilitated and equipped to deliver more comprehensive health services including Human Immuno-deficiency Virus (HIV) and immunization services. Anambra is one of the top ten states in Nigeria with the highest literacy rate at 98%(69). More than 90% of the female population in the state are literate.(67)

So far, there have been no Boko Haram insurgency or attacks in Anambra state security challenges are minor when compared to the North-west(70)

The Study Population

The study population included parents/ caregivers of under-5 children in Sokoto and Anambra states in Nigeria.

Quantitative Sample Design

The sample for the 2018 NDHS is a stratified sample selected in two stages. Stratification was achieved by separating each of the 37 states into urban and rural areas. In total, 74 sampling strata were identified. Samples were selected independently in every stratum through a two-stage selection. Implicit stratifications were achieved at each of the lower administrative levels by sorting the sampling frame before sample selection according to administrative order and by using a probability proportional to size selection at the first sampling stage.

In the first stage, 1,400 EAs were selected with probability proportional to EA size. EA size is the number of households in the EA. A household listing operation were carried out in all selected EAs, and the resulting lists of households served as the sampling frame for selection of households in the second stage. In the second stage's selection, a fixed number of 30 households were selected in every cluster by an equal probability systematic sampling.

The NDHS covers immunisation uptake of all children between the ages of 12-35 months in the six geographical zones of Nigeria. Data collection methods, sampling procedures, ethical considerations and other important part of the survey is found in the original survey report available online at www.dhsprogramme.com.

The key dataset for this study constituted children between the ages of 12-35 months age group with a sample size of 495 in Sokoto state (male- 247, female- 247) and 623 in Anambra (male-306, female- 317).

The **outcome variables** were defined as:

- fully vaccinated,
- partially vaccinated and
- not vaccinated.

Full vaccination refers to any child who has had the vaccines for the six vaccine preventable diseases namely;

- Bacille-Calmette Guerin (BCG),
- Diphtheria
- Pertussis
- Tetanus
- Polio
- Measles

Any child with all except OPV0 was also classified as fully vaccinated. Any child who received fewer vaccines (less than three OPVs [minus OPV0], less than 3 DPT, no BCG and/or measles) was classified as a partial recipient. Children who had none were classified as having not vaccinated.

Vaccination score

The dataset was segmented into two groups based on the child's age. Group 1 for less than 2 years and Group 2 for 2 years or more.

A total score of 8 (BCG = 1, DPT1+2+3 = 3, OPV1+2+3 = 3, and Measles1 = 1) meant full immunisation (for Group 1) while anything less than this was seen as partial immunisation.

A total score of 9 (BCG = 1, DPT1+2+3 = 3, OPV1+2+3 = 3, and Measles1 = 1, Measles2 =1) meant full immunisation (for Group 2) while anything less than this was seen as partial immunisation.

Independent Variables

The key independent variables in this study were individual and socioeconomic factors of the participants in the NDHS 2018 study.

Mother-related independent variables

These include age, marital status, highest education level, husband's/partner's education attainment, literacy, wealth index, the respondent having worked in the last 12 months, and the respondent's occupation.

Child-related independent variables

Child birth weight, child birth order and child gender.

These variables were dichotomized for logistic regression analysis. For instance, parental age was re-classified into less than 30 years and above 30 years.

Drop out rate calculation- $\text{dropout rate} = (\text{Penta1} - \text{Penta3}) \div \text{Penta1} \times 100\%$, where: Penta1 is the number (or percentage) receiving the first pentavalent vaccine dose. Penta3 is the number (or percentage) receiving the third dose. Pentavalent vaccine is used because it's a three dose vaccine and it's the universal metric for immunisation coverage.

Data Analysis

For the quantitative data analysis, initial descriptive analyses were done to check for outliers, missing data ,and consistency of the data set. Univariate, bivariate and multivariate analyses were done.

Cases of children with information on vaccination history were selected from the dataset for analysis. Children from the two study areas of interest were included and the other states were filtered out. The total sample size included was 1118 children with 495 children from Sokoto and 623 children from and Anambra respectively.

NDHS dataset exclusion criteria: Children who were stated as dead were deleted from the dataset.

The dataset was weighted to adjust for sample imbalances and restructure the data in order to reflect the population more accurately. Data were extracted from the dataset, and all analyzed using the SPSS software version 23.

The age in weeks of each child was computed using the Century Day Code variable and the computed variable was used to determine the vaccination status/level of each child.

Vaccination level was determined with respect to the current age of the child in weeks.

The three levels which were No vaccination(1), partial vaccination(2) and full vaccination(3) were defined using the age appropriate vaccination for each child.

According to the WHO, the basic vaccines include BCG, 3 doses each of Pentavalent and Oral Polio Vaccine (OPV) which are given at 6 weeks, 10 weeks and 14 weeks.

Inclusion and Exclusion criteria for secondary data analysis

The 2018 NDHS included all women aged 15-49 in the sample households. For the purpose of this study, the respondents were mothers or caregivers of under-five children. The respondents were asked about their birth history and questions were asked regarding the under-five children. The vaccination history of children between the ages of 0-35 months were collected.

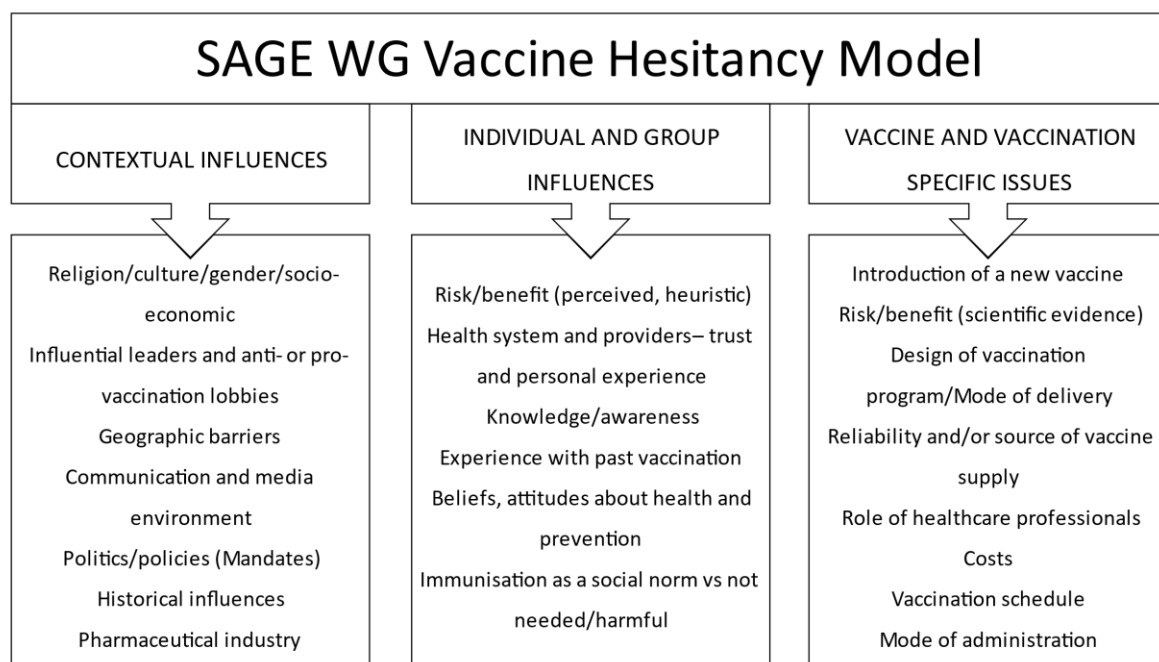
The vaccination data included only living children as at the time of the interview. Anyone who met this criteria was included in the survey, the excluded were only those who declined consent to participate in the study

Ethical Consideration

This study did not require any ethical approval from Kits Research Ethics Committee due to the nature of the data used in this study (literature review and secondary data analysis). Consent to use the NDHS data set was obtained from the DHS program via their website www.dhsprogram.com Confidentiality of the respondent was kept and maintained as the data did not include any personal information. Further more, the survey protocol for the 2018 NDHS was reviewed and approved by the Nigerian National Health Research Ethics Committee (NHREC) and the Institutional Review Board (IRB).

Conceptual Framework

The conceptual framework underpinning this study is the SAGE WG (Strategic Advisory Group of Experts Working Group) Vaccine Hesitancy Model. It was developed in 2012 with the directive to suggest a definition of hesitancy and build a model to classify factors that influence the behavioural decision of an individual to take, postpone or reject any or all forms of vaccination.



Source:

Figure 3: An illustrative map showing the underlying factors according to group

To outline the significant contributing factors, the SAGE Working Group created a matrix of determinants of vaccine hesitancy. The matrix took into account the scope of the hesitancy differentiating between contextual, individual and group, and vaccine- and vaccination specific factors that affect people’s decision to be vaccinated.(71)

Hesitancy is a standard of continuum between those that accept vaccine with no doubts to those that completely refuse the vaccines. (72)

This model has been used by similar studies as a guide in identifying the factors contributing to the uptake of immunisation.

Using the model will unfold factors influencing uptake of immunisation to researchers, programme managers, clinicians and policy makers for effective designing of programme or intervention that will positively influence the uptake of immunisation.

CHAPTER FOUR

Results

Demographic Characteristics

There were a total of 495 children and 623 children from Sokoto and Anambra respectively. Tables 6 and 7 shows the demographic characteristics of the child and respondents.

A larger percentage of the mothers were between the ages of 20-34 years in both states. 97.4% and 91.7% were married in Sokoto and Anambra state respectively. Majority (92.2%) of the respondents in Sokoto were not literate in contrast with respondents in Anambra which had approximately 98% literate mothers. The majority of respondents from Sokoto were Hausas and of the Muslim religion (99.9%) while In Anambra, majority were from the Igbo speaking tribe and practiced Christianity (98.2%).(Table 4)

Half (50%) of respondents in Sokoto belonged to the poorest category of the wealth quintile with Anambra having no one in the poorest wealth category. 83% of those in Sokoto were rural dwellers while Anambra had a higher percentage (86.9%) of people in urban areas than in rural areas(13.1%). Approximately (72.9%), 3 out of 5 respondents had husbands with no education in Sokoto. Meanwhile, in Anambra approximately (64.3%) 2 out of 3 had husbands with a secondary education.(Table 4)

Table 3: Background characteristics of mothers

Variables	Sokoto (N = 495)		Anambra (N = 623)	
	N	%	n	%
Mother’s age				
< 20 years	35	7.1	28	4.5
20-34 years	339	68.6	464	74.5
35-49 years	120	24.3	131	21.0
Marital status				
Never married	1	0.2	22	3.5
With partner	482	97.4	571	91.7
Alone	12	2.4	30	4.8
Literacy level				
Not literate	457	92.2	14	2.2
Literate	38	7.8	609	97.8
Religion				
Christian	1	0.1	612	98.2
Muslim	495	99.9	3	0.6

Others	-	-	8	1.3
Ethnicity				
Fulani	31	6.2	-	-
Hausa	463	93.7	3	0.4
Igbo	-	-	594	95.3
Kanuri	-	-	-	-
Other	1	0.1	26	4.3
Wealth quintile				
Poorest	248	50.2	-	-
Poorer	150	30.3	44	7.1
Middle	47	9.4	124	19.9
Richer	34	6.8	210	33.7
Richest	16	3.1	245	39.4
Place of residence				
Rural	411	83.2	82	13.1
Urban	83	16.8	541	86.9
Husband level of Education				
No education	352	72.9	6	1.0
Primary	54	11.2	131	22.9
Secondary	48	9.9	368	64.3
Higher	26	5.4	67	11.7
Don't know	3	0.6	-	-

Table 4: Demographics of the children

Variables	Sokoto (N = 495)		Anambra (N = 623)	
	n	%	n	%
Sex				
Male	247	50.0	306	49.1
Female	247	50.0	317	50.9
Age of the child (months)				
Under 12 months	172	34.7	220	35.3
12 – 23 months	178	36.0	221	35.5
24 – 35 months	145	29.3	182	29.2
Place of delivery of index child				
Home	450	90.9	56	9.0
Hospital/ Health Centre	45	9.1	565	90.7
Other	-	-	2	0.3
Birth order				
1	60	12.1	156	25.0
2-3	132	26.7	248	39.8
4-5	124	25.1	146	23.4
6+	179	36.2	73	11.7

Children within the ages of 12-23 months were slightly more than other age groups from both states. Out of the 495 participants from Sokoto state, 91% reported the home as the place of

delivery of the index child while in Anambra state, out of the 632 participants, more than 90% reported that the index child was delivered in the health facility.(Table 5)

Uptake of immunisation in Anambra and Sokoto states

Out of the sampled children by states, 59% in Sokoto did not receive the basic vaccination as against less than 6% in Anambra state. 35% and 23% of children in Sokoto and Anambra respectively were partially vaccinated. Only 6% of children in Sokoto recorded full vaccination status while as high as 71% of children in Anambra were fully vaccinated. (Figure 5)

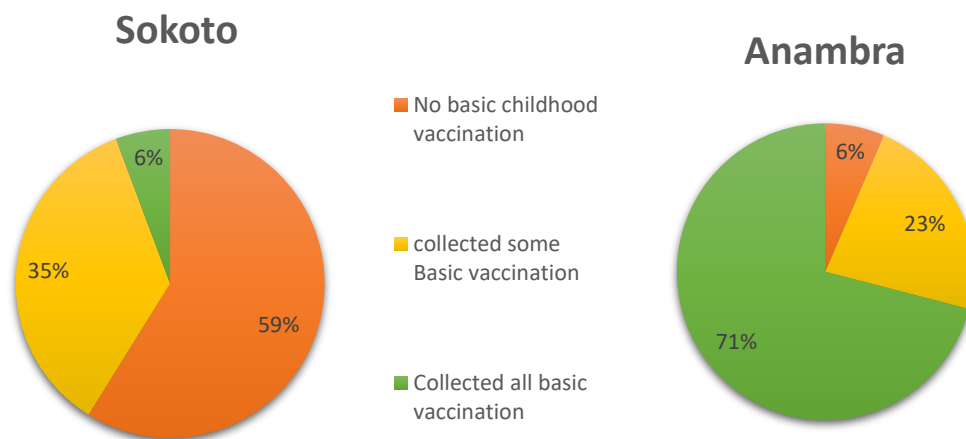


Figure 4: Percentage distribution of vaccination uptake among children in both states

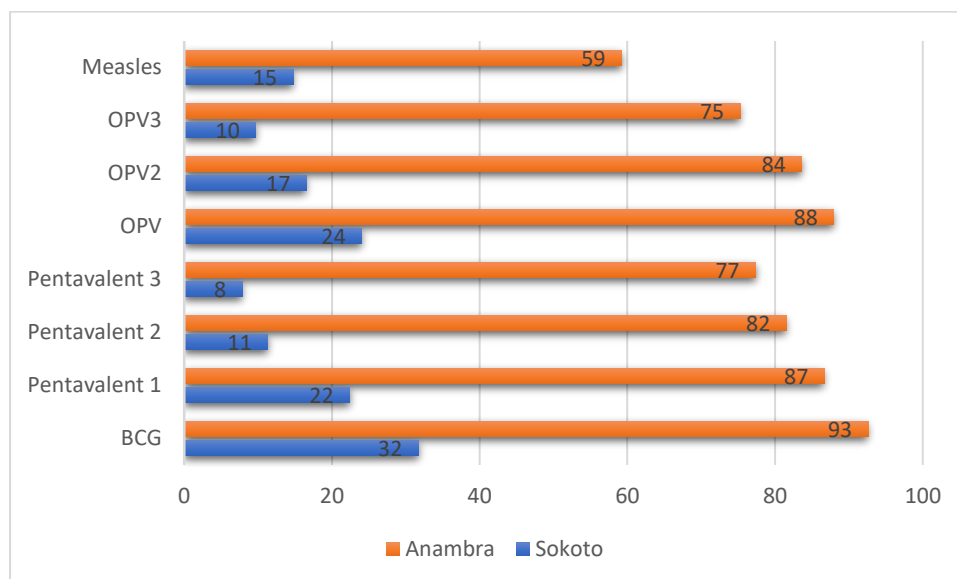


Figure 5: Percentage distribution of vaccination uptake by antigen across states

Figure 5 presents the immunisation uptake in the two states in terms of antigen uptake. In Anambra state, BCG (93%) had the highest uptake while Measles 1 had the lowest(59%). Similarly in Sokoto state, BCG (32%) had the highest uptake. However, in Sokoto the least taken vaccine is the Pentavalent 3 (8%).

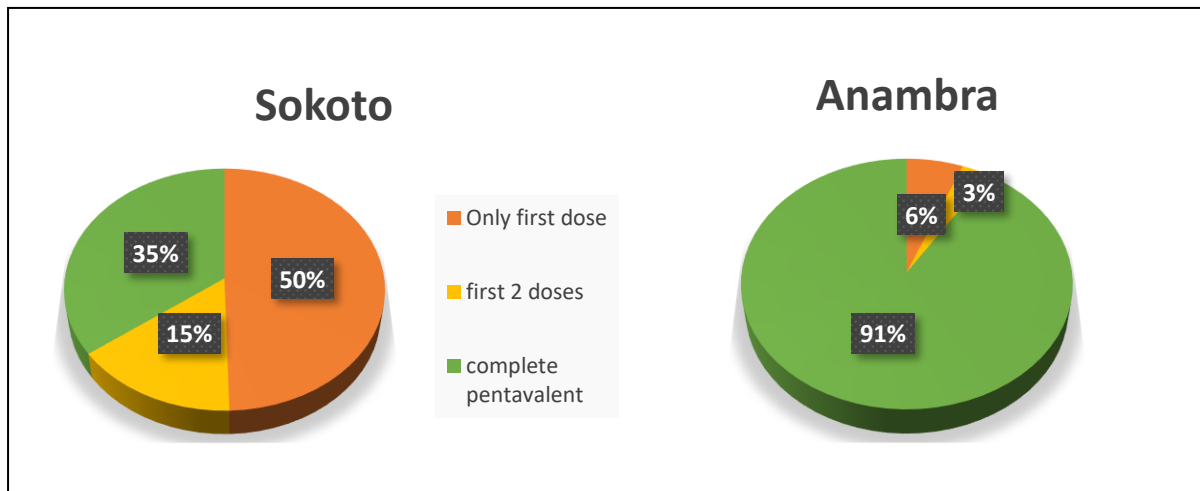


Figure 6: Distribution of immunisation uptake of pentavalent doses taken in each state.

Figure 6 depicts the immunisation uptake of pentavalent in regard to the schedule of the doses. For pentavalent which has an uptake of 22% and 87% in Sokoto and Anambra respectively (figure 5), out of the 22% from Sokoto state, only 1 out of 3 (35%) had the complete 3 doses of pentavalent, 15% missed the last dose and half of them collected only the first dose. In Anambra (with 87% prevalence of Pentavalent uptake), approximately 9 out of 10 children took the complete three doses and only 6% took first dose alone. (Figure 6)

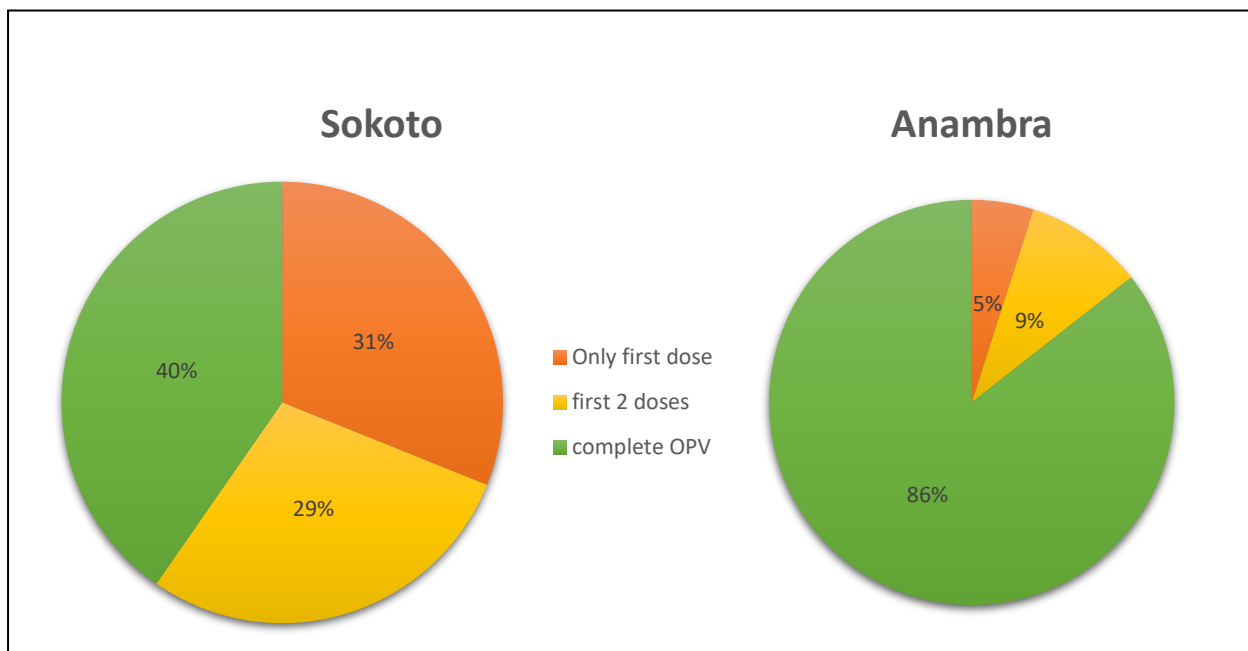


Figure 7: Distribution of pattern of uptake of OPV doses taken in each state.

In Sokoto state, out of 119 children that took the OPV vaccine, only 48 (40%) completed the three doses, 34 (29%) of them missed the last dose and the 37 (31%) had just one dose of the vaccine. Meanwhile, in Anambra state, out of 548 children that took the OPV vaccine, 469

(86%) had the complete doses, only 9% missed the last dose and 1 out of 20 (5%) took first dose alone.(Figure 8).

Drop-out rate of Pentavalent and OPV in both states

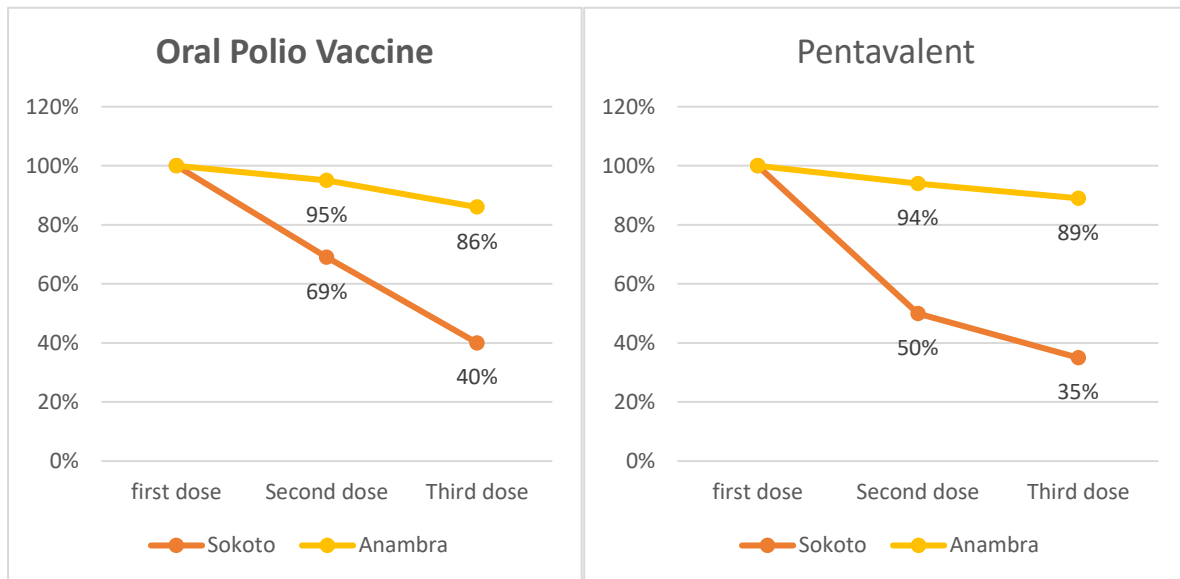


Figure 8: Trend across 3 doses of Pentavalent and OPV in both states

Figure 8 shows a steep fall in the percentage of children who completed doses of OPV out of all who took OPV in Sokoto compared with the trend in Anambra. For Anambra a relatively high percentage of those of who took the first dose collected the consecutive doses. However, in Sokoto only 40% of those who took OPV had all doses. The percentage uptake for both state decreased drastically for consecutive doses.

REVIEW OF FACTORS INFLUENCING THE UPTAKE OF IMMUNISATION IN THE FOCAL STATES

CONTEXTUAL INFLUENCES

Impact of Religion on uptake of immunisation

About half of the Nigerian population practices Islam, 40% practise Christianity while 10% practices traditional indigenous religion. The attention on the role of religion on immunization is triggered by the role religion has played in putting the life of children at risk in the country. The religious leaders role in reforming and restructuring societal norms as well as individuals beliefs, values and perception is very critical in attaining wider coverage of health care services. (23,24) .

For instance, Islamic religious leaders in the northern part of Nigeria including Sokoto stopped the childhood immunization program in 2003 by urging parents to refuse to get their children immunized. (23,47) A quantitative study done in the northern and southern Nigeria showed that children who were either partially or not immunized were found to be more among the Muslim mothers and in the northern part of the country including Sokoto state while fully immunised children were significantly higher among the Christian mothers and in the southern part of the country as stipulated by the same study.(74) An issue is that in Islamic religion, one is forbidden from taking medications before the illness.(74,75)

Gender

Gender has a crucial role in uptake of services including immunization, dependence on the woman's income has previously been shown to be even greater in households where she is the sole provider. When her spouse does not contribute to household earnings, these women may have greater decision-making power and ensure that their children receive full immunisation compare to women with no decision making power in the home. (76)

qualitative studies done in Sokoto state show that majority of the female caregivers lack the autonomy in family decisions as well as family health care , they need the consent of the husband who heads the household to access services. This also aligns with a study in Anambra that showed that mostly women who reside in the rural areas and had no access to household resources were likely to have unimmunized children. (76,77)

Culture / ethnicity

Culture as well as ethnicity play an important role in childhood immunization, In many communities, there are traditional cultural practises where women were unable to go out because of customary rites and enforced curfews.(78) Some cultures' practises endanger maternal well-being and certainly the children. The purdah system, which is practised in northern Nigeria including Sokoto, restricts women's movement during their customary rite. This practise has a negative impact on maternal health as well as child health as women are not permitted to leave the house during the Purdah festival. (79)

In southern Nigeria, the Oro festival restricts women's freedom of movement, particularly during emergencies. Also in other parts of the country, women's movement is restricted during certain holidays, resulting in harsh penalties for defaulters, regardless of their health status, even if they are pregnant. Still in the south, women prioritise their 'Éke' market day above

immunization clinics if it falls on the same day. Also in government instituted immunization sites, health workers do not operate on public holidays or weekends and as such women who put to birth or have babies discharged during this period do not get to be vaccinated.(76,79)(78) This impacts negatively on immunization uptake as most women will miss the vaccination days for their children during this festive season.(6,80)

Influential leaders, anti or pro vaccination influencers

Studies in Nigeria done have identified the importance of the influential leaders such as traditional, religious and community leaders in community members' uptake of services including utilization of immunization.(81,82) Traditional and Religious Leaders (TRLs) are influential and respected in their communities as opinion formers and guides in religious, social, and family life. As a result, they frequently serve as gatekeepers in the community, bridging the gap between the formal health system and the community.(83)

These influential leaders serve as role models and people look up to them and they serve as change agents in regard to uptake of services in the community. They play a critical role in the implementation of health policies at all communal levels as well as health education on pertinent issues. (84,85)

In the North including Sokoto, this influence is exemplified by the resistance to the childhood polio immunization program in 2003 (83) however in Anambra state, most leaders are supportive of childhood immunization services. (23,47)

Geographical barriers

Location of residents has been identified by studies done in several countries including Nigeria to strongly influence the utilization of childhood immunization. (86,87) The location to where the services is administered determines the number of people up taking the services. (88)

A research in rural North Central Nigeria found that children miss vaccinations because of the far distance to the immunisation centre. (89)(90) A survey done in Sokoto state in 2017 expressed that it was challenging accessing immunisation services as most of the roads leading to the facility were in a very bad shape, and in most settlements, the distance to the health facilities were as at least 20-30 km and there were limited transportation options. In Sokoto states, most of the facilities are constituted in the urban region.(45) (91)

This was also in similar to studies from Anambra state highlighting distance as a major barrier to most of the women accessing services in the rural area. This was a great challenge to those who actually wanted to get the services but were not able to do so due to the far distance of the health facilities.(88,92)

Communication and media environment

The problem of parental concern is exacerbated by information and misinformation transmitted through the media in general, and the Internet in particular. Studies identified that majority of the mothers get immunization information from health care workers while some others get their information from media sources such as internet and also from relatives. (86,93)

A study done in Sokoto revealed that majority of mothers got their information about vaccine-preventable diseases from the media (radio), but health workers and friends/relatives also played a role. It was noticed in Sokoto state from a study done in maternal health that many

mothers did not access antenatal clinics and had their delivery at home thereby missing out on immunization information given in the facilities.(45) (94,95) However in a study done in Anambra, all of the mothers interviewed (100%) learned about immunisation from antenatal clinics while others cited churches and the media as additional information sources.(96,97)

Policies/ politics influences in Immunisation

Immunisation is a major challenge in Nigeria. It is supported by Gavi and other International organizations. The mission of EPI in Nigeria is to enhance the health of Nigerian children by eradicating all the six deadly diseases. (98)

In line with the above, Nigeria committed to the World Health Assembly, adopted the World Health Assembly Resolution (WHAR) and United Nations General Assembly Special Session (UNGASS) goals in 1995 with the aim to improve immunisation coverage. The country also developed explicit policies in line with the immunisation programme and systems in place to carry out the corresponding strategies and plans.(98,99)

The declining rate in immunisation coverage appears to be influenced by political issues. As already noted, in Nigeria, the boycott of polio vaccinations in three northern states created a worldwide crisis that was political in origin in 2003. The government's lack of commitment in ensuring the implementation of EPI policy and the administration of EPI at the federal level of Nigerian governance were among those political issues.(5)

Historical influences/ Pharmaceutical Industries

Public confidence in Western medical interventions has been weakened by the historical experiences in the pharmaceutical industry in Nigeria. During a bacterial meningitis outbreak in 1996, An American pharmaceutical corporation Pfizer allegedly ran a clinical experiment in Kano without a license, ethical approval, or informed consent, and several children died as a result. To Nigerian medical experts, it was a 'clear case of exploitation of the ignorant'. Majority of Nigerians lost confidence in the government, they believed that over the years they had collaborated with the western world to poison the population with introduction of new medicine. These historical events has made some Nigerians lose their trust in international organizations, the government as well as the health systems and in regard to this, see the pharmaceutical industry as a profit making organisation. (100)

INDIVIDUAL AND GROUP DIFFERENCES

Health system factors

Health system challenges were one of the contributing factors to immunisation uptake. Several studies in Kenya, Ghana and Nigeria done identified the linkage between the health system factors and uptake of immunisation services (101–103). Majority of facilities where immunisation are delivered are generally unsatisfactory with a poor environment, inadequate or bad infrastructure, and a lack of equipment and supplies and most health facilities lack delivery centres which can be a driving force to immunisation uptake. (6)

The health system has also been faced with financial constraints in implementing immunisation programme especially to the hard to reach areas. Most of the immunisation units are not well equipped with good offices, computers as well as transportation system for outreaches and this either delays outreaches and most of the health facilities have a dearth of locally based healthcare professionals.(90,104)

In Sokoto state, several studies found that the mothers were very dissatisfied with the poor environmental condition of the PHC where immunisation is administered due to lack of clean water, no clean toilets, shortage of infrastructure like seats during the health talks with some of the mothers having to stand outside the whole session because there was not enough space in the hall, lack of supplies and consumables. (105) Majority also highlighted that the long waiting time in the facility was also a major barrier. (106,107)

A study also done in maternal and child health in Sokoto state showed that Mothers in Sokoto state go to the PHC mostly for very ill children or family planning, so they relied on outreaches to vaccinate their children.(105)

However a study done in Anambra state on access to child health services displayed that long waiting times, poor quality of health facilities and inadequate infrastructure were also major barriers that made women rather patronize patent medicine vendors and private facilities than visiting the PMC even the closest ones to their homes.(108)

The two states also highlighted that shortage of health care workers was also a problem in the PHCs. The delivery of vaccine and the immunisation programme as a whole is impacted by this shortage of health workers especially at the local level. Most of the staff in the health facilities are not adequately equipped or trained in immunisation to address the concerns of the people and as such lack information to communicate appropriately to patients. (7)

Lack of adequate supervision and monitoring at the local level may prevent workers from efficiently achieving the programme's targeted objectives, even after training.(88)In Sokoto state, the male household heads expressed a wish for more female immunisation providers and expressed displeasure when their spouses interacted with male immunisation providers.(109) All these contribute to the low coverage and uptake of immunisation. (104)

Beliefs/ attitudes

Some parents continue to have a variety of worries and misconceptions about childhood immunisations despite the fact that their efficacy have been demonstrated even in areas where vaccination rates are high. (108)

It is a common belief in the north that most vaccine preventable diseases example polio was attributed to an evil spirit called "Inna," who comes at night to paralyze their children, some attribute it to God, some say it is witchcraft and can only be cured by prayer while some also believe that it can be attributed to unclean environment and dirty water, and some think vaccination results in abnormalities in children, especially when administered to expectant mothers, and may even result in paralysis in young children. (110) Additionally, the elderly ones see it as an approach used by "white men" to reduce the number of population.(46)(111)

In Anambra, it is a belief by some people that faith in God and his ability to protect believers is sufficient to protect children from disease. As a result, affected respondents do not perceive their children to be vulnerable, nor their medical condition to be severe, relying on the conviction that immunisation of children is irrelevant to God. (78)

Furthermore some people in Sokoto believe that traditional treatment still confers better protection than vaccination, example in the case of herbal treatment for measles, (6) however, in another study about 70% of the mothers in Anambra strongly disagreed to that opinion.(112)

Knowledge and Awareness

Knowing the benefits of vaccines, such as their ability to prevent disease, the immunisation schedule, which specifies the age at which particular shots are advised, and the potential side effects of immunisation are all crucial pieces of information that every parent should have in terms of being knowledgeable about vaccines.(113)(114)

In a telephone survey in 2017 in northern Nigeria, 23% of parents had the opinion that children receive more immunisation than they are supposed to and it might be unhealthy for them, 25% of them were of the view that the child's immune system can be destroyed as a result of taking too many vaccinations while 87% saw immunisation as very important for their children's health. While in the southern part of the country, many parents were knowledgeable on the benefits of vaccination but some still did not take the services due to some other factors such as culture and beliefs which overruled their knowledge.(115,116)

Experience with past Immunisation

Adverse Events Following immunisation (AEFI) has been one of the greatest deterrents of complete childhood vaccination. AEFI can be referred to as any unfavourable medical occurrence that occurs after immunization but does not necessarily have a causal connection to the use of the vaccine.

As vaccine preventable diseases continues to drop, people have become increasingly concerned about the risk associated with vaccines.(117,118) Pain, swelling, and redness at the injection site are some of the frequent unpleasant reactions that occur after immunisation. Others include fever, rash, crying too much, being sleepy or irritable and very rarely may have anaphylaxis, convulsion or encephalitis. This has increased anxiety among parents, discouraging immunisation at first or completion. It is one of the reasons why parents lose their faith in the competence of the health care professionals and in the quality of vaccines.. (6,117)

In Northern Nigeria, the most common reason given by mothers for not completing their children's immunisation was that the child experienced adverse events following the previous immunisation visit. (119)

A study done in relation to AEFI in Nigeria highlighted that about 93% of the people that reported AEFI were from the north while 7% were from the south, it was also reported that about two children died after taking the measles vaccine in the north (120) Similarly, another study on Pentavalent vaccine showed that there were reported cases of infant death noticed after the administration of the vaccine in the south-east in 2021. (118)

Immunisation as social Norms and Laws.

Legislation is one of the efforts used in Nigeria to improve vaccination coverage when other alternatives like policy options and resources are not available. However, lack of enforcement of such laws reduces the impact of the law.(121)

Steps have been employed at the federal and state level to enforce vaccination through legislating for compulsory vaccination. The Child Rights Act, a domestication of the Convention of the Right of the Child passed in 2003 included provision compelling childhood immunisation but has only been fully adopted by 21 states in Nigeria including Anambra state. Sokoto state is one of the 15 states yet to adopt the Federal Child's Rights. The National Policy on immunisation states that immunisation services to all children should be at no cost. (122)

Additionally, a number of northern states, like Jigawa, Niger, and Katsina State, recently passed a law of mandatory childhood vaccination and everyone in the state is compelled to obey the law .(121)

While Nigeria has not leveraged on any structure to enforce its mandatory immunization law of the Child's Right Act, other countries like Pakistan has made immunization a prerequisite for school entry and Liberia enforced financial penalty if parents fails to immunise their children (such school requirements) or exception conditions. (122,123)

Nevertheless, many mothers see it as a norm to immunize their children because of the fear that they might be affected with VPDs and they will be blamed for it. So the feeling of guilt if the child is sick makes them see immunisation as an obligation they must adhere to.(124)

VACCINE AND VACCINATION SPECIFIC ISSUES

Reliability/ source of vaccine supply

The first mandate of the NPI is to "assist states and local governments in their immunisation programme by supplying vaccines, needles and syringes, cold chain equipment, and logistics as may be needed for those programmes .(125) Vaccine shortage has become a pressing concern around the world including Nigeria because it is one of the major causes of incomplete vaccination. (126)

In response to the late or no provision of vaccine supplies, it was decided that UNICEF would supply vaccines. UNICEF began supplying vaccines through a procurement services agreement in the fourth quarter of 2003, and this continues to this day. (5,127)

In 2013, Nigeria had a national average stockout rate of 82.7%. Also in 2021, about 14% of incomplete vaccination was attributed to vaccine stockout in Nigeria.(128) A study on comparative analysis of supply chain disparities between northern and southern Nigeria in 2015 showed that vaccine stock-out was a concern in both the north and the south. (129) Another study done on vaccine stockout in Nigeria in 2020 and 2022 showed that although it was a problem on both sides, geographically, the north east including Sokoto generally had a higher stockout rate than other states including Anambra.(126,128).(6)

Additionally, in majority of the health centres, the children have to reach an estimated number for some vaccines to be opened for usage. This has become a deterrent for uptake of immunisation services thereby leading to incomplete immunisation. (130)

Role of health care providers

Health professionals play a critical role in maintaining public trust in vaccination programme. An effective interaction between parents and health professionals could address the concerns of vaccine-supportive parents while also motivating a hesitant parent to accept vaccines.(130)

Poor health workers communication with parents, caregivers or community leaders can lead to non-understanding of the immunisation schedule, specific diseases target, the immunisation programme as well as refusal of the vaccination.(131)

A qualitative study done in Nigeria in 2017 on communication strategies among health care workers and care givers showed that poor attitude of health care workers was noticed in both the southern and northern parts of the country, more than half of the clients (58%) interviewed were dissatisfied with the attitude of the health care workers, they were described to be disrespectful and rude especially to women with low socioeconomic status, low level of education, teenage mothers and mothers who forgot their vaccination cards. (130,132)

This behaviour can erode trust in health professionals and discourage parents from listening to their health talks and they may decide not to return to the health facility or continue the child's immunisation. For instance, some parents are scared of asking questions about their child's health because of the fear of being scolded by the health care providers. (132)

Poor attitudes among health workers at the state and local government levels, as well as a lack of commitment to social mobilisation activities outside of campaigns, were also reported to have a negative impact on vaccination programme communication interventions and outcomes.(133,134)

Cost

According to the National Policy on Immunisation in Nigeria, immunisation services are expected to be provided at no cost by both the public and private sectors. In this regard, the FMOH developed a public-private partnership (PPP) contract for the delivery of free immunisation services in the country.(131,135)

To further guarantee efficiency of immunisation programme and services in the country, the Nigerian government adopted the REW (Reach Every Ward) strategy and in addition built more primary healthcare facilities so that each ward would have at least one health post that could offer basic medical services like immunisation. The vision of this strategy is to remove all barriers such as distance to the health facilities but despite this, the coverage is still very low.(131,135)

Even when services are provided for free, there are significant barriers and indirect costs, such as travel times and transportation when the nearest public health facility providing these services is not located within a short distance. Furthermore, where private facilities are available, they usually charge a fee for services, which creates a financial barrier for women who might otherwise find them more convenient.(136,137)

Studies done in southern Nigeria highlighted the fact that patients are aware of the free immunization service, but are told by health care workers that if their child is to be vaccinated, they have to pay for some items such as immunization cards, exercise books, pens, syringes and needles.(136,138,139)

Sometimes, the parents have to all contribute money for vaccine transportation to overcome logistical challenges and even some pay a token to the health workers. All these are common practices in both the southern and Northern Nigeria. (121)(6)(139)

There was hardly any information gleaned from the literature review or the NDHS on a few of the factors in the conceptual framework, specifically risk/ benefit (perceived, heuristic), introduction of new vaccine, risk / benefit (scientific evidence), design of vaccination and mode of administration.

DIRRERENCES IN THE FACTORS ASSOCIATED WITH THE UPTAKE OF IMMUNIZATION IN ANAMBRA AND SOKOTO STATE USING THE SECONDARY DATA ANALYSIS (NDHS)

Bivariate Analysis

A cross tabulation of each variable with the outcome variable was done to check if there exists a relationship between the variables and vaccination status. Variables with p-value of <0.05 were termed as being statistically significantly associated with vaccination status.

Table 5: Association between explanatory variables and outcome variables

Variables	χ^2statistic	p-value
Gender	0.63	0.728*
Child's age	36.23	<0.001
Place of delivery	504.46	<0.001
Place of residence	304.98	<0.001
Birth size	9.373	0.052*
Mother's age	17.01	0.002
Mother's literacy level	446.49	<0.001
Marital status	9.84	0.043
Husband's level of education	386.70	<0.001
Wealth index	465.64	<0.001
Currently pregnant	1.44	0.488*
Number of children in family	16.73	<0.001
Possession of health card	459.49	<0.001
Ethnicity	551.11	<0.001
Religion	547.75	<0.001
State	551.12	<0.001

* not statistically significant

Table 7 above shows that there exists a statistically significant relationship between the child's age and vaccination status. The Pearson Chi-square test statistic of 0.63 explains that there exist no significant relationship between the gender of a child and level of vaccination of the child. All the above categorical factors were statistically significant except gender of child, marital status of mother and whether the mother was currently pregnant or not.

A test for multicollinearity between the predictor variables was done. Variables with correlation coefficient ≥ 0.8 would mean multicollinearity exist between them. Therefore, one of them must be dropped. There exist a statistically significant high correlation between the Mother's level of education with literacy level and place of birth. Therefore, mother's level of education was excluded from the multinomial logistic regression model.

Model 1: This model was built on the total sample size including only the state variable to examine the amount of variation in the data explained by the state. The model was statistically significant (-2LL statistic 23.64, $p < 0.001$) with a Negalkerke R² (0.49). This explains that 49% of the variation in vaccination status was due to state

Table 6: A multinomial logistic regression model predicting vaccination level accounting for variation due to state

Variables	Not vaccinated				Partially vaccinated			
	Odds Ratio	95% CI		p-value	Odds Ratio	95% CI		p-value
		Lower bound	Upper bound			Lower bound	Upper bound	
State Sokoto Anambra(Ref)	113.56	68.628	187.907	<0.001	11.71	12.573	30.346	<0.001
-2LL statistic Negalkerke R ²	23.64 0.49							<0.001

Ref= Reference category

Fully vaccinated was used as the baseline category

Table 6 shows that children from Sokoto state are 112.6 times (OR: 113.56, 95% CI: 68.628, 187.907) more likely to have no basic vaccination compared with children in Anambra state. There is also 10.7% chance of children in Sokoto having incomplete vaccination compared with children in Anambra.

Table 7: A multinomial logistic regression model predicting vaccination level among children in Anambra

Variables	Fully vaccinated				Partially vaccinated			
	Odds Ratio	95% CI		p-value	Odds Ratio	95% CI		p-value
		Lower bound	Upper bound			Lower bound	Upper bound	
Age in weeks								
<6 weeks	30.58	0.960	52.832	0.237	0.80	0.002	13.237	0.982
6-9 weeks	3.28	0.451	59.091	0.179	2.14	1.291	10.979	0.015
10-13 weeks	6.17	1.9862	9.375	0.194	10.09	0.375	50.194	0.071
14-35 weeks	11.94	.893	16.109	0.042	6.33	1.798	10.042	0.004
≥36 weeks(Ref)								
Place of delivery								
Home(Ref)								
Hospital	10.59	0.062	21.966	0.055	0.37	0.241	1.944	0.561
Number children in the family								
4 or less (Ref)								
More than 4	0.51	0.349	8.906	0.069	1.89	0.706	5.095	0.145
Birth order								
	0.87	0.553	0.993	0.009	1.03	1.001	8.495	0.036
Mother's age								
<20 years	0.90	0.238	0.946	0.007	1.99	0.148	26.746	0.765
20-34 years	3.85	1.623	81.248	0.027	0.78	0.021	0.874	0.019
35-49 years(Ref)								
Mother's literacy level								
Not literate(Ref)								
Literate	22.97	2.309	34.247	0.009	2.24	0.162	30.999	0.564

Religion								
Catholic	2.93	1.939	10.876	0.028	0.87	0.293	0.987	<0.001
Other Christian	4.01	2.287	8.908	0.001	0.16	0.025	0.846	0.029
Other(Ref)								
Marital Status								
Never married (Ref)								
Married	5.11	2.132	25.625	0.004	6.16	3.163	54.576	0.043
Separated/Widowed	0.96	0.279	89.431	0.19	2.54	0.641	28.095	0.543
Ethnicity								
Igbo	34.52	0.260	50.179	0.821	5.01	0.763	21.714	0.538
Other Tribes(Ref)								
Wealth index								
Poorer(Ref)								
Middle	13.01	9.808	31.582	<0.001	12.41	3.412	20.086	0.013
Richer	29.05	6.903	58.561	<0.001	5.73	1.906	16.878	0.001
Richest	5.98	1.621	7.892	<0.001	3.58	3.677	24.451	0.037
Husband's level of education								
No education(Ref)								
Primary	2.90	0.699	13.968	0.069	1.23	0.123	4.278	0.453
Secondary	4.67	0.478	8.907	0.091	0.90	0.010	17.909	0.564
Higher	22.75	0.690	50.942	0.601	3.02	0.378	8.924	0.411
Place of residence								
Rural	0.117	0.105	6.765	0.903	0.76	0.275	3.950	0.055
Urban(Ref)								
Has health card								
Yes	22.39	5.294	31.088	0.014	4.92	0.683	14.389	0.007
No								
-2LL statistic							437.147	
Negalkerke R ²							0.41	<0.001

Ref= Reference category

Not vaccinated was used as the baseline category

The model is statistically significant with a p-value < 0.001. 41% of the variation in the vaccination status in Anambra can be explained by the explanatory variables.

A child who is between the ages of 14-35 weeks in Anambra has a 11% (OR = 11.94; 95% CI: 2.893 - 16.109) statistically significant higher chance of having a full vaccination to no vaccination compared with a child who is 36 weeks or more. There also exist a statistically significant chance that a child in the 6-9 weeks age group would be 1.14 times (OR = 2.14; 95% CI: 1.291-10.979) more likely to be partially vaccinated rather than not vaccinated compared with a child who is 36 weeks or older.

A unit increase in the birth order of a child in Anambra will bring about a statistically significant chance of 13% decrease that the child would have a complete vaccine. Children with literate mothers have about 22% statistically significant probability of being fully vaccinated to having no vaccination compared to children with illiterate mothers.(Table 9)

The model built on predicting vaccination status in Sokoto state was significant with a p-value < 0.001 and Negalkerke R²= 0.46. There is a statistically significant chance that those who possess health card in Sokoto are 91% less likely chance not to be vaccinated compared to those who do not possess a vaccination card. Children birthed at an hospital/health centre are statistically significantly 12% less likely to have no immunization. Vaccination card, mother's

age, husband's education, place delivered and dwelling place are statistically significant predictors of vaccination status in Sokoto state.(Table 8).

Table 8:A multinomial logistic regression model predicting vaccination level among children in Sokoto

Variables	Not vaccinated				Partially vaccinated			
	Odds Ratio	95% C.I.		p-value	Odds Ratio	95% C.I.		p-value
		Lower	Upper			Lower	Upper	
Age_weeks								
<6 weeks	18.12	0.224	18.252	0.735	1.23	0.054	2.672	0.082
6-9 weeks	2.17	0.987	2.524	0.092	0.92	0.592	5.728	0.060
10-13 weeks	1.33	0.006	7.280	0.917	1.46	0.332	8.616	0.084
14-35 weeks	0.45	0.006	31.266	0.709	1.7	1.026	31.840	0.102
≥36 weeks(Ref)								
Place of delivery								
Hospital	0.88	0.147	0.971	0.018	0.51	0.144	0.910	0.042
Home(Ref)								
Number of children in family								
4 or less	0.52	0.016	142.388	0.857	0.66	0.160	5.342	0.561
More than 4 (Ref)								
Birth order	1.72	0.860	3.426	0.125	0.38	0.144	1.561	0.065
Mother's age								
<20 years	0.53	0.003	5.858	0.119	0.95	0.397	0.045	0.008
20-34 years	10.12	3.000	22.707	0.048	2.34	1.042	2.897	0.039
35-49 years(Ref)								
Mother's literacy level								
Literate	0.52	0.003	0.856	0.092	6.26	3.173	10.001	0.654
Not literate(Ref)								
Wealth_status								
Poorest(Ref)								
Poorer	2.04	0.086	8.478	0.658	0.04	0.194	0.040	0.945
Middle	19.20	0.664	55.011	0.085	0.03	0.235	0.063	0.008
Richer	0.05	0.013	0.280	0.039	0.05	0.240	16.076	0.757
Richest	44.07	0.011	47.561	0.372	0.91	0.040	1.280	0.153
Husband's level of education								
No education(Ref)								
Primary	0.90	0.699	13.968	0.069	0.23	0.123	0.278	0.003
Secondary	0.67	0.478	0.907	0.011	0.40	0.010	0.909	0.044
Higher	0.15	0.090	0.942	0.006	0.52	0.038	0.924	0.019
Type of residence								
Rural	10.12	2.003	14.346	0.024	0.87	9.010	1.735	0.752
Urban(Ref)								
Has vaccination card								
Yes	0.09	0.017	0.803	<0.001	11.86	9.760	13.163	0.020
No (Ref)								

Ref= Reference category

Fully vaccinated was used as the baseline category

CHAPTER FIVE

DISCUSSION

Immunization is one of the most effective public health interventions for reducing disease burden in children and preventing U5M but in Nigeria, inadequate and incomplete immunisation of children is a major public health issue. Using the SAGE conceptual framework served as a guide in categorizing the factors influencing uptake of immunization into three relevant groups that clarified the issues within the Nigerian context.

This study offers insight into the issue of immunization uptake and drop-outs relating to the pentavalent and oral polio vaccines taken at 6, 10 and 14 weeks consecutively, However, this is more prominent in Sokoto than in Anambra state. This finding is in line with a cross-sectional study done in 2017 (46) to assess knowledge, attitude and experience of care-givers on pentavalent and oral polio vaccination in Nigeria, which showed that children from the northern part of the country are less likely to receive full immunization compared to their counterparts in the southern part of the country reason .(140) This finding on drop outs is also consistent with studies done in Bangladesh, Sierra Leone in 2018 and 2019 respectively on incomplete vaccination. (141,142)

Reasons for the drop-outs may be due to low maternal education, in that the parents are not aware of the benefits of immunization to the child or cannot read the information on the vaccination card for the next vaccination appointment; information gap meaning that the mother is not aware or adequately informed that the child needs a second or third dose; past experience with Adverse effect following the vaccine taken after the first dose; or may be due to unavailability of vaccine in the health facility. (11,143,144)

This study has similar findings with other studies in that there is a drop-out rate in pentavalent and oral polio vaccine in respect to the 2nd and 3rd dose. (120) Findings also showed that BCG vaccine was the most taken vaccine in the 2 states, Reasons could be attributed to the fact that women who give birth in the facility tends to have their children immunized due to the fact that BCG is given immediately after delivery in the facility.(145)

The adoption of mobile phone reminders and short message have shown to be effective in states like Kano, Benin and Anambra states. (146–149)

In terms of contextual factors, this study displayed that women who were of the Muslim faith, Hausa or Fulani speaking tribes and low socioeconomic status were less likely to have their child vaccinated compared to women from the Christian or other faith or from Igbo tribe were more likely to have their child fully vaccinated. These findings are similar with studies done in Sub-Saharan Africa and Nigeria(150,151)which highlight that traditional leaders serve as a model to the people, what they believe is what their followers stay with. If they don't believe in immunization, then majority of the communities under their authority will not get their children immunized. For instance, in Islamic religion, it is forbidden to take any form of medication before the ailment and most believe that diseases are from evil spirits that come at night to paralyse their children especially in the case of polio disease. These religious beliefs has an influence in the uptake of immunisation especially in the north including Sokoto. These findings are consistent with other studies in Nigeria (152,153) and in Ethiopia and Ghana which

note that religious and traditional leaders were highlighted as one the reasons for incomplete immunisation in the community .(154,155)

Maternal education is identified as a strong link to uptake of immunization services and that was also the finding in this study. Maternal education also works hand in hand with socioeconomic status i.e. gender, employment and income or wealth quintile. Formal education fosters critical thinking, problem-solving, communication, and other skills important in business and entrepreneurship. As a result, educated women are more likely to engage in income-generating activities, work outside the home in the formal sector, and earn higher wages which makes her more likely to use health facility because she can pay for the services. She is also more likely to be part of the decision making of the home and women who are educated are more aware of the health benefits for their children's survival and well being. (143,156,157)

Educated women are more aware of health issues, understand the importance of healthcare, are aware of where to find healthcare services, and are more likely to use health services compared to uneducated women who might not have an idea of the importance of vaccination. (152,158,159) In regards to maternal education, the low coverage in Sokoto state is probably related to the fact that about 80% of the adults have no form of education compared to Anambra with a higher coverage where majority of the population are educated. This is supported by other studies done in Africa, Uganda and Nigeria. (160,161)

Culture as well as ethnicity also plays important roles in the uptake of services. Culturally, most women are restricted from all forms of movement during the festive period thereby preventing them from accessing immunization services. This finding is supported by similar studies in Nigeria, where immunisation days clashed with mothers' economic activities, particularly market days, and mothers' being too busy, might forget to take the child to be vaccinated.(78)

This study revealed a disparity in service utilisation between urban and rural communities. Households in the urban area used immunisation services more than those in the rural areas. These findings are consistent with other findings from similar studies. (91,162)This could be because a greater number of the primary caregivers in the urban region have a better understanding of immunization services and majority of the health care facilities are constituted in the urban region than their rural counter parts thereby enabling better access to immunization services.(91)

The government of Nigeria has explicit policies and laws but lack of political will or commitment has led to non-implementation of the policies at all levels. This is probably due to the fact that the government has failed to acknowledge the risk involved in a non-vaccination population.

Lack of enough supplies of vaccine or consumables such as gloves, needles and syringes which makes parents to be referred to other facilities or scheduled for next time might be discouraging to parents to return for the child's vaccination.(128) this supports the findings in this study in regards to the drop-out rate in Anambra and Sokoto where 14% of incomplete vaccination was attributed to vaccine stock out.(73,128)

All communities need to be constantly reminded of the need to be vaccinated. Reasons could be attributed to the fact that in northern Nigeria, including Sokoto, insecurity challenges and Boko Haram insurgency has been a threat to people's lives. (163) Health care workers are scared of going to the north because of the fear of being killed or kidnapped for ransom as compare to Anambra state, which is not currently on the list of Boko Haram attack states. So

interventions, campaigns or outreach are tailored more to the south than to the north. This is consistent with other studies done in the north-east Nigeria.(48,70)

Funding gap was a problem in the immunization programme thereby preventing a lot of communities from benefiting from the awareness programme. This can be attributed to lack of political will in prioritizing the immunization programme. This is consistent with other findings done in Africa and Nigeria that non-political commitment could lead to failure to implement strategies that will further improve immunization uptake in the country implying that the government might not provide enough funding for implementation programs such as awareness, outreaches .(5)(164,165)

Poor attitude of health care workers could lead to incomplete or missed vaccination, reason being that women who are treated disrespectfully and scolded on by the health workers might not have the urge to return back to the facility to get the child vaccinated. The same goes with cost of services, women especially from low socioeconomic status will prioritize feeding her children with money she has than spending it as indirect cost in the facility especially when a child is not ill. (149) Evidence has shown that training health care workers to respectfully treat all clients, and also remove all forms of direct and indirect cost impeded on immunization were shown to improve uptake of immunization services.(45,166)

Limitations of the study

There were no in-depth questions specifically on vaccination in the NDHS and many of the variables in the conceptual framework were not covered in the NDHS, for instance the dataset did not address the supply side of vaccination.

The literature search mostly yielded resources about factors influencing demand for immunisation, and was not so many focused-on factors associated with immunisation uptake.

The NDHS dataset did not cover children up to 5 years old, so literature was used to address this gap.

Relevance of Framework

The SAGE WG (Vaccine Hesitancy Model) was relevant to my study because it helped me unravel the different factors influencing immunization uptake and to group them in a manner that allowed a clearer understanding of the Sokoto and Anambra contexts.

Implications for future research

Vaccine hesitancy is a complex and dynamic, and future strategies must reflect and address these complexities in both design and evaluation. First and foremost, implementers must accurately identify the target population and comprehend the true nature of their specific vaccine and/or vaccination concerns; this will help ensure an informed intervention.

Future study should consider designing and delivering interventions that will focus on the target audience in a comprehensive contextualised manner through thorough research.

Future researchers can look into the factors influencing uptake through primary qualitative studies

CHAPTER SIX

CONCLUSION

Immunisation uptake in Sokoto state is very low and reflects the situation of the northern part of Nigeria and many other Sub-Saharan African countries. The higher uptake of immunisation in Anambra state highlights the importance of maternal knowledge, higher socioeconomic status, and possession of a vaccination cards and the contrast in both states is seen clearly in the disparity in the levels of immunisation uptake.

Despite the fact that various interventions focused on increasing vaccination coverage in Nigeria have been identified, achieving the desired levels for the realization of the full benefits of immunisation remains a major challenge. Understanding factors that influence the uptake of childhood immunization among parents in Nigeria using Sokoto and Anambra as a case study provides some useful insights for designing interventions. The factors that drive uptake of immunisation are seen to be interlinked at the various levels of the SAGE model conceptual framework. For instance, education has a way of influencing the socioeconomic status of an individual and exposes the individual to information about the health of her child. This linkage needs to be taken into consideration in the immunisation programme strategies in both states and in Nigeria as a whole. The collection of known immunisation factors, as well as evidence on effective interventions to overcome these barriers, should be a core component of immunisation programmes in Nigeria. These findings will help to improve age-specific vaccination and will assist policymakers in developing the necessary control strategies to increase immunisation uptake in Nigeria.

RECOMMENDATIONS

1. The NPHCDA and the States' Primary Health Care Development Agencies (SPHCDA) in Sokoto and Anambra states should step up efforts to raise community awareness about immunisation uptake in languages other than English and the three most common dialects (Hausa, Igbo, and Yoruba) – for Sokoto, Hausa and Fulani; and for Anambra, Igbo - to promote knowledge on the immunisation schedule and the various vaccines that should be taken in simplified form. The immunisation messages that are to be distributed should be strategic and targeted in terms of content and most viable means that work for each community, such as print media, social media, dramas, town announcements, and village role play.
2. NPHCDA and the SPHCDA for Sokoto and Anambra should leverage on the integration of immunisation services with supplementary immunisation activities (SIAs) because it will provide an opportunity for unimmunized children and defaulters to be reached and immunised through strategies such as house-to-house visits, fixed

posts, and special teams to reach out to eligible children on the streets, orphanages, farms, markets, churches, play grounds, motor parks, and other high-transit points.

3. The NPHCDA and the SPHCDA for Sokoto and Anambra should effectively plan immunisation programmes, ensure equitable distribution of immunisation services, and ensure more accurate evaluation of vaccination programmes across the country, and health data collection should be conducted uniformly at the subnational level across the country's six geopolitical zones.
4. NPHCDA and the SPHCDA for Sokoto and Anambra should adopt “The Communities Caring for Children (CCC) programme” to boost immunisation rates through education, registration, and a reminder system using short message service (SMS), an outreach system involving lay community-based outreach workers who tracked all children, sent mail or phone reminders to parents, assisted some mothers with transportation or scheduling, and home visits to children facing complex barriers in accessing services. Reminders using SMS can also be done by primary health care providers.
5. NPHCDA and the SPHCDA for Sokoto and Anambra should organise frequent training and retraining of immunisation providers in accordance with the national immunisation policy to maintain standard practice. This will improve their knowledge, self-reported practice, and communication skills, allowing them to better address the concerns of all mothers and communicate with them.
6. To prevent indiscriminate charges, the government of Sokoto and Anambra should establish clear guidelines for the provision of RI services in private health facilities, including establishing a fixed service charge for private health facilities. It is also critical for the government to strengthen its oversight function in order to reduce informal payment in public health facilities.
7. NPHCDA and the SPHCDA for Sokoto and Anambra should ensure improving the quality of vaccine supply; to do so, financial commitment, human resources, and strengthening long-term partnerships with international actors such as GAVI, WHO, and UNICEF should be specifically increased for mass and supplementary immunisation activities.
8. There is a need for immunization policy makers to pay particular attention to monitoring, evaluating and supportive supervision of immunization practice of health providers in primary health care in Sokoto, Anambra and Nigeria as a whole.
9. FMOH and NPHCDA need to strengthen advocacy towards the Ministry of Finance to expand budgetary allocations towards immunization services in PHC. This supports the implementation of interventions that have been piloted with donor funds and are to be implemented or scaled up in Sokoto, Anambra and Nigeria.

Word Count 12,067

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Annex 1

Objective	Literature source and type of study	keywords
<p>Objective 2-</p> <p>To identify and compare the differences in factors associated with the uptake of immunization among children in Sokoto and Anambra state</p>	<p>Peer-reviewed Literature- VU Library, PUBMED, MEDLINE</p> <p>Grey literature- Google Scholar, Google, Reports, websites</p> <p>The words were in combination with Boolean operators (AND , OR).</p>	<p>Immunisation, vaccines vaccination, Factors, coverage, uptake, "U5 children" child*, children , illness, mortality, morbidity, death, disability, "north west", "south east", Anambra, Sokoto, kebbi, Borno, imo, Enugu, Nigeria, low -and middle income countries, Sub-Saharan, Ethiopia, Gambia, Zambia, Zimbabwe, Africa, knowledge, awareness, attitude, religion, beliefs, muslisms, Christianits, traditional leaders, community leaders, ethnicity, culture, urban, rural, historical, socio - economic, pharmaceutical, policies, politics, mothers, parents, father, social norms, wealth quintile, gender, influences</p> <p>Past experience, cost, place of "residents"</p> <p>Perception, poor attitude, health workers, education, health system, benefits, risks, pattern, vaccine, vaccine specific, vaccine delivery, health care workers, health care providers, "Reliability of vaccine", "vaccine schedule, role of health care workers", "mode of administration", communication, "media environment", media, "influential leaders", "anti-</p>

		or- pro vaccination lobbies” harmful, “source of vaccine”
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