

**National Primary Healthcare Development Agency**  
**In partnership with**  
**National Bureau of Statistics and the World Health Organization**

**Post Yellow Fever Campaign Coverage**  
**Survey**  
**Main Survey Report**

April 2019

## Contents

<b>List of tables .....</b>	<b>2</b>
<b>List of figures .....</b>	<b>3</b>
<b>Abbreviations .....</b>	<b>4</b>
<b>Executive summary .....</b>	<b>5</b>
Vaccination coverage .....	5
<b>Acknowledgments .....</b>	<b>6</b>
<b>CHAPTER 1 .....</b>	<b>7</b>
<b>INTRODUCTION .....</b>	<b>7</b>
1.1 Background information .....	7
1.2 Geographic and demographic context.....	7
1.3 Previous yellow fever preventive mass vaccination campaigns .....	8
1.4 Objectives of the Survey .....	8
<b>CHAPTER 2 .....</b>	<b>9</b>
<b>ORGANISATION OF THE SURVEY .....</b>	<b>9</b>
2.1 Introduction .....	9
2.2 Survey design .....	9
2.3 Household listing.....	10
2.4 Survey fieldwork.....	11
2.5 Survey quality assurance .....	11
2.6 Data processing and analysis .....	12
<b>CHAPTER 3 .....</b>	<b>13</b>
<b>CHARACTERISTICS OF SURVEY RESPONDENTS.....</b>	<b>13</b>
<b>CHAPTER 4 .....</b>	<b>17</b>
<b>YELLOW FEVER VACCINATION COVERAGE .....</b>	<b>17</b>
4.1 Proportion of eligible individuals who were at home during the campaign .....	17
4.2 Sources of information about the campaign .....	17
4.3 Main reasons for non-vaccination .....	20
4.4 Individuals receiving vaccination before the campaign.....	23
4.5 Adverse effects following immunisation (AEFI) .....	25
4.6 Yellow fever vaccination coverage.....	28
4.7 Individuals receiving yellow fever vaccination for the first time .....	61
4.8 Life-time yellow fever containing vaccines in children aged 9 to 59 months.....	62
4.9 Low coverage enumeration areas.....	64
<b>APPENDIX 1.....</b>	<b>66</b>
Location and coverage of enumeration areas .....	66
Questionnaires .....	70
<b>Household questionnaire .....</b>	<b>71</b>
<b>Individual questionnaire .....</b>	<b>75</b>

## List of tables

Table 2.1: Survey design: Number of households, number of interviews, and response rates, according to residence (unweighted), Nigeria 2019 .....	9
Table 2.2: Distribution of selected EAs and Households by geopolitical zones and states .....	10
Table 2.3 Distribution of field staff by zones .....	11
Table 3.1 Household population by age and sex: Percent distribution of the de facto household population by five-year age groups, according to sex Nigeria 2019 .....	13
Table 3.2 Results of households interviewed: Eligible households, response rates, according to residence, Nigeria 2019 .....	14
Table 3.3 Results of individuals interviewed: Eligible individuals, response rates, according to residence, Nigeria 2019 .....	15
Table 4.1: Proportion of eligible individuals at home: Proportion of eligible individuals at home during the Campaign, Nigeria, 2018. ....	17
Table 4.2: Sources of information about the campaign: Primary source of information about the campaign by state, residence, age category and gender, Nigeria 2019 .....	19
Table 4.3: Reasons for non-vaccination in the campaign, Nigeria 2019.....	21
Table 4.4: Received the vaccine before the campaign, 2019: Proportion of individuals who had received yellow fever vaccine before the campaign by state, age category, gender and residence, Nigeria 2019 ....	24
Table 4.5: Adverse reaction following vaccination: Proportion and 95% CI of individuals who developed an adverse reaction following yellow fever vaccination, Nigeria, 2019. ....	26
Table 4.6: Vaccinated During SIA, 2019: Vaccination coverage by source of vaccination information by state, residence, age category and gender, Nigeria 2019 .....	29
Table 4.7: SIA provided individuals first yellow fever dose, 2019: Proportion of individuals that received first yellow fever dose from SIA by state, residence, age category and gender, Nigeria 2019 .....	61
Table 4.8: Lifetime yellow fever doses for children aged 9 to 59 months: Proportion of children who had received 0, 1 and 2 or more doses of yellow fever vaccine by birth cohort, residence and gender in children aged 9 to 59 months .....	63

## List of figures

Figure 3.1: Age pyramid showing the proportional representation of individuals in different age groups by gender, Nigeria 2019 .....	14
Figure 3.2 Distribution of household and individual response rates .....	16
Figure 4.1 Yellow fever vaccination coverage and the 95% upper and lower confidence bounds by state, Nigeria 2019 .....	28
Figure 4.2: Organ pipe plots for Abuja and Plateau showing coverage by enumeration areas, post yellow fever campaign coverage survey, Nigeria 2019.....	65
Figure 4.3: Organ pipe plots for Kebbi, Niger and Sokoto states, showing coverage by enumeration areas, post yellow fever campaign coverage survey, Nigeria 2019. ....	65
Appendix Figure 1: Map showing coverage and location of enumeration areas in the five implementing states .....	66
Appendix Figure 2: Map of Abuja showing coverage and location of enumeration areas .....	67
Appendix Figure 3: Map of Kebbi state showing coverage and location of enumeration areas .....	67
Appendix Figure 4: Map of Niger state showing coverage and location of enumeration areas.....	68
Appendix Figure 5: Map of Plateau state showing coverage and location of enumeration areas .....	68
Appendix Figure 6: Map of Sokoto showing coverage and location of enumeration areas .....	69

## Abbreviations

AEFIs	Adverse Events Following Immunization
CAPI	Computer-Assisted Personal Interviewing
CI	Confidence Interval
CSPRO	Census and Survey Processing System
deff	Design effect
EA	Enumeration Area
EPI	Expanded Programme on Immunisation
FCT	Federal Capital Territory
FMOH	Federal Ministry of Health
Gavi	Global Alliance for Vaccines & Immunization
GPS	Global Positioning System
GVAP	Global Vaccine Action Plan
LGA	Local Government Area
NBS	National Bureau of Statistics
NMYTCC	National Measles Yellow Fever Technical Coordinating Committee
NPHCDA	National Primary Health Care Development Agency
NPopC	National Population Commission
PYFCCS	Post Yellow Fever Campaign Coverage Survey
RI	Routine Immunisation
SE	Standard Error
SIA	Supplementary Immunization Activities
UNICEF	United Nations Children's Fund
WHO	World Health Organization

## **Executive summary**

Nigeria as a signatory of the Global and Regional Public Health goals, has embarked on implementing the eliminate Yellow Fever Epidemics (EYE) Strategy that was launched in 2017. With more than 50 partners involved, the EYE partnership supports 40 at-risk countries in Africa and the Americas to prevent, detect, and respond to yellow fever suspected cases and outbreaks. The partnership aims at protecting at-risk populations, preventing international spread, and containing outbreaks rapidly. By 2026, it is expected that more than 1 billion people will be protected against the disease. The country has initiated a 10-year plan in line with the EYE strategic objectives. Reactive campaigns started in some States, namely Kogi, Kwara, Zamfara and Kebbi in 2018. This phase 1 States is followed by the end of November 2018, to cover the second preventive mass vaccination campaign in six high risk States (Borno, Plateau, FCT, Niger, Kebbi and Sokoto). For each phase, as approved by Gavi, a post campaign coverage survey is conducted to validate the performance.

The Post Yellow Fever Campaign Coverage Survey was conducted in January and February, 2019 in five of the six implementing states - Sokoto, Niger, Kebbi, Plateau and the FCT. The main objectives were to assess the level of yellow fever coverage in five (5) of the six (6) implementing states (FCT, Plateau, Kebbi, Sokoto and Niger) as well as to analyse coverage by age group (9-11 months, 12 – 23 months, 2 -5 years, 6-15 years and 16-44 years). The survey was also to determine reasons for non-vaccination of eligible population during the campaign and to determine the prevalence of children receiving the first dose of yellow fever vaccine during the campaign (i.e., previously unvaccinated) and finally to identify strengths and weaknesses of program management.

The study was a three-stage stratified sampling design involving the use of computer assisted personal interviewing (CAPI) administered on respondents for yellow fever vaccination status. Survey methodology was adopted from the 2018 WHO Guidelines for National Immunization Coverage Surveys. The sample size for the PYCCS 2019 was designed to estimate state level vaccination coverage in each of the five implementing states.

The survey was commissioned by the National Primary Healthcare Development Agency (NPHCDA) and implemented by the National Bureau of Statistics (NBS) with technical support from WHO and funded by Gavi. The entire duration of the survey was six months.

### **Vaccination coverage**

Information regarding whether individuals, aged 9 months to 44 years, had received yellow fever vaccination during the campaign was sought through use of card evidence and history. FCT, Abuja and Plateau states out of the five states achieved coverage of 96.1 percent and 93.6 percent which was more than the target 80 percent coverage during the campaign. The vaccination coverage in Niger, Kebbi and Sokoto states was 78.1 percent, 68.7 percent and 62.2 percent respectively.

Children between the ages 6-14 years had the highest (88.2 percent) proportion vaccinated during the campaign while children in the age groups of 9 to 23 months and 24 to 59 months, the youth aged 15 to 24 years and adults aged between 22 and 44 years reported 72.9 percent, 83.8 percent 74.5 percent and 72.9 percent respectively.

## **Acknowledgments**

The survey was conceptualised by the National Measles and Yellow Fever Technical Coordinating Committee (NMYFTCC) of the National Primary Health Care Development Agency (NPHCDA) and conducted by the National Bureau of Statistics (NBS). Technical assistance was provided by the World Health Organization while funding for the preventive mass vaccination campaign and the post campaign coverage survey was provided by the Federal Government of Nigeria and Gavi, the Vaccine Alliance.

Special thanks go to Dr Faisal Shuaib, Executive Director NPHCDA, Dr Dorothy Nwodo, Dr Joseph Oteri, Dr AB Garba, Dr Obi Emelife, Dr Fiona Braka, Dr Anne JEAN BAPTISTE, Dr Boubacar Dieng, Dr Isiaka Olarewaju, Mr Runmonkun Olalekan, Mr Joseph Olufemi (FMoH), Mrs Ijeoma Onuoha Mr Kola Ogundiya and Shamsudeen Lawal for their contribution at various stages of the campaign and survey.

This report was prepared by Mr Runmonkun Olalekan, Mrs Ijeoma Onuoha, Mr Kola Ogundiya, Mr Isaac Salihu, Mr Adeyemi Adeniran and John Wagai. Data management and analysis was conducted by Shamsudeen Lawal and Peter Ada and John Wagai.

# CHAPTER 1

## INTRODUCTION

### 1.1 Background information

Yellow fever (YF) is an acute haemorrhagic viral disease transmitted to people of all ages by infected mosquitoes (*Aedes aegypti* and *Haemagogus leucocelaenus* species). Yellow fever infections are principally maintained by a sylvatic (jungle) transmission cycle involving non-human primate reservoirs. Urban yellow fever outbreaks occur when infected people introduce the virus into heavily populated areas with competent vector populations and insufficient vaccination coverage<sup>1</sup>. The incubation period (period between infection via the mosquito bite and onset of symptoms) of the yellow fever virus is 3 to 6 days. Yellow fever infection can vary in intensity, from an asymptomatic disease to a severe illness that leads to death in 20 to 50 percent of patients. The commonest symptoms include headache, muscle and joint pain, fever, flushing, loss of appetite, vomiting and jaundice. There is no specific treatment; however, the most effective measure to prevent and control yellow fever is through vaccination. A single dose of the yellow fever vaccine has been shown to confer recipient's life-long protection against yellow fever.<sup>2</sup>

The World Health Organization (WHO) estimates that about 60,000 people die from yellow fever annually in 47 endemic countries with about 900 million people at risk of the disease with majority of them living in Africa and South America. Historically, serious epidemics have affected unimmunized populations in rural and urban areas. More recently, in the last five to ten years, there has been an increase in the number of reported yellow fever cases in Africa. Nigeria has reported recurrent outbreaks of Yellow fever in 18 states from 2017 till date.

Nigeria has aligned with the global strategy to eliminate yellow fever epidemics (EYE) from 2017 to 2026 which is a comprehensive and long-term strategy that aims at ending yellow fever epidemics by 2026 by ensuring universal access to yellow fever immunization for all persons in yellow fever at-risk countries. The three strategic objectives of the EYE include:<sup>3</sup> 1) Protecting at-risk populations, 2) preventing international spread and 3) containing outbreaks rapidly. The strategy builds on lessons learned from previous control efforts, matches vaccine supply to demand based on risk, improves country uptake of vaccine and leans on strong inclusive partnerships.

### 1.2 Geographic and demographic context

Nigeria is a federation of 36 states and the Federal Capital Territory (FCT) and is the most populous country on the African continent with an estimated population of 198 million people in 2017. The population is expected to rise to over 250 million by the year 2025.

The population in Nigeria is predominantly young, as is typical of countries with high fertility rates. The national median age is 17.2 years and the proportion of children under age 15 years is close to 46 percent, while the proportion of individuals aged 65 and older is 4 percent. The literacy rate for persons 15 years and older in 2015 was 60 percent. Disparities in literacy level exist based on geography and sex: for

---

<sup>1</sup> Shearer FM, Moyes CL, Pigott DM, Brady OJ, Marinho F, Deshpande A, et al. Global yellow fever vaccination coverage from 1970 to 2016: an adjusted retrospective analysis. *Lancet Infect Dis.* 2017;17(11):1209–17.

<sup>2</sup> Yellow Fever.” Accessed March 26, 2019. <https://www.who.int/news-room/fact-sheets/detail/yellow-fever>.

<sup>3</sup> A global strategy to Eliminate Yellow fever Epidemics 2017–2026. Geneva: World Health Organization; 2018. Licence: CC BY-NC- SA 3.0 IGO.



instance, more than 77 percent of women in urban areas are literate whereas only 36 percent of women living in the rural areas are literate. Overall, only 70 percent of males aged 6 years and above have ever attended school, compared with 58 percent of females.

### **1.3 Previous yellow fever preventive mass vaccination campaigns**

Nigeria had a preventive YF mass vaccination campaign in 3 states in November/December 2013. A post-campaign coverage survey conducted following this campaign estimated the coverage as 84% for Cross River state, 59 percent for Akwa Ibom state and 91 percent for Nasarawa state. In January/February 2018, YF PMVC was conducted in 4 states including Kwara, Kogi, Zamfara and Borno. The post campaign coverage survey estimated the coverage as 91 percent in Kwara state, 95 percent in Kogi state, 86 percent in Zamfara state and 96 percent in Borno state.

For this round of yellow fever PMVC was conducted in November and December 2018, in six (6) states namely; FCT, Niger, Plateau, Kebbi, Sokoto and Borno; and a post vaccination campaign coverage survey was conducted in all of the implementing states except in Borno state.

The 2018/19 post campaign coverage survey was implemented by National Bureau of Statistic (NBS) with technical assistance provided by the National Primary Healthcare Development Agency (NPHCDA), World Health Organization (WHO). The National Multi-Agency Committee led by NPHCDA coordinated the survey and funded by the Global Alliance for Vaccine and Immunization (GAVI).

### **1.4 Objectives of the Survey**

Qualitative preventive mass campaign is a criterion for effective reduction of risk of yellow fever outbreaks; therefore, a coverage survey was planned to be conducted after the campaign within two weeks.

#### **1.4.1 Primary survey objectives are:**

- 1) To assess the level of yellow fever coverage in five of the six implementing states (FCT, Plateau, Kebbi, Sokoto and Niger).
- 2) To assess the level of yellow fever coverage in the implementing LGAs of the five (5) states.

#### **1.4.2 The secondary objectives are:**

- 1) To analyse coverage by age group (9-23 months, 24-59 months, 6-14 years, 15-24 years, 25-44 years).
- 2) To analyse coverage by gender
- 3) To identify key communication channels that were effectively used for the campaign
- 4) To determine reasons for non-vaccination of eligible population during the campaign
- 5) To determine prevalence of adverse events following immunization (AEFI) during the campaign
- 6) To determine the prevalence of children receiving the first dose of yellow fever vaccine during the campaign (i.e., previously unvaccinated)
- 7) To identify strengths and weaknesses of program management.

## CHAPTER 2

### ORGANISATION OF THE SURVEY

#### 2.1 Introduction

The 2018/2019 post yellow fever campaign coverage survey (PYFCCS) was a cross-sectional household-based survey conducted on a probability sample of 1400 households in 200 enumeration areas in five implementing states. The survey was to provide representative estimates across each of the 5 states. Caregivers of all children aged between 9 month and 14 years and persons aged 15 to 44 years in the selected households were eligible to participate in the survey. PYFCCS was conducted in January 2019 sequel to the phased implementation of the 2018-19 yellow fever supplemental immunisation activity (SIA).

Given a target coverage of 80%, half-width confidence interval around state-level estimates of 8% (i.e., 80% +/- 8% coverage estimate) and an alpha level (type I error) of 5%, the effective sample size (i.e., sample size per stratum under a simple random sampling assumption) was  $n = 280$ . This level of precision allowed for estimation of coverage with acceptable precision at state, zonal and national levels.

#### 2.2 Survey design

##### 2.2.1 Sampling Frame

The sample design for any household-based survey requires availability of a good sampling frame. The frame of enumeration areas (EAs) developed by the National Population Commission (NPopC) for the purpose of the Housing and Population Census conducted in 2006 was the sampling frame to be used. For this survey.

The sampling frame was developed under the second National Integrated Survey of Households (NISH2) master frame programme. There were no inaccessible LGAs in any of the sampled states due to security or any external factors, except hard to reach areas. Also, there was no exclusion to Interpretation of results from any area.

<b>Table 2.1 Survey design</b>				
<b>Number of households, number of interviews, and response rates, according to residence(unweighted), Nigeria 2019</b>				
Target Number of Respondents per Cluster	Number of enumeration areas (clusters) per strata	Design Effect (DEFF) assuming Intra-cluster Correlation Coefficient = 1/6	Number of Eligible Households randomly selected for coverage survey per enumeration area	Total number of households per state
7	40	1.8	7	280

##### 2.2.1.1 LGA-based NISH Master Frame

From the list of 662,529 EAs for the country, NBS drew a Master Sample of 30 Enumeration Areas with equal probability from each LGA in the 36 states and 40 EAs in each of the 6 LGAs in the FCT, Abuja. This brings the total number of master sample EAs selected by NBS for its household-based surveys to 23,280.

### 2.2.1.2 State-based NISH Master Sample Frame

The National Integrated Survey of Households (NISH) is a two-stage replicated and rotatable cluster sample design. The State-base NISH Master Sample Frame is constructed by pooling together LGA master samples of 30 EAs for all the LGAs in the state and selecting sample of 200 EAs using a systematic selection procedure. These 200 EAs that form the NISH master sample were selected into 20 replicates, with each replicate containing 10 sample EAs.

<b>Table 2.2 Distribution of selected enumeration areas</b>						
Zone	States	No. of States	EA per State	Total No of EAs	No. of households/EA	Total households
North West	Kebbi, Sokoto	2	40	80	7	560
North Central	Niger, Plateau & FCT, Abuja	3	40	120	7	840
Total		5		200		1,400

### 2.2.2 First Stage Selection

The first stage selection is the selection of EAs in each of the five (5) strata namely Kebbi, Sokoto, Niger, Plateau and the Federal Capital Territory (FCT), Abuja. Forty (40) enumeration areas (4 replicates) were selected for coverage in each of the strata. A total of 200 EAs were selected in all the five strata.

### 2.2.3 Second Stage Selection

The second stage involved the selection of households within each cluster by using systematic random sampling. A sample of seven (7) households was randomly selected per EA for the interview providing a total of 1,400 households in the five (5) states.

### 2.2.4 Third Stage Selection

All household members who were aged between 9 months and 44 years were eligible for inclusion into the survey. This eligible age range was divided into three non-overlapping age cohorts of 9 – 23 months, 24 – 59 months, and 6 – 44 years and one eligible person was randomly selected for interview from each of these age cohorts in a household. When there was only one eligible person in an age group, that person automatically qualified to be interviewed and was selected for interviewing. Using this three-stage sampling design, a maximum of three persons were interviewed in the selected households regardless of the number of persons aged between 9 months and 44 years there were in a household. Household members outside the age range of 9 months and 44 years were not included in the survey.

The use of Kish grid at the household for selection of individuals to be interviewed was programmed into the Computer Assisted Personal Interviewing (CAPI) that were used for data collection. Individuals to be interviewed were selected automatically on completion of the household roster.

## 2.3 Household listing

Household listing was conducted to update the sampling frame for the selected enumeration areas. Two (2) levels of training were conducted for the personnel that conducted household listing and mapping. The first level of training was a training of trainers conducted in Abuja while the second level of training was

conducted in every state and targeted personnel to conduct household listing and mapping. The first level training consisted of resource persons and participants from NBS, NPHCDA and WHO.

## 2.4 Survey fieldwork

Computer assisted personal interviewing (CAPI) devices were used for data collection. Field personnel were selected on the basis of knowledge of local language, experience in previous household-based surveys and experience in using CAPI devices for interviewing.

### 2.4.1 Training for Fieldwork

A centralized training was conducted for all field staff in Keffi, Nasarawa state between 21<sup>st</sup> and 24<sup>th</sup> January 2019. The participants at the training included enumerators, monitors, survey coordinators and partners from NPHCDA, NBS and WHO. The training modalities included use of classroom lectures, role play, mock interview and field practical on interviewing using CAPI.

### 2.4.2 Fieldwork Implementation:

Data collection was conducted between January 26<sup>th</sup> and February 29<sup>th</sup> 2019. There were five teams in each state which comprised of 2 enumerators and 1 team leader (Supervisor) making a total of 15 field personnel in each state and 75 field personnel in the five implementing states. Field work was collected over a period of 15 days.

**Table 2.3 Distribution of field staff by zones**

Zones	No. of States	No of teams (5 members per state)	No. of field staff per team	Number of field staff per zone
North West	2	10	3	30
North Central	3	15	3	45
Total	5	25	6	75

## 2.5 Survey quality assurance

A team of experienced facilitators from NBS and partner organisations conducted training of field personnel. Supervisory layers were set up through the use of team leaders who were embedded within the data collection teams to monitor quality. Data collected in the field were synchronised with a centralised database at the end of data collection. The data were then reviewed on a daily basis for completeness and quality and feedback provided to the teams before so that they could address any issues with the data. In addition, monitoring officers/trainers from NBS Headquarters also carried out monitoring in the field in collaboration with monitors selected from other major stakeholders. Some of their functions included the following:

### 2.5.1 Field Supervision

Field interview and the first level of editing were carried out by the interviewers in the presence of monitors. The monitors ensured that the questionnaires were properly administered and edited before leaving for the next enumeration areas.

### 2.5.2 Monitoring of Field Work

Three (3) levels of monitoring were deployed: the first level was done by the NBS state officers, the second by the NBS zonal controllers and the third by the technical team comprising of NBS and the other stakeholders. The monitors ensured proper compliance with the laid down protocols as contained in the manual, effected necessary corrections and tackled problems that arose.

## 2.6 Data processing and analysis

Data collection was conducted using CSPro (Census and Survey) software running on android tablet computers. Range checks and skip patterns were coded into the data entry program to ensure that only all valid responses were collected and that there were responses to all applicable questions. On completion of the household roster, only age-eligible respondents were presented to the interviewer for interviewing and information had to be collected on all selected respondents before a household completion status was generated by the CAPI software. Once an interview was completed, data from an enumerators tablet was synchronized with the supervisors' tablet for primary data editing. The supervisor then transmitted the data to a centralized database once all eligible within an enumeration area had been interviewed.

Data cleaning and analysis was conducted using the supplementary immunisation activity (SIA) module of Vaccination Coverage Quality Indicators (VCQI) software running on Stata version 15 (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC)<sup>4</sup>. All results presented in the report are based on the weighted data to account for the survey sampling design and nonresponse. Design weights were computed as the product of inverse probabilities of selection in the first, second and third stages. Next, the design weight was adjusted for nonresponse by the household or the individual selected for interview to get the sampling weights for households and for children, respectively. Non-response was adjusted at the sampling stratum level. After adjusting for non-response, the sampling weights were normalized and post stratified to get the final standard weights that appear in the data files. Post-stratification was conducted by multiplying the normalised weights with the estimated proportion of respondents aged 9 months – 44 years in each stratum. The estimated number of respondents in each stratum was obtained from recently concluded micro-planning activity.

Bivariate analysis of post yellow fever campaign vaccination coverage, reasons for non-vaccination, adverse effects following immunisation (AEFI) and routine immunisation measles vaccination coverage were presented by residence, gender and zones. Wilson's 95% confidence intervals and upper and lower confidence bounds have been computed throughout the report.

---

<sup>4</sup> [http://www.biostatglobal.com/VCQI\\_resources.html](http://www.biostatglobal.com/VCQI_resources.html)

## CHAPTER 3

### CHARACTERISTICS OF SURVEY RESPONDENTS

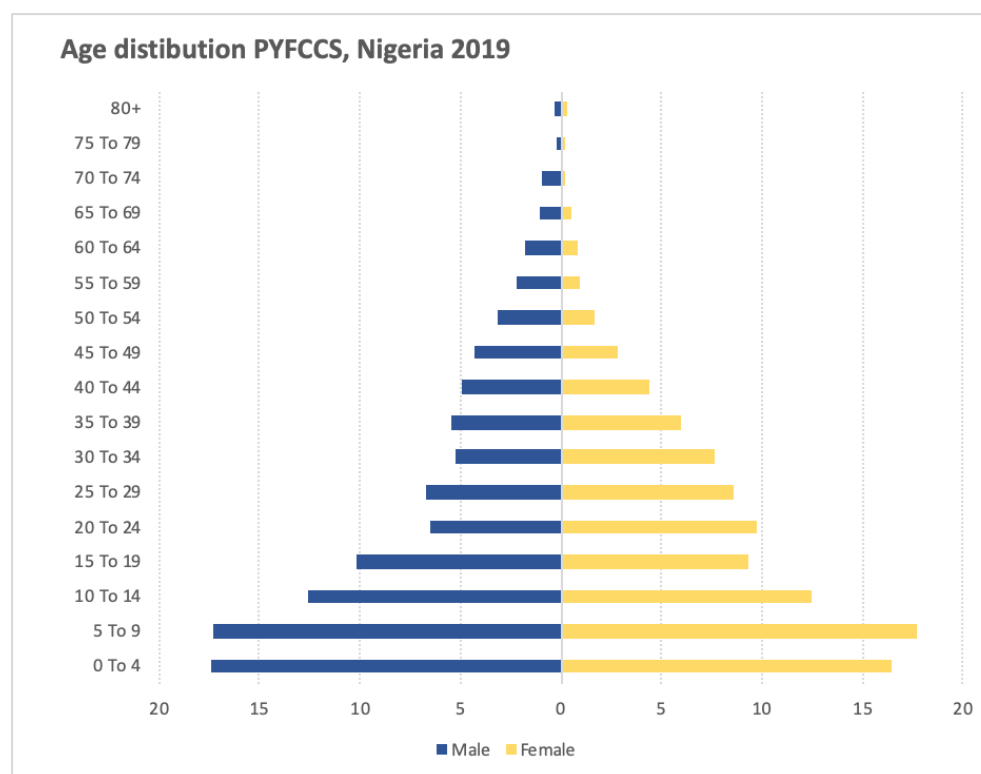
In this chapter the characteristics of the households, the population eligible for interviews and the response rate is described for each stratum. Table 3.1 gives the distribution of the population by age, according to sex. The population age structure derives from the past history of the population. The table is based on persons who are regular residents of the sampled households. Children aged less than 5 years and those aged between 5 and 9 years make thirty five percent of the total population.

<b>Table 3.1 Household population by age and sex</b>						
<b>Percent distribution of the de facto household population by five-year age groups, according to sex Nigeria 2019</b>						
<b>Age category</b>	<b>Male Percent</b>	<b>Unweighted count</b>	<b>Female Percent</b>	<b>Unweighted count</b>	<b>Total Percent</b>	<b>unweighted count</b>
Total	100.0	4,349	100.0	4,314	100.0	8,663
<5 years	17.4	744	16.5	699	17.0	1,443
5 To 9	17.3	772	17.7	767	17.5	1,539
10 To 14	12.6	559	12.5	543	12.5	1,102
15 To 19	10.2	460	9.3	419	9.8	879
20 To 24	6.5	279	9.8	402	8.2	681
25 To 29	6.7	283	8.6	378	7.7	661
30 To 34	5.2	221	7.7	318	6.4	539
35 To 39	5.5	229	6	260	5.8	489
40 To 44	4.9	213	4.4	197	4.7	410
45 To 49	4.3	173	2.8	125	3.5	298
50 To 54	3.1	139	1.7	75	2.4	214
55 To 59	2.2	97	0.9	41	1.5	138
60 To 64	1.8	74	0.8	39	1.3	113
65 To 69	1	46	0.5	21	0.7	67
70 To 74	0.9	37	0.2	9	0.5	46
75 To 79	0.2	10	0.2	8	0.2	18
80+	0.3	13	0.3	13	0.3	26

The table 3.2 below presents information on the number of households selected and interviewed and the household response rate for zone, state and urban/rural residences.

<b>Table 3.2 Results of household interviewed</b>				
<b>Number of households, response rates, according to residence unweighted, Nigeria 2019</b>				
Category	Households selected	Households occupied	Households interviewed	Household response rate (%) <sup>†</sup>
Nigeria	1,400	1,385	1,385	98.9
Urban	280	275	275	98.2
Rural	1,120	1,110	1,110	99.1
Kebbi	280	274	274	97.9
Niger	280	279	279	99.6
Plateau	280	278	278	99.3
Sokoto	280	279	279	99.6
FCT-Abuja	280	275	275	98.2
North Central	560	553	553	98.8
North West	840	832	832	99.0

<sup>†</sup> Households interviewed/households occupied



**Figure 3.1: Age pyramid showing the proportional representation of individuals in different age groups by gender, Nigeria 2019**

Table 3.3 below shows the number of eligible women and of eligible men identified and interviewed. It also provides the response rates by state, zone urban/rural residence and gender. A total of 7,561 members of the households were eligible, 2,344 individuals were interviewed and completed interviews for 2,336 individuals in the five selected states. Individual response rate is over 99 percent.

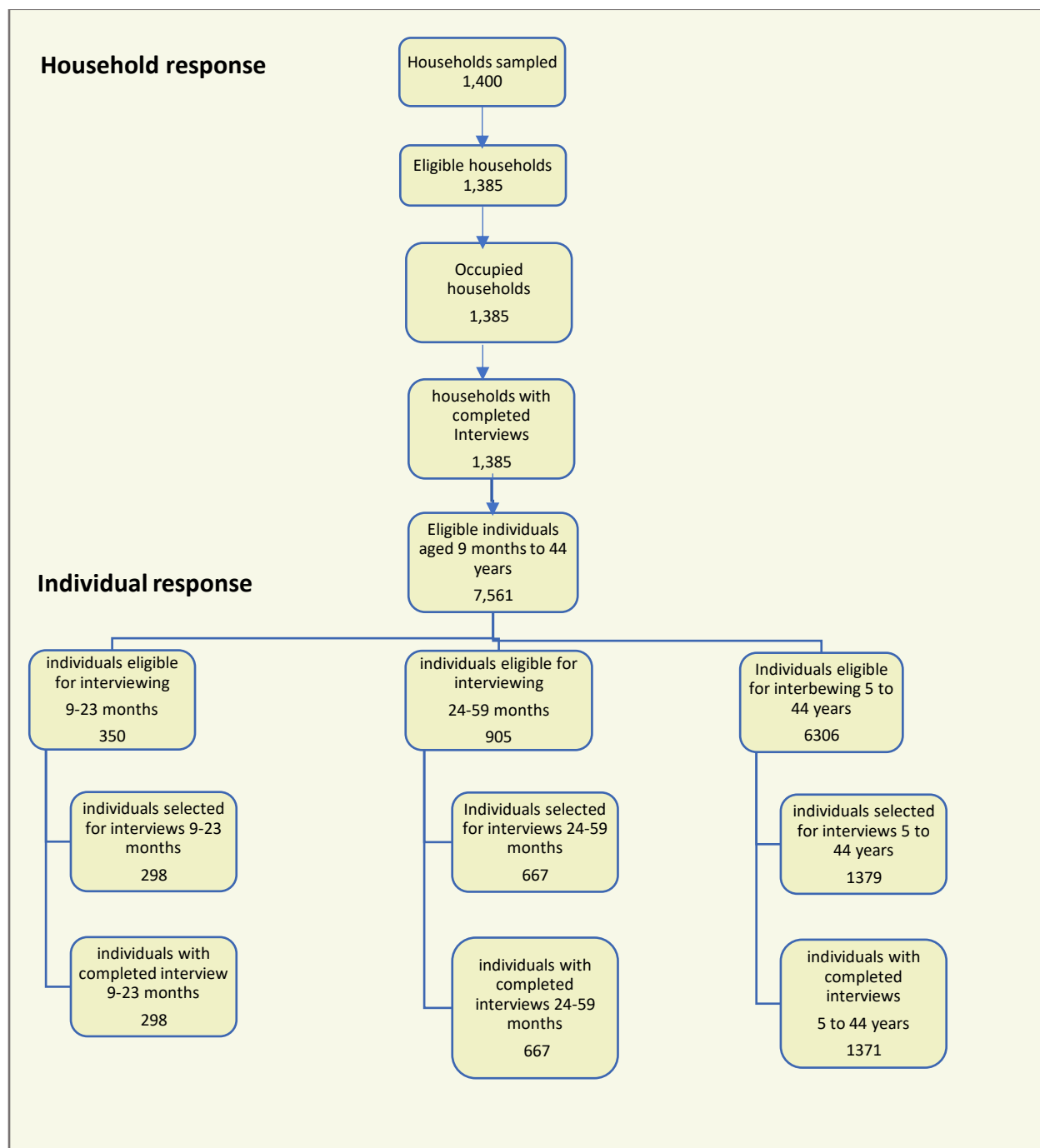
Analysis by state indicates that Kebbi state has the highest (1,627) eligible individuals while Sokoto, Niger, Plateau and FCT, Abuja have 1589, 1572, 1422 and 1351 respectively. The individual response rate in Niger, Plateau and Sokoto states is 100 percent each. Over 6,000 individuals were eligible in rural as compare to urban 1,329.

Majority of the individuals (6,306) eligible for interview are in the age cohort 5-44 years while 905 and 350 individuals are in the age ranges 24-59 months and 9-23 months respectively.

<b>Table 3.3 Results of individuals interviewed</b>				
<b>Eligible individuals, response rates, according to residence, Nigeria 2019</b>				
Category	Eligible from household roster	Individuals selected for interview	Individuals with completed interviews	Individual RR (%) <sup>†</sup>
Nigeria	7,561	2,344	2,336	99.7
Kebbi	1,627	516	510	98.8
Niger	1,572	488	488	100.0
Plateau	1,422	434	434	100.0
Sokoto	1,589	514	514	100.0
FCT-Abuja	1,351	392	390	99.5
Urban	1,329	422	419	99.3
Rural	6,232	1,922	1,917	99.7
9-23 Months	350	298	298	100.0
24-59 Months	905	667	667	100.0
5-44 Years	6,306	1,379	1,371	99.4
Male	3,666	1,196	1,196	100.0
Female	3,895	1,148	1,140	99.3
<sup>†</sup> Individuals with complete interview/Individuals selected for interview				

Figure 3.2 below shows distribution of household and individual response and also shows in detail the third stage selection of eligible individuals at the household level. Of the 350 eligible children aged 9 to 23 months 298 (85.1 percent) were selected for interviews and were interviewed. In the 24 to 59-month age group 905 children were eligible for interviews, 667 (73.3 percent) were selected and were interviewed. Finally, in the 5 to 44-year age group, 6306 individuals were eligible for interviewing, 1379 (21.8 percent) were selected for interviewing and 1371 responded.





**Figure 3.2 Distribution of household and individual response rates**

## CHAPTER 4

### YELLOW FEVER VACCINATION COVERAGE

Results of yellow fever vaccination coverage information focus on the age group between 9 months to 44 years who were the target for the yellow fever campaign. Additionally, the source of information on vaccination, reasons for non-vaccination, adverse effects following immunization (AEFI) and yellow fever coverage from routine immunisation have been presented. Disaggregation of campaign coverage for different subgroups and sector have also been presented.

#### 4.1 Proportion of eligible individuals who were at home during the campaign

Majority of the eligible individuals (97.7 percent) were in their households during the campaign across all the states. The proportions of eligible individuals who were at home during the survey ranged from 95.7 percent in Sokoto state to 98.8 percent in Plateau state. There was no remarkable difference in the proportion of eligible individuals present in their household by residence, gender or across age categories as shown in table 4.1 below.

<b>Table 4.1: Proportion of eligible individuals at home</b> <b>Proportion of eligible individuals at home during the</b> <b>Campaign, Nigeria, 2019.</b>			
	Yes (%)	No (%)	N
<b>NIGERIA (5 States)</b>	97.7	2.3	2,336
Niger	98.2	1.8	488
Plateau	98.8	1.2	434
FCT Abuja	98.5	1.5	390
Kebbi	97.6	2.4	510
Sokoto	95.7	4.3	514
Urban/Rural			
Urban	98.3	1.7	419
Rural	97.5	2.5	1,917
Age category			
9-23 months	98.7	1.3	298
24-59 months	99.0	1.0	667
6-14 years	98.2	1.8	452
15-24 years	96.3	3.7	301
25-44 years	96.1	3.9	618
Sex of household member			
Male	97.5	2.5	1,196
Female	97.9	2.1	1,140
Note: This measure is an unweighted summary of proportions from the survey sample.			
Denominator (N) is the total number of respondents.			

#### 4.2 Sources of information about the campaign

Social mobilization activities conducted before and during any vaccination campaign play an important role in informing the community and ensuring their participation. During the 2018 yellow fever vaccination campaign, various communication media were used to enlighten and mobilize the community prior to the campaign.

Tables 4.2 below show the primary sources of information about the yellow fever vaccination campaign. Generally, community health workers (CHW) were the main source of information about the yellow fever campaign. Close to half (48.2 percent) of the respondents in Plateau state reported that their source of information about the campaign was from a community health worker while Niger, Kebbi, FCT and Sokoto states reported 33.2 percent, 15.5 percent, 11.5 percent and 10.9 percent that they received their information from community health workers respectively. Criers/mobilisers are the next important source of information about the campaign. Niger, Sokoto, Kebbi states and FCT, Abuja reported 36.1 percent, 30.0 percent, 23.1 percent Kebbi state reported that they got the information through a community health worker at 48.2 percent, 33.2 percent and 15.5 percent respectively. Plateau state and Sokoto state had the lowest proportion of respondents reporting to be uninformed about the campaign at 1.6 percent each while Kebbi state had the highest 9.8 percent. There are clear differences in the proportion of respondents who reported to have received information about the campaign from radio, television, criers/mobilisers, community health workers, school, family, neighbour or friend and village chief in urban and in rural area.

The use of internet / social media as a source for information about the campaign was elicited. However, none of the respondents in any of the states cited the internet as a primary source of information on the campaign.

**Table 4.2: Sources of information about the campaign****Primary source of information about the campaign by state, residence, age category and gender, Nigeria 2019**

	Not informed (%)	Radio (%)	Television (%)	Criers / mobilisers (%)	Community health workers (%)	School (%)	Family (%)	Neighbour or friend (%)	Village Chief (%)	Religious leader (%)	Other (specify below) (%)	N
Campaign (five states)	4	12.5	0.7	22.7	23.6	1	2.8	6.5	19.5	6.3	0.3	2,336
Niger	2	2	0	36.1	33.2	1	7.8	2.9	14.3	0.6	0	488
Plateau	1.6	12	0.7	4.8	48.2	1.4	0	5.5	6	19.6	0.2	434
FCT Abuja	4.9	24.1	3.3	15.6	11.5	1.3	2.6	13.6	13.1	10	0	390
Kebbi	9.8	14.1	0	23.1	15.5	0.4	0.8	3.9	29.8	2	0.6	510
Sokoto	1.6	12.5	0	30	10.9	1.2	2.7	8	30.5	1.9	0.8	514
Urban/Rural												
Urban	2.4	27.4	3.1	20.5	16	2.6	4.8	14.1	3.8	5	0.2	419
Rural	4.4	9.2	0.2	23.2	25.2	0.7	2.4	4.9	23	6.6	0.4	1,917
Age category												
9-23 months	4.4	13.4	0.3	24.8	24.8	0.3	2.3	6.7	18.1	4.4	0.3	298
24-59 months	3.4	11.1	0.3	24.6	22.8	0.7	2.5	6.3	21.1	6.7	0.3	667
6-14 years	2.9	12.2	1.1	22.8	23.7	1.8	2.4	5.5	21.9	5.3	0.4	452
15-24 years	5.3	11.6	0.3	17.9	24.6	1.7	4.3	6.6	18.3	9.3	0	301
25-44 years	4.7	14.2	1.1	21.8	23.3	0.8	2.9	7.3	17.3	6	0.5	618
Sex of household member												
Male	4.8	12.9	0.7	22.7	23.9	1.5	2.7	5.6	18.5	6.3	0.5	1,196
Female	3.2	12.1	0.7	22.7	23.2	0.5	3	7.5	20.6	6.3	0.2	1,140

Note: This measure is an unweighted summary of proportions from the survey sample.

Denominator (N) is the total number of respondents.

No respondent cited internet as primary source of information on the campaign

### **4.3 Main reasons for non-vaccination**

Eligible individuals who were not vaccinated during the campaign were requested to provide the main reason as to why they did not receive yellow fever vaccination. Table 4.3 provides the reasons for non-vaccination by state, sector and age-groups. Majority of the eligible respondents who were not vaccinated reported that they did not know that the yellow fever campaign was being conducted. Kebbi reported the highest proportion of 8.1 percent and Niger has the lowest 4.1 percent.

Furthermore, 4.5 percent of respondents reported that they were not authorised by the head of household to be vaccinated while 4.1 percent informed that they are afraid of injection in Sokoto state. In addition, less than one percent of the respondents in rural claimed that the site of the vaccination is too far. Distribution by age category indicate that more than 4 percent of individuals aged between 15 and 44 years did not know about the campaign.

Table 4.3: Reasons for non-vaccination in the campaign, Nigeria, 2019										
	Did not Know about the campaign (%)	Confused with other vaccines (believes that child/self has already been vaccinated (%)	Subject or parent or guardian were missing (%)	Fear of injection (%)	Lack of confidence in vaccine (%)	Fear of side effects (%)	Site of vaccination not known (%)	Site of vaccination too far (%)	Time of vaccination unsuitable (%)	Waited too long at vaccination site (%)
Campaign (five states)	3.4	0.2	0.2	1.6	0.9	0.5	0.3	0.9	1.4	0.2
Niger	1.4	0.4	0.0	0.2	1.6	0.4	0.4	0.0	1.0	0.0
Plateau	1.8	0.0	0.0	0.2	0.0	0.0	0.2	2.1	0.5	0.0
FCT Abuja	1.5	0.0	0.5	0.5	0.5	0.8	0.0	0.0	1.3	0.0
Kebbi	8.0	0.0	0.4	2.4	1.0	0.0	0.2	0.2	0.8	0.0
Sokoto	3.3	0.4	0.0	4.1	1.4	1.2	0.6	2.3	3.3	1.0
Urban/Rural										
Urban	2.4	0.2	0.5	0.7	1.2	0.7	0.0	1.7	2.1	0.5
Rural	3.6	0.2	0.1	1.8	0.9	0.4	0.4	0.8	1.3	0.2
Age category										
9-23 months	3.4	0.3	0.3	1.0	0.7	0.7	0.3	1.7	0.7	0.3
24-59 months	2.5	0.0	0.1	1.2	0.3	0.1	0.3	0.7	0.3	0.0
6-14 years	2.7	0.0	0.4	1.5	0.2	0.0	0.0	0.9	0.2	0.0
15-24 years	4.3	0.0	0.0	2.7	1.0	1.3	0.3	1.3	1.7	0.7
25-44 years	4.4	0.5	0.0	1.8	2.3	0.6	0.5	0.6	3.7	0.3
Sex of household member										
Male	4.0	0.1	0.1	1.6	1.0	0.6	0.2	0.8	1.5	0.2
Female	2.7	0.3	0.3	1.6	0.9	0.4	0.4	1.1	1.3	0.3
Note: This measure is an unweighted summary of proportions from the survey sample. Denominator (N) is the total number of respondents.										

	Missing vaccinator at the site (%)	Not authorised by head of household (%)	Religious beliefs (%)	Sick at time of vaccination (%)	Absent during time of campaign (%)	Too busy to go or take child (%)	Was ill / child ill (%)	Mother ill (%)	Already received YF vaccine (%)	Other (specify) (%)	. (%)	N
Campaign (five states)	0.2	1.8	0.4	0.9	2.6	0.3	0.1	0.4	2.0	2.9	78.7	2,336
North Central	0.0	0.2	0.0	0.4	0.6	0.0	0.0	0.2	0.0	1.3	92.2	824
Niger	0.0	1.2	0.0	1.4	3.3	0.2	0.2	0.6	7.8	3.9	75.8	488
Plateau	0.0	0.0	0.0	0.2	0.7	0.0	0.0	0.2	0.0	1.6	92.4	434
FCT Abuja	0.0	0.5	0.0	0.5	0.5	0.0	0.0	0.3	0.0	1.0	92.1	390
North West	0.3	2.6	0.7	1.3	3.7	0.5	0.2	0.5	3.0	3.8	71.4	1,512
Kebbi	0.8	2.0	0.2	1.2	2.5	0.0	0.0	0.2	1.2	3.1	75.9	510
Sokoto	0.2	4.5	1.8	1.2	5.3	1.2	0.4	0.8	0.4	4.3	62.6	514
Urban/Rural												
Urban	0.2	2.1	0.5	1.0	2.9	0.2	0.5	0.2	2.4	2.1	77.8	419
Rural	0.2	1.7	0.4	0.9	2.6	0.3	0.1	0.5	1.9	3.1	78.9	1,917
Age category												
9-23 months	0.3	2.3	0.0	1.7	1.7	1.3	1.0	0.0	3.7	3.7	74.8	298
24-59 months	0.1	1.9	0.1	0.9	0.3	0.3	0.0	0.3	2.7	0.9	86.7	667
6-14 years	0.0	0.9	0.2	0.2	1.3	0.0	0.0	0.2	2.0	1.3	87.8	452
15-24 years	0.7	3.0	1.0	1.0	2.7	0.0	0.0	1.0	1.3	4.0	72.1	301
25-44 years	0.2	1.3	0.8	1.1	6.5	0.2	0.0	0.6	0.6	5.3	68.6	618
Sex of household member												
Male	0.3	1.0	0.5	0.3	3.4	0.3	0.3	0.1	1.9	1.9	80.1	1,196
Female	0.2	2.5	0.4	1.7	1.8	0.3	0.0	0.8	2.0	3.9	77.3	1,140
Note: This measure is an unweighted summary of proportions from the survey sample. Denominator (N) is the total number of respondents.												

#### **4.4 Individuals receiving vaccination before the campaign**

The status of yellow fever vaccination before the campaign was sought from all respondents, including evidence on whether yellow fever vaccine had been administered. Tables 4.4 below show proportion of individuals who received yellow fever vaccination before the yellow fever campaign. About 46.8 percent of all respondents had received yellow fever vaccine before the campaign. Of all respondent's, 24.0 percent have card to show they had received yellow fever vaccine before the campaign while 22.8 percent reported that they had received yellow fever vaccine before the campaign from recall. Kebbi state had the lowest proportion of individuals who had received yellow fever vaccine before the campaign at 19.7 percent while FCT, Abuja had the highest proportion of children who had received yellow fever vaccine before the campaign at 71.1 percent. More individuals aged 9 months to 44 years had received Yellow Fever vaccine before the 2018 campaign in rural areas compared to urban areas at 47.7 percent and 44.3 percent respectively.



	Yes, Date(s) on card (%)	95% CI (%)	Yes, Recall /History (%)	95% CI (%)	No (%)	95% CI (%)	Do Not Know (%)	95% CI (%)	Yes (%)	95% CI (%)	N	Weighted N
Campaign (five states)	24.0	(19.8, 28.7)	22.8	(18.5, 27.8)	42.4	(37.1, 47.9)	10.8	(7.9, 14.6)	46.8	(41.2, 52.4)	2,336	26,360,832
Niger	24.2	(16.8, 33.6)	20.5	(12.8, 31.2)	42.0	(29.0, 56.2)	13.3	(6.8, 24.5)	44.7	(31.6, 58.5)	488	6,998,717
Plateau	14.4	(8.8, 22.6)	49.6	(40.3, 58.9)	17.2	(10.2, 27.4)	18.8	(9.7, 33.4)	64.0	(52.3, 74.2)	434	3,891,227
FCT Abuja	32.6	(21.9, 45.6)	38.4	(23.9, 55.3)	26.5	(17.0, 38.7)	2.4	(1.2, 04.9)	71.1	(59.6, 80.3)	390	4,626,401
Kebbi	9.9	(6.5, 14.6)	9.8	(5.1, 18.0)	66.6	(57.6, 74.6)	13.7	(9.0, 20.4)	19.7	(14.6, 26.0)	510	5,374,587
Sokoto	37.0	(27.1, 48.2)	6.3	(3.3, 11.5)	50.6	(41.5, 59.6)	6.1	(3.3, 11.1)	43.3	(32.9, 54.3)	514	5,469,903
Urban/Rural												
Urban	22.7	(16.5, 30.5)	21.5	(12.3, 34.9)	46.5	(35.1, 58.2)	9.3	(3.7, 21.6)	44.3	(33.2, 55.9)	419	6,929,565
Rural	24.4	(19.3, 30.3)	23.3	(18.7, 28.5)	41.0	(35.2, 47.0)	11.4	(8.4, 15.2)	47.7	(41.4, 54.0)	1,917	19,431,268
Age category												
9-23 months	39.2	(30.5, 48.7)	11.1	(7.1, 16.9)	47.4	(38.0, 56.9)	2.3	(0.9, 06.0)	50.3	(40.9, 59.7)	298	1,161,405
24-59 months	29.9	(23.6, 37.0)	23.3	(17.9, 29.7)	43.7	(35.4, 52.4)	3.2	(1.7, 05.7)	53.2	(44.5, 61.6)	667	3,290,898
6-14 years	32.1	(25.3, 39.7)	26.1	(19.5, 34.0)	36.6	(28.9, 45.2)	5.2	(3.0, 08.9)	58.2	(49.3, 66.6)	452	8,487,458
15-24 years	12.2	(7.6, 19.0)	28.5	(20.4, 38.3)	42.3	(32.9, 52.4)	17.0	(8.9, 30.0)	40.7	(31.6, 50.4)	301	4,587,332
25-44 years	18.2	(12.8, 25.1)	18.0	(13.0, 24.4)	46.9	(40.3, 53.6)	17.0	(12.1, 23.2)	36.1	(29.3, 43.6)	618	8,833,741
Sex of household member												
Male	24.5	(19.6, 30.2)	22.8	(17.8, 28.8)	42.2	(34.8, 49.9)	10.5	(7.4, 14.6)	47.3	(40.3, 54.5)	1,196	13,471,333
Female	23.4	(18.2, 29.5)	22.8	(17.8, 28.6)	42.6	(37.2, 48.2)	11.2	(7.7, 15.9)	46.2	(39.4, 53.1)	1,140	12,889,500
Abbreviations: CI=Confidence Interval												
Note: This measure is a population estimate that incorporates survey weights. The CI is calculated with software that take the complex survey design into account.												

#### **4.5 Adverse effects following immunisation (AEFI)**

An adverse event following immunization (AEFI) is any unintended medical occurrence which follows vaccination. AEFIs may occur as a result of an individual's reaction to compounds inherent in the vaccine, reaction to substances introduced into the vaccine by the manufacturing process, inappropriate vaccine handling, vaccination error or may be coincidental occurrences unrelated to the vaccination. Yellow fever vaccination may be associated with adverse effects as a result of vaccine composition or as consequence of vaccine administration. Most AEFI's are mild and resolve within a few days following vaccination. However, yellow fever vaccination may sometimes be associated with severe adverse effects which may persist for a long time after vaccination including yellow fever vaccine-associated neurologic disease and yellow fever vaccine-associated viscerotropic disease. AEFIs should be monitored, well documented and reported.

Fourteen percent of all respondents reported having an adverse reaction following yellow fever vaccination. Sokoto State has the highest percentage (26.0 percent) of individuals who reported that they developed a reaction in the months following the vaccination while Kebbi State reported the lowest (7.4 percent). More (24.5 percent) children age 9-23 months reported that they develop a reaction in the months following the vaccination while those in the age category 25-44 years report the least percentage (7.6 percent).

The most common form of adverse reaction following vaccination was fever between 7 and 12 days which occurred 6 percent of the population. Fever occurring between 12 days was highest in Sokoto state occurring in 10 percent of those vaccinated with yellow fever vaccine and higher in residents living in rural areas 6.4 % and children aged between 9 and 23 months (13.2 percent).

<b>Table 4.5: Adverse reaction following vaccination</b>								
<b>Proportion and 95% CI of individuals who developed an adverse reaction following yellow fever vaccination, Nigeria, 2019.</b>								
	Did you / the child develop a reaction in the months following the vaccination? (%)	95% CI (%)	Subtotal: Type of adverse reaction (%)	95% CI (%)	Fever between 7 and 12-days following vaccination? (%)	95% CI (%)	General rash between 7- and 10-days following vaccination? (%)	95% CI (%)
Campaign (five states)	14.1	(10.6, 18.4)	14.1	(10.6, 18.4)	5.7	(3.4, 09.5)	1.2	(0.3, 05.2)
Niger	10.6	(5.9, 18.3)	10.6	(5.9, 18.3)	2.1	(0.9, 04.6)	0.2	(0.0, 01.0)
Plateau	10.6	(5.4, 19.8)	10.6	(5.4, 19.8)	4.9	(2.0, 11.4)	0.2	(0.0, 0.7)
FCT Abuja	15.7	(9.2, 25.5)	15.7	(9.2, 25.5)	6.1	(2.5, 14.4)	0.1	(0.0, 0.7)
Kebbi	7.4	(4.0, 13.3)	7.4	(4.0, 13.3)	6	(3.1, 11.2)	0	(0.0, 0.2)
Sokoto	26	(15.5, 40.3)	26	(15.5, 40.3)	10.4	(3.4, 28.0)	5.6	(1.2, 22.1)
Urban/Rural								
Urban	12.9	(7.0, 22.5)	12.9	(7.0, 22.5)	3.8	(1.8, 07.7)	0.5	(0.1, 02.1)
Rural	14.5	(10.6, 19.4)	14.5	(10.6, 19.4)	6.4	(3.6, 11.4)	1.5	(0.3, 07.1)
Age category								
9-23 months	24.5	(17.0, 33.9)	24.5	(17.0, 33.9)	13.2	(8.5, 19.9)	0.1	(0.0, 0.7)
24-59 months	19.7	(14.5, 26.2)	19.7	(14.5, 26.2)	9.4	(5.8, 14.9)	1.6	(0.3, 07.2)
6-14 years	18	(12.6, 24.9)	18	(12.6, 24.9)	8	(4.5, 13.8)	2	(0.4, 09.5)
15-24 years	12.6	(7.3, 21.0)	12.6	(7.3, 21.0)	4.6	(1.3, 14.3)	1.8	(0.4, 07.1)
25-44 years	7.6	(5.0, 11.3)	7.6	(5.0, 11.3)	1.9	(0.9, 04.0)	0.3	(0.1, 01.7)
Sex of household member								
Male	12.8	(9.1, 17.7)	12.8	(9.1, 17.7)	5.2	(2.8, 09.4)	1.1	(0.3, 04.6)
Female	15.4	(11.5, 20.3)	15.4	(11.5, 20.3)	6.3	(3.9, 10.2)	1.4	(0.3, 05.9)
Abbreviations: CI=Confidence Interval								
Note: This measure is a population estimate that incorporates survey weights. The CI is calculated with software that take the complex survey design into account.								

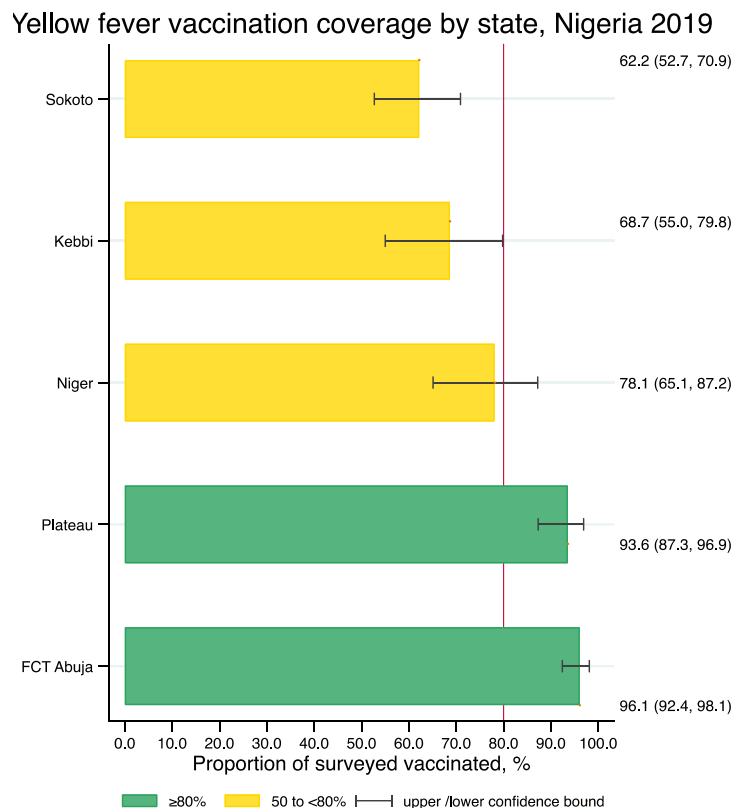
<b>Table 4.5: Adverse reaction following vaccination. Continued</b>										
<b>Proportion and 95% CI of individuals who developed an adverse reaction following yellow fever vaccination, Nigeria, 2019.</b>										
	Pain at the site of injection? (%)	95% CI (%)	Seizure (black-out or convulsions); or High fever (within a few hours or a few d (%)	95% CI (%)	Pain or lump where the shot was given? (%)	95% CI (%)	Headache (severe or continuing)? (%)	95% CI (%)	Confusion or dizziness? (%)	95% CI (%)
Campaign (five states)	10.5	(7.5, 14.4)	0.0	(0.0, 0.2)	0.0	(0.0, 0.2)	0.5	(0.2, 01.4)	0.1	(0.0, 0.8)
North Central	8.5	(4.5, 15.4)	0.0	(0.0, 0.4)	0.0	(0.0, 0.4)	0.1	(0.0, 0.4)	0.0	(0.0, 0.4)
Niger	9.1	(4.1, 18.9)	0.0	(0.0, 0.8)	0.0	(0.0, 0.8)	0.8	(0.2, 02.9)	0.0	(0.0, 0.8)
Plateau	12.7	(6.6, 23.2)	0.0	(0.0, 0.8)	0.0	(0.0, 0.8)	0.1	(0.0, 0.8)	0.0	(0.0, 0.8)
FCT Abuja			0.0	(0.0, 0.9)	0.0	(0.0, 0.9)	0.0	(0.0, 0.9)	0.0	(0.0, 0.9)
North West	21.2	(12.3, 34.0)	0.0	(0.0, 0.2)	0.0	(0.0, 0.2)	0.7	(0.3, 02.1)	0.2	(0.0, 01.2)
Kebbi	8.5	(4.5, 15.4)	0.0	(0.0, 0.7)	0.0	(0.0, 0.7)	0.2	(0.0, 01.1)	0.7	(0.1, 03.7)
Sokoto	9.1	(4.1, 18.9)	0.0	(0.0, 0.7)	0.0	(0.0, 0.7)	1.3	(0.3, 05.9)	0.0	(0.0, 0.7)
Urban/Rural										
Urban	10.9	(5.6, 20.3)	0.0	(0.0, 0.9)	0.0	(0.0, 0.9)	0.0	(0.0, 0.9)	0.0	(0.0, 0.9)
Rural	10.3	(7.1, 14.8)	0.0	(0.0, 0.2)	0.0	(0.0, 0.2)	0.7	(0.3, 01.9)	0.2	(0.0, 01.1)
Age category										
9-23 months	12.3	(6.8, 21.3)	0.0	(0.0, 01.2)	0.0	(0.0, 01.2)	0.0	(0.0, 01.2)	0.0	(0.0, 01.2)
24-59 months	13.8	(9.5, 19.6)	0.0	(0.0, 0.6)	0.0	(0.0, 0.6)	0.5	(0.1, 01.8)	0.0	(0.0, 0.6)
6-14 years	14.7	(9.8, 21.4)	0.0	(0.0, 0.8)	0.0	(0.0, 0.8)	0.3	(0.1, 01.2)	0.0	(0.0, 0.8)
15-24 years	8.9	(5.2, 15.0)	0.0	(0.0, 01.2)	0.0	(0.0, 01.2)	1.5	(0.3, 07.2)	0.0	(0.0, 01.2)
25-44 years	5.8	(3.6, 09.2)	0.0	(0.0, 0.6)	0.0	(0.0, 0.6)	0.4	(0.1, 02.0)	0.4	(0.1, 02.3)
Sex of household member										
Male	10.3	(7.0, 14.9)	0.0	(0.0, 0.3)	0.0	(0.0, 0.3)	0.3	(0.1, 0.8)	0.0	(0.0, 0.3)
Female	10.7	(7.5, 15.1)	0.0	(0.0, 0.3)	0.0	(0.0, 0.3)	0.8	(0.2, 02.8)	0.3	(0.1, 01.6)
Abbreviations: CI=Confidence Interval										
Note: This measure is a population estimate that incorporates survey weights. The CI is calculated with software that take the complex survey design into account.										

## 4.6 Yellow fever vaccination coverage

Information regarding whether individuals received yellow fever vaccination during the campaign was sought through use of card evidence, history or finger-mark. The target yellow fever vaccination coverage was 80 percent in all states. Table 4.6 below reports the proportion of individuals who received yellow fever vaccination during the campaign by state, age category and sex and by the source of evidence of vaccination. Seventy eight percent of all individuals aged between 9 months and 44 years received yellow fever vaccination during the 2018 campaign. The source of information on the vaccination was 56.9 percent, 20.6 percent and 66.0 percent from card, history and finger-marking respectively.

FCT, Abuja and Plateau state achieved coverage of 96.9 percent and 93.7 percent and had lower confidence bound of 94.4 percent and 89.4 percent respectively which is more than the target 80 percent coverage per state needed to achieve herd immunity against yellow fever. The other three states including Niger (78.1 percent), Kebbi (68.7 percent) and Sokoto (62.2 percent) achieved less than the target coverage.

Children between the ages of 6 and 14 years have the highest (88.2 percent) proportion vaccinated during the campaign while those in the age groups 24-59 months, 15-24 years and 9-23 months reported 74.5 and 72.9 respectively. There was no difference in the proportion of individuals vaccinated by gender or residence. Young children aged between 9 and 11 months had lower measles vaccination during the campaign than children in the older age groups.



**Figure 4.1 Yellow fever vaccination coverage and the 95% upper and lower confidence bounds by state, Nigeria 2019**

	Vaccinated during SIA, by card (%)	95% CI (%)	Vaccinated during SIA, by history (%)	95% CI (%)	Vaccinated during SIA, by finger- mark (%)	95% CI (%)	Vaccinated during SIA (%)	95% CI (%)	N	Weighted N
Campaign (five states)	56.9	(51.6, 62.0)	20.6	(16.0, 25.9)	66.0	(60.5, 71.1)	78.4	(73.3, 82.7)	2,336	26,360,832
Niger	52.6	(43.6, 61.4)	24.6	(15.9, 35.9)	73.1	(60.3, 83.0)	78.1	(65.1, 87.2)	488	6,998,717
Plateau	58.0	(41.5, 72.8)	34.1	(19.4, 52.6)	62.7	(49.2, 74.5)	93.6	(87.3, 96.9)	434	3,891,227
FCT Abuja	82.9	(69.9, 91.0)	13.2	(5.9, 27.0)	86.6	(71.0, 94.5)	96.1	(92.4, 98.1)	390	4,626,401
Kebbi	54.4	(41.1, 67.1)	12.7	(6.7, 22.8)	55.1	(44.8, 64.9)	68.7	(55.0, 79.8)	510	5374587
Sokoto	42.0	(33.9, 50.5)	19.7	(12.0, 30.7)	52.6	(43.1, 62.0)	62.2	(52.7, 70.9)	514	5,469,903
Urban/Rural										
Urban	58.6	(48.8, 67.7)	21.8	(12.8, 34.5)	73.0	(60.1, 82.9)	80.4	(69.9, 87.8)	419	6,929,565
Rural	56.3	(49.8, 62.5)	20.1	(15.3, 26.1)	63.5	(57.8, 68.9)	77.6	(71.6, 82.7)	1,917	19,431,268
Age category										
9-23 months	54.7	(45.6, 63.4)	16.1	(10.8, 23.4)	65.0	(55.7, 73.3)	72.9	(64.1, 80.2)	298	1,161,405
24-59 months	60.3	(52.6, 67.6)	22.7	(16.6, 30.2)	76.5	(69.1, 82.6)	83.8	(76.7, 89.1)	667	3,290,898
6-14 years	67.4	(60.1, 74.0)	20.3	(14.5, 27.8)	77.0	(69.6, 82.9)	88.2	(81.2, 92.9)	452	8,487,458
15-24 years	56.6	(47.1, 65.6)	17.9	(12.2, 25.4)	57.5	(48.2, 66.4)	74.5	(66.2, 81.3)	301	4,587,332
25-44 years	45.9	(38.1, 53.8)	21.9	(15.7, 29.7)	56.1	(48.8, 63.2)	69.5	(62.4, 75.8)	618	8,833,741
Sex of household member										
Male	56.9	(50.5, 63.2)	21.9	(16.5, 28.6)	68.5	(62.0, 74.4)	79.7	(73.9, 84.5)	1,196	1,3471,333
Female	56.8	(50.9, 62.5)	19.1	(14.8, 24.3)	63.4	(57.6, 68.9)	76.9	(71.3, 81.7)	1,140	1,2889,500
Geopolitical zone										
North Central	71.5	(60.7, 80.3)	22.8	(14.3, 34.2)	75.7	(65.7, 83.5)	95.0	(91.7, 97.0)	824	8,517,627
North West	49.9	(44.0, 55.8)	19.5	(14.5, 25.7)	61.4	(54.6, 67.8)	70.4	(63.4, 76.6)	1,512	17,843,206
Abbreviations: CI=Confidence Interval; LCB=Lower Confidence Bound; UCB=Upper Confidence Bound; DEFF=Design Effect; ICC=Intra-cluster Correlation Coefficient Note: This measure is a population estimate that incorporates survey weights. The CI, LCB and UCB are calculated with software that take the complex survey design into account.										

**Table 4.6: Vaccinated During SIA, 2019 continued****Vaccination coverage by source of vaccination information by state, residence, age category and gender, Nigeria 2019**

	Vaccinated during SIA (%)	95% CI (%)	StdErr (%)	95% LCB (%)	95% UCB (%)	DEFF	ICC	N	Weighted N
Campaign (five states)	78.4	(73.3, 82.7)	2.4	74.2	82	7.7	0.6317	2,336	26,360,832
Niger	78.1	(65.1, 87.2)	5.6	67.4	86	8.9	0.7014	488	6,998,717
Plateau	93.6	(87.3, 96.9)	2.3	88.6	96.5	3.9	0.2901	434	3,891,227
FCT Abuja	96.1	(92.4, 98.1)	1.3	93.2	97.8	1.9	0.1021	390	4,626,401
Kebbi	68.7	(55.0, 79.8)	6.3	57.3	78.3	9.5	0.7275	510	5374587
Sokoto	62.2	(52.7, 70.9)	4.6	54.3	69.6	4.6	0.304	514	5,469,903
Urban/Rural									
Urban	80.4	(69.9, 87.8)	4.6	71.8	86.8	5.6	4.1704	419	6,929,565
Rural	77.6	(71.6, 82.7)	2.8	72.6	82	8.9	0.9194	1,917	19,431,268
Age category									
9-23 months	72.9	(64.1, 80.2)	4.1	65.6	79.2	2.6	3.2171	298	1,161,405
24-59 months	83.8	(76.7, 89.1)	3.1	78	88.4	4.8	1.6483	667	3,290,898
6-14 years	88.2	(81.2, 92.9)	3	82.5	92.3	3.8	2.2257	452	8,487,458
15-24 years	74.5	(66.2, 81.3)	3.9	67.6	80.3	2.4	2.7038	301	4,587,332
25-44 years	69.5	(62.4, 75.8)	3.4	63.6	74.9	3.4	1.1503	618	8,833,741
Sex of household member									
Male	79.7	(73.9, 84.5)	2.7	74.9	83.8	5.4	0.8781	1,196	1,3471,333
Female	76.9	(71.3, 81.7)	2.6	72.3	81	4.5	0.7367	1,140	1,2889,500
Geopolitical zone									
North Central	95.0	(91.7, 97.0)	1.3	92.4	96.8	2.9	0.2071	824	8,517,627
North West	70.4	(63.4, 76.6)	3.4	64.6	75.7	8.2	0.6224	1,512	17,843,206

Abbreviations: CI=Confidence Interval; LCB=Lower Confidence Bound; UCB=Upper Confidence Bound; DEFF=Design Effect; ICC=Intra-cluster Correlation Coefficient

Note: This measure is a population estimate that incorporates survey weights. The CI, LCB and UCB are calculated with software that take the complex survey design into account.

## 4.7 Individuals receiving yellow fever vaccination for the first time

Yellow fever vaccine is provided at nine months as part of the routine immunisation schedule and also for travellers to yellow fever endemic countries. A single dose of yellow fever vaccine provides life-long protection against yellow fever. A proportion of the population, however, does not receive yellow fever vaccination during routine immunisation or when traveling putting them at high risk of contracting yellow fever during an outbreak. Tables 4.7 show the percentage and the 95% confidence intervals of Individuals who received yellow fever vaccination for the first time during the campaign.

About 27.6 percent of the individuals received yellow fever vaccination for the first time from the yellow fever campaign. Kebbi State recorded the highest percentage (44.1 percent) followed by Niger state and FCT, Abuja with 32.1 percent and 24.6 percent respectively. Plateau state recorded the least with 13.1 percent. A higher percentage of individual received yellow fever vaccination for the first time in urban areas compared to rural areas at 33.8 percent and 25.4 percent respectively. More males (28.4 percent) received yellow fever vaccination for the first time than females (26.8 percent).

**Table 4.7: SIA provided individuals first yellow fever dose, 2019.**

**Proportion of individuals that received first yellow fever dose from SIA by state, residence, age category and gender, Nigeria 2019**

	SIA Provided first yellow fever Dose (%)	95% CI (%)	StdErr (%)	95% LCB (%)	95% UCB (%)	DEFF	ICC	N	Weighted N
NIGERIA	27.6	(22.4, 33.5)	2.8	23.2	32.5	9.3	0.7806	2,336	26,360,832
Niger	32.1	(19.2, 48.4)	7.6	20.9	45.6	12.8	1.0512	488	6,998,717
Plateau	13.1	(7.3, 22.2)	3.7	8.1	20.5	5.1	0.4167	434	3,891,227
FCT Abuja	24.6	(15.5, 36.8)	5.4	16.8	34.6	6.0	0.5727	390	4,626,401
Kebbi	44.1	(35.0, 53.6)	4.7	36.5	52.0	4.5	0.2974	510	5,374,587
Sokoto	18.6	(12.7, 26.4)	3.4	13.5	25.0	4.0	0.2507	514	5,469,903
Urban/Rural									
Urban	33.8	(21.0, 49.5)	7.5	22.8	46.9	10.6	8.7423	419	6,929,565
Rural	25.4	(20.8, 30.6)	2.5	21.5	29.7	6.3	0.6202	1,917	19,431,268
Age category									
9-23 months	25.3	(17.6, 35.0)	4.5	18.7	33.3	3.1	4.3435	298	1,161,405
24-59 months	30.9	(22.7, 40.5)	4.6	23.9	38.9	6.5	2.3768	667	3,290,898
6-14 years	29.9	(22.8, 38.1)	3.9	23.8	36.8	3.4	1.8661	452	8,487,458
15-24 years	23.9	(16.1, 34.0)	4.6	17.2	32.2	3.5	4.8820	301	4,587,332
25-44 years	26.4	(20.1, 33.8)	3.5	21.0	32.6	3.9	1.3954	618	8,833,741
Sex of household member									
Male	28.4	(21.2, 36.9)	4.0	22.3	35.5	9.5	1.7030	1,196	13,471,333
Female	26.8	(22.2, 31.8)	2.4	22.9	30.9	3.4	0.5181	1,140	12,889,500
Geopolitical zone									
North Central	19.4	(13.4, 27.2)	3.5	14.2	25.8	6.5	0.5882	824	8,517,627
North West	31.5	(24.7, 39.3)	3.7	25.8	38.0	9.6	0.7431	1,512	17,843,206

Abbreviations: CI=Confidence Interval; LCB=Lower Confidence Bound; UCB=Upper Confidence Bound; DEFF=Design Effect; ICC=Intra-cluster Correlation Coefficient

Note: This measure is a population estimate that incorporates survey weights. The CI, LCB and UCB are calculated with software that take the complex survey design into account.



#### **4.8 Life-time yellow fever containing vaccines in children aged 9 to 59 months**

Yellow fever vaccination is provided as part of routine vaccination in children at 9 months. This section explores the total number of doses of yellow fever vaccine ever received by children in this age group. Table 4.8 represent all yellow fever vaccines received by individuals between 9 months and 59 months from the yellow fever campaign or routine immunisations, individuals were grouped into three categories as having received zero (0) dose, one (1) dose and two or more doses (2+) of yellow fever vaccinations.

About 17.9 percent of the respondents had never received a single dose of yellow fever containing vaccine despite of the recently concluded preventive mass vaccination campaign. Distribution by age category indicate that 25.9 percent and 15.0 percent of all children aged 9 to 23 months and 24 to 59 months respectively received a single yellow fever dose. More girls had not received a single dose yellow fever containing vaccines (20.0 percent) compared to boys at 15.9 percent.

A larger percentage (19.6 percent) of individuals living in rural areas have not received a single yellow fever containing vaccine compared to the percentage of children living in urban areas. Sokoto state had the highest percentage (30.2 percent) followed by Kebbi and Niger states with 26.9 percent and 11.3 percent respectively.

From the table, children aged 24 to 59 months have higher percentage (50.4 percent) than children aged 9 to 23 months with 34.1 percent that had received a single dose of yellow fever containing vaccines. More females had received a single dose yellow fever containing vaccines with 46.5 percent than males with 45.8 percent.

About 46.9 percent of individuals living in rural area had received a single yellow fever containing vaccine compared to those living in urban area. Plateau state had the highest percentage (69.7 percent) of individuals that have received a single yellow fever containing vaccine, followed by Niger and Kebbi states with 53.4 percent and 50.3 percent respectively.

Furthermore, 40.1 percent and 34.5 percent of all children aged 9 months to 23 months and aged 24 months to 59 months have received two or more doses of yellow fever containing vaccines respectively. Males that had received two or more doses are 38.3 percent while females recorded 33.5 percent. A larger percentage (44.1 percent) of individuals living in urban areas have received two or more doses of yellow fever containing vaccine compared to those in rural area (33.5 percent). FCT have the highest percentage (62.8 percent) followed by Sokoto and Niger states with 41.9 percent and 35.4 percent respectively.

**Table 4.8: Lifetime yellow fever doses for children aged 9 to 59 months****Proportion of children who had received 0, 1 and 2 or more doses of yellow fever vaccine by birth cohort, residence and gender in children aged 9 to 59 months**

	All ages: 0 doses (%)	All ages: 1 doses (%)	All ages: 2+ doses (%)	N	Age: 0 - 0 doses (%)	Age: 0 - 1 doses (%)	Age: 0 - 2+ doses (%)	N	Age: 1 - 0 doses (%)	Age: 1 - 1 doses (%)	Age: 1 - 2+ doses (%)	N
North Central	4.6	52.6	42.7	280	32.7	42.7	24.6	17	5.3	41.0	53.7	66
Niger	11.3	53.4	35.4	212	20.7	64.7	14.6	10	18.5	31.8	49.7	53
Plateau	6.9	69.7	23.4	158	20.6	51.2	28.2	12	9.8	47.9	42.3	40
FCT Abuja	2.3	34.9	62.8	122	62.5	21.8	15.7	5	0.0	33.1	66.9	26
North West	21.8	44.3	34.0	685	37.5	33.5	29.0	31	29.1	30.9	40.0	179
Kebbi	26.9	50.3	22.8	238	47.4	30.0	22.6	12	34.0	35.4	30.7	68
Sokoto	30.2	27.9	41.9	235	47.0	3.5	49.5	9	34.2	25.8	40.1	58
NIGERIA	17.9	46.2	36.0	965	36.1	36.3	27.7	48	23.7	33.2	43.1	245
Urban/Rural												
Urban	12.3	43.6	44.1	148	29.9	30.9	39.2	9	15.1	23.2	61.6	40
Rural	19.6	46.9	33.5	817	39.5	39.4	21.1	39	26.6	36.6	36.9	205
Age category												
9-23 months	25.9	34.1	40.1	298	36.1	36.3	27.7	48	23.4	33.3	43.3	244
24-59 months	15.0	50.4	34.5	667	0.0	0.0	0.0	0.0	100.0	0.0	0.0	1
Sex of household member												
Male	15.9	45.8	38.3	510	34.7	48.7	16.6	24	17.2	34.5	48.3	135
Female	20.0	46.5	33.5	455	37.2	25.6	37.2	24	30.3	31.9	37.8	110
Geopolitical zone												
North Central	4.6	52.6	42.7	280	32.7	42.7	24.6	17	5.3	41.0	53.7	66
North West	21.8	44.3	34.0	685	37.5	33.5	29.0	31	29.1	30.9	40.0	179
Abbreviations: CI=Confidence Interval; LCB=Lower Confidence Bound; UCB=Upper Confidence Bound; DEFF=Design Effect; ICC=Intra-cluster Correlation Coefficient												
Note: This measure is a population estimate that incorporates survey weights.												

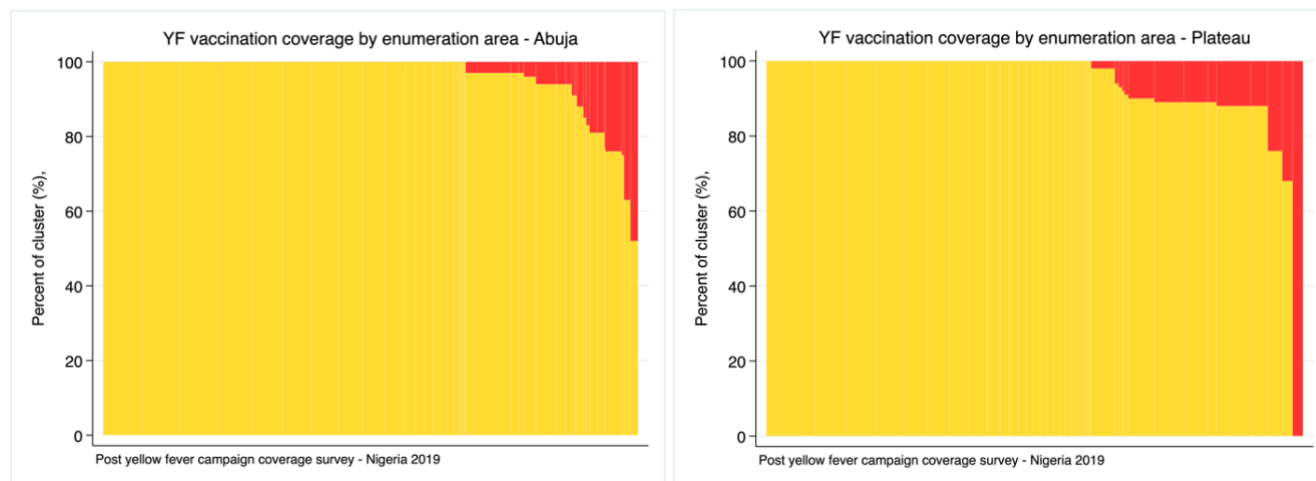
**Table 4.8: Lifetime yellow fever doses children aged 9 to 59 months - continued****Proportion of children who had received 0, 1 and 2 or more doses of yellow fever vaccine by birth cohort, residence and gender in children aged 9 to 59 months**

	Age: 2 - 0 doses (%)	Age: 2 - 1 doses (%)	Age: 2 - 2+ doses (%)	N	Age: 3 - 0 doses (%)	Age: 3 - 1 doses (%)	Age: 3 - 2+ doses (%)	N	Age: 4 - 0 doses (%)	Age: 4 - 1 doses (%)	Age: 4 - 2+ doses (%)	N
North Central	0.8	62.7	36.5	55	2.3	60.1	37.6	72	3.0	48.2	48.8	70
Niger	2.7	46.3	51.0	46	3.3	71.1	25.6	56	20.2	57.6	22.2	47
Plateau	1.6	87.8	10.6	32	4.3	77.9	17.8	38	7.1	70.7	22.2	36
FCT Abuja	0.0	38.0	62.0	23	0.0	39.9	60.1	34	0.0	31.5	68.5	34
North West	20.1	46.3	33.6	148	14.9	47.0	38.1	188	21.3	52.7	26.0	139
Kebbi	31.1	48.6	20.3	54	12.5	66.9	20.6	63	22.7	58.3	19.0	41
Sokoto	36.7	43.3	20.0	48	26.7	13.8	59.5	69	21.9	40.5	37.7	51
NIGERIA	15.9	49.9	34.3	203	12.2	49.9	38.0	260	17.1	51.6	31.3	209
Urban/Rural												
Urban	14.2	40.0	45.8	28	6.2	51.6	42.2	37	8.4	62.5	29.0	34
Rural	16.3	52.4	31.3	175	14.0	49.3	36.7	223	19.5	48.6	31.9	175
Age category												
9-23 months	40.7	49.6	9.7	5	0.0	0.0	100.0	1	17.1	51.6	31.3	209
24-59 months	15.5	49.9	34.6	198	12.2	49.9	37.9	259	0.0	0.0	0.0	0.0
Sex of household member												
Male	7.8	50.3	41.8	101	16.5	44.6	38.9	136	19.3	51.0	29.7	114
Female	24.8	49.4	25.8	102	7.9	55.1	37.0	124	14.5	52.4	33.1	95
Geopolitical zone												
North Central	0.8	62.7	36.5	55	2.3	60.1	37.6	72	3.0	48.2	48.8	70
North West	20.1	46.3	33.6	148	14.9	47.0	38.1	188	21.3	52.7	26.0	139
Abbreviations: CI=Confidence Interval; LCB=Lower Confidence Bound; UCB=Upper Confidence Bound; DEFF=Design Effect; ICC=Intra-cluster Correlation Coefficient												
Note: This measure is a population estimate that incorporates survey weights.												

## 4.9 Low coverage enumeration areas

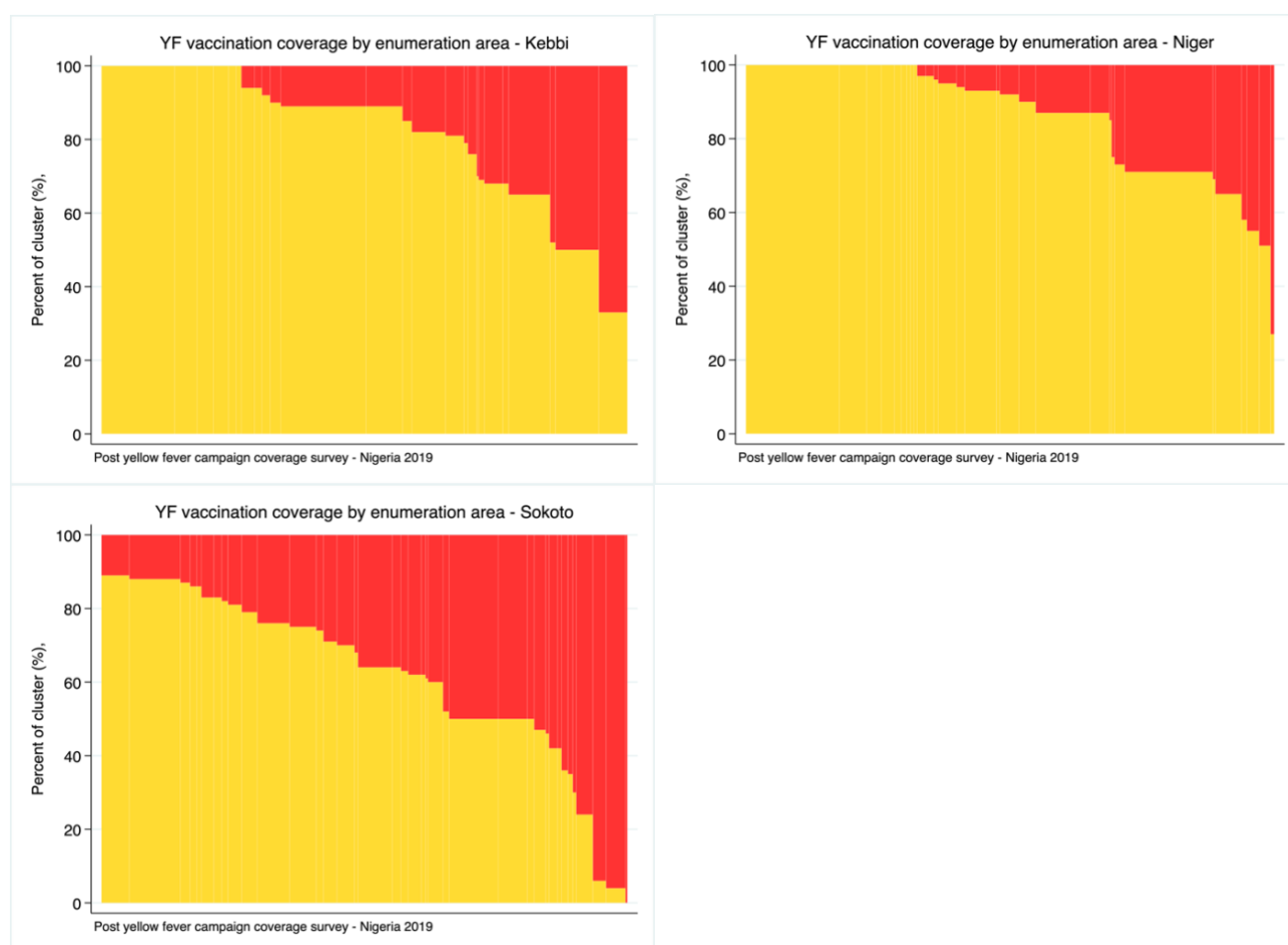
Vaccination coverage at an enumeration area can be used as a proxy for the quality of vaccination campaign in communities in the neighbourhood of EAs. Organ pipe plots (OPPs) which consist of a series of vertical bars of varying width are plotted to represent coverage an enumeration area. The coloured portion of the bar (height of the bars) represents the vaccinated proportion of eligible respondents in an enumeration area while the width of each bar is proportional to the sum of survey weights (relative size of the enumeration area). The bars are sorted left to right in descending order of enumeration area level coverage. The total areas covered by the bars (shaded yellow) represents the weighted vaccination coverage for a state while the area shaded red represented the unvaccinated population.

The organ pipe plot for FCT- Abuja and Plateau state, the two states which had the highest post yellow fever campaign vaccination coverage, showing that nearly all bars fully coloured (100 percent coverage at the enumeration area) and that the bars that did not achieve perfect coverage were narrow (had low weights). The enumeration area with the lowest coverage in FCT-Abuja was 42 percent. One enumeration area in Plateau state, however, had zero percent coverage as depicted by missing bar on the OPP.



**Figure 4.2: Organ pipe plots for Abuja and Plateau showing coverage by enumeration areas, post yellow fever campaign coverage survey, Nigeria 2019.**

Kebbi and Sokoto states have a higher proportion of enumeration areas with low coverage compared to FCT- Abuja and Plateau state. Notably, from the OPP for Sokoto state, none of the enumeration areas in Sokoto states achieved perfect (100 percent) coverage while one enumeration area had none of the individuals selected for interviewing were vaccinated. Fourteen out of the forty enumeration areas selected in Sokoto state had less than 50 percent of the individuals selected for the interview vaccinated against yellow fever.

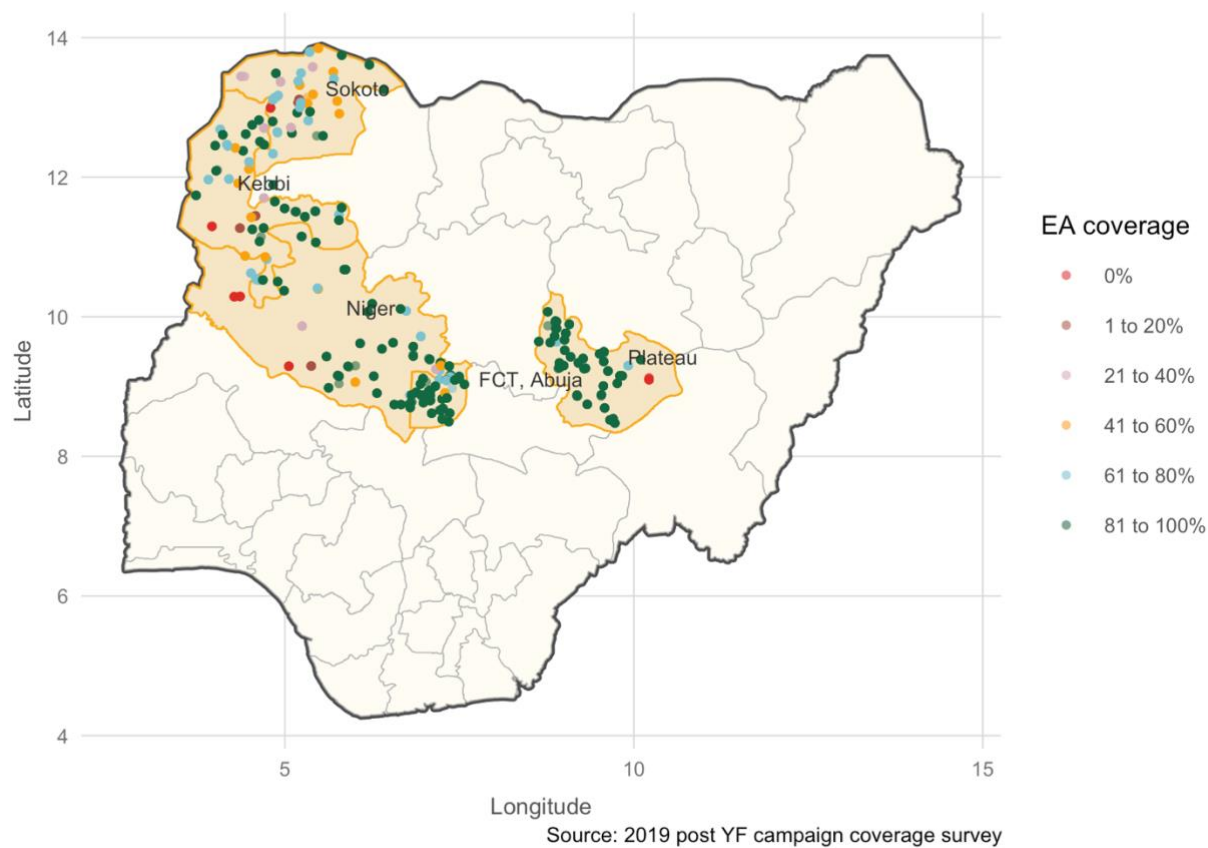


**Figure 4.3: Organ pipe plots for Kebbi, Niger and Sokoto states, showing coverage by enumeration areas, post yellow fever campaign coverage survey, Nigeria 2019.**

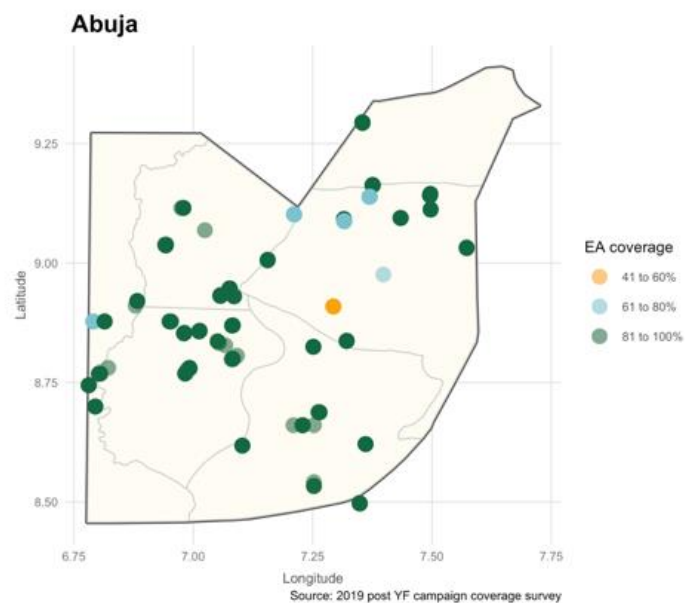
# APPENDIX 1

## Location and coverage of enumeration areas

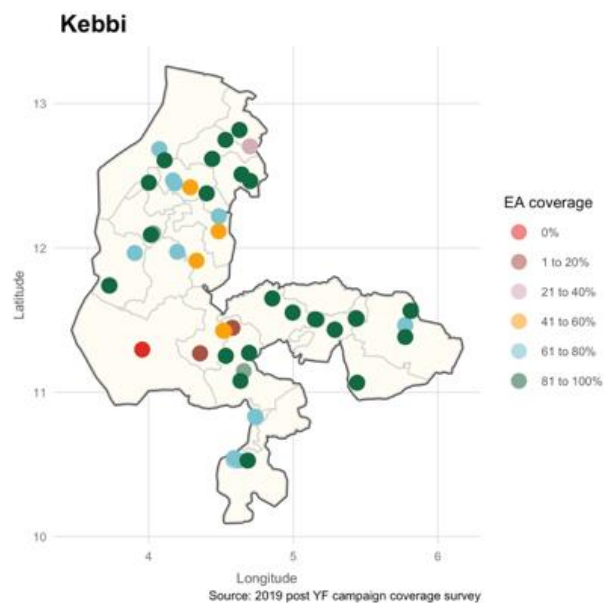
Appendix Figure 1: Map showing coverage and location of enumeration areas in the five implementing states.



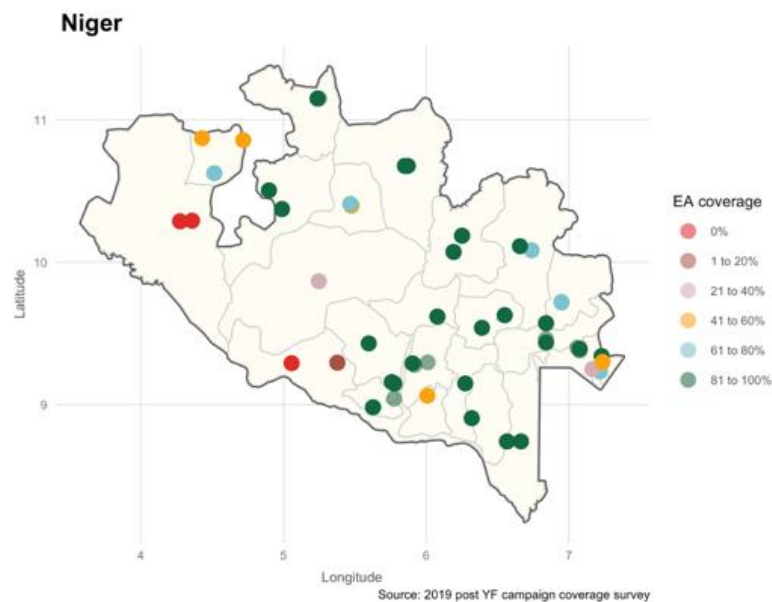
Appendix Figure 2: Map of Abuja showing coverage and location of enumeration



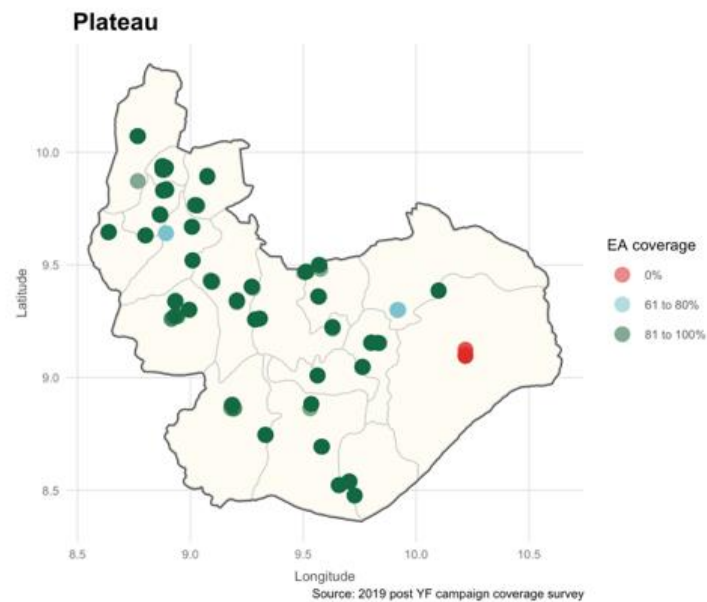
Appendix Figure 3: Map of Kebbi state showing coverage and location of enumeration areas



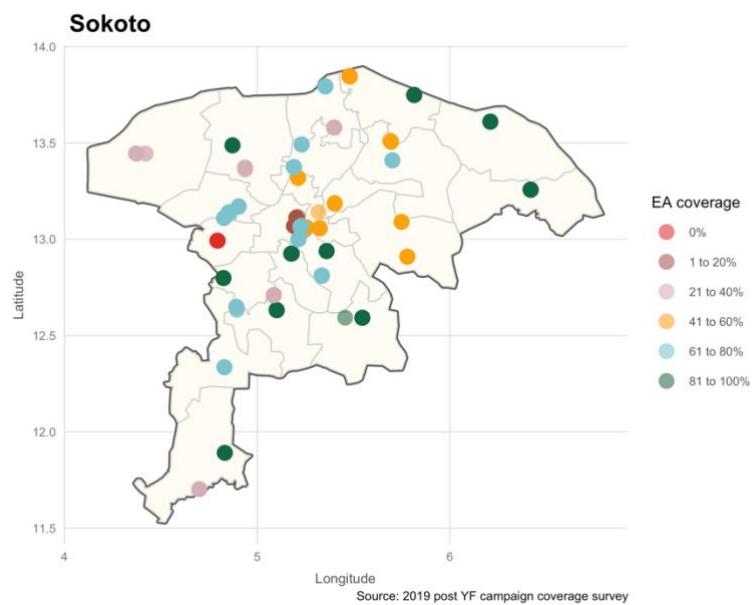
Appendix Figure 4: Map of Niger state showing coverage and location of enumeration areas



Appendix Figure 5: Map of Plateau state showing coverage and location of enumeration areas



Appendix Figure 6: Map of Sokoto state showing coverage and location of enumeration areas





## APPENDIX 2

### Questionnaires

## Household questionnaire

HOUSEHOLD INFORMATION PANEL		HM
HM01. State ID number: _____	HM02. State name: _____	
HM03. Cluster number: _____	HM11. Household ID number: _____	
HM05. Interviewer ID: _____	HM07. Supervisor ID: _____	
HM06. Interviewer name: _____	HM08. Supervisor name: _____	
SIA15. Latitude _____	SIA16. Longitude _____	
<p>WE ARE FROM NATIONAL BUREAU OF STATISTICS. WE ARE CONDUCTING A SURVEY YELLOW FEVER VACCINATION. I WOULD LIKE TO REQUEST TALK TO YOU AND OTHER MEMBERS OF YOUR HOUSEHOLD. THE INTERVIEW WILL TAKE ABOUT <b>45</b> MINUTES. ALL THE INFORMATION WE OBTAIN WILL REMAIN STRICTLY CONFIDENTIAL AND ANONYMOUS.</p> <p><b>HM13. MAY, I START NOW?</b>  YES .....---1  NO- .....---2</p> <p>-----DISCUSS WITH SUPERVISOR BEFORE ENDING INTERVIEW</p>		

HOUSEHOLD ROOSTER: COMPLETE FOR ALL MEMBERS IN THE HOUSEHOLDS IN THE HOUSEHOLD

HM21 SN	HM22 NAME OF HOUSEHOLD MEMBER	HM23 RELATIONSHIP OF HOUSEHOLD MEMBER TO HOUSEHOLD HEAD	HM24 SEX OF HOUSEHOLD MEMBER  1 MALE 2 FEMALE	HM25 DID THE HOUSEHOLD MEMBER SLEEP HERE LAST NIGHT?	HM26 DATE OF BIRTH (DD, MM, YYYY)	HM27 AGE AT TIME OF CAMPAIGN (COMPLETED YEARS)	HM28 AGE AT TIME OF CAMPAIGN (COMPLETED MONTHS)	HM29 DID THE INDIVIDUAL LIVE HERE DURING THE CAMPAIGN?  (COMPLETE ONLY FOR PERSONS AGED 9 MONTHS TO 44 YEARS)	HM30 CHECK ELIGIBLE FOR POST- CAMPAIGN SURVEY? (9 MONTHS TO 44 YEARS)	HM31 DID YOU (NAME) RECEIVE THE YELLOW FEVER VACCINE DURING THE RECENT CAMPAIGN (YELLOW FEVER VACCINATION CAMPAIGN IN NOVEMBER/DECEMBER 2018)?	HM32 DID YOU (NAME) RECEIVE A VACCINATION CARD AFTER RECEIVING THE YELLOW FEVER VACCINE DURING THE RECENT CAMPAIGN?	HM33 WAS THE FINGER OF THE YOU (NAME) MARKED WITH A PEN AFTER RECEIVING THE YELLOW FEVER VACCINE DURING THE CAMPAIGN?
1		01	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
2		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
3		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
4		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
5		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
5		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
5		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
5		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
6		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N
7		___	1 2	Y N	___/___/___			Y N	Y N	Y N	Y N	Y N

\* Codes for HM23:  
Relationship to head of household:

01 Head  
02 Spouse / Partner  
03 Son / Daughter

04 Son-In-Law / Daughter-In-Law  
05 Grandchild  
06 Parent

07 Parent-In-Law  
08 Brother / Sister  
09 Brother-In-Law / Sister-In-Law

10 Uncle / Aunt  
11 Niece / Nephew  
12 Other relative

13 Adopted / Foster/  
Stepchild  
96 Other (Not related)

98 Don't know

# SELECTION OF INDIVIDUALS TO BE INTERVIEWED FOR THE YF MODULE

SL

**SL1.** Check HM27 and HM28 in the List of Household Members and write the total number of individuals aged 9-23 months, 23 – 59 months, 5-44 years.

Total number 9 to 23 months ..... \_\_\_\_

Total number 24 to 59 months ..... \_\_\_\_

Total number 5 to 44 years ..... \_\_\_\_

**SL2.** Check the number of individuals in each of the age categories of SL1:

☐ Zero ⇒ Go to the next age category.

☐ One ⇒ Go to SL9 and record the rank number as '1', enter the line number, individuals name and age.

☐ Two or more ⇒ Continue with SL2A.

**SL2A.** List each of the individuals in each age category below in the order they appear in the List of Household Members. Do not include other household members outside of the age range. Record the line number, name, sex, and age for each individual in the age category. Note that this is repeated for all age categories that have two or more members in SL2 above.

SL3. Rank number	SL4. Line Number from HL1	SL5. Name from HL2	SL6. Sex from HL4		SL7. Age from HL6
Rank	Line	Name	M	F	Age
1	— —		1	2	— —
2	— —		1	2	— —
3	— —		1	2	— —
4	— —		1	2	— —
5	— —		1	2	— —
6	— —		1	2	— —
7	— —		1	2	— —
8	— —		1	2	— —
9	— —		1	2	— —

**SL8.** Check the last digit of the household number (HH2) from the cover page. This is the number of the row you should go to in the table below.

Check the total number of individuals in the specific age category you are interested in in SL1 above. This is the number of the column you should go to in the table below.

Find the box where the row and the column meet and circle the number that appears in the box. This is the rank number (SL3) of the selected individual.

Last Digit of Household Number (from HH2)	Total Number of Eligible individuals in the Household (from SL1)						
	2	3	4	5	6	7	8+
0	2	2	4	3	6	5	4
1	1	3	1	4	1	6	5
2	2	1	2	5	2	7	6
3	1	2	3	1	3	1	7
4	2	3	4	2	4	2	8
5	1	1	1	3	5	3	1
6	2	2	2	4	6	4	2
7	1	3	3	5	1	5	3
8	2	1	4	1	2	6	4
9	1	2	1	2	3	7	5

**SL9.** Record the rank number (SL3), line number (SL4), name (SL5) and age (SL7) of the selected individual.



Rank number    —

Line number    — —

Name \_\_\_\_\_

Age       — —

## Individual questionnaire

 <b>NPHCDA</b> National Primary Healthcare Development Agency Making Nigerians Healthy	 <b>NATIONAL PRIMARY HEALTH CARE DEVELOPMENT AGENCY</b> <b>POST YELLOW FEVER CAMPAIGN COVERAGE SURVEY, NIGERIA 2018</b>
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

ELIGIBLE PERSON INFORMATION PANEL		SIA
<i>This questionnaire is to be administered to the selected individual if the individual is aged 15 years and above and to mothers or caregivers (see List of Household Member) of the selected child if the selected child is aged 9 months – 14 years (see List of Household Members)</i>		
<b>SIA01.</b> State ID number: _____	<b>SIA02.</b> State name: _____	
<b>SIA03.</b> Cluster number: _____	<b>SIA11.</b> Household ID number: _____	
<b>SIA05.</b> Interviewer ID: _____	<b>SIA07.</b> Supervisor ID: _____	
<b>SIA06.</b> Interviewer name: _____	<b>SIA08.</b> Supervisor name: _____	
<b>SIA12.</b> Individual listing number (HM21): _____	<b>SIA12a.</b> Name (HM23): _____	
<b>SIA09.</b> Day/Month/Year of interview: ____ / ____ / ____ SIA09_d / SIA09_m / SIA09_y	<b>SIA10.</b> Start time of interview Hour and minutes ____ : ____	

<p><b>Visit/Attempt 1</b>  <b>SIA92. Date</b>  ____ (D) ____ (M) ____ (Y)  HM13_d HM13_m HM13_y</p> <p><b>SIA93. Disposition Code</b>  Return later; no one home (fill in # of eligible respondents if you learn it from a neighbour) ..... 1</p> <p>Come back later; interview started but could not complete ..... 2</p> <p>Refused; someone is home but refused to participate..... 3</p> <p>Complete; collected all necessary information..... 4</p> <p><i>If response is not 4, plan to make a second visit</i></p>	<p><b>Visit/Attempt 2</b>  <b>SIA94. Date</b>  ____ (D) ____ (M) ____ (Y)  HM15_d HM15_m HM15_y</p> <p><b>SIA95. Disposition Code</b>  Return later; no one home (fill in # of eligible respondents if you learn it from a neighbour) ..... 1</p> <p>Come back later; interview started but could not complete ..... 2</p> <p>Refused; someone is home but refused to participate ..... 3</p> <p>Complete; collected all necessary information ..... 4</p> <p><i>If response is not 4, plan to make a third visit</i></p>	<p><b>Visit/Attempt 3</b>  <b>SIA96. Date</b>  ____ (D) ____ (M) ____ (Y)  HM17_d HM17_m HM17_y</p> <p><b>SIA97. Disposition Code</b>  Return later; no one home (fill in # of eligible respondents if you learn it from a neighbour) ..... 1</p> <p>Come back later; interview started but could not complete ..... 2</p> <p>Refused; someone is home but refused to participate ..... 3</p> <p>Complete; collected all necessary information ..... 4</p> <p><i>If response is not 4, select 1 and move to next household</i></p>
<p><i>Repeat greeting if not already read to this respondent:</i></p> <p>WE ARE FROM NATIONAL BUREAU OF STATISTICS. WE ARE CONDUCTING A SURVEY ABOUT THE SITUATION OF CHILDREN, FAMILIES AND HOUSEHOLDS. I WOULD LIKE TO TALK TO YOU ABOUT (child's name from UF3)'s. THE INTERVIEW WILL TAKE ABOUT <b>20</b> MINUTES. ALL THE INFORMATION WE OBTAIN WILL REMAIN STRICTLY CONFIDENTIAL AND ANONYMOUS. MAY, I START NOW?</p>		<p><i>If greeting at the beginning of the household questionnaire has already been read to this person, then read the following:</i></p> <p>NOW I WOULD LIKE TO TALK TO YOU MORE ABOUT (child's name from household listing)'S RECEIPT OF VACCINATION DURING THE RECENT YELLOW FEVER VACCINATION CAMPAIGN. THIS INTERVIEW WILL TAKE ABOUT 20 MINUTES. AGAIN, ALL THE INFORMATION WE OBTAIN WILL REMAIN STRICTLY CONFIDENTIAL AND ANONYMOUS.</p>

DEMOGRAPHIC INFORMATION		AG
<p><b>D1.</b> NOW I WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT THE DEVELOPMENT AND HEALTH OF (name).</p> <p>ON WHAT DAY, MONTH AND YEAR WAS (NAME) BORN?</p> <p><i>PROBE:</i> WHAT IS HIS/HER BIRTHDAY?</p> <p><i>If the mother/caretaker knows the exact birth date, also enter the day; otherwise, circle 98 for day.</i></p> <p><i>Month and year must be recorded.</i></p>	<p>Date of birth</p> <p>Day ..... __ __</p> <p>DK day ..... 98</p> <p>Month ..... __ __</p> <p>Year ..... 201 __</p>	
<p><b>D2.</b> HOW OLD IS (NAME)?</p> <p><i>PROBE:</i> HOW OLD WAS (NAME) AT HIS/HER LAST BIRTHDAY?</p> <p><i>Record age in completed months.</i></p> <p><i>Record '0' if less than 1 month.</i></p> <p><i>Compare and correct AG1 and/or AG2 if inconsistent.</i></p>	<p>Age (in completed months) ..... _____</p> <p><i>If age is &lt;9 months or ≥44-years go to individual selected from the KISH grid for interviewing, otherwise end interview</i></p>	



IMMUNIZATION		SIA
<b>SIA17.</b> WERE YOU (WAS THE CHILD) LIVING HERE DURING THE CAMPAIGN? (YELLOW FEVER VACCINATION CAMPAIGN IN NOVEMBER/DECEMBER 2017)?	Yes ..... 1 No ..... 2	
<b>SIA18.</b> WHAT WAS THE PRIMARY SOURCE OF INFORMATION ABOUT THE OCCURRENCE OF THE CAMPAIGN?  <i>(Ask the question first, after the person has answered, go through the list of answers to select the primary source.)</i>	Not informed ..... 1 Radio ..... 2 Television ..... 3 Internet ..... 4 Criers / mobilisers ..... 5 Community health workers ..... 6 School ..... 7 Family ..... 8 Neighbour, friend ..... 9 Village chief ..... 10 Religious leader ..... 11  Other ( <i>specify below</i> ) ..... 66	66 => SIA19
<b>SIA19.</b> IF 'OTHER' IN 18 ABOVE, PLEASE SPECIFY	_____	
<b>SIA20.</b> DID YOU (THE CHILD) RECEIVE THE YELLOW FEVER VACCINE DURING THE RECENT CAMPAIGN (YELLOW FEVER VACCINATION CAMPAIGN IN NOVEMBER/DECEMBER 2018)?	Yes, card seen ..... 1 Yes, card NOT seen ..... 2 No ..... 3 Don't know ..... 99	1 => SIA21 3 => SIA25 9 => SIA27
<b>SIA21.</b> DID YOU (THE CHILD) RECEIVE A VACCINATION CARD AFTER RECEIVING THE YELLOW FEVER VACCINE DURING THE RECENT CAMPAIGN?	Yes, card seen ..... 1 Yes, card not seen ..... 2 No card ..... 3 Don't know ..... 99	
<b>SIA22.</b> WAS THE FINGER OF THE YOU (THE CHILD) MARKED WITH A PEN AFTER RECEIVING THE YELLOW FEVER VACCINE DURING THE CAMPAIGN?	Yes, mark seen on the child ..... 1 Yes, child not available to check ..... 2 No ..... 3 Don't know ..... 99	

<b>SIA23.</b> DID YOU (THE CHILD) DEVELOP A REACTION AFTER THE VACCINATION?	Yes ..... 1 No ..... 2	01⇒SIA24 02⇒SIA25
<b>SIA24.</b> IF YES, WHAT WAS THE PROBLEM(S)?	Fever between 7- and 12-days following vaccination? ..... A General rash between 7- and 10-days following vaccination? ..... B Pain at the site of injection? ..... C Sensitivity to light or other problems with vision? D Extreme drowsiness, fainting? ..... E Fussiness, irritability, crying for an hour or longer? ..... F Early bruising or bleeding, unusual weakness? .G Difficulty in breathing or swallowing? ..... H Itching, especially of feet or hands? ..... I Hives (other itching or irritation)? ..... J Seizure (black-out or convulsions); or High fever (within a few hours or a few days after the vaccine)? ..... K Pain or tiredness of eyes, swelling, or a lump where the shot was given? ..... L Headache (severe or continuing)? ..... M Confusion or dizziness? ..... N Muscle weakness in legs spreading to upper body? ..... O Loss of bladder or bowel control? ..... P Problems with speech or hearing ? ..... Q Other ( <i>specify</i> ) ..... R	R => SIA24A
<b>SIA24A.</b> IF 'OTHER' TO SIA24, SPECIFY	_____	

<p><b>SIA25.</b> YOU (THE CHILD) DID NOT RECEIVE THE YELLOW FEVER VACCINE DURING THE CAMPAIGN, WHY?</p> <p><i>(Ask the question first, after the person has answered, go through the list of answers to find the main reason for non-vaccination.)</i></p>	<p>Didn't Know about the campaign.....01</p> <p>Confused with other vaccines (believes that they have already been vaccinated) ..... 02</p> <p>Subject or parent / guardian were missing .....03</p> <p>Fear of injection ..... 04</p> <p>Lack of confidence in vaccine ..... 05</p> <p>Fear of side effects ..... 06</p> <p>Site of vaccination not known ..... 07</p> <p>Site of vaccination too far ..... 08</p> <p>Time of vaccination unsuitable ..... 09</p> <p>Waited too long at vaccination site ..... 10</p> <p>Missing vaccinator at the site ..... 11</p> <p>Not authorised by head of household..... 12</p> <p>Religious beliefs ..... 13</p> <p>Sick at time of vaccination ..... 14</p> <p>Absent during time of campaign..... 15</p> <p>Too busy to take child ..... 16</p> <p>Was ill ..... 17</p> <p>Mother ill..... 18</p> <p>Already received Yellow Fever vaccine..... 19</p> <p>Other (<i>specify</i>) ..... 66</p>	<p>66 =&gt; SIA26</p>
<p><b>SIA26.</b> IF 'OTHER' TO SIA25, PLEASE SPECIFY</p>	<p>_____</p>	

<b>SIA27.</b> BEFORE THE CAMPAIGN, HAD YOU (THE CHILD) ALREADY RECEIVED THE YELLOW FEVER VACCINE?	Yes, dates on card.....1 Yes, recall /history .....2 No .....3 Don't know .....9	1 => SIA27A 2 =>SIA27A 3 =>SIA35 9 =>SIA35
<b>SIA27A:</b> REQUEST TO BE SHOWN VACCINATION CARD/ INTERNATIONAL YELLOW FEVER CARD FOR (NAME).	Yes, card seen.....1 No, card not seen .....2	1 => SIA28 2 =>SIA35
<b>SIA28.</b> IF THE HOME-BASED VACCINATION RECORD (ROUTINE) IS AVAILABLE, RECORD THE DATES OF VACCINATION: 1ST YELLOW FEVER VACCINATION  [WRITE 44 IN THE DD FIELD IF THE VACCINATION IS MARKED ON THE CARD, BUT THERE IS NOT A CLEAR DATE]	____ / ____ / 201____ (DD/MM/ YYYY)	
<b>SIA34.</b> <i>End data of interview.</i>	____ / ____ / 201____ (DD / MM / YYYY)	
<b>SIA35.</b> <i>Record the end time.</i>	HOUR AND MINUTES ..... ____ : ____	
<b>SIA36.</b> <i>Interviewers comments.</i>	_____	
<b>SIA37.</b> <i>Supervisors comments.</i>	_____	