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“Measles campaigns and their effects on the overall immunization system”

An evaluation by
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and
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List of relevant acronyms

AEFI	Adverse Effects Following Immunization
AFENET	African Field Epidemiology Network
BCG	Bacillus Calmette-Guérin
CHAI	Clinton Health Action Initiative
cMYP	Comprehensive Multi-year Plan
DTP3	Diphtheria-tetanus-pertussis
EOC	Emergency Operations Centre
ICC	Interagency Coordination Committee
IDI	In-depth interview
FGD	Focus Group Discussion
GAVI	Global Alliance for Vaccines and Immunizations
JRF	Joint Reporting Form
KII	Key informant interview
KIT	Royal Tropical Institute
LGA	Local Government Authority
LIO	Local government immunization officers
MCV	Measles Containing Vaccine
MICS	Multiple Indicator Cluster
MR	Measles Rubella
NDHS	National Demographic Health Survey
NMTCC	National Measles Technical Coordinating Committee
NPHCDA	National Primary Health Care Development Agency
NPI	National Program on Immunization
OECD DAC	Organisation for Economic Co-operation and Development, Development Assistance Committee
ODK	Open Data Kit
REW	Reach Every Ward
RES	Reaching Every Settlement
RFP	Request for Proposals
RI	Routine Immunization
RIS	Reaching Inaccessible Communities
SIA	Supplementary Immunization Activity
SFH	Society for Family Health
SIO	States Immunization Officers
SMC	Social Mobilization Committees
SPHCDA	States Primary Health Care Development Agencies
UNICEF	United Nations International Children's Emergency Fund
VPD	Vaccine Preventable Disease
WDC	Ward Development Committee
WHO	World Health Organization
WUENIC	WHO/UNICEF Estimates for Immunization Coverage

Executive summary

Measles is an important public health problem in Nigeria. Gavi has been supporting the measles vaccination campaigns in Nigeria for children between 9 and 59 month since 2013. Several campaigns have been conducted but Nigeria's measles epidemiological profile indicates that there continues to be a high risk for measles outbreaks. KIT (Amsterdam) in cooperation with SFH (Nigeria) was selected by Gavi to assess: 1) the quality of the recurrent measles campaigns (2015/2016 and 2017/2018) and their effect on the immunization system and; 2) the extent to which campaigns integrated lessons learned from previous campaigns. The evaluation presented in this report was conducted during the implementation of the 2017-2018 measles vaccination campaign (data collection between November 2017 and March 2018). For the evaluation a **mixed method approach** was chosen, consisting of document review, a qualitative study, and re-analysis of existing quantitative data. Analyses were guided by an evaluation framework outlining questions related to the design, implementation, outcome and lessons learned of the campaigns 2015/2016 and 2017/2018. The document review focused on the earlier campaigns and **lessons learned from earlier campaigns**. The quantitative part focused on the **results of the campaigns** in terms of measles vaccination coverage and on the effect of the campaigns on children at risk of being **zero dose** children. The qualitative part focused on the quality of the campaigns including the *"what, why and how questions"* to **explain the various successes and challenges to reach the objectives of the campaigns**. In both the quantitative and qualitative parts of the evaluation the **effects of the campaigns on routine immunization** services was addressed.

This evaluation validated the campaigns to be of a **good quality** based on their **design** according to international standards (WHO and Gavi) and **implemented** by highly motivated teams at all levels in the country. The quality of the campaigns benefitted as well from the **integration of lessons learned** from earlier measles (and other) vaccination campaigns. These lessons were well presented in the **campaign plans and guidelines** and were **known by the implementers** at state LGA and ward level. The 2017-2018 campaign made use of **several innovative approaches** such as: learning from the polio team (structures), microplanning, use of ODK software for monitoring, What's app for monitoring and communication, GIS for estimating the number of children, house-to-house mobilization and line listing in social mobilization, and staggering of the campaign within the various LGAs. Furthermore, the campaigns were **appreciated by the stakeholders and community** (users of the service) at ward level.

The **target** of the campaigns (>95% measles vaccination coverage for first dose MCV1 measles vaccination coverage) **was not reached**, although results of the 2017/2018 campaign showed a substantial improvement compared to earlier campaigns. **Comparison of the 2016 and 2018 PMCCS results shows that improvements** on vaccination coverage have been made. Overall, campaign vaccination coverage increased by **3 percentage points and five states achieved 95%** or higher MCV1 coverage.

Many efforts to "Reach All Targeted Children" during the campaigns were observed. During the preparation phase the evaluation team was asked by Gavi to pay attention to 'zero dose' children, i.e. those children that had never received a first dose of measles containing vaccine. For this reason the evaluation team decided to analyze how this group of children benefitted from the campaign. The indicator "proportion of total children vaccinated during the campaign who were zero-dose" can be viewed as an indication of the campaign's effectiveness in terms of providing an opportunity for zero-dose children. Data for this was available for both the 2015/16 and the 2017/18 campaigns. During the 2015/2016 campaign 84.5% of children aged 9-59 months were vaccinated, of **which 38.8% for the first time** (they were 'zero-dose' before the campaign), ranging from 73.2% in Jigawa state to 13.4% in Imo state. This did not change much in the following campaign: after the

2017/18 campaign it was found that 87.5% of children aged 9 to 59 months were vaccinated. Of these, **39.8% had received the measles vaccination for the first time** and were zero-dose before the campaign, ranging from 84.4% in Katsina state to 7.1% in Anambra state. It is also important to reflect on the percentage of zero-dose children who were reached by the campaign. The indicator “proportion of total zero-dose children who were vaccinated during the campaign” reflects a campaign’s ability to have an impact on coverage levels and can be viewed as more of an impact indicator. This indicator could only be derived for the 2017/18 campaign. The lowest percentage of zero-dose children reached by the campaign was found in Oyo state (50.6%), meaning that only 50.6% of children aged 9-59 months who had not received MCV before the campaign, received MCV1 during the 2018 MVC. In Katsina, however, an estimated 100.1% of zero-dose children was reached by the campaign. Overall the two indicators show consistent geographical patterns, with higher coverage of either zero-dose children indicators in the Northern states, and lower coverage in the Southern states. This indicates that in the Northern states, campaigns have more impact on coverage levels in because they are better able to reach zero-dose children.

MCV1 coverage varies per geopolitical zone. Northern states generally have a lower MVC1 than southern states with children between 9-59 months. This can be explained by other findings showing that children who **are at risk of being zero-dose** – some specific ethnic groups, low education of mothers, younger mothers, home deliveries and low wealth quintile - are more prevalent in the Northern states. Further, **higher participation in measles vaccination campaigns was observed in states with a lower MCV1 coverage**. In these geographical areas campaigns might be a more effective way of providing immunization services than routine immunisation services, due to various contextual factors that influence **health-seeking behaviour** of the population.

Although the campaign sensitized communities and their leaders about the importance of measles vaccination through a wide range of methods, there was no evidence of a **positive or negative effect** of the vaccination campaigns on the **routine immunization** system. The quantitative evaluation did not show a change in utilization of routine immunization services after the campaigns. Although the qualitative part of the evaluation revealed that the design of the 2017/2018 campaign included attention to **routine immunization, the evaluation did not enable to assess if this led to a strengthened** routine immunization system. This main reason was timing, since the evaluation of the 2017/2018 campaign was initiated after the campaign had started. Therefore it was not possible to observe the routine services before the implementation of the campaign in order to make before-after comparisons.

The evaluation recommends the following:

- For the **design** of the campaign we recommend the **NPHCDA** and the **NMTCC** to tailor the campaigns more to the needs of the zero dose children. For this it is helpful to 1) **conduct a vulnerability analysis** to target specific vulnerable groups that have a higher risk to be zero dose, and 2) **assess the differences in health seeking behavior** of the communities in the various states for measles vaccination, and use the information of both assessments to introduce a targeted approach for the measles vaccination campaigns.
- For the **planning** of campaigns, we recommend the **NMTCC, State** and **LGA immunization officers** to **continue the micro planning** exercises as a strategy for estimating the workload and needs for measles vaccination campaigns **and for the routine** immunization. A vulnerability analysis at LGA / ward level can be included in the micro plan to allow local health workers to identify their at-risk population with regard to routine immunization services.
- During the **implementation** of campaign we recommend the **NMTCC** to **document all these lessons learned and discuss them taking DAC criteria** into account. Special attention should be given to: 1) the relevance of a campaign to increase the vaccination coverage and the strengthening of routine services; 2) the use of in-country platforms and capacity to increase

the effectiveness of the campaign; 3) decreasing the equity gap by ensuring that zero-dose children are adequately targeted; 4) the efficiency of the campaign with regard to use of resources; 5) finally the sustainability to continue the measles vaccination campaigns every two years. Stakeholders at the various levels in the system should take part in these discussions.

- Regarding the **outcomes** of the campaigns in terms of routine immunization strengthening we recommend the **NPHCDA** to reflect on whether nationwide measles vaccination campaigns with a “one blanket approach” are the most appropriate strategy to reach and maintain a nationwide MCV1 coverage that can protect the country against measles outbreaks. The re-thinking should especially include a reflection on the geographical diversity in Nigeria in terms of observed MCV1 coverage and access to care. In some areas routine services could benefit more from the campaigns, especially with regards to increasing utilization and adherence to services. In other areas, routine services could better be replaced by intensive targeted campaigns with a focus on the unreached zero-dose children. Performing a vulnerability analysis at LGA or even ward level can provide insights into where RI have to provide extra efforts to reach zero dose children. Intensified monitoring and supportive supervision of routine immunization in the period after the campaign should be performed to ensure that the lessons learned during the campaign and the information obtained through e.g. the microplanning is appropriately used during routine immunisation.
- To get a better **understanding** of the **impact of** measles vaccination campaigns **on RI** we recommend the **NPHCDA** and its partners, including Gavi to conduct a before campaign and after campaign assessment. The after assessment should be timed so that there is sufficient time to see any changes in utilization of RI after the campaign. In such an evaluation, specific attention should be given to the links between the measles vaccination campaigns and the RI in all phases of the campaign (design, training, implementation and lessons learned).

Acknowledgements

This evaluation could not have been conducted without the support of the National Measles Technical Coordinating Committee (NMTCC) that provided the necessary documents and data bases for analysis, the State Immunization Officers (SIOs) and Local government immunization officers (LIOs) in the 6 states we visited who facilitated the activities and access to all stakeholders during the campaign 2017/2018 and of course not without all the stakeholders that were busy to carry out their campaign task but still found time to participate in In Depth Interviews and Focus Group Discussions.

Chapter 1. Background

1.1 Introduction

Immunization is one of the most potent and cost-effective of all health interventions, with a major effect on the reduction of mortality and critical to the reduction of deaths among children under five years old (WHO, 2017). Global immunization trends over the years have been positive with three regions in 2014 — the Americas, Europe and Western Pacific — maintaining over 90% diphtheria-tetanus-pertussis (DTP3) immunization coverage and the Western Pacific reaching 96% (WHO, 2014). However, the number of children under one year of age who did not receive DTP3 immunization worldwide was 18.7 million in 2014. The majority (75%) of those children live in ten countries - India, Niger, Indonesia, China, Ethiopia, Pakistan, Democratic Republic of Congo, Bangladesh, Angola and Nigeria.

Similarly, measles is still an important concern as it remains one of the leading causes of death among young children globally. Despite the availability of a safe and effective vaccine, approximately 134 200 people died from measles in 2015 – mostly children under the age of five years (WHO, 2017). By the end of 2016, 85% of children had received one dose of measles vaccine by their second birthday, and 164 countries had included a second dose as part of routine immunization (WHO, 2015a). The first dose coverage rates ranged from the highest (93%) in the WHO European Region and the lowest (72%) in Africa in 2016 (WHO, 2018).

Nigeria is the most densely populated country in Africa with a projected population of approximately 190 million in 2017 an annual growth rate of 2.83%. It is the second largest contributor to the under-five mortality in the world (National Population Commission, 2006; UNICEF 2018). According to the 2016 Multiple Indicator Cluster Survey (MICS) (National Bureau of Statistics, 2017), only 23% of children aged 12 to 23 months completed a full course of prescribed routine immunization. However, there are marked inequalities across geopolitical zones with immunization completion ranging from about 50% in the South West and South South to 27%, 14% and 10% in the North Central, North East and North West respectively. Various studies identify factors responsible for this poor performance especially at community level (Antai 2011; Fatiregun 2014) – these include medical mistrust driven by socio-political factors (Chen 2004; Jegede 2007), weak health systems with poor patronage by clients, hostile attitudes of health workers, work conflicts between competing programmes and even routine and supplemental immunisation activities (NPHCDA 2012).

Specifically, for measles, according to the NDHS, national coverage has ranged from 36% in 2006 to 41% in 2008 and 42% in 2013 (NDHS 2013) and 2016 (MICS 2016). Variations also exist between geopolitical zones: for instance, measles coverage in the northern state of Kano (northern region) is 16.5% compared to 97.8% in the South Eastern Enugu state (King 2016). These zonal differences can be explained by contextual socio-cultural and political issues and have been exacerbated in the North Eastern region by the recent Boko Haram insurgency (NDHS 2013). In 2014, the incidence of measles in Nigeria was among the highest in West Africa with a rate of 3.95 cases per 100,000 total populations compared to less than two cases per 100,000 in the rest of the West African countries (WHO 2015b).

Nigeria introduced routine immunization of measles in 1984. Coverage estimates show that measles vaccine coverage through routine services has plateaued around 42% since. This coverage level is still far below the level of routine coverage necessary to prevent outbreaks (WHO-UNICEF 2018). In 2005 and 2006, Nigeria conducted its first catch up campaign in the Northern and Southern regions of the country. Additional catch up campaigns were conducted in 2008 and 2011. While there was a downward trend in the number of measles cases reported between 2007 and 2009, a resurgence of measles cases in 2010 and 2011, coupled with already low measles vaccine coverage, resulted in the need for a follow up campaign in 2013.

Nigeria applied for funding to conduct measles campaigns with Gavi in 2013 and 2015. However, by reaching 84.5% of the total target population 9 – 59 months, with slightly less coverage in the North (82.7%) and slightly higher coverage in the South (86.9%) these campaigns did not reach the target of >95% measles vaccination coverage for measles (MCV1) (NPHCDA, 2015a).

Nigeria's measles epidemiological profile indicates that, despite of above-mentioned campaigns, there continues to be a high risk for measles outbreaks, which indicates that there may be quality issues in the conduct of the campaigns. Gavi agreed to support a new measles vaccination campaign in 2017-2018 and decided to have an independent evaluation to better understand the quality of the campaigns and their effect on measles vaccination status of children under-five. The evaluation was planned during the implementation phase of the campaign.

1.2 Purpose, objectives and evaluation questions

Purpose

The Gavi Alliance (Gavi) commissioned an independent evaluation to assess the design, implementation, outcomes and lessons learned of the Gavi funded measles campaigns and their effect on the overall immunization system in Nigeria. The purpose of the evaluation is to retrospectively assess the Gavi-supported measles follow-up campaigns conducted in November 2015 and January 2016; and prospectively assess the planned two phased campaign scheduled to be conducted in October 2017 through March 2018. The results intend to provide lessons learnt to the Alliance regarding measles campaigns that have been conducted in countries with Gavi support. This information will be used to improve the design and implementation of the measles support and to help countries (and specifically Nigeria) to identify actionable steps to improve the outcome of measles campaigns and routine immunization activities.

Objectives

The objectives as stipulated in the TOR were three fold:

1. To assess the quality of the recurrent measles campaigns
2. To assess the effect of the recurrent measles campaigns on the immunization system.
3. To assess the extent to which the campaigns integrate lessons learned from previous campaigns into their respective design, planning, implementation and post-campaign states in Nigeria.

For guidance of this evaluation and further giving meaning to 'quality' and 'effect' the Organisation for Economic Co-operation and Development, Development Assistance Committee (OECD DAC) criteria were used. We assessed the process and outcome of the evaluation using the following criteria: relevance, effectiveness, efficiency, impact and sustainability of the campaigns. ¹ We added equity as an extra criterion. We defined these criteria as follows in table 1.

¹ OECD DAC evaluation criteria. Available from:
<http://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm>

Table 1	Definitions for the OECD DAC criteria for this evaluation
Criteria	Definition
Relevance	The Nigeria-funded measles campaigns (2015/2016, 2017/2018) are complementary to the routine immunization for measles to increase the measles vaccination coverage to > 90% in all geopolitical zones of Nigeria.
Effectiveness	The objectives of the measles campaigns were achieved.
Impact	<ul style="list-style-type: none"> - The measles vaccination campaigns contributed to the regular functioning of health services, especially routine immunization system. - The campaigns contributed to a decrease in the number of measles outbreaks, and in case of outbreaks a decreased incidence of measles.
Efficiency	Resources were used efficiently (time, human resources, materials) during the campaign combined with an increased measles vaccination coverage.*
Equity	Equity gaps between various under-fives groups (hard to reach, vulnerable children) are decreased due to the campaign
Sustainability	In order to decrease measles mortality, campaigns should be continued until >90% immunization coverage has been achieved at the national level for both first and second dose of measles for a period of at least three consecutive years (WHO).

* No costing analysis was included in this evaluation

Evaluation questions

Based on the above, and based on the RFP of this evaluation, the objectives are further translated into evaluation questions covering the design and planning (including quality against international standards), implementation, outcomes and lessons learned of the campaigns as and can be found in Annex 1: Evaluation Framework. The main evaluation questions are summarized here, the sub-questions can be found in Annex 1:

A. Design and planning

A1. Were Nigeria Gavi-funded measles campaigns (2015/2016, 2017/2018) well designed?

B. Implementation

B1. To what extent were Nigeria's measles campaigns (2016/2016, 2017/2018) implemented as planned (in terms of timeline, scale and quality?)

B2. To what extent was the management at country level responsive (in terms of appropriateness, rapidity, and effectiveness) to the difficulties faced during the implementation of the campaign?

B3. To what extent were the measles campaigns aligned with routine immunization activities?

B4. To what extent was the implementation monitored and evaluated (i.e. post campaign coverage survey) in an effective manner?

B5. To what extent were lessons documented for the future measles campaigns?

C. Outcomes

C1. To what extent have the measles campaigns for Nigeria (2015/2016, 2017/2018) achieved their objectives?

C2. To what extent did contextual factors (e.g. concurrent immunization activities) explain these outcomes?

C3. What have been the unintended (positive and negative) consequences of the campaigns (2015/2016, 2017/2018) on the overall immunization system, such as its delivery strategies (outreach, routine, financial incentives) and components (cold chain, staff, transportation) at all levels?

C4. To what extent has motivation of health system staff at all levels influenced the outcomes of the campaign?

C5. What are the consequences of the changed institutional setting for the Measles Campaign 2017-2018?

D. Lessons learned

D1. What are the lessons learnt from the 2015/2016 and 2017/2018 Nigeria measles campaigns?

During the preparation meeting in Abuja (January 2018) Gavi requested to include one other issue into the evaluation, namely: *“how to address the zero-dose children: the children who are never vaccinated with measles containing vaccine”*.

Chapter 2. Methodology

The evaluation was conducted between December 2017 and August 2018 in cooperation between KIT and SFH in Nigeria. The development of the design, the oversight, data analysis and report writing was performed by KIT, while SFH was in charge of the qualitative data collection in all selected six states (including the selection and training of data collectors). SFH also assisted in obtaining the quantitative data from the various stakeholders in Abuja and they organized of the preparation phase workshop and the data validation workshop. An overview of the evaluation activities can be found in Annex 2.

2.1 Evaluation design

A mixed methods evaluation design was used combining literature review, quantitative and qualitative research methods during the design, data collection and analysis phases. This design was chosen to meet the objectives of this evaluation building a knowledge base on “what works, why, where and for whom”. Figure 1 presents the generic mixed methods approach as developed at KIT.

During this evaluation the activities designed in figure 1 were not followed in a linear way; there was an iterative approach partly due to the short time span to prepare the evaluation (see limitations). Data collection in the field started early, adaptations on the data collection tools were made after the first round of data collection, and the final evaluation question was only finalized after the preparation meeting in January.

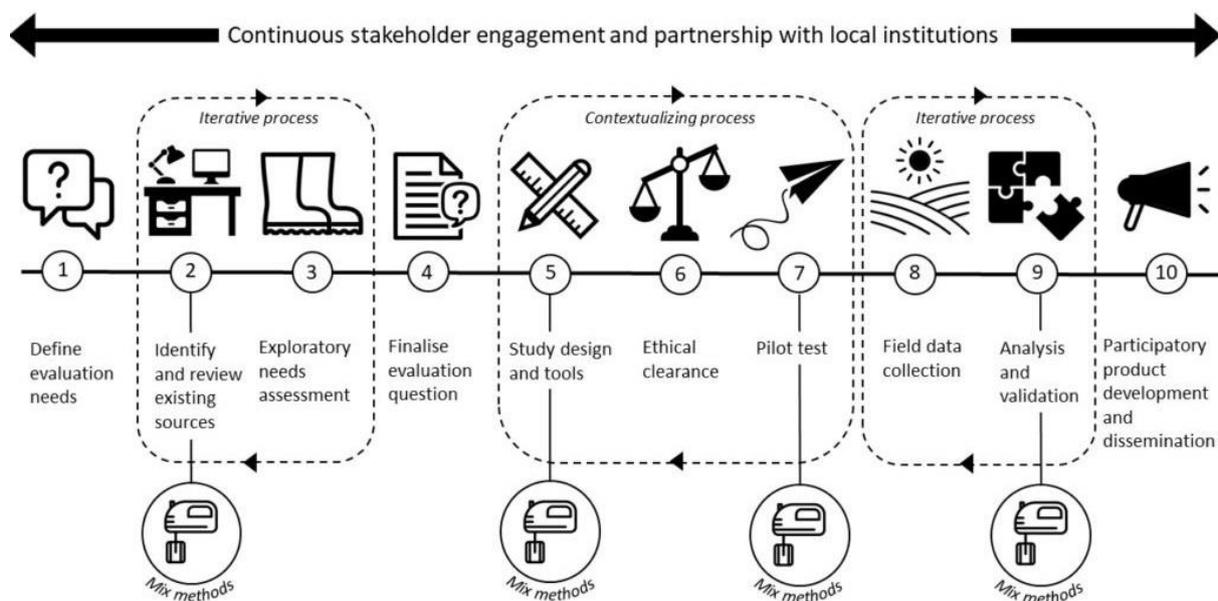


Figure 1. Mixed methods evaluation approach developed at KIT

In this design the moments of triangulation are depicted during phases of the evaluation. The evaluation followed this approach using concurrent triangulation², which means that two or more methods are used to confirm, cross-validate, or corroborate findings within a study. In this way both methods are used to overcome a weakness in using one method with the strengths of another.

² <https://researchrundowns.com/>

2.2 Research methods

The evaluation framework in Annex 1 indicates which research methods were used for each evaluation question. The following sections describe the research methods in detail.

Literature review

A peer-reviewed and grey literature search was conducted in Pubmed and Google Scholar (final search on Friday 25 May 2018), using the search terms “Nigeria” AND “Immunization”; “Nigeria” AND “Measles”; “Nigeria” AND “Immunization”; “Nigeria” AND “Supplementary Immunization Activities”; “SIA”, “Nigeria” AND “Routine immunization”; “Supplementary immunization activities”. Furthermore, program evaluation reports, (international) guidelines and scientific articles documented that were shared by Gavi and Nigerian Public Health Care Development Agency (NPHCDA) were reviewed. Based on the discussions with Gavi after the preparation phase more importance was given to zero-dose children and equity in the evaluation. A new search was conducted using the search terms “zero dose children” and “equity”, and some additional literature was found. One evaluation team member reviewed the documents and extracted relevant information related to the evaluation questions. As a next step the most important findings were summarized and written down as a narrative. To answer the evaluation questions only literature from Nigeria was used. Literature from other countries was analyzed and taken into account to develop the key recommendations for Nigeria in this report.

Quantitative evaluation

Design and data

The aim of the quantitative analysis was to assess whether the measles campaigns Nigeria (2015/2016, 2017/2018) achieved their objectives as defined in the evaluation framework and to assess the impact of measles campaign on the immunization coverage and measles morbidity and mortality. Table 2 provides an overview of definitions of indicators that were used to answer each objective. No primary data analysis was conducted as part of this evaluation. Instead, existing data were requested from multiple sources for secondary analyses. Annual data on measles mortality, measles caseload and measles vaccination coverage through RI were derived from the WHO Measles and Rubella Surveillance Data, to assess variation over time and in relation to the timing of the campaign. Furthermore, sub-nationally disaggregated data on measles caseload and post measles campaign vaccination coverage were derived from the NPHCDA and the PMCCS to evaluate geographical variation in measles morbidity and campaign effectiveness in terms of reaching zero-dose children. Finally, data from the 2016 Multiple Indicator and Cluster Survey were used to identify determinants of non-vaccination and measles vaccination campaign participation. A detailed description of the datasets and sources that were used can be found in annex 4. Furthermore, the data sharing agreement can be found in Annex 5.

Table 2. Definition of variables used to assess measles campaign objectives 1-3^A		
Objective	Variable	Definition
1	Measles caseload annual	Number of reported and confirmed measles cases
1	Measles caseload monthly	Number of reported and confirmed measles cases by month
1	Measles mortality	Number of reported deaths as a result of confirmed measles infection
1	Measles incidence	Number of reported and confirmed measles cases per 1,000,000 population
2	Routine DTP3 coverage	Estimated vaccination coverage among children aged 12-23 months for DTP3 through routine services
2	Routine MCV1 coverage	Estimated vaccination coverage among children aged 12-23 months for MCV1 through routine services
2	Measles campaign zero-dose coverage	Proportion of children aged 9-59 months who were vaccinated through measles campaign and for whom the measles campaign provided the first dose of MCV.
2, 3	Measles campaign coverage	Estimated vaccination coverage among children aged 9-59 months for MCV through the measles campaign
3	Measles incidence	Number of reported and confirmed measles cases per 1,000,000 population
Objective 1: To reduce national measles mortality by 95% compared with 2000 estimates. Objective 2: To accelerate/support measles elimination targets. Objective 3: To prevent the risk of major outbreaks through immunizing at least 95% of the population at risk in each LGA by 2020		

Statistical analysis

All statistical analyses were performed in RStudio version 1.0.143, and QGIS version 3.0.0 was used for the geographical visualization of the data. Various statistical methods were used to address of each evaluation questions. A descriptive time trend analysis was performed to assess the impact of the measles campaigns on the national measles vaccination coverage, mortality and morbidity. Furthermore, by using Geographical Information Systems (GIS) software we were able to map several relevant indicators such as vaccination coverage, measles incidence and several socio-economic indicators on state level. The global univariate Moran's I was calculated to quantify the existence of significant spatial autocorrelation (i.e. clustering) of measles vaccination coverage. This value ranges from -1.0 (complete dispersion) to +1.0 (complete clustering). In addition, Local Indicators of Spatial Autocorrelation (LISA) were calculated in order to identify and locate clusters of states with a relatively high or low vaccination coverage. For both tests a significance level of five percent was used. Finally, logistic regression models were fitted on data from the 2016 Multiple Indicator Cluster Survey to identify determinants of non-vaccination and determinants of SIA participation. A more detailed description of this analysis as well as the determinants that were included can be found in Annex 6.

Qualitative methods

The aim of the qualitative evaluation was to understand the experiences, perceptions, attitudes and opinions among stakeholders regarding the measles campaigns. The qualitative data aim to provide the answers on the quality of the vaccination campaigns and as such helps to understand the outcomes of the quantitative analysis. Among a broad range of stakeholders on federal, state, LGA and ward level data was collected by means of in -depth interviews (IDIs), focus group discussions (FGDs) and observations of vaccinations teams and review meetings at State and LGA level during the implementation of the campaigns. The data collection tools are presented in Annex 8.

To get a comprehensive picture of the country, it was decided in agreement with Gavi to include six states, 2 per geopolitical zone, and two LGAs per state for the qualitative data collection. A list of criteria for selection of states and LGAs was developed in close consultation with the MoH and NGOs and fine-tuned during the preparation workshop. The initial criteria for the selection of states were: 1) phasing strategy of the campaign implementation, 2) geopolitical zone representation of the states

and 3) security. During the preparation workshop a fourth criteria 'SIA performance in the past' was added.

Although security was not an initial criterion for state selection, the final decision as to whether a state could be visited for the evaluation was based on two considerations: how safe the area was deemed in general; and safe it would be to bring in extra visitors (including expats) for the evaluation. Sometimes selected states had to be changed because of changing realities: e.g. North Central data collection was planned to hold in Benue, but was moved to Niger state due to security concerns at the moment of the campaign.

Criteria for the selection of LGAs were: 1) representation of LGA's with low-medium-high coverage as based on the Joint Reporting Form (JRF); 2) representation of urban/rural and hard to reach areas; 3) health system factors such as health workforce shortage, health budget, variety of service provider; 4) logistical considerations such as feasibility and safety to travel to LGAs; and 5) implementation of innovative approaches. The selection of respondents for the IDIs and FGDs was done using purposeful sampling and aimed for the number and types of respondents (see Annex 4 with a list of the LGAs).

For the qualitative data analysis all interviews were transcribed, translated into English and coded with Nvivo version 10 software using a coding framework (Annex 9) based on the evaluation questions. Per code key findings and relevant quotes were extracted and when differences were seen among LGAs or stakeholders these were reported.

Triangulation and adaptations in the evaluation framework

Triangulation was performed throughout the whole evaluation. As a concurrent use of both qualitative and quantitative methods was chosen, a regular communication moments between the quantitative and qualitative team were established. Triangulation led to adaptations in the evaluation questions in order to collect information related to relevance, effectiveness, efficiency, impact and sustainability of the campaigns during the following phases:

Preparation:

- Design of the proposal: assessment of evaluation question and decision on which method to use to receive relevant information to answer the question
- End of preparation phase: during the preparation workshop and during the IDIs with various stakeholders critical issues were discussed. Information obtained during the first round of data collection and in depth discussions led for example to the discrepancy between the aim of the campaign (to Reach Every Child) and the persistence of a number of non-vaccinated children ("zero-dose".) It was decided to add a vulnerability analysis in the design to provide more insight in which children are at risk of not to being vaccinated.

Data analyses:

- During the analysis phase qualitative team and the quantitative teams met regularly to discuss qualitative findings in the light of the quantitative outcomes. The results of the vulnerability analysis for zero-dose children was confirmed by the qualitative information.

Reporting and dissemination:

- Conclusions and recommendations: these are based on comparing and integrating the information obtained of the quantitative and qualitative results

Ethical considerations

Before the implementation of the study ethical approval was sought from the Nigeria Ethical Board by the Society for Family Health (SFH). In line with ethical guidelines, the study respondents for the

qualitative interviews received an information sheet and were asked for informed consent. The data was stored and analyzed anonymously and stored in a safe place locked with a password. The data collectors were trained in ethical standards for doing research and were aware of the need to create a safe environment for respondents to share their thoughts and experiences.

2.3 Methodology limitations and challenges

The evaluation has some methodological limitations.

Overall:

- The evaluation was carried out at the same time as the implementation of the 2017/2018 campaign and started only during the second round of the campaign. As a result it was not possible to evaluate the effect of campaigns on the routine immunization system because it was too late to collect qualitative data on the functioning routine services before the 2017/2018 campaign. Furthermore, during the campaign there was limited time to discuss or observe routine activities with health staff as they were rightly pre-occupied with campaign activities. Although important information was obtained on the effect of the campaign on the RI, the evidence is not as strong as it could have been with a proper before-after comparison.

Regarding the qualitative data collection:

- The high turnover of health staff at all levels in the system meant that most health workers could only respond to questions of the 2015/2016 campaign by consulting reports, which were often incomplete and did not reveal all experiences. As a result there is less information on the 2015/2016 campaign compared to the 2017/2018 campaign. Therefore the 2015/2016 campaign could not be assessed in the same manner as the 2017/2018 campaign.
- Although criteria were listed to select states, not all data was available to make a fully informed selection. For example, there was little information on health system factors like health worker shortages or health budgets. Furthermore, safety issues influenced the selection of states. While at first Benue state was selected for the second evaluation round, due to the security situation it was shifted to Niger state. These limitations could have led to selection bias limiting findings regarding the situation from relatively unsafe areas. The results may present a relatively positive scenario as we assume that the implementation and outcomes of the campaigns are worse in the state that are unsafe and relatively more fragile.

Regarding the quantitative analysis:

- MCV and DTP3 coverage data on LGA level were not available for a sufficient number of years to perform (interrupted) time trend analysis to be able to quantify the change in MCV and DTP3 coverage following MCV campaigns; therefore the analyses were limited to descriptive assessment.
- data on MCV/DTP3 coverage was only available up to 2016 making it difficult to assess the impact of the 2015/2016 campaigns on the respective immunization coverage and the effect of the 2017/2018 campaign could not be assessed.
- reliable MCV coverage estimates on LGA level were not available, therefore we were unable to perform spatial regression analysis to assess the relationship between measles incidence and vaccination coverage; instead a Poisson regression was conducted to estimate the association between measles vaccination coverage and measles incidence on state level.
- no subnational measles mortality data past 2015 were obtained and therefore the trend in mortality could only be assessed on national level from 2010 to 2015.
- MICS data is based on household surveys and by design does not include the most vulnerable children e.g. those living in an orphanage or other institutions.
- PMCCS raw data were not made available. Therefore, the analysis were dependent on data that was already processed and/or limited to data extracted from reports. Hence we could

not assess the number of children who were given a second dose (MVC2) opportunity and assess the quality of the reported data.

All evidence for the quantitative analyses were graded based on the GRADE criteria³ (See Annex 10).

Furthermore, the evaluation had to cope with various challenges. The evaluation started at the same time as the campaign, therefore the preparation meeting could only be held after the first round of data collection. Furthermore, stakeholders were often busy with campaign activities, leading to delays in arrival of introduction letters for the evaluation team. Some review meetings were done in local language and only after the first data collection round the evaluation team could respond to this and make sure that the evaluation team always included a person who understood the local language.

Chapter 3. Findings

This chapter gives the results, following the evaluation framework and consistently following similar numbering as in Annex 1: chapter 3.1 on design and planning (section A of the evaluation framework), chapter 3.2 on the implementation (section B of the evaluation framework), chapter 3.3 on outcomes (section C of the evaluation framework) and lastly chapter 3.4 on the lessons learnt (section D of the evaluation framework). These results are based on the literature review, the quantitative and qualitative methods used, as indicated also Annex 1 which links the evaluation questions with the different methods used.

A list of literature used can be found in Chapter 7. An overview of all the datasets used for the quantitative results can be found in Annex 5. Finally, a complete overview of respondents for the qualitative results can be found in Annex 8.

3.1 Design and planning

Key findings

- Overall we can conclude that the 2017/2018 campaign was **well designed** to facilitate a nation-wide campaign. The **lessons learned** from the 2015/2016 campaign were **taken into account**, there was special attention for **strengthening routine immunization** in the plan and concurrent immunization activities.
- Nigeria followed the WHO guidelines and Gavi strategies for the design, consulted local stakeholders, and responded well to the questions of Gavi's Independent Review Committee Task/Team.
- The set objectives for the campaign were **relevant but ambitious**. The focus was on **reaching all targeted children** (9-59 months). No specific attention was observed in relation to reaching the **zero dose** children.
- The **timelines and monitoring and evaluation** plans were well set. Overall the design of the 2017/2018 campaign improved compared to the 2015/2018 campaign.

³ <https://bestpractice.bmj.com/info/toolkit/learn-ebm/what-is-grade/>

A1. To what extent have Nigeria Gavi funded Measles Campaigns been well designed?

This question is answered by addressing the following 8 sub-questions from the evaluation framework:

1. To what extent have lessons learned from previous immunization campaigns and specifically measles vaccination campaigns been incorporated in the design and planning?

Lessons learned from previous campaigns have been considered in the design of the 2015 and 2017 campaigns (NPHCDA 2015, 2017). The 2017 plan explicitly presents how the design of the campaign was adapted per lesson learned related to *funding, political commitment, coordination and planning, training, target population, advocacy, communication and social mobilization*.

The findings from this evaluation confirm that most of these changes - based on lessons learned from the past - are not only 'found in the documents' but actually taken up in the design of the 2017/2018 campaign and shared with stakeholders at all levels in the system and are integrated during the implementation of the campaign. In chapter 3.2, Table 3 provides an overview on the lessons learned from previous campaigns, how these lessons were translated into the campaign design 2017-2018 and the results of this improved design on the campaign.

2. Are the measles campaigns designed following the WHO guidelines for conducting quality campaigns ensuring campaigns will strengthen routine immunization?

Stakeholders at federal level explained that the WHO guidelines were used to design the 2017 campaign although adapted to the Nigerian context. A review of the guidelines confirmed the use of the WHO guideline as a base for the national guidelines and showed the numerous adaptations making the guide fit to the context in Nigeria. The measles Campaign Field Guide 2017/2018 has become a detailed document where all steps of the campaign are clearly described including the procedures, composition of teams and responsibilities of the various stakeholders. Interestingly, lessons learned from the previous campaigns are mentioned before a (sub) chapter starts. Examples that provide evidence that the WHO guidelines are used for the development of the measles campaign guidelines in Nigeria are:

- The guide includes general messages as *Key Principles (Things to Do)* and *Common Errors (Things to Avoid)* to unite the staff to maintain not only the same technical input but also to work towards a nationwide attitude. This advice is found back in the WHO measles campaign guidelines mentioning that key messages should be developed and taken into account during the entire campaign including monitoring and evaluation. The key message in the 2017/2018 guidelines are shown in table 3.

Key Principles (Things to Do)	Common Errors (Things to Avoid)
Be first Be right Be credible Express empathy Promote action Show respect	Mixed messages from multiple experts Information released late Paternalistic attitudes Failing to counter rumors in real-time Public power struggles and confusion

- Determining the vaccine wastage during the microplanning by using the vaccine wastage (multiplication) factor. This is explained in the WHO guidelines and for the Nigerian guidelines adapted in understandable language and examples for the Nigerian health workers; further the

same calculation table is used in the WHO and the Nigerian measles guidelines. The IDI and FGD revealed that guidelines were adapted to ward level

- The readiness assessment tool used to prepare the last Measles Vaccination Campaign in Nigeria was modified to the local context, and based on different thematic areas like planning, coordination, social mobilization, vaccine logistics, implementation and monitoring.

Finally, the general language in the guideline is adapted to the context in Nigeria, mentioning the different administrative areas (Ward, Local Government Area (LGA) and providing adapted simple organograms for the measles campaign in Nigeria.

3. Has the Gavi Measles and Rubella Strategy been considered in the design?

The document from Gavi “Report to the Board” 2-3 December 2015 provides an update of Gavi’s Measles and Rubella Strategy. We used this document to assess whether the Nigerian campaigns were based on the main principles for Gavi’s support to measles and rubella: 1) central component of coverage and equity; 2) country ownership; and 3) programmatic and financial sustainability as these “would ensure the best return on investment, increased country ownership, sharp focus on strengthening RI and on quality, targeted campaigns when necessary and financial sustainability.”

Central component of coverage and equity

The campaigns were implemented nationwide, not leaving a single state, LGA or ward unattended, except for a few insecure areas. Reaching Every Child is a principle that is seriously taken into account in the macro and microplanning of the campaign. However equity can also be interpreted in the way: “one receives what one needs” or “invest more where the hardest need is”. Taking into account this paradigm, various choices with regard to equity could have been considered: having a more intensified campaign in those areas where measles vaccination coverages are lower preferable with a disaggregation up to ward level. No information was obtained to know if such a design was considered.

Country ownership

The campaign is hosted in the National Primary Health Care Development Agency (NPHCDA) with the Executive Director as end responsible authority. Monthly meetings chaired by the executive director with all stakeholders were conducted. The campaign is implemented through the National Health System structures using the State Immunization Officers, the LGA Immunization Officers, the health workers and community leaders as implementers.

The State Level Counterpart Funding principle is included in the design (and implementation) of the campaign: State level provides a part of the funding for the campaign such as the allowances and the transport of the SIOs and LIOs, while funding of transport and allowances of the vaccination teams is provided by the federal campaign budget. Additionally, ownership is visible by the efforts to mobilize local organizations to provide support (mostly in commodities) to the campaign such as the Lions Club providing nearly nationwide aprons for all the workers in the campaign.

Furthermore, there has been an intensive collaboration of the National Measles Technical Coordinating Committee (NMTCC) with Gavi partners to leverage other Gavi funding platforms such as the AFENET, NCDC, BMGF, UNICEF, US CDC and WHO. They were working closely together to guarantee the quality of the campaign.

Institutional and financial sustainability

With regard to the sustainability a few concerns can be mentioned. These campaigns and especially the 2017/2018 campaign are major logistic events that provide but also take enormous investments (time and resources) from the health system. The main reason measles vaccination campaigns are perceived to be necessary is the inability of the Primary Health Services to reach a 95% measles vaccination coverage. For a large part the same health workers are providing the services to the same

populations during the campaign as they do during routine immunization. Although extra staff were deployed during the campaign (retired staff, health workers from training institutions) in several states it was mentioned that routine health services could not be continued during campaign days because of absence of the health staff at the health facilities due to a lack of staff to combine both duties. The intensity of the 2017/2018 campaign has been experienced as very stressful by a part of the implementers.

The campaign currently depends on donor funding. If financing for campaigns is discontinued, measles campaign staff hope to continue to use the organizational structure of the polio eradication program. The Gavi funds for 2015/2016 measles vaccination campaign were provided to the Federal Ministry of Health. However, funds for the 2017/2018 campaign, due to audit issues in the past, were not directly channeled through these government systems but provided through UNICEF and WHO.⁴ This evaluation did not include a cost effectiveness or a financial analysis and as such does not provide further insight on the financial sustainability.

With regard to sustainability the “Report to the Board” mentions the 5-year measles rubella plan as part of the cMYP. Nigeria has developed a 4 year Measles Elimination Strategic Plan 2017-2020 (draft available in February 2017) and as such fulfills this criteria (this plan seems to have turned into a ten year plan). Based on this analysis we conclude that the Gavi Measles and Rubella (MR) Strategy was taken into consideration.

Other issues: age

After the previous campaign several outbreaks occurred, the measles desk tried to better understand better vaccination coverage in relation to age, sex and location. They found that the prevalence of measles was highest between 11 and 59 months of age, and between 6 and 8 years .

Gavi decided not to support vaccination to a larger age cohort (6 months to 10 years). One of the reasons for this decision were the disappointing results of the previous campaign, not reaching the desired coverage with the age cohort of 6-59 months. The Measles Rubella Initiative, in an extra SIA response on a severe outbreak in three Northern States, financed the vaccination of children from 1 to 10 years. This outbreak was associated with an influx of internally displaced persons from areas of Nigeria newly liberated from Boko Haram.

In the 2017/2018 campaign a change was observed: the previous campaigns used household based microplanning for 0-10 year olds but current ones used line listing targeting 9-59 month olds.

4. To what extent have local partners been consulted in the design and planning?

At federal level, experts from WHO, UNICEF, AFENET, NCDC, BMGF and CHAI were members of the NMTCC participating in the design of the campaigns. MSF and the Red Cross were invited occasionally for the meetings of the NMTCC. The measles campaign staff for the 2017/2018 campaign moved out of the main building of the NPHCDA to the annex building where the Polio Campaign Staff is hosted. This was done to make more use of their knowledge in vaccination campaigning especially in the field of communication and reaching all children (GIS method, line listing etc.).

The microplanning was done with close involvement of ward representatives, including traditional leaders and other community representatives. According to the respondents during the 2017/2018 campaign more stakeholders were involved than in previous campaigns. The involvement of traditional rulers and village heads in microplanning was perceived by many stakeholders as having improved the identification of vulnerable children thereby reducing the chances of missing children in

⁴ Gavi Report to the Board, 6-7 June 2018: Successfully Transitioning Nigeria From Gavi Support

the campaigns. In several cases it was mentioned that the involvement at community level could still be strengthened.

5. To what extent was the design and planning of the measles campaigns based on available data and reflecting realities in Nigeria (i.e. resources available, geographical differences, immunization coverage, immunization system)

The measles vaccination campaign 2017 plan (NPHCDA 2017) clearly explained the use of data to estimate the target populations and to draw the implementation plan. A technical team composed of statisticians and immunization experts evaluated information from multiple sources: census projections, walk-through household based enumeration and GIS based population estimates. For the North, GIS estimates were selected as the basis for the operational target population estimates. For the South, the walk-through estimates were chosen, as it was recently conducted in the South (polio vaccination) and the GIS data method for the South had not been concluded. As a buffer 10% increase was added for states where walk-through estimates expressed incompleteness.

Furthermore, the 2017 plan stated that number of health workers and security issues should be taken into account when planning the campaign. In areas facing these challenges the campaign the plan recommends a staggered implementation⁵ to ensure that health workforce is mobilized to support all areas in a phased manner. The staggering logic was determined after the State micro plans were submitted and verified. Generally microplanning is perceived by all stakeholders as an important method to develop a local plan based on local realities. Estimation of logistics, human resources etc. are based on the calculation provided in the micro plan.

6. To what extent have concurrent immunization activities such as other immunization campaigns (i.e. polio, meningitis A) been taken into consideration in the design?

The measles vaccination campaigns 2015 plan (NPHCDA 2015) stated that the campaigns should be built on experiences and lessons learned from previous and other concurrent immunization activities like previous Measles MenAfriVac and Polio campaigns. It stated that the Polio Eradication Initiative achieved great successes in reducing the number of wild polio virus through innovative strategies in security high risk areas and that the measles plan should work within the polio structures to ensure that all targeted populations are reached. As mentioned before, the measles campaign staff were hosted in the same premises as the polio campaign staff which enabled them to draw from the positive experiences of the polio-counterparts. This included: 1) use of polio data to identify low performing LGA; 2) reliance of polio strategies for advocacy, communication and community mobilization and 3) estimation of target population in the Northern States using GIS methods.

More generally, based on measles and polio outbreak response in the three north eastern states, lessons learned from Reaching Every Settlement (RES) and Reaching Inaccessible Communities (RIC) were applied in measles campaign planning and implementation through effective coordination with Borno and Yobe polio Emergency Operations Centres (EOC). During the campaign the key strategy was "Reaching Every Child". The planning exercises included identifying and reaching children in inaccessible communities. A major strategy to reach this was the training of health workers in those (including security constrained) areas to provide the needed services. This led to a package of different strategies to ensure that every child was reached including intensified health education and social mobilization; microplanning with communities; the involvement of community leaders (religious and

⁵ Vaccination activities/ sites are planned one after the other rather than simultaneously

traditional) as key instruments of encouraging compliance of community members and garnering more political support and use of political leaders. Many of these strategies were discussed with the Polio Campaign staff.

7. Are well-defined and realistic objectives for the measles campaigns, timeline and monitoring and evaluation plans set?

The objectives of the 2017/2018 campaign are described in the guidelines for the measles campaign and in this manner shared with the stakeholders at all levels in the country:

The overall goal of the measles MVC (follow-up) is to reduce measles transmission by achieving >95% coverage in all states and LGAs in line with the National Measles Strategic Plan:

The specific goals are:

- Achieve $\geq 95\%$ national measles vaccination coverage and reach all targeted children.
- Implement a higher quality campaign than previously, which incorporates lessons learned from previous measles and polio vaccination campaigns
- Uses the opportunity provided by the follow-up measles campaign to reach previously missed children with one dose of measles vaccine by leveraging the polio campaign strategies
- Use opportunities provided by the measles vaccination campaign to strengthen the health system and immunization program (i.e., EPI service delivery, cold chain capacity, supply chain management, waste management, strengthening Vaccine Preventable Disease (VPD) case detection and notification, data reporting and analysis, microplanning at LGA/ward/health facility levels)
- Strengthen the pharmacovigilance system for monitoring Adverse Events Following Immunization (AEFIs)

During the preparation meeting in Abuja (January 2018), when the first round of data collection was already performed, Gavi asked the evaluation team to pay attention to the possible high number of “zero-dose” children in Nigeria. The newspaper Daily Trust in Nigeria in October 2015 mentioned in relation to children that were suspected to suffer from measles based on several publications: “*Over 63 percent are zero doses, which means they have never had any immunization*”; the weekly epidemiology report (number 44 2016) of the Nigerian Centre of Disease Control mentioned that: “*vaccination status of the measles cases was 52.4% zero dose*”. This information was available before the design of the 2017-2018 campaign was made, but no specific objective nor strategy else than “reaching all” was included in the guide.

Timelines

Timelines in the 2017/2018 campaign provided more time for proper announcement, training and implementation of the campaign: announcements were made earlier; training was given just before the implementation of the campaign.

Monitoring and evaluation plans

Monitoring and evaluation plans were well developed and implemented with Open Data KIT (ODK) and written on paper.

8. To what extent have the Gavi’s Independent Review Committee Task/Team comments to Nigeria on previously submitted measles campaign proposals been incorporated in the design?

There were seven main recommendations from the IRC on which the NPHCDA responded in 2017 before the campaign started. The available digital Excel document of 2017 (IRC 2017) shows that NPHCDA responded well to these comments of the IRC and most reviewers were satisfied with the answers. The comments were integrated in the campaign design and enrollment according to the answers given by the country. Below, follows a summary of the comments of the IRC and the answers of the NPHCDA. . An overview of these comments and responses is given in Table 4.

Table 4. Overview of IRC comment and response by NPHCDA	
IRC comment	NPHCDA response
Functional Denominator: the functional denominator takes into consideration the development of a methodology for defining the target population, which can be tested during the SIA. As well as enrolled population to a digital system for routine immunization. Something tangible to help coverage monitoring and for achievement of routine.	Target population was planned to be defined in various ways, GIS in the North, Line listing (“Walk through”) in the South. For the implementation experiences from the Polio Campaign were used. No evidence is found that these methods will be used (in a digital manner) for RI afterwards.
Use of SMS digital technologies:	ODK software (android) was introduced to monitor the progress of the campaign and to provide quick support if needed. During the preparation, results of micro plan validation activities were recorded in ODK and transmitted to the national level for analysis. At ward level, the pre-implementation checklist is filled and these data are collected using ODK and submitted in real-time, at several time points before the campaign. Furthermore, the supervisor fills the implementation checklist in ODK (and paper) and send it to NPHCDA for analysis. Payment was given out in various ways depending such via cash, e-payment or ‘VAT cards.
Mop-ups not addressed in the budget	Mop-ups were implemented after the 6 days implementation period and was an anticipated event. As such, a separate budget was not needed as mentioned also in the answers to the IRC
Intra campaign monitoring: provide the methodology that will be used for campaign monitoring and mop-up including sensitivities around trigger points used to decide if mop-up needed and adequately delivered.	An increase in monitoring and supervision in comparison to former campaigns was planned for and observed. Especially the observation of the quality of procedures was intensified. Supervision, on the job training and daily debriefing meetings at state and LGA were planned and implemented. ODK was planned to use monitoring and to provide quick feedback
Advocacy, communication, social mobilization: develop clear and simple key messages to address vaccination hesitancy and refusal issues; include key messages on importance of routine programme and safekeeping of the vaccination card.	Reflected in the design: An intensive social mobilization strategy was developed and started earlier in time compared to former campaigns and was perceived as an improvement over the previous campaigns.by stakeholders. A key addition was the house-to-house mobilization that did not exist in previous campaigns and was perceived as a major driver of success. In various states strong involvement of the government and other stakeholders were planned for. Community leader, village heads, teachers and religious received roles and responsibilities in the campaign especially with regard to social mobilization The respondents at ward level assured various times (but not all) that they were called the people to use the RI services.
Develop crisis communication plan: to include holding statements, press releases etc. and the list of designated spokespersons. Plan to include NITAG members and other public voices to address public concerns and rumors.	The campaign included a strong communication strategy with governors and other public persons involved in the launch of the campaign in various states, radio and television messages and attention in the newspapers. According to all stakeholders this aspect was much stronger than in the former campaign.
Phasing of the SIA: consider reverse phasing so that lessons from higher coverage states can then be used in higher risk States and LGAs	The answer given by the country on this comment of the campaign was found back in the guidelines and often in the implicated that it was not useful to change the phasing of the campaign (as suggested) but lessons learned from former campaign are integrated in the guidelines and in the roll out of the campaign.

3.2 Implementation

Key findings

- Overall, **the implementation of the 2017/2018 campaign was more successful** compared to the 2015/2016 campaign. Improvements include more commitment of stakeholders, better supervision, training, social mobilization and more effective waste management and AEFI. Improved waste management and supervision contributed to **efficient** use of resources.
- **Lessons learned** from the earlier campaigns **were incorporated** in campaign design and implementation.
- The **ongoing monitoring and evaluation during the campaign implementation**, using pre-campaign checklists and the ODK app with real time data and daily review at LGA level, were highly valued by the stakeholders and an important improvement compared to previous campaigns.
- Mentioned **challenges** included issues related to **funding, transport, logistics notably cold chain issues, human resources, social mobilization, insecurity and hard to reach areas**. **Local commitment** of stakeholders made that many of the problems were solved.
- The **effect of the measles campaign on routine immunization** gives a mixed picture when evaluating the implementation. Some positive remarks during interviews could not be confirmed by triangulation with data from the community or health facility observations (see limitations of study).

B.1 To what extent were Nigeria’s measles campaigns (2016/2016, 2017/2018) implemented as planned (in terms of timeline, scale and quality?)

According to the 2017/2018 Measles Campaign Field Guide the plan was to conduct the campaign in two phases: phase 1 for the Northern states and phase 2 for the Southern states. A detailed time schedule was provided, with three streams in the Northern part and on stream in the Southern part. This time schedule is shown in table 5. The periods within a stream show the staggered approach which was implemented in all states. The 2017/2018 campaign was implemented within the proposed timeframe, although at state level some delays occurred due to delays in counterpart funds.

Phase 1: Northern	Phase 2: Southern
<ul style="list-style-type: none"> • Stream 1 (NW states): November 9 – 14 and November 16– 21 • Stream 2 (NE states): November 30–December 5 and December 7–12 • Stream 3 (NCZ states and FCT): February 1–6 and February 8–13 	<ul style="list-style-type: none"> • 17 Southern States: March 8–13 and March 15–20

Although the TOR did not provide a specific question on implementation of lessons learned (only with regard to the design) this aspect of the evaluation was considered very important by the evaluation team. And for this reason this sub-chapter starts with providing an overview table of the lessons learned, and how these lessons modified the campaign. Table 6 provides an overview of the lessons learned during former campaigns, the measures taken into the design of the campaign 2017/2018 and finally the results of these actions verified by the evaluation.

Table 6: Overview of lessons learned during the 2015 measles vaccination campaign and measures taken in design and implementation of 2017 campaign and the results found during the evaluation 2017-2018

<i>Area</i>	<i>Lessons learned during 2015 measles vaccination campaigns</i>	<i>Measures planned for the 2017 measles vaccination campaigns, based on 2017 plan</i>	<i>Results from the qualitative research in 2017-2018</i>
Funding and accountability	Funding for key activities were not released on time at LGA level in 2015	A new fund disbursement system with more clear-cut financial responsibility. Technical committee with Interagency coordination committee (ICC) finance team will monitor fund release and flow to LGA level. State task force will mandate state financial team to plan coordinate and retire funds.	At <u>LGA level</u> , <u>accountability improved</u> with increased transparency of the disbursements of funds to the vaccination teams. – making the relevant local government stakeholders aware when funds arrived; therefore funds were less likely to be misused or disbursed late to the teams. * Accountability addressed in trainings (availability of materials and the collection of evidence through immunization cards) leading to reduce the wastage of materials in comparison to the past campaigns. * ODK software to monitor both the payment of transport allowances and specific amounts disbursed to the field teams
Political commitment	In 2015 political commitment at highest level was not sufficient	Measles vaccination campaign was showcased at polio eradication related meetings and Nigeria’s governors’ forum was sensitized.	A strong communication strategy with governors and other public persons involved in the launch of the campaign in various states,
Coordination	National measles committee was housed under non-polio SIAs and some Ministries were not fully engaged	National Measles Technical Coordinating Committee set up with focal point, government and global partner. Relevant ministries were engaged earlier.	The National Measles Technical Committee is in place, and functions. Monthly debriefing meetings are held at the NPHCDA
Planning	Staggering was needed due to shortfall of health care workers in some LGAs	Staggering of implementation will be adopted based on available of human resources	Staggering was implemented and appreciated especially to address the HRH shortage And as a second opportunity for children who

		<p>(verified micro plan) and security issues.</p> <p>At state level existing Emergency Operations Centers (EOC)/State teams will be leveraged for state planning/implementation and weekly tracking of key activities.</p> <p>Readiness assessment tool will be used to track pre-implementation activities and will feed into dashboard for analysis and inform area of attention.</p> <p>Proper coordination and planning will be in place to deploy technical assistance from non-implementing to implementing states.</p> <p>Technical officer/consultant will be assigned to each implementing state.</p>	<p>missed the first round of vaccination.</p> <p>The intense supervision from partners like AFENET, WHO, UNICEF was valued by stakeholders and described as different from “business as usual”. For example, partners conducted on-the job training of the vaccinators when faulty injection techniques were noticed.</p>
Training	<p>Weak coordination/collaboration training working group in planning training and development materials.</p> <p>Invited personnel was not involved in training at lower level, or not available to conduct training.</p>	<p>Training working group reorganized/strengthened (clear Terms of Reference), involved development training plan.</p> <p>Previous training will be reviewed, best practices training (in line with global standards and country context) identified, e.g. involvement national level facilitator at lowest level of implementation, criteria for team selection.</p> <p>No political invitations training, direct supervision National Measles Technical Coordinating Committee (NMTCC) and Training Working Group and implementation training at all levels.</p> <p>LGA level bias selection reduction: LGA team includes partners and traditional leaders will supervise and validate team member selection. Training Working Group will review list of health workers to be trained to ensure quality and random</p>	<p>Content wise, the training was considered better: more practical than theoretical such as the practical aspects of vaccine administration more emphasis on group work, social mobilization and on accountability.</p> <p>The training was considered a successful refresher exercise.</p> <p>Training was segregated depending on functions and roles, for instance, recorders were trained separately from vaccinators.</p> <p>Consultants from NPHCDA and UNICEF assisted with the training in all the states.</p> <p>Microplanning training was performed felt to be short by some of the stakeholders.</p>

		<p>sample, included in national training database for tracking.</p> <p>Shift traditional cascade training model to cluster based training model to improve training quality. National level pool of core trainers who directly train last mile health workers. Microplanning training will be conducted for senior state officials and cascaded down to the LGA and ward level.</p>	
Target population	2015 measles campaign planning was based on figures extrapolated from the 2006 census (generalized growth rate 3.2% across all states). This affected planning, implementation and achievements	Different strategies adopted to determine appropriate target population. Following data sources evaluated by experts: Walk through Enumeration data, GIS based population data, Inter-Agency Population committee estimates.	For the North, GIS estimates were selected as the basis for the operational target population estimate, For the South, the Walk-Through estimates were chosen, as it was recently conducted in the South
Advocacy, communication and social mobilization	Delays in sending social mobilization funds, coverage survey showed that major reasons for poor uptake were lack of awareness.	Committee working with ICC Finance ensure early release of funds and monitor state and LGA level using State Measles Technical Coordinating Committee (MTCC). Community consultants present at state level 3 months before implementation to leverage on polio data to identify low performing LGA for focus. Different approaches for community awareness (community level meeting led by community leaders, edutainment events, health talks for schools by Wad Focal People (WFPs)). Improve strategies e.g. community based approaches for inter personal communication, de-emphasis ineffective IEC materials such as posters. Promote demand through interpersonal engagements (Household sensitization and mobilization, compound meetings with head of Household and town announcers). Early sustained engagements with schools, key influencers and other mobilization structures. Leverage	<p>An intensive social mobilization strategy was an improvement over the previous campaigns. A key addition was the house to house mobilization which was perceived as a major driver of success.</p> <p>In various states there was improved involvement of the government and other stakeholders. Community leader, village heads, teachers and religious leaders were more involved in the 2017 campaign as compared to the 2015 campaign. An increased funding allocation to social mobilization was reported often, especially by the state policy makers</p>

		use of social media and measles. Clear plan to respond to potential anti-measles vaccination messages and Adverse Effect Following Immunization (AEFI).	
Team distribution	Team distribution did not adequately consider issues of terrain and population density	Team distribution will be verified by micro plan (number of teams, transport and funding). Financial considerations for special populations and environments.	In total, there were 7 people (instead of 5) in a field team - 2 vaccinators, 2 recorders, 1 crowd controller, 1 town announcer and 1 house to house mobilizer. Previous campaigns did not have the house-to house mobilizer and town announcers on the team.
Deployment	Experience in Borno, Yobe, Adamawa (Jan 2017) successfully leveraged deployment of health workers from some ward to support other ward with inadequate personnel	Approach will be continued, especially in security compromised LGAs, team from some ward move to support other wards, if still insufficient manpower, teams move from other LGAs (staggered implementation)	extra staffs were deployed during the campaign (retired staff, health workers from training institutions)

1. Implementation of activities (if any) designed to reinforce the immunization system

The 2015/2016 and 2017/2018 measles vaccination campaign plans both explain how the activities were designed to strengthen the routine immunization systems using measles vaccination campaign as point of entry (NPHCDA 2015, NPHCDA 2017). The 2015/2016 plan for example explains that the national Non-Polio SIA technical committee (chaired by the Head SIAs) was assigned to ensure the SIAs were used to strengthen systems. The training included elements on EPI beyond measles and rubella. Additional measles surveillance was an integral part of the trainings at all levels of the measles vaccination campaigns. Solar Direct Drive refrigerators were installed in all wards in all Southern states to strengthen the cold chain for EPI, in line with recommendation of the Effective Vaccine Management (EVM) assessments. Furthermore, posters and other messages for social mobilization included messages on routine vaccination. However, the 2015/2016 measles vaccination campaign micro plans were not used for updating facility-level Routine Immunization (RI) micro plans. Table 7 presents an overview of the activities to strengthen RI in the 2017/2018 plan and implemented based on the evaluation findings.

Table 7: Overview of activities to strengthen RI in the 2017 plan and implemented based on the evaluation findings

Activities in 2017 plan	Actual implementation
1. Update cold chain inventory, identify gaps, conduct repair and maintenance,	The cold chain remained a challenge in some areas, particularly in remote areas (see also B.2.1). Problems related to power outages, maintenance and fuel costs for generators and transport were mentioned by various stakeholders, including cold chain officers. In Edo the lack of financial resources to maintain generators, or inadequate funds provided by the state for technical assistance/fixes were highlighted. Some indicated that materials were procured that would remain for RI. However, whether the improvement of the cold chain can be sustained for the betterment of the RI cannot be concluded from this evaluation.
2. Strengthening the AEFI processes, which include procurement of AEFI kits, availability of AEFI tool and refresher training,	AEFI processes, procurement of AEFI kits, availability of tools including training on AEFI was done without many difficulties. Respondents (community and health workers) mentioned the availability of paracetamol as a strength of this campaign. During the training for this measles campaign attention was given to AEFI. To what extent this will lead to strengthening RI cannot be concluded from this evaluation.
3. Advocacy materials and kits used to promote the measles follow up campaign would be adapted as a fundamental part of RI information generated	As the effect of the design on the RI can only be evaluated by comparing the RI before and after the measles campaign and this was an intra campaign evaluation this was hard to assess. Nevertheless, one respondent reacted: <i>“What I like about this publicity campaign is that it enables people to know the importance of receiving immunization, it also makes people more knowledgeable about the importance of immunization.”</i> (Ward Development Committee Member).
4. Site mapping and cost implication for hard to reach communities during the follow up campaign would be leveraged to revise RI budget for efficient service delivery to those communities.	
5. In training key topics to reinforce RI skills will be included,	Respondents indicated that attention had been given to key aspects of RI during the training.
6. Info from campaign checklists will be used to correct and plan outreach services, while data on sources of information will be used to determine appropriate channels to relay RI messages to the public,	As these are activities which will be performed only after the evaluation period this aspect could not be verified
7. Partnership with media during campaign would be sustained and utilized to strengthen RI in area of media coverage and positive reporting	As aforementioned, the effect of the design of the measles campaign can only be evaluated after campaign not during the campaign.
8. Trained supervisors will be used to support RI services in area of critical need,	
9. Teams will be trained to evaluate child vaccination cards to ascertain level of utilization of routine immunization services, defaulting children will then be mobilized by providing them with appropriate information and messages, the date, time and place on next vaccination,	From observations in all states and from respondents in the interviews, a picture emerged that vaccination cards were not routinely checked during the campaign. State and local government implementing stakeholders reported several times that information on RI was given to the caregivers after the measles vaccination. That evidence exists in the interviews (IDI) but was not confirmed by observations on the field and was also not specifically mentioned in the focus group discussions of the community members.
10. Community based announcers trained during campaign would be encouraged to support community mobilization for routine immunization; this would create demand and enhance routine immunization uptake.	No evidence was found that community based announcers (house-to-house mobilizers and town criers) included promoting RI in their activities.

2. How did Gavi in-country partners support the implementation of the measles campaign?

Technical support (WHO, UNICEF, AFENET) was mentioned by respondents in the field; the partners were appreciated for their input like supervision, materials and funding:

“It is so many people that came together to do this work oh, it is like a collaborative effort. WHO, GAVI, family support, many people came together to ensure that this things work.”

This was confirmed by observations and in-depth interviews held in Abuja at Federal level. Particularly, WHO, UNICEF and CHAI were involved in the implementation of the campaign at state level. Other in-country partners were involved at federal level in the design and monitoring of the implementation (e.g. participating in the Technical Committee). The interviewed delegates of these organizations expressed a high level of engagement and commitment during this campaign. The following quotes from stakeholders illustrate the support of country partners in this campaign:

“What consultant does is, they go to the state and help them in developing their micro plans, advocacy, ensuring all the things stated in the National TOR for state to be done at the LGA level are done and implemented and also if there is a coverage survey, we participate immediately, so technically that’s what they do.”

3. Which contextual factors explain the successes, and challenges faced?

Contextual factors relate to the wider environment in which the campaign takes place: the geographical context, socio-economic context, the political context and related safety issues and the cultural context. Annex 7 provides a set of state level maps (2016) showing the geographical variations in percentage of specific ethnic groups, percentage of home deliveries, percentage of poorest wealth quintile, percentage of uneducated mothers and the young mothers are visualized. This information was used to do the vulnerability analysis (for ‘zero-dose’ children) described in chapter 3. C. These maps provide information about population characteristics that influence utilization of health services. This explains a part of the challenges, but successes and challenges are also related to for example geographical factors (distance), the infrastructure (such as roads, availability of health facilities) in the various states. What is a challenge in one state will not be for another (e.g. (non) availability of transport).

For the 2015/2016 campaign successes and challenges related to contextual factors, the evaluation team relied on the desk review as the health workers present in this campaign were often different – or could not recall the examples of the former campaign. Findings in the desk review were very limited. The Measles Vaccination Coverage Survey (2016 presentation Hanova Medical Limited) mentions *“A breakdown of this reason shows that ‘unaware of need for immunization’ was the key reason in the Northern States while ‘place and or time of immunization was unknown’ was the key reason in the Southern States”*

For the 2017/2018 measles campaign, issues related to the geographical context were mentioned, particularly in relation to transport (see also B.2.1). Furthermore, in some cases contextual factors were not taken sufficiently into account during the microplanning, such as changes in demographics provoked by e.g. “mobile populations”. For example, migratory patterns or IDPs entering in Gombe, made estimating coverage difficult. In Edo state, some dynamic and mobile communities with new churches that were recently established within communities were not captured in the micro plans. In addition, there were places with other unique characteristics (such as a wide geographical spread) which had not been taken into consideration in the budget. Inter-ward and inter-LGA borders were not captured in the micro-plans and therefore no leeway had been made for adjustments. Lastly,

several stakeholders mentioned safety issues as a reason for problems with the planning (see also B.2.1). For the influence of socio-economic determinants on the campaign, see section C.

B.2 To what extent was the management at country level responsive (in terms of appropriateness, rapidity, and effectiveness) to the difficulties faced during the implementation of the campaign?

Given the scale and large geographic area targeted by the campaign, a wide variety of challenges and problems were reported by the various stakeholders. Some problems, especially related to logistics and mobilization, tend to differ at ward level. Structural issues related to microplanning are seen at state level. Many problems were resolved by local stakeholders (e.g. through additional supervision visits to fill gaps in mobilization) and may not have affected outcomes greatly. The use of ODK was mentioned various times as being helpful for supervision monitoring and reporting, and as such helpful to communicate and address problems quickly. Stakeholders at LGA and ward level perceived improvements in planning compared to earlier campaigns (e.g. announcements were made earlier). However, timelines were not always perceived as practical. Too many other events occurring at state and lower level conflict with planned campaign events such as public holidays, religious events, other campaigns etc.

1. What were the challenges experienced during the implementation of the campaigns?

Overall, the implementation was perceived as more effective and comprehensive than in previous campaigns and the different committees involved in the implementation functioned well in most places sampled – e.g. AEFI committee, Delta committee, Training committee, AVC general committee:

"This time around, we have to involve more hands unlike before – then you could have maybe the PHC coordinator, the LIO, the CCO, the health educators but this time around we had to involve other program ME officers like the RH, the Nutrition, the DSNO, the RBM, they were all involved." Edo stakeholder.

In Oyo state, vaccines and materials were perceived as sufficient for the allocated teams. Logistics were considered to have been made easier and were perceived as better organized in this present campaign compared to the former because the materials always arrived on time unlike previously.

Further, it can be mentioned that stakeholders, including community members and health workers, adhered better to timelines. A Ward Development Committee member in EDO State mentioned that the punctuality of health workers is much appreciated:

"Yes, that's what I told you, the community they were excited, we love this very one now. Like in those days, a mother will sit in a place waiting for the nurses, you cannot see the nurses, they tell you by 9 am they have not seen them but this programme now, 7 o'clock you come to their hospital you will see nurses there, they resume work 7 and close that kind 2-3pm, so this one is the best, I continue giving them kudos".

Training

Training was perceived more adequate compared to previous campaigns, with more resources committed, improved organization, more practical instead of theoretical approach, emphasis on group work, stress on accountability, emphasis on social mobilization, presence of NPHCDA and UNICEF consultants and efficient monitoring of the training. Furthermore, the training of stakeholders for the 2017/2018 campaign was segregated depending on functions and roles, for examples recorders were trained separately from vaccinators.

"We had trainings of LGA team, state team had its training earlier, DSN had their own training, the LIOs had their own training, who else? The supervisors and monitors had their own training. Two parts of training. One is going on now for second phase." Edo stakeholder.

Documentation and recording

Documentation and recording was perceived as improved during the 2017/2018 campaign. While previously recorders tallied before the vaccines were given, now the vaccine was given before the recording was done and card was given. Also stakeholders valued the real time monitoring using the ODK software on phones as it improve accuracy of data and is less cumbersome compared to paper. Daily data uploads allowed the national stakeholders to get real time information on the campaigns in the states and give prompt directives where necessary. No indication was found if these methods will be used in the future for RI.

"We use the ODK during pre-campaign for training and validation of micro plans and also intra-campaign implementation. It has been very helpful to the national body in making decisions. It has also helped us at the local level in making decisions during evening reviews." AFENET focal person

Waste management

Waste management in this campaign was perceived as better organized. Previously needles and syringes in the safety boxes were disposed via the 'burn and bury' method, while now modern incinerators are used. Waste was collected in safety boxes and polythene bags at the vaccination sites and collected at LGA level before being transported to incinerators at state level. The more structured approach to collection and disposal was considered as responsible for less litter at the vaccination posts. However, although many of the 2015/2016 campaign challenges were addressed in the design of the 2017/2018 campaign, as mentioned under A.1, there were still issues and challenges with the implementation of the 2017/2018 campaign. Some of the 2015 campaign issues and challenges were mentioned again during the 2017/2018 campaign, there were also some other issues and challenges.

Staggering

Staggering, was mostly seen as useful, especially to address the human resources shortage and to vaccinate children in the second phase that were missed in first phase. However, in Edo some stakeholders perceived it as a challenge and a top down measure.

"This staggering they forced us to do it. It is imposed - it is compulsory that we must stagger. It is a strange innovation. I don't even know the basis." – Rural LG stakeholder

Funding

Funding of the 2017/2018 campaign was perceived as improved by the respondents. The different local governments were assisted with the funding from the partners (WHO and UNICEF) to ensure the implementation, in particular the cold chain. Counterpart funding was provided for the transportation of the vaccination teams.

In Gombe state, funding and support for the campaign was rated high compared with previous campaigns. However, the true value of the increase in funds was not clear considering the economic recession and inflation in the country that had taken place in the years between the last two campaigns. Furthermore, the budgeted amount was usually perceived as insufficient because of inflation, which occurred between the point of budgeting and implementation.

In Niger state a two day delay was caused due lack of available funds from Federal level, delaying the start of the campaign. Late release of counterpart funding was also flagged in Niger state.

Transport

At LGA level, lack of funding, notably including provisions to pay for transport to less accessible villages was mentioned as an obstacle in several states, including Edo, Imo and Gombe. Besides discouraging implementers, the resulting lack of mobility of officials caused by lack of funding was quoted as resulting in delays in implementation in Edo. From review reports, it seems that not all teams were allocated the right amount of money in Edo, or not in a timely manner. Moreover, rough terrain already complicates roll out in ideal situations, so lack of transport is even more pressing. As one vaccination team stakeholder put it:

“In my opinion, if we are moving from one post to the other, there should be a means of transportation provided for us, but there is none, with walking around carrying the tools in our hands.”

Transportation was noted as a problem in Oredo, an urban LGA – this was caused by budget gaps from the top, not at the point of disbursement to teams:

“The money they brought was not really much, like they brought money for 55 teams and we’re working with 65 Teams, sorry we are working with 85 teams. So, you can see the gap so, because of that one, so we just try to augment for many things aside the 55.”

Health worker morale

Health workers morale was generally high in all the states despite complaints about delayed release of funds and insufficient financial allowances. A noted common focus of the field staff in all the states was to achieve their daily implementation targets (DIP) within the short campaign period.

Many of the state and LGA stakeholders stated that financial allowances were available but more often field staff in the southern states perceived what they were given as insufficient. Some ward focal persons in Edo also complained of the delayed release of funds and lack of clarity as to the amounts due. In Edo state, though there were clear directions on what should be given to various teams, there appeared to be no consistency in responses about what was actually given at the fieldworker level. The issue of “money for the teams” was a source of prolonged discussions during one of the review meetings. The issues related to under-payment of teams and non-payment in some cases even though the funds had been released and were supposed to be paid. Some field teams had not gotten any allowances by the time of the interview - stating that they were told that they would get that after the work was completed. The delay in the release of transportation allowances was given as a reason why some areas were not accessed quickly by the field teams. As mentioned in table 6 on lessons learned: accountability on transferring of funds at LGA level has improved, but is never totally resolved.

In Oyo State, transportation was mostly provided directly for the teams – (local government buses) and daily allowances were provided. Field team members noted that the amount to be paid in the current campaign was less than what was paid previously and considered this as discouraging. The allowances had not yet been paid at the time of the interviews (see also B.1.6).

Logistics

Different states had different experiences regarding logistics. Whereas some issues were flagged with vaccine provision, other departments highlighted early delivery as a key success for this campaign. Vaccines and supplies appeared to be sufficient at national and regional levels but shortages were experienced locally – usually more frequently reported in the southern states and linked to shortages in allocated teams by national level. However, logistical challenges were also sometimes due to microplanning which had not taken geographical spread, urban dynamics and ward / LGA border mobility, sufficiently into consideration.

Issues with the cold chain were mentioned by various stakeholders, including cold chain officers. One Edo officer highlighted the lack of financial resources to maintain generators, or inadequate funds provided by the state for technical assistance/fixes. Another cold chain officer highlighted the issue of continuous power outages complicating large scale roll out. In Niger state, one CCO actually reported having more issues than during the last campaign: *“[During the last campaign] electricity was stable, good generator was available and we had enough staff unlike now that they have retired without replacement.”*

Several stakeholders working on the campaign explained that inadequate planning led to a shortage of vaccines and [vaccination] cards within a few days of the campaign. This led to delays. During the validation workshop, this could not be confirmed: shortages of vaccines was rather described as a local problem, not affecting the campaign at large: the regional stores did not experience stock outs during the campaign.

In Niger state, vaccines and other supplies were perceived as adequate depending on the location. According to the rural LGA, there were extras provided. The materials were considered more than in previous campaigns. However, there was an important difference between urban and rural areas - in the urban LGA, the stakeholders noted that there were no extras. They actually ran out of vaccines by the third day of the campaign because they had immunized more than their target population (reported by NGO focal person and other stakeholders). It was not clear whether this was because of poor microplanning or because of a more dynamic population in the urban areas – more likely a combination of both issues. According to the CCO, they had also included the wastage factor in their calculations to determine their requirements and they had been issued according to their requirements with no extras added (also confirmed by the M&E stakeholder).

In Sokoto state, vaccines, materials and HRH were perceived as adequate. However, a noted problem was that some of the health workers trained for the campaigns were not the people that actually came back to do the work (this comment was made with reference to previous campaigns). This was the reason given for poor injection techniques observed in the field (and discussed during the daily review meetings).

In Oyo state, vaccines and materials were perceived as sufficient for the allocated teams. Logistics were considered to have been made easier than in earlier campaigns due to the state counterpart funding. Materials had also arrived on time unlike previously. Nevertheless, according to state level stakeholders, logistics was affected by the insufficiency of the number of teams allocated by the national level because the materials were bundled to align with the number of teams. Furthermore, the state experienced a shortfall in logistics because of the extra teams provided by the LGAs. However, several government stakeholders were of the opinion that the logistical shortages were due to faulty microplanning. One of the respondents detailed that the training for the microplanning was conducted in one day instead of two, which had affected the quality.

Social mobilization

The intensive social mobilization strategy was frequently mentioned by stakeholders as an improvement and the fact that more funding was allocated to this. The addition of house-to-house mobilizers and the town announcers to the vaccination team of two vaccinators, two recorders and one crowd controller was perceived as a major driver of success. Stakeholders also mentioned that the megaphones allocated per team instead of ward was an improvement. However, social mobilization was hampered by rumors in the southern states and required extra effort by traditional, religious and political leaders to convince a non-compliant minority. Involvement of religious and community leaders worked out positively:

“The lessons are that this campaign is more opened. They open the campaign earlier 2 weeks while the last was just a week and in this one, they called community leaders, religious, town

criers and put us in one place for 6 hours lecturing us, showing us drama and as you leave that place, that thing is still in your memory. People really did their work even the media, they have been saying it” - Community leader Niger state

Some stakeholders reported relatively high rejection from schools, and push back due to rumors about monkey pox. Although the majority of the schools received letters announcing the campaign, not all schools received planned advocacy visits. As a consequence, instances of non-compliance by schools was an issue in some wards in states like Edo, with schools either not communicating the campaign to parents or refusing to do so until convinced of the importance of the campaign. In the case of three schools in Edo, last minute meetings with parents and teachers were scheduled at the beginning of the vaccination week and an ‘influential’ person (in this case the WHO representative) was sent to ensure cooperation. A key challenge at local level across all states remained the difficulty in convincing (a small minority of) parents to vaccinate their children. In various states, interviewees recorded rumors about the dangers of attracting ‘monkey pox’ through the vaccination, or mistrust of soldiers handing out medical supplies for other campaigns. In Edo state, rumors were even recorded about Boko Haram being involved as vaccinators. In Imo state, a rumor was recorded about the vaccine causing impotence. Consequently, a relatively large amount of effort needed to be invested in order to convince a small minority of people. Stakeholders throughout the country indicated that efforts to ‘enlighten’ parents have generally been effective, helped by broad community support (including key leaders), as well as presence of political (state) officials and health personnel.

In Sokoto state, some caregivers were under the mistaken impression that there would be incentives such as mosquito nets. When they did not see these incentives, they refused to vaccinate their children. In Gombe state one stakeholder mentioned the difficulty with people attending the campaign in another community than their own, thinking they would not be reached in their own communities. Sometimes parents cross state borders, e.g. for market days, making it more difficult to assess who was covered.

Security/hard to reach areas

Stakeholder interviews suggested that mobilization efforts were more challenging in the remotest parts of states where communities have little access to TV’s and radio’s. Security issues were mentioned for some wards in Edo, leading to delays in line listing. The stakeholders felt that though the population size was considered, the geographical spread had not been considered in the microplanning, so the teams were overwhelmed:

“The people are sensitized but the teams are not enough to capture the geographical spread of the target population - a lot of the people are scattered across long distances.” Stakeholder, Edo.

Governance/accountability

The accountability framework in which sanctions for poor performance and rewards for exceptional performance to work was in place and appreciated by various stakeholders. Accountability was stressed during trainings and in relation to the availability of materials and the collection of evidence through immunization cards. Stakeholders also felt that this reduced the wastage of materials in comparison to the past campaigns. At LGA level, accountability improved with increased transparency of the disbursements of funds to the vaccination teams. A four man signatory form was introduced which made all stakeholders aware when funds arrived; funds can less likely be misused or disbursed late to the teams. Furthermore, the use of the ODK app to monitor the payment and amount of transport allowances to the field teams was considered an improvement compared to the previous campaigns when only a checklist was used for the release of counterpart funding, an example of this is the following statement

“Like I always tell them, when you keeping wasting time in disbursing this funds, you are generally telling the national or the people, that bring this money, that you can run this campaign without money because the ODK we do in the field and send to the dashboard, they watch the tree”. Stakeholder in Imo State

An improvement in terms of how funding was registered was reported in Sokoto: in 2017, the state counterpart fund was clearly linked with some activities, unlike in 2015, thereby contributing to increased transparency.

Human Resources

Human Resource (HR) shortage was mentioned more frequently in the southern states than in the northern states. However, this was mostly managed successfully by all the states. A common strategy mentioned frequently in the southern states was the provision of the extra three-man team by the local government. Though there were complaints of excessively heavy workload in some cases, there was no evidence that the HRH shortage hindered implementation of the campaigns.

The issue of limited number of teams for the campaign was a common complaint in Imo, Oyo and Edo states. This was reported as due to the number of teams assigned from the national level. In Edo, for instance, some partners noted that there were too few teams for the campaign. An interesting assertion by the stakeholders was that the number of teams allocated to the state was assigned by the national level before the microplanning was done and they had been told to plan around the allocated number of teams.

In Gombe state, most of the stakeholders mentioned that the HRH was sufficient for the exercise but during the LGA review meeting in Kwami, there was reported shortage of human resources because the RI activities were running concurrently with the campaign.

In Imo state, more reports of HRH shortage were found among state level stakeholders. However, though some of the stakeholders at LGA levels, in both urban and rural areas perceived the HRH for the campaigns as enough, there were complaints of shortages at this level as well:

“The difference is that 2015/2016 campaign was easier but this present campaign is very tedious, there is work in this campaign because the teams are not complete and the team composition is also not complete.” LGA stakeholder, Imo.

Work pressure was indicated by several stakeholders e.g.:

“The only thing I don’t like about the campaign is that, you see for somebody working from morning till 1 or 12 o’clock, sometimes we will be able to finish maybe 1 or 12, we don’t have our breakfast before we left, to me sincerely speaking I don’t eat before I left my home.”

In Imo state, various stakeholders thought the number of teams were reduced compared to the last campaign. In Edo, interviewees working in urban areas (Benin) said there were instances where teams had to be split up in order to try and reach as many schools and churches as necessary (this stakeholder said there were 490 teams available, whereas during the last campaign there had been 800-900). Besides fewer team members, this meant that supervisors could not always be present. Additionally, in Oyo state, not all the people that came for the training came for the implementation and this intensified shortage of HR. The interviews did not give a clear answer of the “why” behind this. Workers were requested from the school of hygiene and school of nursing. Mobilizers also complained of shortage in the number of people needed for the line listing, resulting in more LGAs being assigned to the second phase.

In Imo state, a FGD participant found it problematic that only outside mobilizers were attracted to work in his ward, and not suitable local candidates. In Oyo state a community leader also complained about nepotism involved in the selection of candidates:

“The only thing I can refer to as not successful is choosing wrong people to be part of the mobilizer, people that the community member will not listen to, because they know someone in the local government.”

2. How were the problems solved?

The problems discussed in the previous paragraph could not all be solved during the implementation of the campaign, especially not those that relate to the design and planning of the campaign. Nevertheless, stakeholders mentioned that government ownership, community ownership and LGA ownership lead to a felt high level of responsiveness at each level contributing to a *problem solving attitude* at all levels during the campaign.

Observation of the daily review meetings indicated that most of the problems with the implementation were solved during those meetings in a very practical manner, which is demonstrated with the following case: In Edo state shortage of immunization cards in the urban LGA was a distressing problem for the vaccinators and recorders who felt this could compromise their work. If the monitors did not see the cards of the children they had vaccinated, this would raise doubts that the immunization had taken place – and result in sanctions. The stakeholders decided that old cards from 2013 should be used because of the surplus from past years. Ward summary sheets were also limited - in the rural LGA, the ward summary sheet supplied was only for three days for 19 teams. The solution to this problem was however simple - photocopies of ward summary sheets and LGA summary sheets were made – though stakeholders complained that this had not been the case in previous years.

To address the shortage of teams in some of the states (Imo, Edo, Oyo), special three-man teams paid for by the LGA were recruited. Oyo state also had some emergency recruitment from the schools of hygiene and nursing. Stakeholders perceived the staggering as a good strategy that helped to address the shortage, which they noted, would have been worse if implementation had not occurred in phases.

Dealing with shortage of vaccines were addressed in various ways. E.g., according to a state level stakeholder, during phase 1 of the staggering allocated materials were almost exhausted and they then encroached into the reserves for phase 2. National authorities were alerted about this short fall and the looming shortage was solved.

3. What technical support supervision was received during campaigns?

The implementation of the measles campaign was monitored by national, state and the LGA supervisors, various partners and independent monitors, hired by WHO and UNICEF. Supervisors including technical staff were deployed to the field to do on-the-spot check and corrections, to monitor the campaign activities and report daily using the ODK software. WHO and UNICEF provided a lot of monitoring and supervisory support. WHO measles campaign consultants supported the campaigns from planning to implementation while the measles technical officers provided additional supervisory and monitoring support. Field teams perceived supervision as better than in previous campaigns - more thorough and supportive - with errors corrected, and on-the-job training carried out where necessary.

The LGAs were technically supported by the state and local government. In addition national supervisors provided supportive supervision through various partners - AFENET, WHO, UNICEF, NCDC, CHAI. Independent monitors conducted both the process monitoring and -what is called- 'outside monitoring' and send the "recalling data" daily during the campaigns. This information was used to plan the target population for the next day.

The provision of the measles technical officers by the WHO is a difference from past campaigns:

"The supervision is useful because it is more of supportive supervision. Like the one that visited our cold store, when she opened the freezer she corrected us on certain things like the way we should arrange the ice packs."

One WHO officer in Niger state mentioned that:

"Our waste are being managed well and our personnel, that's the LGA team even from the state and national are going out to supervise. They are going to the interiors to see what is happening, not only in the town. They are going all over to see that the work is well done."

Another stakeholder in Gombe stated:

"This campaign was successful principally because we had adequate supervision. We had a lot more national monitors to support the process of supervision. We made sure that every supervisor had a hard copy checklist in monitoring and ODK."

Contrastingly, in Oyo, one state government stakeholder mentioned that supervision was not as efficient in this campaign as compared to the last campaign.

4. Other available support (debriefing sessions, relations with colleagues and supervisors)?

Support was received in various forms like role training, transportation fare, campaign funding, supervision during the campaign and sharing sensitization materials for community education. Stakeholders had a general 'top down' perspective to support, meaning that forms of support like financial, technical, supervision, training and mobilization were originating from a higher governing level (state, federal and local government) and then disseminated to lower levels. There were various reports amongst local level participants of where financial support (as well as other forms of support) came from. Yet, most respondents report receiving some form of support.

A form of support mentioned by respondents was 'moral support'.

"Another support we had is moral support, church leaders brought out their time to explain it to people very well, he explains to people that they should all allow their eligible children get the measles vaccination to avoid outbreak of measles. Because it will bring plenty problem, and bring disfigure of our children, so they should bring out their children for the immunization"

According to one stakeholder. This 'moral support' was frequently mentioned by implementing stakeholders throughout interviews regarding campaign support. This speaks to the impact of religious leaders, community leaders, town criers and other agents of sensitization to mobilize and further cover of the community.

A form of 'supplemental support' was described as well. Mobilizers spoke about supervisors who would "move money from their own pocket" in order to "motivate these people to continue". Sometimes the community provided food for health workers during the campaign.

Noted difference in support between 2015 and 2017 measles campaign were the 1) implementation of 'house to house mobilizers' in order to support mobilization of the community. 2) Training support was reported as improved because of the increase in training methods like role play and reduction of training class sizes; training classes were also more specialized by campaign role and conducted by LGA. 3) Increased communication with stakeholders via "dashboard⁶" and "measles committee coordinators" and modes of supervision increased, a respondent perceived, interest of stakeholders in health workers, "they would come and ask us how we are doing and make sure we aren't wanting for anything," according to an LIO in Edo state who responded to deputy governor's presence during the campaign.

Majority of the states mentioned more political support in these campaigns than in previous ones; the Deputy Governor in Edo state was frequently mentioned by stakeholders. Also the support of local government chairmen was reported in the majority of the visited states. For instance, the support given by the Shonghom LG, Gombe chairman who fixed the generator in the local government.

"We got maximum support from our supervisor, community leaders and religious leaders even the people in the community gave us food. We didn't have any shortage everything was given to us with extra. We have enough working materials in the store we go there daily to collect from the store. They always give us 10 extra in case of shortage."

The interaction between national, state, LGA and ward level, during this campaign, was quite well done: the majority of stakeholders, except the mobilizers and recorders, indicated that they received feedback from a higher level about the performance of the campaign. Daily Review Meetings were mandatory and considered as very useful. Stakeholders reported a critical review of issues and data during the evening debriefing at the LGAs and the state levels. LGA review meetings allowed for correction of technical details in the data before the summary was submitted. Other procedures for feedback reported by various stakeholders include:

- Ward focal person: we received documented feedback from the LGA, including percentage rate and score and by attending LGA review meetings
- M&E officer: The federal level invites SIO for meeting and give feedback
- WHO consultant: WhatsApp groups in which wards are sharing what is happening (including pictures) based on this information:
 - CCO/LIO/PHC coordinator go when necessary and check the situation on the ground
 - CCO: at the end of the campaign feedback from state to LGA level
 - Sharing with lower levels: Wards: some LIO indicate they share results with wards other don't, CCO's say they do
 - LGAs: M&E officer and SIO indicate that they share feedback from federal level with LGAs

5. What guidelines are available?

There is a general expression of usefulness regarding protocols and guidelines during the 2017/2018 measles campaign, "it's useful to have something to point at as a guideline," said a CCO. Participants report receiving guidelines from 'national' level during training. During interviews some respondents were able to show written guidelines and others state that guidelines were given verbally during

⁶ Daily information from the independent monitors via ODK. Used for discussing during the review meetings and used for planning for the next day of the campaign.

training. It was mentioned that guidelines were adapted to ward level but there missing an explanation for how this was done. Not many changes in guidelines were observed by respondents in the field between the 2015 and 2017 measles campaigns but some additions were noted. For example additional guidelines for rewarding participants and sanctioning those not performing in the campaign according to a local Niger NGO, however we could not confirm this in the official guidelines. But the qualitative data include issues of participants with a “lack of commitment,”

“they may work like where we are now; they may work through here than the other area they won’t go there because of lack of commitment,”

Another change reported was the increased selectiveness in team composition:

“more adequate and experienced hands for this campaign”.

Community leaders generally reporting a lack of guidelines:

“I don’t know about guidelines. I am here telling people to vaccinate,”

Alternatively, many participants commented on the level of “seriousness” of this campaign and “guidelines were more dispersed in this one”.

6. What are the experiences with incentives?

Regarding **financial allowances**, many of the state and LG stakeholders in all the states stated that they were available but more field staff in the southern states perceived what they were given as insufficient. In Edo state, though there are clear directions on what should be given to various teams, there appeared to be no consistency in responses about what was actually given at the fieldworker level. The data collectors observed that people involved in the campaign are hesitant to disclose what they receive for allowance, it are more general statements as:

“The transport fare is nothing to write home about. Vaccinator” – Edo state

However talking about incentives and allowances was sometimes lengthy but not very conclusive: the issue of the logistics money for the teams was a source of prolonged discussions during one of the review meetings. With regard to issues related to under-payment of teams and non-payment in some cases even though the funds had been released and the monies were supposed to be paid; others stated that the LG provided buses for their transportation and they did not know the cost.

Some of the field teams had not gotten any allowances by the time of the interview - stating that they were told that they would get that after the work was completed. We found that payment is done before, after as well as during the 2017/2018 measles campaign. Compensation is given via cash, e-payment or ‘vat cards’. Payment depends on role of stakeholder in the campaign and release of funds by LGA. Participants explain the variations in payment schedule by, *“maybe it’s the culture I don’t know or the standard I don’t know”*, responded a stakeholder.

Some of the differences noted are an increase in funds and monetary compensation for transportation as well as use of participant account numbers for placement. Respondents express issues of under payment or non-payment; some respondents report about no compensation or only receiving transportation support; some respondents refused to answer questions regarding numerical value of compensation. In general, a lack of understanding, regarding compensation and what it includes, is observed with the various respondents.

During an observation, an account of monetary compensation is made: “Vaccinators and recorders are LGA staff; mobilizers and crowd controllers are from the communities. The team is made up of two vaccinators, two recorders, one line lister, one mobilizer and one crowd controller. The teams are given an allowance of 6,000 Naira per day (1k each for vaccinators and 800 each for the rest). This allowance is inclusive of transportation cost. The ward focal person is given 42,000 Naira for the entire campaign which includes his fuel for supervision.”

In Imo state, disbursement of financial allowances to the teams were reported as having been done in a timely manner and with higher amounts given in this present campaign. However, two stakeholders (from urban and rural areas) noted that the amount of money they were given for mobilization was reduced in the present campaign compared to the former ones.

B.3 To what extent were the measles campaigns implemented aligned with the routine immunization activities?

Has a post-campaign review with the Interagency Coordination Committee (ICC) on measured needed to ensure and strengthen continuity between campaigns and routine immunization been convened after the 2015/2016 campaign?

The desk review did not find any information on the actual alignment with routine immunization activities during the implementation. Post-campaign reviews were reported in the interviews. However, there was no reference to discussions on measures needed to ensure and strengthen continuity between campaigns and routine immunization. The report of the independent monitors was used more to determine why children were missed and to assess the level of information about the campaign among the care givers Also stakeholders reviewed best practices and bad ones – and how the next implementation could be planned with these in consideration. It is reported that all this information will be used for future planning exercised and for modifying and updating the campaign guidelines.

Is a post-campaign review with the ICC on measured needed to ensure and strengthen continuity between campaigns and routine immunization been convened after the 2015/2016 campaign?

The desk review did not find any information on the actual alignment with routine immunization activities during the implementation. No evidence is found on change in RI service utilization after campaigns (see 3.3 Outcomes). Post-campaign reviews were reported in the IDI but there was no reference to discussions on measures needed to ensure and strengthen continuity between campaigns and routine immunization.

B.4 To what extent was the implementation monitored and evaluated (i.e. post campaign coverage survey) in an effective manner?

Have post campaign coverage surveys (PCCS) been conducted after the 2015/2016 campaign?

A PCCS has been conducted within 8 weeks after the 2015/2016 campaign. The complete report was shared and data were extracted from the report and used for the quantitative analysis

Are post campaign coverage surveys planned for after the 2017/2018 campaign?

A PCCS was conducted after the 2017/2018 campaign and the final analysis were shared and used for quantitative analysis. The focal areas for the PCCS is usually determined by the partners (sometimes through balloting) and the national stakeholders commission an independent survey to verify the work done and the areas covered.

Have mop-up activities been conducted in areas where coverage <90% as estimated by administrative data?

Mop up was conducted in all the visited states. The trigger point ranged from 5-10% depending on the states. For instance, in Gombe, mop up was carried out if the percentage of missed children was up to 5% while in Niger state the trigger point was 10%.

Are monitoring tools available and used during the campaign?

Monitoring tools were available and used during the campaigns – these include the concurrent monitoring check list (in the ODK), LGA summary sheets, AEFI data sheets, tally sheets - hard copies and electronic tallying. The tally sheets were grouped by age and gender; zero doses, 9 to 11 months and 12 to 59 months. In addition, the line-list register developed by the house-to-house mobilizer was used in Gombe by the mobilizer to keep track of the children being immunized.

B.5 To what extent were lessons documented for the future measles campaigns?

The IDIs revealed that reports were made and submitted after campaign and that review meetings are held daily to document lessons learned. The process of documenting lessons learned seems to differ among LGAs. Some lower rank stakeholder were not asked to write lessons down, e.g. recorders and vaccinators in some LGAs. It seemed it was assumed that the discussions will be taken up to state level to be documented. The various methods observed were observed and/ or reported:

- The federal level invites the SIOs for meeting to discuss (and provide feed-back)
- WhatsApp groups in which wards are sharing what is happening (including pictures). At the end of the campaign feedback from state to on issues found will be shared with the LGA level. However if these experiences are later documented is not clear

During the evaluation the team has not observed in how far all the notes of review meetings, the exchange on Whats App and information of the ODK are analyzed and made to a comprehensive overview on lessons learned. This is "an after campaign" exercise and as such could not be observed.

3.3 Outcomes

Key findings

- Although **no evidence of any effect of the campaigns on the utilization of routine immunization** services were observed, other positive effect such as the availability of materials and data tools, training of health workers and strengthening of cold chain came forward in the qualitative analysis.
- Northern states have a lower overall measles vaccination coverage than southern states, among children between the ages of 12 and 23 months, according to the MICS. This can be explained by other findings that show that **children who are at risk of non-vaccination** - due to various factors related to ethnicity, low education of mothers, younger mothers, home deliveries and low wealth quintile - are more prevalent in the northern states. As a result these states have a **higher risk of measles outbreaks** as an increase in vaccination coverage was associated to a decrease in measles incidence.
- Overall, improvements were made between the 2015/2016 and 2017/2018 measles campaign. Health workers were reportedly more **motivated and a higher level of commitment** to reach all wards was observed during the 2018 campaign. Furthermore, **post campaign vaccination coverage has improved with 5 states** having reached their target of 95% coverage in 2018 as compared to none after the 2016 campaign.
- All evidence for the quantitative analyses were graded based on the GRADE criteria⁷ (See Annex 10).

C.1 To what extent have the Measles Campaigns for Nigeria (2015/2016 – 2017/2018) achieved their objectives?

Objective 1: To reduce the national measles mortality by at least 95% compared with 2000 estimates

In order to evaluate whether the measles campaign has been effective in reducing measles mortality we analyzed data on reported measles mortality and caseload over time for all age groups. Unfortunately, we were unable to locate mortality data dating all the way back since 2000, and had to base our analysis on data from 2010 to 2015, from the WHO/UNICEF Joint Reporting Forms (JRF) as this was the only data available on measles mortality. Annual data on measles caseload, however, was available from 1995 to 2017 from the WHO Measles and Rubella Surveillance Data⁸. It is worth noting that both measles mortality and caseload is difficult to measure as an increase or decrease in reported cases might be more indicative of an improved surveillance system (better sensitivity or specificity respectively).

⁷ <https://bestpractice.bmj.com/info/toolkit/learn-ebm/what-is-grade/>

⁸ http://www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/active/measles_monthlydata/en/

Figure 2b show the number of reported deaths as a result of measles infection from 2010 to 2015. This graph shows an upward trend in measles morbidity since 2010 with an ‘out of trend’ spike in 2013. This spike concurs with a measles outbreak in 2013 (Figure 2a).

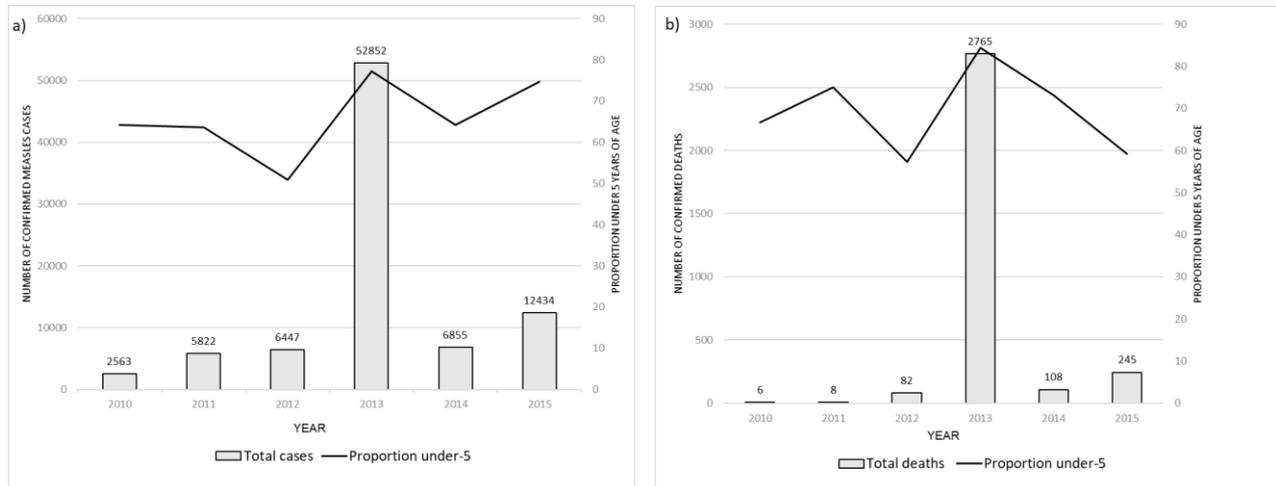


Figure 2. a) Number of reported measles cases and proportion of cases in children under the age of five from 2010 to 2015 in Nigeria. b) Number of reported deaths as a result of measles infection and proportion of deaths in children under the age of five from 2010 to 2015 in Nigeria.

Figure 3 shows the annual measles caseload from 1995 to 2017 as reported in the WHO Measles and Rubella Surveillance Data and includes the timing of the campaigns. Overall, an enormous decrease in measles morbidity can be observed from 2006 onwards, coinciding with the start of measles vaccination campaigns.

Objective 2: To accelerate/support measles elimination targets

The measles elimination target requires a 95% vaccination coverage with 2 doses of measles vaccine either through routine and/or campaign services (NPHCDA 2017). In order to assess the progression towards this goal data from multiple sources were used. First of all, WHO and UNICEF estimates of National Immunization Coverage (WUENIC)⁹ were used to assess the trend in national coverage of measles vaccination (MCV1) through routine services among children aged 12-23 months from 1984 until 2017. Aforementioned data were also used in combination with the timing of the measles campaign to assess whether the campaign had any visible effect on the utilization of routine immunization services. For example, a sudden fall in routine coverage of DTP3 after a measles vaccination campaign might suggest an unintended negative effect of the campaign on routine immunization services (e.g. a lack of motivation for utilization of routine immunization services). Likewise, a sudden increase in routine coverage of DTP3 after a measles vaccination campaign might suggest an (un-) intended positive effect of the campaign on routine services (e.g. increased motivation for utilization of routine immunization services).

⁹ Although the aim of the WUENIC is to provide estimates for immunization through routine services, their methodology is in part based on survey immunization coverage results such as the MICS. However, the immunization coverage from the MICS does not differentiate between RI and SIA services, and therefore the WUENIC estimates are not able to fully isolate immunization coverage through routine services.

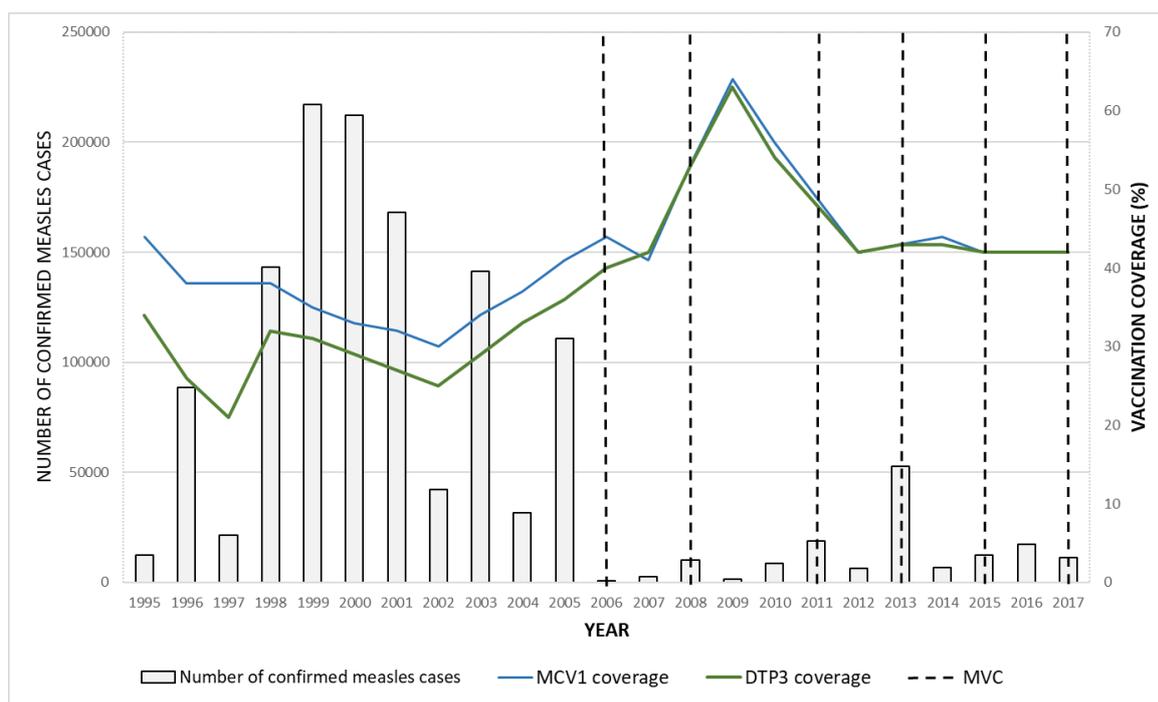


Figure 3. Number of confirmed measles cases among all age groups, WUENIC estimates of routine immunization coverage of MCV1 and DTP3 among children aged 12-23 months and timing of measles vaccination campaigns, Nigeria, 1995 – 2017.

Figure 3 shows the trend in MCV1 coverage through routine services from 1995 to 2017. From the time period 2003 to 2014 the national MCV1 coverage for Nigeria fluctuated between 40% and 65%. In most recent years, since 2012, MCV1 coverage through routine services has plateaued around 41%, which is far below the 95% coverage which is necessary for measles elimination. These data suggest that routine immunization services are not sufficient in reaching 95% measles vaccination coverage.

To assess the effect of the measles vaccination campaigns on national levels of MCV1 or DTP3 vaccination coverage one should look at both the trend *before* the campaign as well as the trend *after* the campaign. For example, after the 2008 campaign we can see an increase in MCV1 and DTP3 coverage. However, looking at the trend *before* 2008, we can see that there was already an upward trend in MCV1 and DTP3 coverage. This makes it less likely that the increase in coverage is the result of a measles vaccination campaign. Overall, the campaigns held in 2006, 2008, 2011, 2013 and 2015/16 did not seem to have influenced the national coverage of MCV1. Only after the 2006 campaign a small decrease in MCV1 coverage was observed. Unfortunately, we could not assess the potential effect of the 2017/18 measles campaign on the national coverage of MCV1 and DTP3 through routine services as WUENIC estimates were only available until 2017.

As mentioned in other parts of this report (C3) the 2017-2018 campaign had planned strengthening the RI in the design and efforts were made to do this. However the evaluation did not provide evidence that these efforts were turned into a sustainable improvement of the RI system due to the limitation in the evaluation timing.

Furthermore, data from the 2015/16 and 2017/18 Post Measles Campaign Coverage Survey (PMCCS) were used to assess the ability of the measles vaccination campaign to reach the zero-dose children which might have otherwise been missed by routine services. Figure 4a and 4b show maps and graphs of the percentage of children aged 9-59 months vaccinated during the campaign for whom the campaign provided their first dose of measles containing vaccine in 2015/2016 and 2017/2018, respectively. The indicator “proportion of total children vaccinated during the campaign who were zero-dose” can be viewed as an indication of the campaign’s effectiveness in terms of providing an opportunity for zero-dose children. Data for this was available for both the 2015/16 and the 2017/18 campaigns. During the 2015/2016 campaign 84.5% of children aged 9-59 months were vaccinated, of which 38.8% for the first time (they were ‘zero-dose’ before the campaign), ranging from 73.2% in Jigawa state to 13.4% in Imo state. This did not change much in the following campaign: after the 2017/18 campaign it was found that 87.5% of children aged 9 to 59 months were vaccinated. Of these, 39.8% had received the measles vaccination for the first time and were zero-dose before the campaign, ranging from 84.4% in Katsina state to 7.1% in Anambra state.

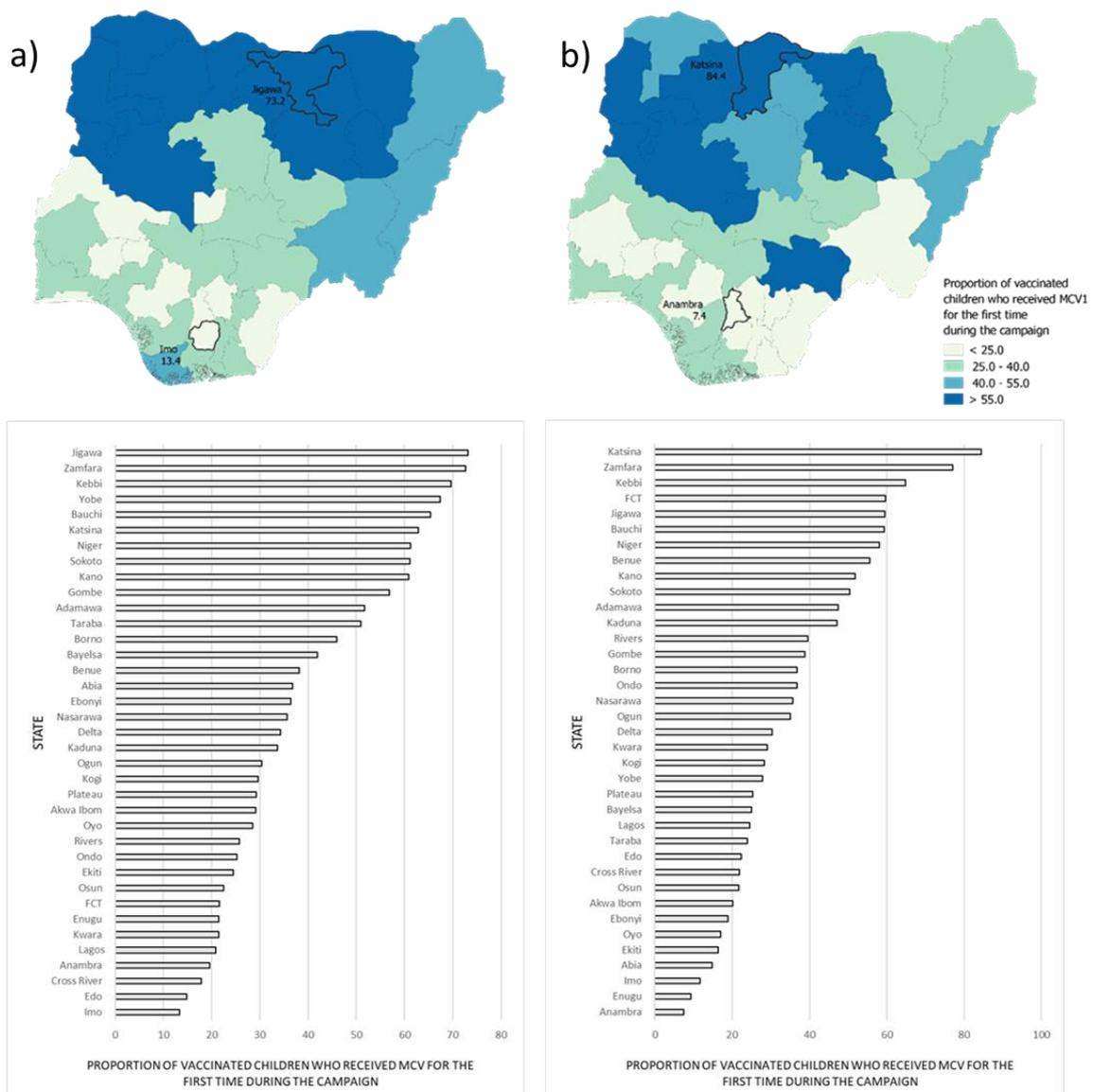


Figure 4. Graph and map with the proportion of children aged 9-59 months vaccinated during the 2015/16 campaign for whom the campaign provided the first dose of MCV in a) 2015/16, and b) 2017/18.

Furthermore, the 2018 PMCCS report provided additional data that allowed for slightly more in depth analysis of the ability of the 2018 measles vaccination campaign to reach the zero dose children¹⁰. We were able to compare the proportion of children between the ages of 9-59 months who had never received MCV through RI or campaigns (based on card or recall) before and after the campaign. Figure 5a shows the proportion of children between the ages of 9-59 months who reportedly had not received MCV before the campaign, either through RI or campaigns (based on recall and card). States in the north west of Nigeria had a higher percentage of 'zero-dose' children aged 9-59 months before the 2018 campaign as compared to states in the south of Nigeria. The lowest percentage of zero dose was found in Anambra (9.6%) and the highest in Katsina (84.3%). Nationally, the estimated proportion of zero dose children has decreased substantially from 45.0% before the 2018 MVC to 11.2% after the 2018 MVC. After the MVC 2018, the lowest proportion of zero-dose children aged 9-59 was found in FCT Abuja (1.7%), and the highest in Kano (24.5%). Figure 5b shows the geographical distribution of zero dose children between the ages of 9-59 months after the 2018 campaign, the pattern that we were able to discern before the MVC 2018 is less evident here. Furthermore, figure 6c shows the percentage point difference between the proportion of zero dose children before and after the 2018 campaign. Highest achievement was made in Katsina, where the estimated proportion of zero dose children was reduced with 76.6 percentage points. In Imo however, the proportion of zero dose children decreased only slightly - 4.1 percentage point - after the 2018 MVC. Overall, states in the North West of Nigeria seem to have higher yield in vaccinating zero-dose children (figure 5c).

Finally, It is also important to reflect on the percentage of zero-dose children who were reached by the campaign. The indicator "proportion of total zero-dose children who were vaccinated during the campaign" reflects a campaigns ability to have an impact on coverage levels and can be viewed as more of an impact indicator. This indicator could only be derived for the 2017/18 campaign. Figure 5d shows the geographical distribution of the estimated proportion of zero dose children aged 9-59 months who were reached by the 2018 MVC and were given their first vaccination. This map indicates that the Northern states were in general more successful in reaching children aged 9-59 months who had not received measles vaccination before the 2018 campaign than Southern states. The lowest percentage of zero-dose children reached by the campaign was found in Oyo state where only 50.6% of children aged 9-59 months who had not received MCV before the campaign, received MCV1 during the 2018 MVC. In Katsina, however, an estimated 100.1% of zero-dose children was reached by the campaign. Overall the two indicators "proportion of total zero-dose children who were vaccinated during the campaign" and "proportion of total children vaccinated during the campaign who were zero-dose" show consistent geographical patterns, with higher coverage of either zero-dose children indicators in the Northern states, and lower coverage in the Southern states. This indicates that in the Northern states, campaigns have more impact on coverage levels in because they are better able to reach zero-dose children.

¹⁰ Unfortunately, the 2016 PMCCS report did not provide data in sufficient detail for this analysis. Furthermore, discrepancies in the 2018 PMCCS data were found which we were unable to verify due to lack of raw data.

During the qualitative part of the research no specific findings on zero-dose children were made. The message for this campaign was: to vaccinate all children from 9 to 59 months (taking the opportunity to provide as well a second dose of measles vaccination). During social mobilization no specific strategy to identify “zero dose” children was made.

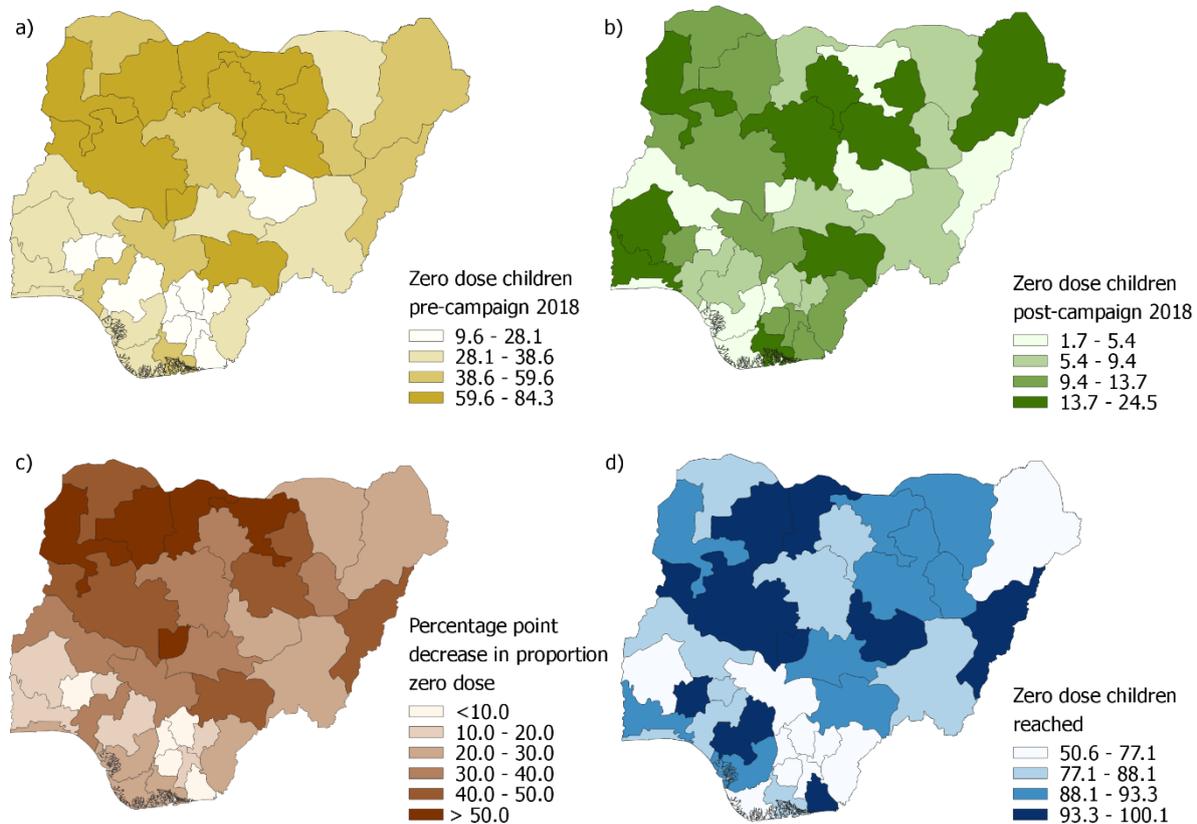


Figure 5. Proportion of children aged 9-59 months who had not received MCV through RI or campaigns a) before the 2018 MVC in Nigeria, and b) after the 2018 MVC in Nigeria, c) the percentage point difference in proportion of children aged 9-59 who had not received MCV through RI or campaign before and after the 2018 MVC in Nigeria, d) the proportion of zero dose children aged 9-59 who were vaccinated during the 2018 MVC in Nigeria.

Finally, an analysis of data from the Multiple Indicator Cluster Survey (MICS) 2016 was performed to assess determinants of non-vaccination for MCV1 for children between the ages of 12 to 23 months. Although this specific analysis does not provide an answer as to whether the recent campaigns have accelerated or supported measles elimination targets, they provide some valuable insight into how future campaigns could better target children. Our analyses focus on both children who are at risk of not being vaccinated as well children who are less likely not to be reached by a campaign. In summary, our analyses suggest that children between the ages of 12 and 23 months are more likely to be vaccinated against measles through either RI or measles vaccination campaigns with increasing wealth status, mother’s level of education and mother’s age at first birth. In addition, children from Hausa ethnicity and children whose mother has delivered her last child at home are less likely to be vaccinated. Finally, state is significantly associated with child’s vaccination. This means that geographical variation exists in children’s odds of being immunized against measles through RI or measles vaccination campaigns. In general, states in north of Nigeria have a lower vaccination coverage than states in the South of Nigeria. More information regarding the results of this analysis

can be found in box 1 and 1 detailed description of the methodology, findings and limitation of this analysis can be found in annex 6.

Box 1: Vulnerability analysis

One of the objectives of the campaign is to vaccinate children against measles who have not received measles vaccinated before. Better understanding of determinants associated with measles non-vaccination could be useful in targeting these so called 'zero-dose' children. Therefore, we have conducted a vulnerability analysis using data from the 2016 Multiple Indicator Cluster Survey. According to the results of the multivariate logistic regression, the following determinants are associated with measles vaccination status (through either RI or measles vaccination campaigns) among children between the ages of 12 and 23 months:

- State: children in northern states are less likely to be vaccinated against measles than children in southern states.
- Ethnicity: children from Hausa ethnicity are less likely to be vaccinated than children from Yoruba or Igbo ethnicity.
- Wealth quintile: the odds on being vaccinated against measles increases with increasing wealth status.
- Mother's level of education: a higher level of mother's education is associated with a lower odds of being vaccinated against measles.
- Mother's age at first birth: children born to mothers aged 35 years or older are more likely to be vaccinated against measles than children born to young mothers (<20 years of age)
- Delivery in health facility: children whose mother delivered her last child in a health facility are more likely to be vaccinated against measles than children whose mother has delivered her last child at home.

Interestingly, most of the risk factors of non-vaccination are predominantly prevalent in the northern states of Nigeria. Furthermore, the results of a multivariate regression analysis to identify determinants that are associated with SIA participation show that children (aged 12 to 23 months and vaccinated against measles through either RI or vaccination campaigns) from higher wealth quintiles and more educated mothers are less likely to participate in a SIA. However, this is not specific for measles SIA's, but SIA in general.

Differences between states were also found, but these are potentially biased by a higher exposure to SIA's.

A detailed description of the methodology and results of both multivariate analysis can be found in annex 6.

In summary, the results of the analysis indicate that children between the ages of 12 and 23 months are more likely to be vaccinated against measles through either RI or measles vaccination campaigns with increasing wealth status, mother's level of education and mother's age at first birth. In addition, children from Hausa ethnicity and children whose mother has delivered her last child at home are less likely to be vaccinated. Finally, state is significantly associated with child's vaccination. This means that geographical variation exists in children's odds of being immunized against measles through RI or measles vaccination campaigns.

Objective 3: To prevent the risk of major outbreaks through immunizing at least 95% of the population at risk in each LGA by 2020

In order to assess whether the campaign has reached 95% coverage, subnational estimates of measles vaccination coverage among 9-59 month old children through the measles campaign in 2015/16 and 2017/18 in Nigeria were obtained from the PMCCS 2016 and 2018. Unfortunately, these data did not provide information on LGA level and therefore the analysis was limited to state level. Nationally, the campaign achieved 84.5% coverage of MCV in 2016 and 87.5% in 2018. State disaggregated coverage

estimates show that none of the states reached the 95% target in 2016 whereas in 2018 five states reached 95% coverage. Figure 6a and 6b show the geographical variation in measles campaign coverage in 2016 and 2018. Furthermore, figure 6c shows the difference between the 2016 and 2018 measles vaccination coverage on state level in percentage points. Here we can see that some states (i.e. Kaduna, Kano, Osun, Borno and Rivers) show a decrease in measles coverage from 2016 to 2018 - although not more than 10% - whereas other states have achieved an increase in measles coverage of over 10 percent points (i.e. Sokoto, Zamfara, Gombe, Nassarawa, Kwara and Bayelsa).

According to the PMCCS 2016 the national vaccination coverage of MCV through campaign among children aged 9-59 months was 84.5%. Interestingly, the MICS 2016 - which measures the MCV vaccination coverage of 12 to 23 month old children through either campaign or RI – reported a coverage of 42.0% nationally. This substantial difference in vaccination coverage can in part be explained by methodological differences such as different age groups and source of vaccination (table 8). However, it is unlikely that these methodological issues fully explain the difference in coverage found between the two surveys. Another important factor is the timing of the survey, data collection for the MICS 2016 survey was carried out approximately 7-11 months after the measles vaccination campaign and PMCCS survey were executed. As a result of this, a considerable number of children who were not eligible for vaccination during the campaign would have become part of the MICS cohort and be counted amongst the non-vaccinated children.

Table 8: Comparison of PMCCS 2016 and MICS 2016.		
	PMCCS 2016	MICS 2016
Outcome - result	84.5%	42.0%
Outcome - definition	MCV vaccination coverage through 2016 measles vaccination campaign among 9-59 month old children in Nigeria, 2016.	MCV vaccination coverage through campaign or routine services among 12-23 month old children in Nigeria, 2016.
Field work	January 2016 - February 2016	September 2016 – January 2017

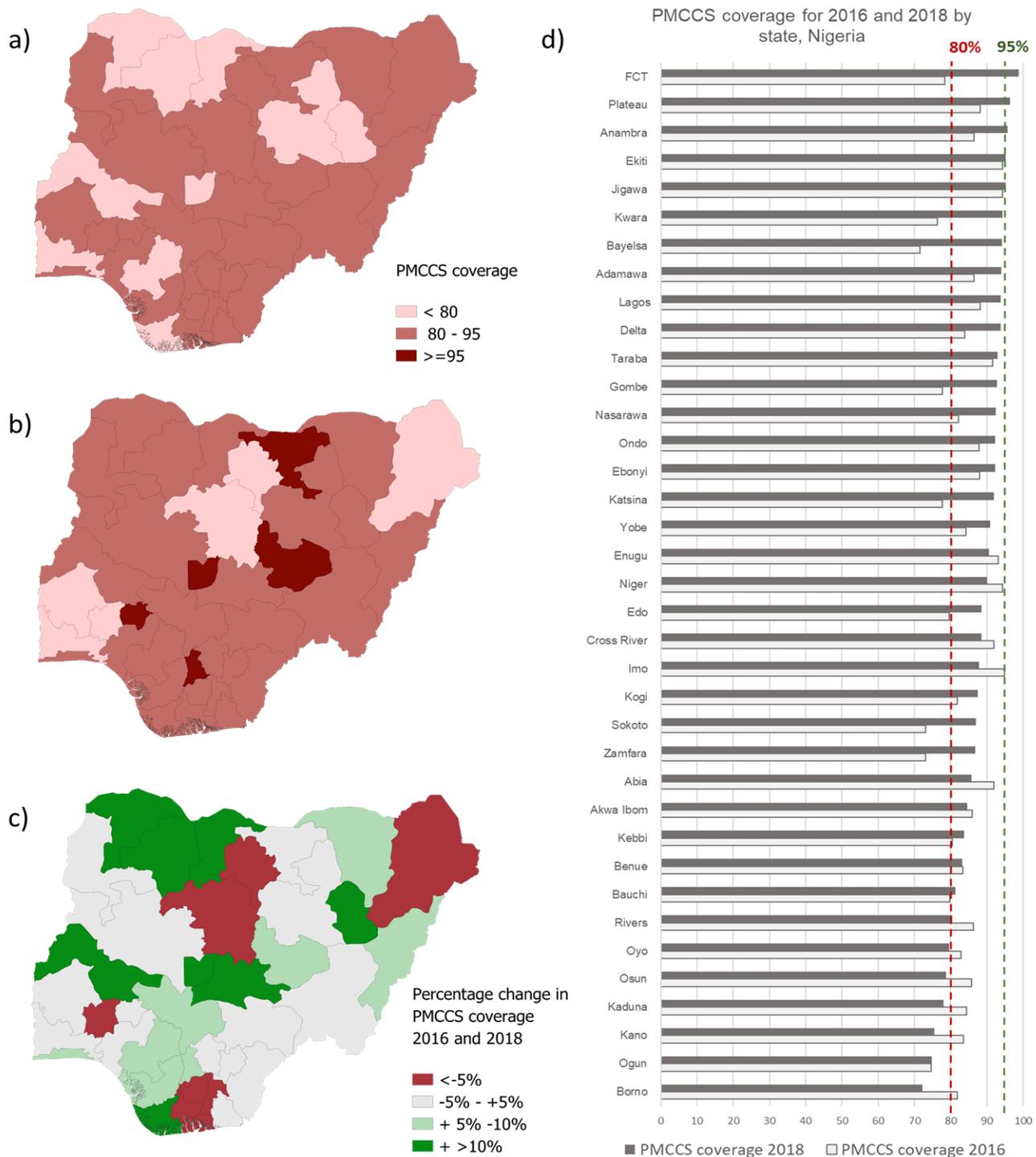


Figure 6. State level MCV coverage among children 9-59 through 2015/16 measles campaign (a), 2017/18 measles campaign (b), the difference in coverage between the 2015/16 and 2017/18 measles vaccination campaign (c) and a graph showing the 2016 and 2018 PMCCS data (d).

To evaluate whether states with a low vaccination coverage also suffer from higher incidence of measles, we analyzed the relationship between these two indicators visually with a scatter plot (figure 7) and a map (figure 8). Data for 2016 was used as this is the only year for which coverage and incidence data are both available. From figure 7 we can see that with increasing vaccination coverage the incidence of measles decreases. This indicates that states with a higher coverage experience fewer measles cases than states with a low coverage.

Figure 7. Measles incidence per 1,000,000 population and measles vaccination coverage through RI or campaign service among children aged 12-23 months, Nigeria, 2016.

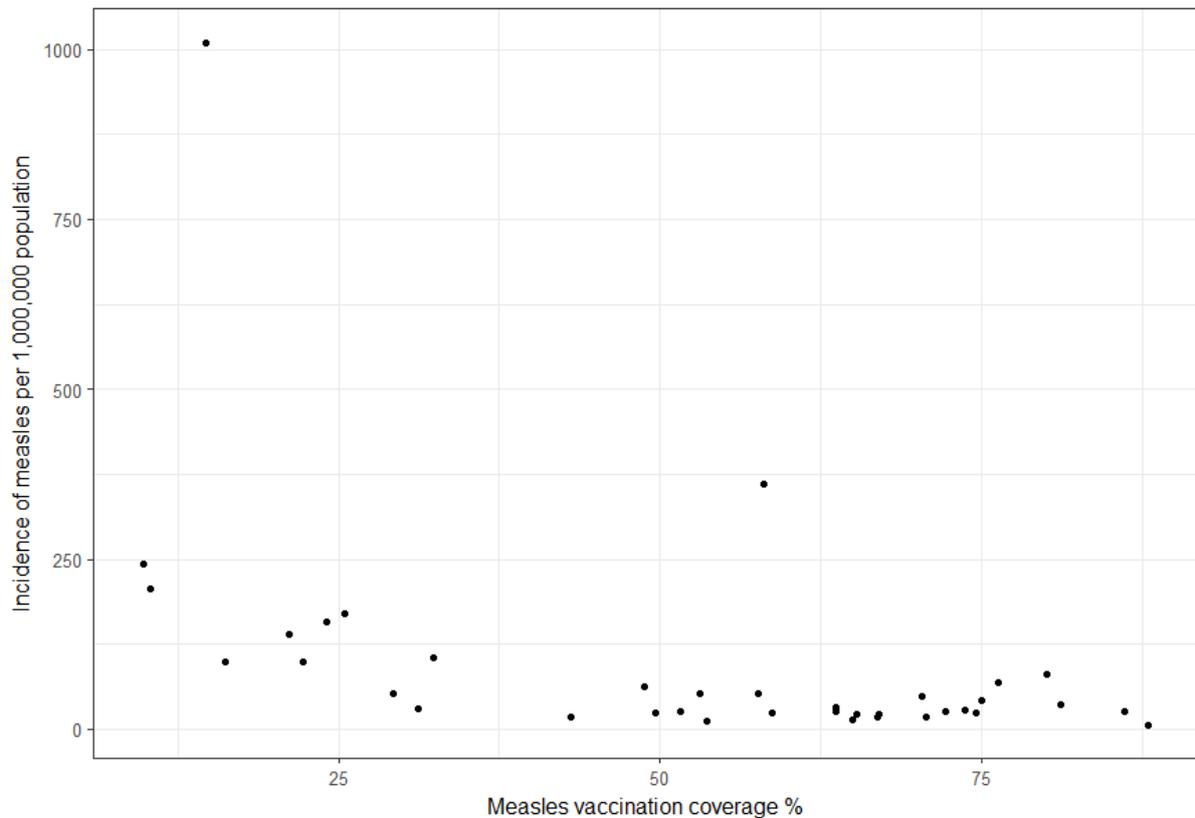


Figure 8 confirms aforementioned findings. The blue circles represent the incidence in a given state, and their size is proportional to incidence (the larger the circle, the higher the incidence) in 2016. In addition, the map shows measles coverage by state with light colors representing states with a low coverage and darker colors representing states with a high coverage. We can see that most of the larger blue circles are in states with lower vaccination coverage. Especially Yobe state had a high incidence in 2016 according to this map, but also Sokoto and Borno state suffered from relatively high measles incidence in 2016, which can partly be explained by the low vaccination coverage of these states.

The relationship between measles vaccination coverage and incidence can be quantified by fitting a Poisson regression model. The results of the model can be found in table 9 and should be interpreted as follows: A one percent increase in vaccination coverage is associated with a 3% decrease in incidence of measles. This corresponds to an incidence rate ratio (IRR) of 0.97. An IRR below 1 suggests a negative association (i.e. a decrease in incidence associated with decrease in coverage), and an IRR above 1 suggests a positive association (i.e. an increase in incidence associated with an increase in coverage). While this overall figure provides a good approximation to quantify the relationship between measles incidence and vaccination coverage, a careful inspection of the input data (Figure 8) reveals that association between the measles coverage and the measles incidence is not linear: there is a steeper decrease in incidence of measles when coverage is increased starting from very low levels, but this decrease levels off at higher levels, i.e. when approximately 50% and 60% coverage has been achieved. This hypothesis was tested by adding an interaction term to the model and by comparing the fit of that model to that of the original model using a log likelihood ratio test. The latter suggested that there is indeed a significant difference in the association between vaccination coverage and measles incidence after 50% to 60%. In other words, an increase in coverage leads to a smaller decrease in incidence after a vaccination coverage around 50% to 60%.

Table 9: Results of Poisson regression model of the association between measles incidence and measles vaccination coverage 2016		
Change in coverage*	IRR (95%CI)	% Change in incidence
1%	0.97 (0.97 – 0.97)	3%
5%	0.86 (0.85 – 0.86)	16%
10%	0.74 (0.73 – 0.75)	29%

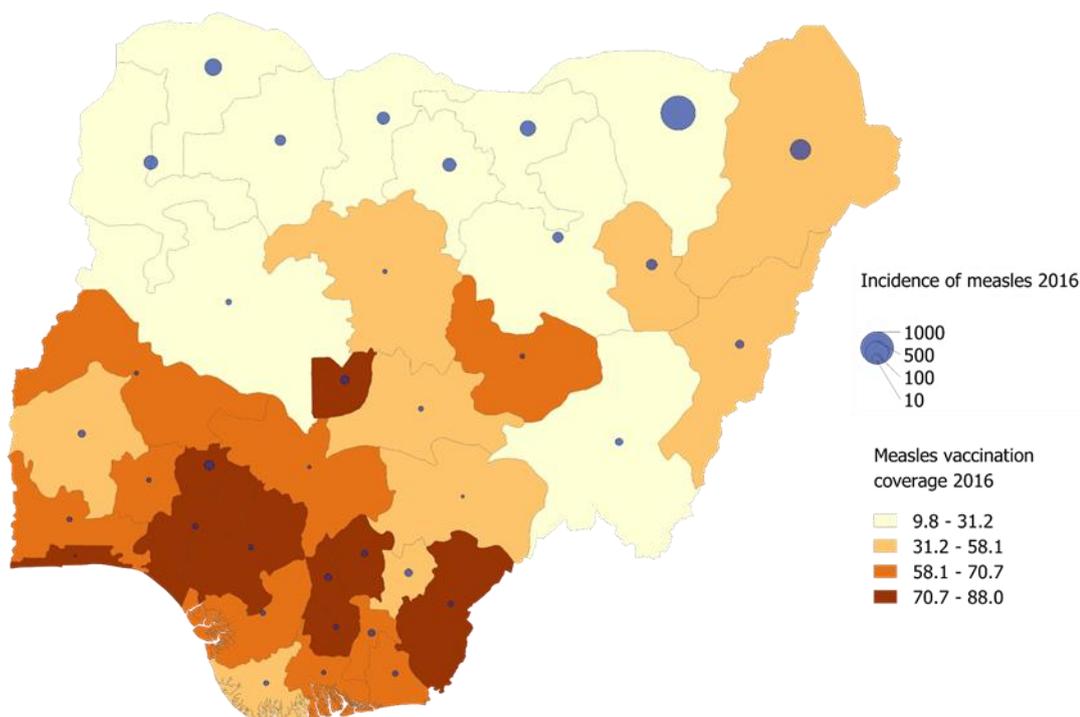


Figure 8. State level coverage of MCV through RI or measles vaccination campaigns among children aged 12-23 months old in 2016 (MICS) and incidence of measles per 1,000,000 population in graduated symbols.

C2: To what extent did contextual factors (e.g. concurrent immunization activities) explain these outcomes?

Are the outcomes associated with socio-economic status and other contextual elements?

The quantitative analysis provided already insight into this question however, there are also qualitative perceptions by stakeholders how individual factors influence the utilization of the vaccination services.

The stakeholders perceived **coverage** as better in the southern states than in the northern states (in line with the quantitative findings) – a statement made sometimes in reference to perceived unfairness of funding:

“The best state in the north was poorer in coverage than the worst state in the south yet in the north money flowing into immunization in one LGA is more than what more than the money flowing into immunization in one state in the south”. Imo stakeholder.

However, there is **no reported perception of difference in utilization** related to socio-economic status.

In Gombe state, the Hausa **ethnic group** were perceived by the key informants as the ones that rejected immunization more than the rest. In Oyo state, children of the non-indigenes, the Igedes utilize immunizations less than the indigenes – these Igede people were usually averse to immunization and sometimes, the language barrier exacerbated their non-compliance.

In Oyo state were reported challenges in reaching all the target population in a community in Afijio due to their **nomadic characteristics**:

“This community is quite large, the Fulani within this community are nomads, they stay in different settlements, they don’t stay at a fixed place. These Fulani settlements are about four or five and are far apart, that is the reason why not all the children have been reached”. WDC member, Afijio

In Edo state more frequent reports were made of rejections from schools and churches from the urban area compared to the rural area. This may be due to more cohesive nature of the rural LGAs, which make them more amenable to the direction of their traditional and religious leaders - a finding seen in the community FGDs. An issue in the urban areas was that the number of churches and schools was very fluid and observance of advocacy and social mobilization protocols for all of them was not always feasible/ or done.

C3. What have been the unintended (positive and negative) consequences of the campaigns (2015/2016, 2017/2018) on the overall immunization system, such as its delivery strategies (outreach, routine, financial incentive) and components (cold chain, staff, transportation) at all levels?

1. How have the campaigns affected the NPI (routine and outreach services)?

The 2017 measles vaccination campaign plan (NPHCDA 2017a) explicitly states that the country strives to use the measles follow up campaigns as an entry point to strengthen routine immunization. Furthermore, the plan states that since 2005 Nigeria has conducted several SIAs (including 5 measles and 4 rounds of Maternal and Neonatal Tetanus Elimination (MNTE) and Meningitis A campaigns) and that these further strengthened immunization- and the broader health system through improved health worker knowledge and skills, cold chain and vaccine management, laboratory and surveillance as well as planning and coordination at the lower levels. These SIAs played a significant role in the establishment of AEFI surveillance structures and systems that are now being incorporated into the routine immunization systems. It has also supported the establishment of waste management system with supplies and installation of incinerators.

Based on the interviews almost all stakeholders related to the organization or implementation of the measles vaccination campaign agree that the campaigns contribute to the routine immunization system for the following main reasons 1) awareness creation among community for RI; 2) awareness creation among stakeholders for better cooperation, collaboration and communication; 3) better understanding of the number of children in area and commitment to stakeholders to reach every ward; 4) improved availability of materials, e.g. availability of reporting materials, data tools and it strengthens cold chain 5) training of health workers basic concepts of vaccination

“This immunization educates everybody because most of our men don’t even know that children are being immunized against measles” – Young women, Shonghom LGA, Gombe State

“Well positively because we are having better coverages, creating more awareness, more materials for the cold-chain, better tools are being brought in, more hands are being trained and retrained” – Stakeholder, Edo State

“We tell them and we tell the vaccinators, always ... tell the care givers that routine immunization is always on. It is part of this campaign. They should still bring their children for routine immunization, that it is very important.” – Religious leader, Igueben LGA, Edo State

“Well, it has impacted as in largely, as in the coverage is more because there are so many mothers that are defaulters, so when we go out like this during campaign we see them, so we try to encourage them to come back or what we did, we collect their phone numbers, so we call and try talking to the mother to bring their children to the clinic if the child have missed any routine immunization, so the campaign is really helping, because after the campaign people still keep coming you still see mothers in the health facility, like my child hasn’t been given, you give them” – Stakeholder, Erodo LGA, Edo State

“Actually, the detailed micro planning help the RI providers to get to know more of their communities and also since the caregivers don’t have to work more than 1km, so this gives the RI provider the opportunity to know communities were they could go for outreaches and mobile outreach sessions. Also it gives them a better opportunities because SIAs are used to strengthen RI sessions so this also give them better coordination and better mobilization for their RI session, every mother whose child is vaccinated is reminded of the routine immunization and were they could get them so it creates more awareness”. – Stakeholder, Erodo LGA, Edo State

“We utilizing this campaign to sanitize people on the antigen RI, we use it to sensitize the religious leader, school, agriculture unit, education unit etc.” – Stakeholder, Chanchanga LGA, Niger state

However, despite all these sayings of various stakeholders, none of the users (parents of the children) mentioned during the Focus Group Discussions that they heard the message of bringing their children to RI during the campaign.

RI continued during the campaign, except in Shonghom LGA and Gombe state, and different experiences are reported. A mobilizer explains that team is divided in two, one stays at health facilities to attend all other health issues while the other team is concerned with campaign. On the other hand a vaccinator says health workers carry out normal activities.

The majority of stakeholders report there are no effects on routine health services (outside of immunization). Except the SIO in Edo state reports that due to the campaign, health facilities get overcrowded. Young women in Gidan LGA in Sokoto state also report that some facility workers are in different location for the campaign.

“They are at the health post, some of them are busy with the campaign moving out to the locations.” Religious leader, Onuimo LGA, Imo State.

Some stakeholders indicate negative effect of campaigns on RI, e.g. SIO in Imo state says that people think campaigns have replaced RI and that it costs a lot of money. Furthermore, people may think that immunization now comes to their front door.

“The measles campaign affected the routine immunization in some areas, but in like urban areas were we have enough health workers, not all of them would go for the campaign, some of them would be in the health facility and they routine would be continued.” – Stakeholder, Niger State

“So the north is over dosed with these supplemental activities to the extent that, they now think that supplemental activities is the immunization, no mother in the LGA is going to her facility to immunize their child. They said they will go house to house, forgetting that house to

house only given for polio vaccine. So it now landed us Nigeria in problem in were they are now today. A situation was the country is not up to more or less about 30% in Nigeria coverage because everybody was concentrating on campaigns abandoning routine immunization. So that's the issue." Stakeholder, Imo State.

"Except in some rural communities, because in the state or I can say national we have issues regarding skilled health workers, that is those that would man the health facilities, so for some rural health facility now maybe you have 2 qualified health workers or even some you may have one health qualified worker managing the health facility, so during this campaign, the guy or the lady is been engaged either as a vaccinator or as a team supervisor for this measles campaign, you see that the routine has already been affected because there is nobody to deliver the routine immunization and is not every child that is been given the measles, is from 9, so what happen to those that were below 9 months, so you see that it has affected it" - Stakeholder, Niger stage.

"You know some people they prefer when they come to their front door; that is closer to them for them to collect their vaccination. So that might be the only negative side of it." - Stakeholder, Chanchaga LGA, Niger State

Few higher-level stakeholders indicate it is not possible to evaluate the effect now, as it needs time to know the outcome.

"You know we cannot tell about that now, except after the campaign we see how RI has gone up, that is when I can answer that question." Stakeholder, Erodo LGA, Edo State

2. What were the unintended positive consequences of the campaigns at national, LG, ward and community levels?

The desk review did not found any information on unintended positive consequences of the campaigns at national, state, LG, ward and community levels.

The qualitative interviews revealed some unintended positive consequences. At ward level, improved vaccinator education and practice encouraged movement of waste from RI posts and vaccination of children due for other vaccinations (penta2, penta3) was reported. At community level, unintended effects were raised awareness of health facilities, awareness creation among other health related topics and the campaign initiating dialogue with key stakeholders in the community. For example, one school in Edo state used the opportunity to lobby for increased health education in their school.

3. What are the unintended negative consequences of the campaigns at national, state, LG, ward and community levels?

The desk review did not found any information on unintended negative consequences of the campaigns at national, state, LG, ward and community levels.

The qualitative interviews revealed some unintended negative consequences. At state and LGA level, some stakeholders said immunisation activities hurt routine staffing at facilities in Edo. At ward level, health workers are forced to adopt 'Staggering' of wards. This means that when vaccination areas were hard to reach using participants own mode of transportation and increased "stress" on health workers to meet their targets. At community level, it was reported that there were possibilities of AEFI deters caregivers from bringing children for vaccination and lack of follow up responsibilities for community leaders. Furthermore, there were several campaign rumours like those that vaccination

was used to harm children and control the population, possible over dosing with SIAs in the North and the fact that populations see no need to go to the hospital for immunization again.

No unintended positive or negative consequences of the use of incentives were observed. The experience with incentives are described in chapter B2.

C4: To what extent has motivation of health system staff at all levels influenced the outcomes of the campaign?

The community is observing positively the organization and the professionalism of this campaign:

“There is an improvement in this campaign, there are now professional health workers unlike before that the health workers are not accommodating and lack of experience but we are all happy now.” and “Previous campaigns they lack orientation, but the staffs involve in this year 2017 campaign really handle our children with care” are saying from the FGD SOKOTO-BODINGA-YOUNG WOMEN (15-39).

This observation was made in nearly all states: vaccinators and mobilizers showed motivation for the work they do and had a good attitude towards the community.

Another ward Development Committee member in EDO State mentioned that the punctuality is much appreciated:

“Yes, that’s what i told you, the community they were excited, we love this very one now. Like in those days, a mother will sit in a place waiting for the nurses, you cannot see the nurses, they we tell you by 9 am they have not see them but this programme now, 7 o’clock you come to their hospital you will see nurses there , they resume work 7 and close that kind 2-3pm, so this one is the best, i continue giving them kudos”.

Incidentally there was also criticism towards health workers:

“Tanks, from NPHCDA also commended the focal person in ward wasn’t doing good job stating that the staff don’t use to turn up early to place of assignment, he said he met only 2 persons on field and it took time before others came out for work. He said most of the male focal persons are not serious with their work stating that the women does it better than the men,” according to observation notes during a review meeting in Gombe.

Further investigation is needed for the long-term efficacy of financial compensation to campaign participants as a motivator, “they were paid, so they have the motivation, a mobilizer of Niger state.

C5: What are the consequences of the changed institutional setting for the Measles Campaign 2017-2018

1. What are the advantages and disadvantages of having the measles campaign outside the NPHCDA, and being located in the PEOC for the current campaign?

The Measles Campaign staff is for the 2017/2018 campaign hosted in the same building as the Polio Vaccination Campaign staff. This is perceived as positive by the measles campaign staff as it resulted in an extensive exchange of information with regard to communication methods, available data and data analysis and management (how to make results visible for all in graphs etc.) as a result of this leading to new methods and tools

Various strategies to ensure that every child is reached including intensified health education and social mobilization; microplanning with communities were strengthened through this formal and

informal exchange of information by “living together” leading to a more continuous discussion of these strategies were discussed with the Polio Campaign staff.

2. What does this mean for the sustainability of the campaign and the RI services?

The in-housing of the measles staff at the polio campaign is perceived by the measles team as positive with regards to sustainability of the campaign. When financial means go down they can continue to partner up with them on issues like microplanning sessions, distribution channels etc. However if this will be at the benefit of the routine Immunization or only at the benefit of the measles campaigns is doubtful. The evaluation team felt, although interviewed staff at Federal level all agreed that RI is a very important vehicle to have a high measles coverage, and that the campaign staff is part of the “measles desk” the energy went into the campaign and discussions were focussed on campaign methods and management. This can be provoked as the evaluation was performed during the campaign and not after the campaign. After a period of a few months the campaign staff may have more time to reflect on the interaction between the campaign and the RI.

A positive finding is that, although delayed, the draft of the Measles Elimination Strategic Plan 2017-2020 (campaign and RI combined) was submitted in February 2017, but not yet approved. This strategy provides a SWOT analysis of the measles vaccination campaign and of the RI services.

Some stakeholders in the field complained that there was too much attention for the campaign and too few for advocacy around RI activities illustrating that the need for integration of the measles campaign and RI is felt at field level.

“I prefer routine immunization and this one will cost the government money to create awareness but when the mothers are used to health center in their area they can go there at any time to vaccinate their child is better than this once in a while or move around immunization.” - Oyo Ibadan – religious leader

3.4 Lessons learned

D1. What are the lessons learnt from the 2015/2016 and 2017/2018 Nigeria measles campaigns?

To avoid repetition in the report we present the lessons learned in chapter 5 ‘lessons learned and recommendations’. The lessons learned of the 2015/2017 campaign have also been discussed in detail in section 3.1 under question A1-1 ‘To what extent have lessons learned from previous immunization campaigns and specifically measles vaccination campaigns been incorporated in the design and planning?’

Chapter 4. Conclusions

This chapter summarizes the conclusions according to the evaluation objectives to assess: 1) the quality; 2) the impact on the routine immunization and 3) the integration lessons learned of the campaigns. For each objective we will conclude on the findings related to the design, implementation and outcomes of the campaigns in line with the evaluation framework. In the next chapter, chapter 5, we will discuss the measles vaccination campaigns according to the DAC criteria for evaluation.

Objective 1) To assess the quality of the recurrent measles campaigns

The evaluation team was impressed by the **design**, planning, organization and **implementation** of the nationwide campaign of 2017-2018. A detailed guideline based on international examples was available, it was timely planned, and a high commitment of health and community workers at all levels in the systems was observed. Monitoring and supervision was well organized and management of logistics, despite many challenges, had improved by former years. Most of the questions from the evaluation framework with regard to the quality were answered in a positive manner. The qualitative evaluation provided clear evidence that the plan was not a “paper plan” but an approach used everywhere in the country, with a high level of technicality, supported and implemented by motivated stakeholders. The 2017-2018 campaign was **perceived by the community as a well-organized**, implemented by professional health workers with a friendly attitude. The community leaders were satisfied with their inclusion in the (micro) planning, the social mobilization strategies were successful and there was a clear division of roles and responsibilities during the implementation of the campaign. The health workers involved observed a well-coordinated support and supervision from the higher levels in the system. However, the communication from higher level in the systems to changes in the campaign could be improved.

In terms of **effectiveness**, the campaign it did not bring the expected result of 95% coverage. Only five states reached this coverage and a wide variation was seen among states. The quantitative analysis gave some indications on the variations of MCV1 across areas. Northern states have a lower MVC1 than southern states with children between 9-59 months. This can be explained by other findings showing that children who are at risk of non-vaccination – ethnicity related, low education of mothers, younger mothers, home deliveries and low wealth quintile - are more prevalent in the Northern states. As a result these states have a higher risk of measles outbreaks (an increase in vaccination coverage was associated in the quantitative analysis to a decrease in measles incidence).

The **overall goals** of the 2017-2018 campaign included two aspects in relation to the target group: 1) achieve $\geq 95\%$ national measles vaccination coverage and reach all targeted children and 2) Use the opportunity provided by the follow-up measles campaign to reach previously missed children with one dose of measles vaccine by leveraging the polio campaign strategies. No specific attention for identification and targeting zero dose children was included in the design. Nationally, the estimated proportion of zero dose children has decreased substantially from 45.0% before the 2018 MVC to 11.2% after the 2018 MVC, but a variation of decrease is observed between states. Highest achievement was made in Katsina, where the estimated proportion of zero dose children was reduced with 76.6 percentage points. In Imo however, the proportion of zero dose children decreased only slightly - 4.1 percentage point -

The **equity-gap** between children in the northern and southern part of the country has decreased but continues to exist after the measles vaccination campaigns. In the northern states are found more “zero dose” children. However health seeking behavior seems to differ between the northern and southern states, observing that in the north children are more vaccinated through campaigns, making

the likelihood that the number of “zero dose” children in the North had been higher in the absence of measles vaccination campaigns.

With regard to **impact** great reduction in measles caseload has been achieved before and after 2006, which also marked the first year of the measles vaccination campaign. It is important to point out that these observational analyses based on time-trends only cannot be used in isolation to attribute positive or negative effects to the campaigns. However, they can still be useful as part of the broader body of evidence which this evaluation aims to produce.

The 2017/2018 used several innovations that are perceived successful by stakeholders and these are highlighted in table 10 below.

Table 10 Overview of innovations used in the 2017/2018 campaigns	
Innovation	Description and reported value
Polio team design	The design of the polio vaccination campaigns were used to structure the measles vaccination campaigns. It was considered efficient by stakeholders to build on existing structures rather than building it from scratch. For example the measles campaign staff for the campaign of 2017/2018 ‘moved out’ of the main building of the NPHCDA to the annex building where the Polio Campaign Staff is hosted. This hosting in led to cross-fertilization between the two teams. For example: 1) use of polio data to identify low performing LGA; 2) polio strategies used for advocacy, communication and community mobilization and 3) based on polio activities in the Northern States the GIS was selected to calculate the estimated target population.
Microplanning	Microplanning is perceived by all stakeholders as an important method to develop a local plan based on local realities. The involvement of the traditional rulers and village heads in microplanning was perceived by many stakeholders as having improved the identification of vulnerable children thereby reducing the chances of missing children in the campaigns.
ODK software	ODK software (android) was introduced to monitor the progress of the campaign and to provide quick support if needed. During the preparation, results of micro plan validation activities were recorded in ODK and transmitted to the national level for analysis. At ward level, the pre-implementation checklist is filled and these data are collected using ODK and submitted in real-time, at several time points before the campaign. Furthermore, the supervisor fills the implementation checklist in ODK (and paper) and send it to NPHCDA for analysis. Payment was given out in various ways depending such via cash, e-payment or ‘VAT cards. Further ODK software was used to monitor both the payment of transport allowances and specific amounts disbursed to the field teams. The use of ODK was mentioned various times as being helpful for supervision monitoring and reporting, and as such helpful to communicate and address problems quickly. ODK improved accuracy of data and thereby the efficiency of the campaign. Daily uploading allowed the national stakeholder to get real time information on the campaigns and give prompt directives where necessary.
What’s app	During the evaluation the team has not observed in how far all the notes of review meetings, the exchange on What’s App and information of the ODK are analyzed and made to a comprehensive overview on lessons learned. This is “an after campaign” exercise and as such could not be observed. WhatsApp groups were used at ward level to share what was happening (including pictures).
GIS and line listing	For the North, based on polio activities, GIS estimates were selected as the basis for the operational target population estimates. Line listing (“Walk through”) of all children eligible for vaccination campaign was used in the South.
House-to-house mobilization	An intensive social mobilization strategy was developed and started earlier in time compared to former campaigns. This was perceived as an improvement over the previous campaigns by stakeholders. A key addition was the house-to-house mobilization that did not exist in previous campaigns and was perceived as a major driver of success.

Staggered implementation	Staggering, meaning a phased implementation of the campaigns across LGAs, was appreciated especially to address the HRH shortage in some LGAs and as a second opportunity for children who missed the first round of vaccination.
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Objective 2) To assess the effect of the recurrent measles campaigns on the routine immunization system

Although the **design** of the campaigns clearly incorporated elements to strengthen RI, e.g. increased competencies of staff due to the training provided, increased cold chain equipment, waste management, the evaluation could not assess whether this has indeed improved after the campaigns due to the limited time frame and design of the evaluation. The evaluation did not include any before and after 2015/2016 and 2017/2018 campaigns assessment of the routine immunization system regarding the above-mentioned elements. Moreover, it is too early to assess the long-term effects of the 2017/2018 campaign. Still the evaluation gives some indication about the effect on RI and this was mainly related to the **implementation** of the campaign. Based on the qualitative study stakeholders see some positive effects on the RI system namely 1) awareness creation among community for RI; 2) awareness creation among stakeholders for better cooperation, collaboration and communication; 3) better understanding of the number of children in area and commitment to stakeholders to reach every ward; 4) improved availability of materials, e.g. availability of reporting materials, data tools and it strengthens cold chain 5) training of health workers basic concepts of vaccination. If these potential effects will sustain after the campaigns should be followed up later. However, awareness raising on RI of the community during the campaign was not be confirmed by the community during the FGDs. Furthermore stakeholders did not recall if during post- campaign reviews discussions on measures needed to ensure and strengthen continuity between campaigns and routine immunization were included. In terms of **outcomes**, the quantitative analyses did not provide evidence that routine measles coverage increased due to the campaigns. No suggestive pattern of an increase in coverage of measles nor DTP vaccinations after measles campaigns up to 2015/2016 was observed. The effect of the 2017/2018 campaign on routine measles and DTP vaccinations is yet unknown as it is too early to make this assessment.

Objective 3) To assess the extent to which the campaigns integrate lessons learned from previous campaigns into their respective design, planning, implementation and post-campaign states in Nigeria.

Lessons learned during the former campaigns were all integrated in the **design** of the 2017-2018 campaign (see table 6). These lessons were well communicated in the campaign plans and guidelines and were known by the implementers at state LGA and ward level. There is clear evidence that campaigns were indeed improved based on the lessons learned from the past. State and local government stakeholders as well as partners highlighted that the 2017/2018 campaign was improved on the components on planning especially the microplanning and staggered approach, social mobilization strategies (house to house), accountability, training, supportive supervision and documentation and reporting of vaccinated children.

The close cooperation with in country platforms and local stakeholders have contributed to the capability of the campaign to 1) reach many children (involvement of religious/ traditional/ community leaders and the local education sector and using methods from the polio vaccination campaign and 2) contributed to the (perceived) quality of the campaign and motivation of local stakeholders, due to the intense supportive supervision at state and LGA level from partners such as AFENET, WHO and UNICEF.

In the **implementation** the evaluation team concludes that there is a culture across all levels involved in the campaign to continuously pointing out lessons learned for improvement. At national level the

design of the 2017/2018 was based on lessons learned of the past and improvements were made and implemented. At state, LGA and ward level an attitude was observed among stakeholders to reflect on lessons learned and continuously solve problems. The majority of stakeholders at local level could easily list lessons learned from the past, the pre implementation checklist was used and the review meetings were instrumental to list challenges and make improvements accordingly and waste management. The use of new methods as ODK software for monitoring and reporting was appreciated by all stakeholders

Chapter 5. Discussion

In this chapter we will discuss the **relevance, effectiveness, impact, equity, efficiency and sustainability** of the campaigns in the context of Nigeria, as defined in Chapter 1. We will use literature from other setting and discuss alternative options in order to eventually provide recommendations to Nigeria that is now in the phase of preparing for the next campaign.

Relevance

In 2017 the estimated national immunization coverage for MCV1 through routine services was 41%, while the target for elimination lies at 95% (NPHCDA 2017). This suggests that measles vaccination campaign – if executed well – might be a necessary strategy to boost measles vaccination coverage and by doing so accelerate achieving measles elimination targets in Nigeria. This follows the opinion of WHO mentioning: “Routine measles vaccination for children, combined with mass immunization campaigns in countries with low routine coverage, are key public health strategies to reduce global measles deaths.”¹¹ As such, the campaigns are still relevant.

Substantial variation can be found between states in the proportion of children aged 9 to 59 months who had received measles vaccination for the first time during the campaign. The data show that, in some states, the measles vaccination campaign reaches many ‘zero-dose’ children who were not vaccinated through routine services. This indicates that measles vaccination campaigns have the ability to boost up vaccination coverage by vaccinating many children who might otherwise be missed by routine immunization services in various states such as: Ziguinchor, Ziguinchor and Kebbi. In other states however, the additional yield in vaccination coverage through these campaigns might be less, as only a small proportion of children who were vaccinated by the campaign had not received measles vaccination before. Examples of such states are: Anambra, Cross river, Edo, Enugu, Imo, Lagos and Osun, which all had less than 25% zero dose children in both 2016 and 2018 campaign. In these states the measles vaccination campaign probably only make a minor contribution in accelerating the progression towards measles elimination. These states might benefit more from a targeted approach in which communities with a certain risk profile are directly targeted. This is also supported by the vulnerability analysis which provides evidence that vaccination status of children is associated with specific determinants such as: state, ethnicity, wealth quintile, mother’s level of education, mother’s age at first birth and delivery in a health facility.

Minetti et al (2013) evaluated the effective impact of the mass measles vaccination campaigns in Malawi and explored the efficiency of a nonselective campaign versus targeted vaccination in populations with heterogeneous access to mass vaccination campaigns. It is questionable if in a mass campaign the “zero dose” children who never received a measles vaccination before had the same chance to be reached as other children. Children who are regularly using the RI are traced relatively easy, they are known and adhere to services. “Zero dose” children are may be unknown to the health system and more difficult to find and convince to be vaccinated. The authors conclude that selective campaigns targeting hard-to-reach individuals are of greater benefit, particularly in highly vaccinated populations.

The quantitative analysis of this evaluation shows a vulnerability assessment method to identify where most “zero dose” children will be found. Also Portnoy et al (2017) examined in 14 countries how measles vaccination campaigns would strengthen measles control efforts and achieve their objective by identifying the zero-dose children reached compared with those children previously reached by routine vaccination efforts. This enables better assessment of the “real-world” impact of routine vaccination and measles vaccination campaigns efforts in achieving the worldwide goals of measles control and elimination.

¹¹ <http://www.who.int/immunization/diseases/measles/en/>

The question can be raised whether all children need to be vaccinated in the entire country during the campaign in order to reach a coverage of 95% MCV1. The quantitative analysis showed a wide variation of use of vaccination services in various parts of the country, suggesting that in part of the states people do use RI while in other parts services are more used when these can be accessed through a campaign (e.g. polio, child health day's campaigns).

Effectiveness

The expectations regarding the results of this campaign were high. Efforts to design and implement an effective campaign in close cooperation with a broad range of stakeholders -including the Gavi partners at national level-, based on lessons learned, with innovative approaches such as “learning from the polio campaign” at federal level, the counterpart funding at state level, the staggered approach at LGA level and the house-to house mobilizers and the line listing at ward level, were expected to lead to a high measles vaccination coverages.

Comparison of the 2016 and 2018 PMCCS shows that slight improvements have been made in terms of campaign vaccination coverage among children aged 9-59 months old. Overall, campaign vaccination coverage increased with 3 percentage points but only five states have achieved 95% of higher coverage. At this rate, it is unlikely that in 2020 95% coverage will be achieved in all states. Nevertheless, efforts should continue to keep up the vaccination coverage as the data further testifies that a low vaccination coverage – via RI or measles vaccination campaigns – is associated with higher incidence of measles.

It is important to point out that the coverage estimates as presented by the PMCCS 2016 and the MICS 2016 show a great difference and the coverage estimates (MICS estimates are much lower). This can in part be explained by methodological differences between the two surveys as described in the results section (C1. Outcomes) and recall bias. However, it is unlikely that these methodological issues fully explain the difference in coverage found between the two surveys. Another important factor is the timing of the survey, data collection for the MICS survey was carried out approximately 7 months after the measles vaccination campaign and PMCCS survey were executed. As a result of this, a considerable number of children who were not eligible for vaccination during the campaign would have become part of the MICS cohort and be counted amongst the non-vaccinated children. This suggests that, although coverage of measles vaccination might be high directly after a measles campaign took place, it is likely to drop fast as a result of the influx of new children eligible for measles vaccination, ultimately resulting in a higher risk of outbreaks. This underscores the limitation of relying solely on vaccination campaigns to achieve the targets for measles coverage and the importance of strengthening routine services alongside, in order to achieve sustainable health impact.

Impact

Decreasing measles mortality by at least 95% compared with 2000 has been met. Furthermore, caseload and mortality time series need to be interpreted with caution as changes in reporting mechanism can have a huge impact on data quality. Nevertheless, an increase in measles mortality between 2010 and 2015 has been found concurring with an increase in measles caseload in the same time frame. However, a substantial reduction in measles caseload had been achieved since 2006, which also marked the first year of the measles vaccination campaigns in Nigeria. It is important to point out that these observational analyses based on time-trends only cannot be used in isolation to attribute positive or negative effects to the campaigns. However, they can still be useful as part of the broader body of evidence which this evaluation aims to produce.

In terms of impact of the campaigns on the routine immunization services, the quantitative data show that the previous campaigns do not seem to have an effect on the use of routine immunization services

and therefore do not seem to accelerate measles elimination targets by stimulating uptake of routine immunization services. However, the measles campaigns also do not seem to show an unintended negative effect on the uptake of routine immunization services as reflected by the DTP3 coverage through routine services. If strengthening of routine immunization services through the campaigns occurred could not be verified by this evaluation, there is risk that the communities see measles vaccination campaigns (as topic of this evaluation) or SIA's in general as a replacement of routine immunization services, as reported in this evaluation. This issue is discussed in the international literature and reports mixed results on whether SIAs have a positive or negative impact on the routine immunization system (Hanvoravonchai 2011, Koehlmoos 2011, Verguet 2012 & 2013, Mounier 2016, Kerr 2017). Health system challenges remain if measles SIAs are relied upon as a replacement for weak routine vaccination programs rather than as a supplementary improvement to routine vaccination services. Some have recommended that SIAs must have "reached, and sustained, a predetermined level" in order to counteract the potential for these efforts to supplant or mask weak routine vaccination programs (Heymann 2010). In Nigeria the effect of the campaigns have sustained: there is decrease in vaccination coverage over the last years, however the pre-determined level of 90% was never met.

Efficiency

The efficiency of the 2017-2018 campaign was improved by inclusion of lessons learned from former campaigns and cross fertilization with the polio vaccination campaigns. The polio data and experiences were used to identify low performing LGA, strategies for advocacy, communication and community mobilization and based on polio activities in the Northern States the GIS was selected to calculate the estimated target population.

Due to the microplanning exercise resources were better planned and less spoiled. Even the wastage was mentioned to be less due to the good planning. Real time monitoring (ODK) improved accuracy of data and thereby the efficiency of the campaign. Daily uploading allowed the national stakeholder to get real time information on the campaigns and give prompt directives where necessary.

The aim of the campaign to Reach Every Child between 9 and 59 months in the entire country made the campaign to an enormous exercise without knowing exactly how many children really needed to be vaccinated for MCV1. The vulnerability analysis that we performed shows that in the southern states a high percentage of the people use RI to have their children be vaccinated. Although the aim of this campaign was to provide also the second dose to all children, the efforts to provide a service near to the homes of the people was probably very costly and time consuming and therefore less efficient for those LGAs where many people already attend routine immunization services.

This evaluation did not include a costing analysis and for this it is not possible to give a precise estimation of the most important costs driver and where to make efficiency gains. When comparing a blanket approach of the campaign (with the objective to reach all children) with a targeted approach the latter may be more efficient. However with a blanket approach economies of scale could be more easily reached and may be more feasible.

Equity

The biggest challenge during a campaign is to reach those children who are never be vaccinated before, the so-called "zero dose" children. Various strategies were foreseen in the design of the campaign to include all children in the campaign (house to house, line listing, GIS) but no strategy was foreseen to get more insight where "zero dose" children can be found. The quantitative analysis showed that it is possible to characterize the children aged 12 to 23 months who are less likely to be vaccinated against measles; mapping analyses of survey data suggests that measles vaccination coverage, overall (by either campaign or routine), is neither geographically socio-economically nor

ethno-culturally equitable. A vulnerability analysis can provide insight on identification of (clusters) of non-vaccinated children.

However, analysis on any campaign attendance in general (not limited to measles only) show high participation among certain risk groups. It provides some insight in which populations are likely to be reached by and benefit from measles vaccination campaigns and which populations are more likely to use routine services. Subsequently, this information can be used to determine where the focus should be by measles vaccination campaigns and where it may be more efficient to strengthen routine services in order to reach the zero dose children; tailoring services to the health seeking behavior of communities. A campaign can be a useful vehicle to reduce equity gaps in immunization status. However, as the campaigns 2015/2016 and 2017/2018 used a nationwide design without identifying and targeting those children most at risk of not being vaccinated the effect on the equity gap is likely not used to its full potential. A recent article by Portney et al (2017) stated that SIAs can reach the children that are missed by the routine immunization system and thereby are able to reduce inequities in immunization coverage.

Sustainability

Several component of the measles vaccination campaigns contribute to its sustainability. Firstly, the campaign is implemented through the National Health System structures using the State Immunization Officers, the LGA Immunization Officers, the health workers and community leaders as implementers. This (institutional integration) has led to a high level ownership and of responsiveness at each level also contributing to a *problem solving attitude* at all levels during the campaign. But the fact that the handling of donor funds after the 2015-2016 campaign was transferred from the Federal Ministry of Health to Gavi's partners UNICEF and WHO impacts negatively on the institutional sustainability.

Secondly, there is ownership of the campaign within the NPHCDA. The "NMMTC" seems to have the organizational and technical knowledge and managerial capacities to organize these campaigns. However, as the qualitative part of the study revealed the intensity of the 2017/2018 campaign has been experienced as very stressful by a part of the implementers, including the health workers at LGA and ward level. In geopolitical zones where the majority of people use the routine immunization services to have their children been vaccinated for measles this should be avoided.

Thirdly, the campaign is financed for a large part by donor funds, however commitment of states is reflected by the state counterpart funds that were released in all states visited, as was observed by the evaluation team.

Chapter 6. Lessons learned and recommendations

6.1 The design of the campaign

Lessons learned

The **relevance** to perform each 2 years is the trust that the vaccination coverage will increase substantially to diminish measles outbreaks and measles incidence. If the 2017-2018 campaign will reach this is not yet analysed but the former measles vaccination campaigns did not.

The enormous efforts (money, time and human resources) to realize the campaigns have not been as effective as foreseen. Modifying the design of the campaign by aiming to prioritize zero dose children to benefit from the campaign can increase the **relevance, the effectiveness and the efficiency of the campaign**.

Two lessons learned from the campaign can be used to re-design the campaign:

- 1) Nigeria shows a great diversity between the various states with regard to socio-economic, geographical and cultural context including factors on ethnicity and security, and the strength of the health system, leading to a differentiated health seeking behaviour of the communities. The vulnerability analysis, performed for this evaluation, showed that children living in the northern states, children from Hausa ethnicity, children with a mother without any education, children from the lowest wealth quintile, children whose mother were less than 20 years when the first child was born and children whose mother did not deliver her last child in a health facility have a significant higher risk not to be vaccinated against measles.
- 2) The analysis shows that these children who are “at risk to be zero dose” seek services for vaccination more through campaigns than RI. Further the quantitative data show that 84.5% of children aged 9-59 months who were vaccinated during the 2015/16 campaign, 38.8% were vaccinated with measles containing vaccine for the first time (i.e. zero-dose before the campaign), ranging from 73.2% in Jigawa to 13.4% in Imo. After the 2017/18 campaign it was found that 87.5% of children aged 9 to 59 months were vaccinated with measles containing vaccine during this campaign. Of these, 39.8% had received the measles vaccination for the first time and were zero-dose before the campaign, ranging from 84.4% in Katsina to 7.1% in Anambra.

This information with regard to zero dose children could be used to design campaigns in a more targeted approach, by investing more in those states (or LGAs) with a high number of zero dose children. The vulnerability analysis for at risk children can also be used for routine immunization activities, by developing an active approach in identifying these children in the catchment area of a health facility. In this way, equity through “assisting the unreached to be reached” will be probably strengthened, without the need to invest resources to reach all the children who already use RI for measles vaccination.

Microplanning has been identified as a useful tool in planning the campaign. This microplanning should be based also on a vulnerability analysis, based on RI data and the knowledge of health seeking behaviour of health workers and local leaders. By involving these local actors health seeking behaviour of population can be made visible at LGA and even ward level.

Recommendation

To the NPHCDA and the NMTCC

The evaluation team recommends to 1) conduct a vulnerability analysis to target specific vulnerable groups that have a higher risk to be zero dose, and 2) assess the health seeking behavior of the various

communities for measles vaccination, and use this information to introduce a targeted approach for the measles vaccination campaigns, by tailoring the campaigns more to the different needs of the various communities especially with the objective not to miss zero dose children.

Full measles vaccination campaigns can be organized in geographical areas (zones or states) where a high amount of vulnerable children (suspected to be zero dose) are identified, while for areas where few vulnerable children are expected to be found a full campaign could be modified to an intensified period of sensitization for measles vaccination in order to stimulate utilization of the RI and the measles vaccination can be provided at and during the existing RI services.

The approach of vulnerability analysis should be used when developing micro plans and SIO should learn and stimulate their staff to use their knowledge of their communities

6.2 Planning of the campaign

Lessons learned

The 2017-2018 campaign included a set of measurements to work in a more efficient manner. An important strategy was the development of micro plans. Micro plans were developed at ward level, with involvement of the community (leaders) which increased the ownership and is appreciated by the communities. During the micro planning exercise, enough consideration should be given to geographical issues such as – geographical spread of some areas; interstate and inter-ward borders that result in dynamic populations so that this can be taken into account in the calculations of the denominator and later in the Daily Implementation Plans.

Two problems were observed in relation to microplanning: 1) mistakes in the micro plan lead to logistic barriers during the roll out phase (e.g. shortage of vaccines) and 2) frustrations when at a higher level a decision was taken to change the planning such as the number of teams to participate in the campaign or to use the staggered approach when lower level stakeholders did not want this, as people felt not taken seriously.

Recommendation

To the NMTCC, the State and LGA Immunization Officers:

The microplanning as a tool for estimating the workload and needs for measles vaccination campaigns and RI should be continued to use from now onwards as acquired skills should not be lost. The number of children to be vaccinated during the RI (denominators) should be based on the information obtained during the campaign. State Health Directors and SIAs have to assist their health staff to perform and include a vulnerability analysis at LGA / ward level in the microplanning. This will assist local health workers to identify their at risk population with regard to immunization services. Regular review of micro plans for RI services should be performed during supportive supervision.

Furthermore, the evaluation team recommends to discuss and explain carefully at local level any changes made to the micro plan at higher level in order to maintain local ownership and perceived value of the plan among various stakeholders.

6.3 Implementation of the campaign

Lessons learned

The NMTCC and the health system in Nigeria have proven the ability to organize a nationwide campaign involving many parties from federal - down to community level. Although the goal to reach 95% coverage was not reached innovative approaches and incorporating lessons learned from former measles vaccination campaigns and polio vaccination campaigns increased the **effectiveness and efficiency** of the campaigns. Effectiveness as five states reached the target of 95% to which several

contributing factors can be identified such as improved mobilisation and efficiency because of the microplanning. Intensified monitoring and supportive supervision at state and the LGA by consultants from the in-country platform with Gavi partners contributed to the quality of the campaign. The daily review meetings at LGA and state level at each day of the campaign and the monthly review meetings at state and national level provided opportunity to share lessons learned. During the evaluation no evidence was found that at state, LGA or ward level straight after the campaign the lessons learned during the campaign and the information obtained through e.g. the microplanning will be used for RI in order to sustain increased vaccination coverages.

Recommendations

To the NMTCC:

All these lessons learned should be consequently documented and discussed taken DAC criteria into account with attention for: 1) the relevance to increase the vaccination coverage and the strengthening of the RI, 2) the use of in-country platforms and capacity to increase the effectiveness of the campaign 3) decreasing the equity gap by ensuring that the zero dose children will be addressed, 4) the efficiency of the campaign with regard to use of resources, 5) finally the sustainability to continue the measles vaccination campaigns each two years.

Stakeholders at the various levels in the system, should take part in these discussions to adapt the lessons to the context. The lessons should also be discussed with other platforms involved in campaigns (e.g. polio) in the country in order to have a continuous cross fertilization between various initiatives. To answer to the great variety in contexts and realities in the country the lessons learned should be assessed on what they mean for the different geopolitical zone with regard to the design, planning and implementation.

6.4 Outcome of the campaign: to sustain and increase what is reached

Lessons learned related to the link between measles vaccination campaigns and RI

Routine immunization is of high importance to reach and maintain high vaccination coverages in the population. The quantitative analysis did not show a negative nor positive change in use of routine immunization services after the campaigns indicating that there has until now not seen any effect of improved use of routine immunization after the campaigns, while the qualitative analysis only suggested that 1) no evidence was found that at state, LGA or ward level information obtained through the microplanning will be used after the campaign for RI in order to sustain increased vaccination coverages 2) the community members (during the FGD) did not mention to have heard advocacy messages to intensify the use of routine immunization services 3) the evaluation did not find evidence that outcomes of post campaign surveys lead to discussions on measures needed to ensure and strengthen continuity between campaigns and routine immunization.

Recommendations

To the NPHCDA:

In the light of this evaluation, that not found evidence that MCV1 coverage reached to a high level (or signs to maintain this) the NPHCDA should re-think if the nationwide measles vaccination campaign with a “one blanket approach” is the most appropriate strategy to reach and maintain a nationwide MCV1 that can protect the country against measles outbreaks. The re-thinking should especially include where the RI 1) can benefit more from the campaigns, especially with regard to make people utilize and adhere to RI services and 2) where the RI can better be replaced by intensive targeted campaigns with a focus on the “unreached” zero dose children. Performing vulnerability analysis at the level of LGAs or even wards can provide inside where the health staff have to provide extra efforts to reach zero dose children during the RI. Post campaign reviews should include the discussion of the outcome of the Post Campaign Coverage Surveys and the discussion about the applicability of these

strategies with state, LGA and ward level stakeholders and develop an action plan to convert this strategy to practice. This should be combined with intensified monitoring and supportive supervision of the RI services -including the health workers connected to it- in the period straight after the campaign.

Lessons learned related to strengthening the routine immunization system

In the design of the campaign it was foreseen that the routine immunization system would benefit of the measles vaccination campaign by the training of health workers, improved cold chain systems and an intensive attention for the importance of measles vaccination. The design for the evaluation did not allow to perform a full evaluation on improvements of the RI services. No baseline and after campaign assessment of RI was included (did not fit into the time frame of the evaluation). Further performing an evaluation during the implementation of the campaign was useful to assess the campaign but not as useful to assess the RI, as these were often not functional and health workers were occupied with campaign duties. To answer the question if the campaigns have strengthened the routine immunization system before and after assessment needs to be done.

Recommendations

To the NPHCDA and its partners, including Gavi:

When aiming to assess impact of measles vaccination campaigns on RI a longer period to enable the implementation of a baseline survey before the campaigns followed by an analysis of the functioning after the campaign should be taken into account. The period after the campaign should be extended more to perform also a quantitative assessment to understand if utilization of RI increased after the campaign. In such an evaluation, specific attention should be given to the links between the measles vaccination campaign and the RI in all phases of the campaign (design, training, implementation and evaluation).

Chapter 7. References

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Annex 1: (Adapted) Evaluation Framework

Key evaluation questions	Specific evaluation questions	Data Collection & information sources	Data analysis
A. Design and planning			
A1. To what extent have Nigeria Gavi-funded measles campaigns (2015/2016, 2017/2018) been well designed?	<ol style="list-style-type: none"> 1. To what extent have lessons learned from previous immunization campaigns and specifically measles vaccination campaigns been incorporated in the design and planning? 2. Are the measles campaigns designed following WHO guidelines for conducting quality campaigns and ensuring campaigns will strengthen routine immunization 3. Has the Gavi Measles and Rubella Strategy been considered in the design? 4. To what extent have local partners been consulted in the design and planning? 5. To what has the design and planning of the measles campaigns been based on available data and reflecting realities in Nigeria (i.e resources available, geographical differences, immunization coverage, immunization system) 6. To what extent have concurrent immunization activities such as other immunization campaigns (i.e polio, meningitis A) been taking into consideration in the design? 7. Are well-defined and realistic objectives for the measles campaigns, timeline, and monitoring & evaluation plans set? 8. To what extent have the Gavi's Independent Review Committee's Task/Team comments to Nigeria on previously submitted measles campaign 	<ul style="list-style-type: none"> • Reports immunization campaigns • WHO guidelines • Measles campaign reports • Gavi Measles and Rubella Strategy • Minutes of planning meetings • Program documents • Comments Gavi's independent Review Committee's/Task Team • In depth interviews with key informants 	<p>Conceptual framework Descriptive analysis Content analysis Thematic analysis</p>

Key evaluation questions	Specific evaluation questions	Data Collection & information sources	Data analysis
	proposals been incorporated in the design?		
B. Implementation			
B1 To what extent were Nigeria's measles campaigns (2016/2016, 2017/2018) implemented as planned (in terms of timeline, scale and quality?)	<ol style="list-style-type: none"> 1. Implementation of activities (if any) designed to reinforce the immunization system? 2. How did Gavi in-country partners support the implementation of the measles campaign? 3. Which contextual factors explain the successes, and challenges faced? 	<ul style="list-style-type: none"> • In depth interviews with key informants • In-depth interviews with facility health workers • FGDs with community men and women • IDI with State/LGA authorities 	Descriptive analysis Thematic analysis Contribution mapping Causal models Triangulation between different sources of information
B2 To what extent was the management at country level responsive (in terms of appropriateness, rapidity, and effectiveness) to the difficulties faced during the implementation of the campaign?	<ol style="list-style-type: none"> 1. What were the challenges experienced during the implementation of the campaigns? 2. How were the problems solved? 3. What technical support supervision was received during campaigns? 4. Other available support (debriefing sessions, relations with colleagues and supervisors)? 5. What guidelines are available? 6. What are the experiences with incentives? 	<ul style="list-style-type: none"> • In depth interviews with key informants at state and LGA level • In-depth interviews with health workers 	Descriptive analysis Thematic analysis
B3 To what extent where the measles campaigns implemented aligned with routine immunization activities?	<p>Has a post-campaign review with the Interagency Coordination Committee (ICC) on measured needed to ensure and strengthen continuity between campaigns and routine immunization been convened after the 2015/2016 campaign?</p> <p>Is a post-campaign review with the Interagency Coordination Committee (ICC) on measured needed to ensure and strengthen continuity</p>	<ul style="list-style-type: none"> • Program documents • In depth interviews • Minutes of post-campaigns review meeting 	Content Analysis Descriptive analysis

Key evaluation questions	Specific evaluation questions	Data Collection & information sources	Data analysis
	between campaigns and routine immunization been convened after the 2015/2016 campaign?		
B4 To what extent was the implementation monitored and evaluated (i.e. post campaign coverage survey) in an effective manner?	<p>Have post campaign coverage surveys been conducted after the 2015/2016 campaigns?</p> <p>Are post campaign coverage surveys planned for after the 2017/2018 campaigns. If yes that will be most likely done after the contract period</p> <p>Have mop up activities been conducted in areas where coverage < 90% as estimated by administrative data?</p> <p>Are monitoring tools available and used during the campaign?</p>	<ul style="list-style-type: none"> • Program documents • NPI program data • Reports post campaign coverage surveys • SIA Technical Report • KII • In-depth interviews of health workers including ward focal persons on immunization 	Content Analysis Descriptive analysis
B5 To what extent were lessons documented for the future measles campaigns?		<ul style="list-style-type: none"> • Program documents 	Content Analysis
C. Outcomes			
C1 To what extent have the measles campaigns for Nigeria (2015/2016, 2017/2018) achieved their objectives?	<p><i>Objective 1 To reduce the national measles mortality by at least 95% compared with 2000 estimates</i></p> <ul style="list-style-type: none"> - What is the annual trend in estimated national measles mortality from 2000 till 2017? <p><i>Objective 2 To accelerate/support measles elimination targets¹²</i></p> <ul style="list-style-type: none"> - What is the annual trend in MCV coverage at national level between 2000 and 2017? - What is the change in MCV and DTP3 coverage following a measles campaigns (interrupted time series analysis of LGA-level coverage data 	<p>Secondary data analysis of:</p> <ul style="list-style-type: none"> • Routine Immunization program data or WHO-UNICEF joint reporting form (LGA level) • WUENIC immunization coverage estimates (national level) • National measles cases and outbreaks notification data • WHO disease burden estimates • WHO vaccine preventable disease monitoring system 	Descriptive Analysis Inferential Analysis

¹² For elimination of measles, > 95% of coverage with 2 doses of measles vaccine, either through routine and/or campaigns is needed.

Key evaluation questions	Specific evaluation questions	Data Collection & information sources	Data analysis
	<p>from 2000 to 2017?)</p> <ul style="list-style-type: none"> - What are the individual-level risk factors of non-vaccination (zero-dose measles)? How do children who receive MCV vaccinations from routine services differ (in term of these risk factors) from children who receive vaccinations through campaigns or supplementary immunization activities (re-analysis of individual level MICS data)? - Based on the identified individual-level risk factors, which areas or key populations could be prioritized for targeted vaccination campaigns (maps and triangulation of vaccination coverage, risk profile and indicators of access to services and campaigns) <p><i>Objective 3 To prevent the risk of major outbreaks through immunizing at least 95% of the population at risk in each LGA by 2020</i></p> <ul style="list-style-type: none"> - What is the proportion of LGA's with more than 80% and 95% coverage of MCV1 through campaigns in 2015/16 and 2017/18? - Is there a relationship between measles cases (or outbreaks) and vaccination coverage (by routine and campaign) (spatial regression using LGA-level 	<ul style="list-style-type: none"> • WHO measles surveillance database • 2016/17 Nigeria MICS individual level datasets 	

Key evaluation questions	Specific evaluation questions	Data Collection & information sources	Data analysis
	<p>coverage)</p> <p><i>Objective 4. To provide periodically (2015 and 2017) a second dose opportunity for measles vaccine to children 9m-59 months regardless of their previous vaccination status.</i></p> <ul style="list-style-type: none"> - Out of the children who were vaccinated through campaigns according to the 2016/17 MICS, how many had already been vaccinated through routine services, by LGA level (at 9 months or later) ? 		
<p>C2 To what extent did contextual factors (e.g. concurrent immunization activities) explain these outcomes?</p>	<ol style="list-style-type: none"> 1. Are the outcomes associated with socio-economic status and other contextual elements? 2. To what extent did health workers modify their regular REW strategic practices in line with the measles campaigns? 3. What are the perceptions of the stakeholders regarding the enabling/constraining factors that facilitated/hindered behavioral change among beneficiaries ? 4. What is the perception of the beneficiaries of the overall change in immunization utilization in the communities/families? 5. If there were changes how can they be explained? 	<ul style="list-style-type: none"> • Secondary (re) analysis of available databases • KII with national, state and LGA stakeholders. • In-depth interviews with health workers including ward focal persons on immunization • In-depth interviews with ward and community stakeholders. • FGD with community men and women 	<p>Inferential Analysis Descriptive Analysis Thematic Analysis Contribution mapping Causal models Triangulation between different sources of information</p>

Key evaluation questions	Specific evaluation questions	Data Collection & information sources	Data analysis
C3 What have been the unintended (positive and negative) consequences of the campaigns (2015/2016, 2017/2018) on the overall immunization system, such as its delivery strategies (outreach, routine, financial incentives) and components (cold chain, staff, transportation) at all levels?	<ol style="list-style-type: none"> 1. How have the campaigns affected the NPI (routine and outreach services)? 2. What were the unintended positive consequences of the campaigns at national, state, LG, ward and community levels? 3. What were the unintended negative consequences of the campaigns at national, state, LG, ward and community levels? 	<ul style="list-style-type: none"> • KII with national, state and LGA stakeholders. • In-depth interviews with health workers including ward focal persons on immunization <p>In-depth interviews with ward and community stakeholders including WDC members</p>	<p>Descriptive Analysis Thematic Analysis Contribution mapping</p>
C4: To what extent has motivation of health system staff at all levels influenced the outcomes of the campaign?	<ol style="list-style-type: none"> 1. What are the main reasons for “missed children”? 2. What makes health staff at all levels motivated to participate in this campaign? <p>What makes health staff at all levels making efforts to reach each child?</p>		
C5: What are the consequences of the changed institutional setting for the Measles Campaign 2017-2018	<ol style="list-style-type: none"> 1. What are the advantages and disadvantages of having the measles campaign outside the NPHCDA, and being located in the PEOC for the current campaign? 2. What does this mean for the sustainability of the campaign and the RI services? 		
D. Lessons learnt			
D1 What are the lessons learnt from the 2015/2016 and 2017/2018 Nigeria measles campaigns?	<ol style="list-style-type: none"> 1. What were the lessons learned at the national, state, LG and facility levels from the measles campaigns? 	<ul style="list-style-type: none"> • KII with national, state and LGA stakeholders. • In-depth interviews with health workers including ward focal persons on immunization • In-depth interviews with ward and 	<p>Descriptive Analysis Thematic Analysis</p>

Key evaluation questions	Specific evaluation questions	Data Collection & information sources	Data analysis
		community stakeholders including WDC members	

Annex 2: Overview of activities

Phase and activities	Date
Preparation phase	
Contract signed	28 November 2017
Start desk review	28 November 2017
Development of tools for 1 st data collection, jointly KIT and SFH	28 – 8 December 2017
Data collection and analysis phase	
Training of research assistants/data collectors by SFH and KIT staff	8 – 9 December 2017
Visit to Kwami and Songhom Local Government Authority (LGA) in Gombe, SFH with one KIT staff	10 - 15 December 2017 (last interview was conducted on the 22 nd on a stakeholder who had travelled). KIT staff left on the 13 th .
Visit to Bodinga and Tangaza LGAs, Sokoto, SFH	11 – 17 December 2017
Attendance of daily LGA review meetings in Gombe and Sokoto – SFH	10 – 12 December 2017 (Gombe) 11 – 16 December (Sokoto)
Attendance of State Review meetings with the expanded team - State Primary Health Care Development Board immunization campaign team, NPHCDA, representatives of World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF), African Field Epidemiology Network (AFENET) etc. – KIT and SFH	8 and 12 December 2017 (Gombe) 12, 15 and 16 th December 2017 (Sokoto)
Transcripts made by SFH	15 December – 12 January 2017
First analysis data 1 st data collection - Code book developed, KIT (Annex 7) - Transcripts coded, KIT	Ongoing
Preparation meeting with Stakeholders (see list of participants in preparation report) SFH and KIT staff	16 January 2018
Interviews with Stakeholders, SFH and KIT staff - AFENET - Nigeria Centre for Disease Control (NCDC) - Technical Assistant to the chair of the Measles Technical Committee, NPHCDA - Disease Control and Immunization, programme officer on measles, NPHCDA - UNICEF - Chair of the Technical Measles Campaign Committee, NPHCDA	15 – 18 January 2018
Visit to steering committee, SFH and KIT staff	17 January 2018
Adaptation tools based on first field visit and stakeholders input, SFH and KIT staff (Annex 6)	18 January – 5 February 2018
Training of research assistants/data collectors by SFH and KIT staff	5 and 6 February 2018
Visit to Niger state Chanchaga and Agaie LGAs for qualitative data collection, one staff member of KIT present in Chanchaga LGA for support.	7 - 12 February 2018
Training of research assistants/data collectors by SFH and KIT staff – Imo state; Observation of pre-implementation activities	6 and 7 March 2018
Qualitative data collection in Imo and Edo states –one KIT staff member present in Imo (Orlu and Onuimo LGAs), and Edo (Oredo LGA) for support	8-14 March 2018
Report Preparation Phase, KIT	Draft ready 5 February 2018 Submitted 13 March 2018
Validation workshop Nigeria	24 May 2018
Reporting and dissemination phase	
Final report	Draft ready 13 June 2018 Final report ready: TBD
Presentation of evaluation results at country level	At country level: TBD At global level: TBD

Annex 3: List of participants validation workshop

Event: GAVI Measles Campaign Evaluation Stakeholders Workshop				
Location/ Venue: Bolton White Hotel, Abuja				
Date: 24 th May, 2018				
S/N	NAME	ORGANIZATION	DESIGNATION	SEX
1	Usman Bako Alex	GSPHCDA	SIO	M
2	Okanlawon Rukayat Adenike	IBADAN NORTH	LIO	F
3	Aikhele Justina	SMOH EDO	SIO	F
4	Doris Ehima	OREDO LGA EDO	LIO	F
5	Samuel Sha'aibu	AFENET	Measles consultant	M
6	Jiya Samuel	NSPHCDA	SIO	M
7	Analyst Dave Emman Jimoh	NPHCDA	Head M&E & data management	M
8	Shebu Ahmed	SSPHCDA	SIO	M
9	Aminu Yusuf	SSPHCDA	LIO	M
10	Yusuf Ibrahim Gussoro	SSPHCDA	LIO	M
11	Awah Chukwuma Quintus	Imo state MOH	SIO	M
12	Ekechi Christiana	Imo SMOH	LIO	F
13	Ogechi Onuoha	SFH	Senior Technical Specialist	F
14	B. Gerretsen	KIT	MD	M
15	M.V Gurp	KIT	Epidemiologist	F
16	A.van den BROEK	KIT	MD	F
17	Chimaobi Ihebuzor	NPHCDA	Measles FP	M
18	Basseyy Edidion	NPHCDA	Measles FP	M
19	Nwachukwu John	SFH		M
20	Wole Fajemisin	SFH	DRMR	M
21	Louritta Akpelan	SFH		F
22	Jennifer Anyanti	SFH	DMD Programs	F
23	Eke Tobeelni	NPHCDA	Consultant	M
24	Bright Ekweremadu	SFH	MD	M
25	Ajoteri	NPHCDA	Chairman NMTCC	M

Annex 4: States and LGA's selected for qualitative data collection

Overview of states and LGAs selected for qualitative data collection based on several criteria							
State	Geopolitical Zone	LGA	Senatorial Zone	Criteria			
				Measles Vaccination Coverage (JRF**) low-medium-high	Rural/Urban	Health Systems factors	Logical considerations
Sokoto	North West	Bodinga	Sokoto South	Medium	urban	Adequate health workforce	In all states, senatorial distribution was considered. LGAs were selected from different senatorial zones. Each state has 3 senatorial zones.
		Tangaza	Sokoto North	High	rural	Adequate health workforce	
Gombe	North East	Kwami	Gombe North	High*	Rural	Adequate health workforce	
		Shonghom	Gombe South	High*	Urban	Adequate health workforce	
Niger	North Central	Chanchaga LGA	Niger East	High	Urban	Adequate health workforce	
		Agaie LGA	Niger South	Medium	Rural	Inadequate health workforce	
Imo	South East	Orlu	Orlu senatorial zone	High	Urban	Health workforce information not available at the time of selection	
		Onuimo	Okigwe senatorial zone	Low	Rural		
Edo	South-South	Igueben	Edo Central	High	Rural	Adequate health workforce	
		Oredo	Edo South	Low	urban	Adequate health workforce	
Oyo	South West	Afjio	central senatorial Zone	High	Rural	Inadequate health workforce	
		Ibadan North	South senatorial Zone	Low	Urban	Inadequate health workforce	

* all LGAs in Gombe have relatively high coverage of routine immunization system.
 ** Joint Reporting Form

Annex 5: Data and datasets used by objective

Dataset/report	Variable	Definition	Time period	Administrative level	Source	Notes
Joint Reporting Form (JRF) 2010-2015	Measles caseload	Number of reported and confirmed measles cases.	2010 - 2015	National	NPHCDA	
	Measles mortality	Number of reported deaths as a result of confirmed measles infection	2010 - 2015	National	NPHCDA	
WUENIC estimated national immunization coverage 1984 - 2016	National MCV1 coverage	Estimated vaccination coverage among children aged 12-23 months for MCV1 through routine services.	1984 - 2017	National	http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswuc/overagemcv1.html	
	National DTP3 coverage	Estimated vaccination coverage among children aged 12-23 months for DTP3 through routine services	1984 - 2017	National	http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswuc/overagedtp3.html	
WHO Measles and Rubella Surveillance Data	Measles caseload	Number of reported and confirmed measles cases.	1995 - 2017	National	http://www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/active/measles_monthlydata/en/	
MICS 2016	Determinants of non-vaccination	See annex 7	2016	State	http://mics.unicef.org/	

	Determinants of participation in SIA	See annex 7	2016	State		
	MCV coverage	MCV1 coverage through RI or SIA among children aged 12-23 months.	2016	State		
PMCCS files 2016	Measles vaccination campaign coverage	Estimated vaccination coverage among children aged 9-59 months for MCV through the measles campaign	2016	State	NPHCDA	Raw data was not obtained
	Measles campaign zero-dose coverage	Proportion of children aged 9-59 months who were vaccinated through measles campaign and for whom the measles campaign provided the first dose of MCV.	2016	State		
PMCCS files 2018	Measles vaccination campaign coverage	Estimated vaccination coverage among children aged 9-59 months for MCV through the measles campaign	2018	State	NPHCDA	Raw data was not obtained
	Measles campaign zero-dose coverage	Proportion of children aged 9-59 months who were vaccinated through measles campaign and for whom the measles	2018	State		

		campaign provided the first dose of MCV.				
Measles incidence 2016 - 2018	State level measles incidence 2016 - 2018	Number of reported and confirmed measles cases per 1,000,000 population	2016 - 2018	State	NPHCDA	

Annex 6: Data sharing agreement

DATA SHARING AGREEMENT

FOR QUANTITATIVE HEALTH DATA NEEDED FOR THE EXTERNAL EVALUATION LED BY KIT IN COLLABORATION WITH SFH OF THE GAVIMEASLES CAMPAIGNS IN NIGERIA

This Agreement shall become effective as of [date] the “Effective Date”

By and between
KIT Health - Koninklijk Instituut voor de Tropen
Mauritskade 63
1092 AD Amsterdam
Netherlands

(hereinafter referred to as “Receiving party ”)

And
FILL IN HERE

(hereinafter referred to as “Disclosing party”)

WHEREAS It is desirable for the Receiving party to receive data from the Disclosing party relating to the implementation of health programs conducted under their stewardship to enable the Receiving party to bring contracted assignments to a successful completion;

WHEREAS The Disclosing party desires to protect its data from unauthorized use and disclosure;

NOW THEREFORE, in consideration of the foregoing, the parties agree as follows:

1. “Agreement” means this Data Sharing Agreement and all its appendices
2. “Assignment” means the assignment “Measles campaigns and their effects on the overall immunization system” (GAVIReference RFP-MEMCE022017) awarded to the Receiving party by GAVI
3. “Analyses” means all statistical and epidemiological analyses agreed upon for the completion of the Assignment.
4. “Data” means quantitative data needed for the Analyses and includes (i) Routine immunization coverage data for Measles, BCG, DTP3 and Polio, for the years 2000 to 2017, by ward or LGA level, including respective estimated population targets denominators; (ii) Measles Campaign Data for 2005/6, 2015/2016 and 2017/18 campaigns, by ward or LGA, including line-listing or GIS denominators; and (iii) Measles case load and mortality by LGA or Ward.
5. The Receiving party will use the data provided by the Disclosing party for the Analyses agreed upon and only additional exploratory research questions directly related to the scope of the assignment. A methodology section will also accompany any results to enable a replication of all analyses conducted.
6. The Receiving party shall not make the Data available, directly or indirectly, to third parties without prior written authorization from the Disclosing party;
7. The Receiving party shall not share, publish or disseminate data findings and reports which do not fall within the scope of the Assignment, without explicit approval of the Disclosing party.

8. The Receiving party will provide Data only to those employees and representatives who require access to Data the purpose of the contracted assignments.
9. The Receiving party understands and agrees that the Disclosing party will only provide data that is anonymised or aggregated and which therefore do not enable the identification of individuals.
10. The Disclosing party will provide the data to the Receiving party free of charge.
11. The Receiving party shall not be liable for disclosure of the Disclosing party's Data if (i) it is, at the time of the disclosure, available to the public or otherwise legally in the public domain; (ii) it legally and properly comes into the public domain after through no breach or fault by the Receiving party of its obligations herein contained; (iii) it can be shown by competent written records to have been in Recipient's possession at the time of disclosure hereunder;
12. This Agreement may be terminated by either party by giving 30 days written notice to the other party and, unless sooner terminated or otherwise extended by being incorporated into another agreement, it shall automatically terminate upon acceptance by GAVI of the final evaluation report compiled by KIT.
13. The parties understand and agree that (i) the Data is and shall remain at all times the sole property of the Disclosing party;
14. This Agreement constitutes the entire Agreement between the Parties pertaining to the subject matter hereof, and supersedes all prior and contemporaneous discussions, understandings, negotiations and preliminary agreements of the Parties about the subject matters hereof.
15. No change, modification or termination of any terms, provisions or conditions of this Agreement shall be valid or binding unless made in writing and signed by the Parties.
16. Both parties will use commercially reasonable efforts to settle all matters in dispute amicably.
17. Each Party warrants that it has the authority to enter this Agreement.

Date:
On behalf of the Disclosing party:

Name:
Title:

Date:
On behalf of the Receiving party:

Name:
Title:

Annex 7: Multivariate logistic regression analysis on determinants of measles vaccination status and participation in SIAs

As part of the evaluation of measles vaccination campaigns in Nigeria we have performed an analysis of the Nigeria Multiple Indicator and Cluster Survey (2016) in order to gain better insight in the characteristics of the children who are most often not vaccinated against measles and the children who are most likely to participate in a SIA. The determinants that were used to characterize children least likely to be vaccinated were chosen as indicators of childhood vulnerability.

As data from the MICS survey comes in different datasets several datasets were used for this analysis. Data on child characteristics, immunization status and household characteristics were derived from the children's dataset. These data were used with the women's dataset to obtain data on the child's mother. Finally, the birth history dataset was merged as well to obtain information on children's birth order. A description of the variables and datasets that were used can be found in table 10.

The approach that we used consisted of descriptive statistics and logistic regression analysis performed in RStudio version 1.1.432. A univariate logistic regression was fitted for all independent variables, followed by a multivariate logistic regression analysis. All variables with a p-value below 0.2 in the univariate analyses were added to the multivariate model. A backward selection approach was used to build the multivariate model, using $p < 0.05$ as a cut off for inclusion. Odds ratios are presented along with corresponding p values and 95% confidence intervals to indicate statistical significance. To account for the multistage clustering design used by the MICS all statistics – both descriptive and inferential statistics - were performed on a weighted dataset (accounting for weights, primary sampling unit and strata).

Variables	Definition	Type	Dataset
Measles vaccination	Child between the ages of 12 and 23 months who received a dose of MCV according to vaccination card or mother's recall.	Dichotomous	Child
Participation in SIA	Child between the ages of 12 and 23 months who has ever received a vaccination through campaigns or other SIAs	Dichotomous	Child
Sex of the child	Male or female	Dichotomous	Child
Type of place of residence	Urban or rural	Dichotomous	Child
State	State of residence	Category	Child
Ethnicity	Ethnicity of the household	Category	Child
Mother's education	The level of education received by the child's mother	Category	Child
Wealth quintile	Indication of wealth of household defined by a composite measure of a household's living standard	Category	Child
Birth order	The order the child is born in their family	Category	Birth history
Mother's age at first birth	Age of the mother at her first delivery	Category	Child

Location of mother's delivery	of last Mother's last delivery in a facility or at home	Women
		Dichotomous

Results

Table 11 shows the descriptive statistics of the outcome variables and independent variables. It shows the share of each group (e.g. sex, state, residency etc.) for different subgroups of the study population. Most of the children between the ages of 12 and 23 months are from Hausa ethnicity (56.5%). However, their share is substantially lower among the children between the ages of 23 and 23 months who have received measles vaccination through either RI or SIA. Furthermore, 58.8% of the mother's had delivered their last baby at home, whereas this was only the case for 36.2% among the children who had ever received MCV.

Slightly more girls have ever participated in an SIA (52.6%) than boys (47.4%). Furthermore, the share of rural children who have ever participated in an SIA (71.6%) is higher than their share in the total sample (60.2%). Furthermore, the share of Hausa ethnicity is increased among children who ever participated in SIA (60.8%) as compared to the total sample (43.3%).

Table 11. Descriptive statistics of outcome and independent variables for Nigeria (MICS 2016) ¹					
Variable		Measles vaccination status ³		SIA participation ²	
		Received MCV1	All children aged 12-23 months	Participated in SIA	Children aged 12-23 who received MCV1
Sex	Male	50.4	49.7	47.4	50.3
	Female	49.6	50.3	52.6	49.7
Residency	Urban	47.1	31.2	28.4	39.8
	Rural	52.9	68.8	71.6	60.2
State	Abia	1.3	0.8	0.5	1.2
	Adamawa	2.5	2.1	0.7	2.5
	Akwa	2.8	1.9	4.4	2.6
	Anambra	2.1	1.2	2.8	1.8
	Bauchi	2.9	5.4	9.0	5.2
	Bayelsa	0.8	0.7	0.6	0.7
	Benue	2.7	2.1	1.4	2.4
	Borno	9.2	6.5	9.6	9.1
	Cross	2.3	1.3	1.9	1.8
	Delta	2.4	1.6	0.0	2.1
	Ebonyi	1.3	0.9	0.4	1.2
	Edo	2.1	1.0	0.2	1.5

	Ekiti	0.8	0.4	0.3	0.6
	Enugu	2.0	1.0	0.6	1.5
	Gombe	1.6	2.0	3.5	2.1
	Imo	2.9	1.6	1.3	2.5
	Jigawa	1.4	5.5	9.0	3.9
	Kaduna	6.3	5.9	6.9	5.4
	Kano	5.2	8.8	5.7	5.8
	Katsina	3.9	7.7	11.1	5.6
	Kebbi	2.0	3.3	5.1	2.0
	Kogi	2.1	1.4	0.2	1.8
	Kwara	1.7	1.0	0.4	1.3
	Lagos	8.5	4.0	0.4	6.0
	Nasarawa	2.4	2.0	3.6	2.3
	Niger	3.1	4.0	4.1	3.5
	Ogun	1.5	1.1	0.6	1.5
	Ondo	2.8	1.5	0.8	2.2
	Osun	2.0	1.4	2.6	1.9
	Oyo	3.6	2.5	0.9	3.4
	Plateau	4.7	3.1	1.6	3.8
	Rivers	2.4	1.4	0.9	1.9
	Sokoto	0.8	3.5	3.1	1.5
	Taraba	0.8	1.2	0.2	0.8
	Yobe	1.5	4.1	1.6	1.4
	Zamfara	1.9	5.0	2.0	3.9
	FCT Abuja	1.6	0.9	2.0	1.2
Ethnicity	Hausa	33.4	56.5	60.8	43.3
	Igbo	14.7	8.3	6.8	12.1
	Yoruba	17.6	9.7	5.5	14.0
	Other ethnic group	34.3	25.6	26.9	30.7
Mother's education	None	15.0	28.4	35.5	21.8
	Primary	15.7	14.1	13.2	15.4
	Secondary or technical	43.7	27.8	22.0	37.7
	Higher	16.7	7.8	5.7	11.8
	Non-formal	9.0	21.9	23.6	13.2
Wealth quintile	Poorest	7.2	22.3	23.6	12.8
	Second	13.7	21.6	25.6	17.8
	Middle	17.9	18.9	20.6	18.8
	Fourth	26.0	18.6	15.3	23.6
	Richest	35.2	18.6	14.8	27.0
	<20	8.0	13.1	11.5	9.4

Mother's age at birth	20-34	70.9	67.2	68.9	70.0
	35+	16.7	15.2	16.0	16.0
	Missing	4.4	4.5	3.6	4.6
Birth order	1st	16.4	15.9	13.4	16.1
	2-3	34.7	30.9	28.8	32.5
	4-6	34.8	33.9	37.8	34.2
	7+	9.8	14.9	16.4	12.7
	Missing	4.4	4.5	3.6	4.6
Place of last delivery	Facility	59.5	36.4	34.9	50.1
	Home	36.2	58.8	60.8	45.1
	Missing	4.3	4.7	4.3	4.8
Total		41.7	100.0	21.7	100.0

1. Percentages are based on weighted data. 2. Participation in any SIA, not specifically for measles. 3. MCV coverage through either RI or campaign.

Table 12. shows the results of multivariate regression analysis on determinants associated with measles vaccination status among children between the ages of 12 and 23 months. The model shows significant variation of measles vaccination coverage between states. The odds of being vaccinated against measles range from 3.73 in Lagos and Plateau states to 0.39 in Ogun state, as compared to Kano state.

Aside from state, ethnicity was also significantly associated with vaccination status. Children of Igbo ethnicity have 2.8 times higher odds of being vaccinated against measles than children from Hausa ethnicity and the odds for children from Yoruba ethnicity are almost twice as high than of Hausa children. This indicates that children from Hausa ethnicity are less likely to receive measles vaccination.

Furthermore, the odds of receiving measles vaccination is increased for children whose mother has received education as compared to children whose mother has not received any form of education. In addition, the odds increase with every level of education.

The odds of measles vaccination for children whose mother has received primary education, secondary education and higher education are 1.66, 2.22 and 5.60 higher respectively, than children whose mother has not received any form of education.

Children from households in the poorest wealth quintile have lower odds of vaccination against measles than children from all higher quintiles. Just like mother's education, the odds of a child being vaccinated increases with each quintile, with the odds for children from the richest wealth quintile being 4.67 times higher than children from the poorest wealth quintile.

Children whose mother was over 35 when giving birth to her first child are 1.3 times more likely to be vaccinated against measles than children whose mother gave birth to her first child between 20 and 34. Furthermore, children whose mother gave birth to her first child below the age of 20 were 17% less likely to be vaccinated against measles. Although the latter is not statistically significant, it does indicate that the odds of receiving measles vaccination increases with mother's age at first birth.

Finally, we looked at the place of mother's last delivery as an indicator of access to or usage of (mother and child) health services. According to the model, children born to a mother whose last delivery took

place in a health facility were 1.88 times as likely to be vaccinated against measles than children born to a mother who did not deliver in a health facility.

Figure 2 shows maps and graphs of the share of each of these determinants across Nigeria. Interestingly, all of the determinants that are associated with vaccination status are more prevalent in the northern states than in the southern states.

Table 12. Results of the univariate and multivariate analysis on determinants of measles vaccination status through RI or SIA of children 12-23 months in Nigeria, 2016.

Variables		Univariate		Multivariate	
		B (p-value)	95%CI	B (p-value)	95%CI
Sex	Male (reference)	1.00 (0.60)			
	Female	0.96	(0.81 - 1.13)		
Type of place of residence	Urban (reference)	1.00 (<0.001)			
	Rural	0.28***	(0.22 - 0.35)		
State	Borno(reference)	1.00 (<0.001)		1.00(<0.001)	
	Abia	6.15***	(3.70 - 10.20)	0.68	(0.31 - 1.47)
	Adamawa	3.25***	(1.95 - 5.40)	2.31**	(1.33 - 4.02)
	Akwa Ibom	4.81***	(2.74 - 8.45)	1.09	(0.56 - 2.12)
	Ambra	8.12***	(4.71 - 14.01)	0.7	(0.30 - 1.63)
	Bauchi	0.89	(0.54 - 1.46)	1.22	(0.75 - 1.96)
	Bayelsa	3.3***	(2.03 - 5.39)	0.99	(0.53 - 1.87)
	Benue	3.45***	(1.94 - 6.14)	1.58	(0.79 - 3.13)
	Cross River	4.47***	(2.39 - 8.36)	2.83**	(1.41 - 5.69)
	Delta	8.97***	(4.90 - 16.42)	2.9**	(1.41 - 5.96)
	Ebonyi	5.64***	(3.29 - 9.67)	1.13	(0.61 - 2.10)
	Edo	4.23***	(2.38 - 7.50)	0.85	(0.37 - 1.94)
	Ekiti	26.53***	(11.01 - 63.95)	3.67**	(1.51 - 8.94)
	Enugu	9.22***	(4.74 - 17.92)	1.37	(0.62 - 3.01)
	Gombe	13.75***	(6.86 - 27.56)	1.52	(0.62 - 3.73)
	Imo	1.52+	(0.97 - 2.39)	1.93*	(1.12 - 3.34)
	Jigawa	9.12***	(5.21 - 15.95)	0.87	(0.39 - 1.94)
	Kadu	0.37***	(0.23 - 0.60)	0.5*	(0.30 - 0.85)
	Kano	2.49**	(1.41 - 4.41)	1.64+	(0.94 - 2.87)
	Katsi	0.83	(0.51 - 1.36)	1.05	(0.64 - 1.72)
	Kebbi	1.06	(0.65 - 1.73)	1.6	(0.91 - 2.80)
	Kogi	4.78***	(2.59 - 8.82)	1.62	(0.80 - 3.32)
	Kwara	6.29***	(3.33 - 11.89)	1.83	(0.66 - 5.03)
	Lagos	26.28***	(14.34 - 48.19)	3.73***	(1.85 - 7.49)
	Sarawa	3.29***	(1.99 - 5.44)	1.98*	(1.04 - 3.75)
	Niger	1.48	(0.88 - 2.47)	1.34	(0.82 - 2.18)
	Ogun	3.71***	(2.13 - 6.45)	0.39*	(0.18 - 0.85)
	Ondo	11.38***	(6.22 - 20.83)	2.48*	(1.16 - 5.27)
	Osun	4.72***	(2.45 - 9.11)	0.92	(0.38 - 2.20)
	Oyo	4.64***	(2.51 - 8.57)	0.91	(0.42 - 1.99)

	Plateau	5.66***	(3.13 - 10.25)	3.73***	(1.96 - 7.10)
	Rivers	6.59***	(3.28 - 13.22)	1.02	(0.42 - 2.50)
	Sokoto	0.34***	(0.19 - 0.61)	0.47*	(0.26 - 0.86)
	Taraba	1.29	(0.68 - 2.45)	1.15	(0.59 - 2.24)
	Yobe	0.54*	(0.29 - 0.98)	0.66	(0.35 - 1.23)
	Zamfara	0.6+	(0.35 - 1.04)	0.79	(0.43 - 1.45)
	FCT Abuja	9.53***	(5.50 - 16.53)	2.62**	(1.45 - 4.76)
Ethnicity	Hausa (reference)	1.00 (<0.001)		1.00(<0.001)	
	Igbo	8.66***	(6.54 - 11.47)	2.81***	(1.61 - 4.88)
	Yoruba	9.49***	(7.06 - 12.74)	2.05*	(1.11 - 3.79)
	Other ethnic group	3.86***	(3.12 - 4.79)	1.58**	(1.17 - 2.13)
Mother's education	None (reference)	1.00 (<0.001)		1.00(<0.001)	
	Primary	3.05***	(2.43 - 3.83)	1.66***	(1.25 - 2.20)
	Secondary/-technical	6.78***	(5.47 - 8.42)	2.22***	(1.63 - 3.02)
	Higher	29.02***	(19.47 - 43.25)	5.6***	(3.41 - 9.20)
	Non-formal	0.73*	(0.54 - 0.99)	1.11	(0.81 - 1.53)
Wealth quintile	Poorest (reference)	1.00 (<0.001)		1.00(<0.001)	
	Poorer	2.28***	(1.72 - 3.03)	1.71***	(1.29 - 2.27)
	Middle	4.17***	(3.12 - 5.55)	2.01***	(1.45 - 2.80)
	Richer	8.9***	(6.49 - 12.23)	2.62***	(1.86 - 3.70)
	Richest	23.83***	(17.46 - 32.53)	4.67***	(3.14 - 6.93)
Birth order	1st (reference)	1.00 (<0.001)			
	2-3	1.16	(0.95 - 1.43)		
	4-6	0.99	(0.80 - 1.23)		
	7+	0.5***	(0.38 - 0.65)		
Mother's age at first birth	20-34 (reference)	1.00 (<0.001)		1.00 (<0.05)	
	<20	0.44***	(0.34 - 0.56)	0.83	(0.64 - 1.08)
	35+	1.08	(0.88 - 1.32)	1.3*	(1.01 - 1.68)
Mother's last delivery in facility	No (reference)	1.00 (<0.001)		1.00 (<0.001)	
	Yes	6.19***	(5.23 - 7.32)	1.88***	(1.57 - 2.26)

+ p-value<0.1, *p-value<0.05, **p-value<0.01, ***p-value<0.001. MCV vaccination status based on vaccination card or mother's recall.

Figure 10. State level maps showing the geographical variations in % Hausa (a), % home deliveries (b), % poorest wealth quintile (c), % uneducated mothers (d), % young mothers (e) 2016.

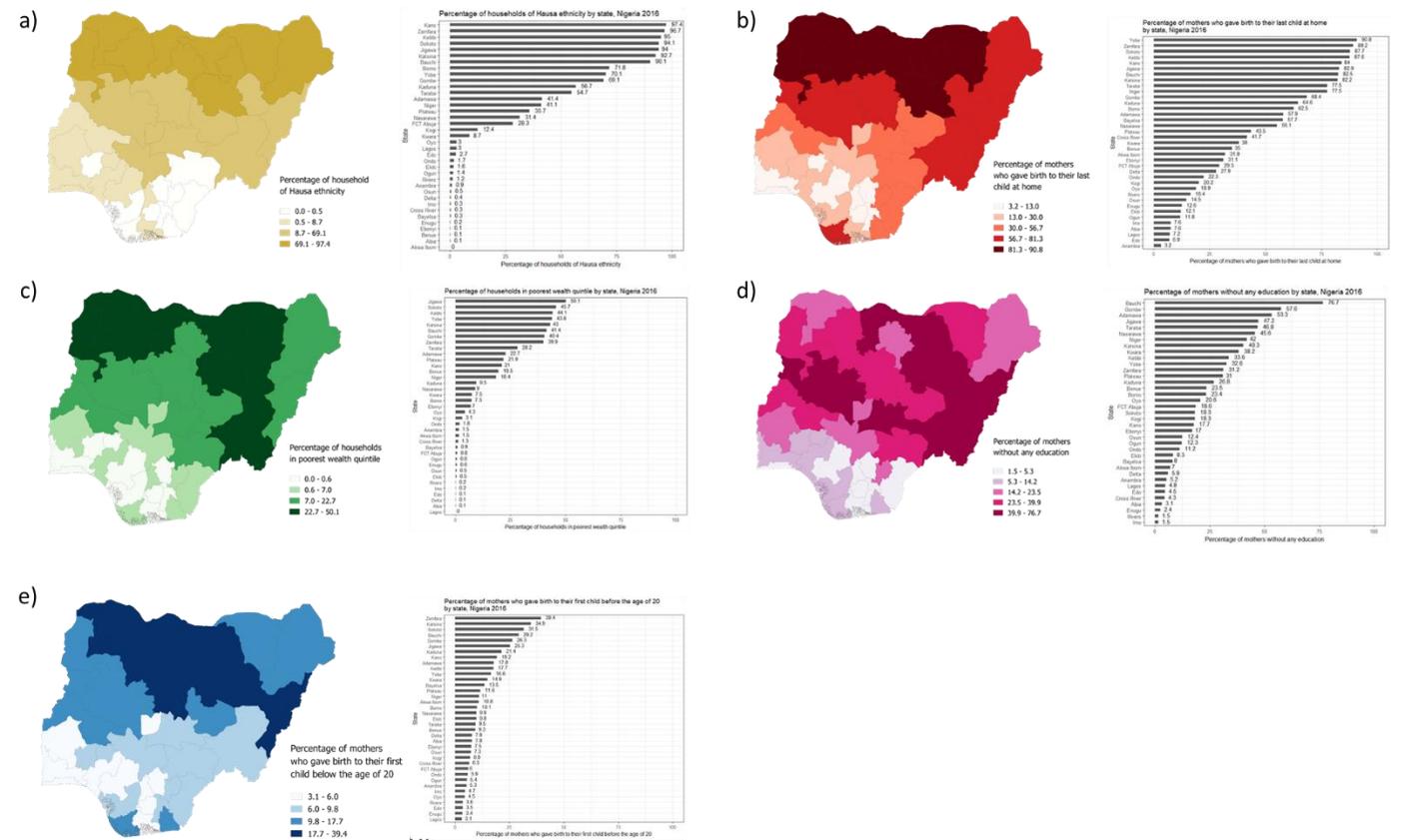


Table 13 shows the results of the univariate and multivariate logistic regression analysis on determinants of SIA participation among children between the ages of 12 and 23 months. Participation in SIA is significantly different across states with odds of participating in SIA ranging from 0.08 in Lagos to 2.97 in Akwa Ibom as compared to Borno. This indicates that the ability of the SIAs to mobilize the community to participate is not equal across the states.

Interestingly, children whose mother is higher educated have lower odds of vaccination through SIAs than those whose mother is not educated, and the odds of being vaccinated through SIAs decreases with increasing level of mother's education.

A similar effect was found for wealth quintile, where children from richer wealth quintiles are less likely to participate in SIAs than children from the poorest wealth quintile. This could indicate that mother's with a higher level of education or from richer wealth quintiles are more likely to find their way to routine immunization services, whereas mother's with a lower level of education or from a poor wealth quintile might be more dependent on SIAs to provide immunization services for their children.

Table 13. Results of the univariate and multivariate analysis on determinants of participation in any SIA among children 12-23 months in Nigeria, 2016.

Variables		Univariate		Multivariate	
		B (p-value)	95%CI	B (p-value)	95%CI
Sex	Male (reference)	1.00 (0.12)			
	Female	1.16	(0.96 - 1.40)		
Type of place of residence	Rural (reference)	1.00 (<0.001)			
	Urban	0.53**	(0.36 - 0.78)		
State	Borno(reference)	1.00 (<0.001)		1.00 (<0.001)	
	Abia	0.33+	(0.10 - 1.08)	0.55	(0.17 - 1.85)
	Adamawa	0.22*	(0.06 - 0.82)	0.16**	(0.04 - 0.64)
	Akwa Ibom	2.01	(0.73 - 5.51)	2.97*	(1.08 - 8.20)
	Ambra	1.68	(0.57 - 4.97)	2.73+	(0.89 - 8.36)
	Bauchi	2.04	(0.73 - 5.76)	1.22	(0.40 - 3.69)
	Bayelsa	0.74	(0.26 - 2.15)	1.15	(0.39 - 3.33)
	Benue	0.5	(0.14 - 1.82)	0.47	(0.13 - 1.70)
	Cross River	1.01	(0.34 - 2.95)	1.33	(0.45 - 3.93)
	Delta	0***	(0.00 - 0.00)	0***	(0.00 - 0.00)
	Ebonyi	0.27*	(0.08 - 0.89)	0.28*	(0.08 - 0.97)
	Edo	0.12*	(0.02 - 0.70)	0.2+	(0.04 - 1.11)
	Ekiti	0.42	(0.11 - 1.69)	0.66	(0.16 - 2.76)
	Enugu	0.32+	(0.09 - 1.17)	0.52	(0.14 - 1.91)
	Gombe	1.85	(0.62 - 5.51)	1.12	(0.35 - 3.61)
	Imo	0.42	(0.14 - 1.25)	0.72	(0.24 - 2.18)
	Jigawa	3.35*	(1.21 - 9.26)	1.92	(0.63 - 5.80)
	Kadu	1.29	(0.45 - 3.69)	1.38	(0.44 - 4.36)
	Kano	0.9	(0.33 - 2.41)	0.69	(0.24 - 1.99)
	Katsi	2.49+	(0.84 - 7.40)	1.6	(0.51 - 5.05)
		(1.46 - 11.81)	-		
Kebbi	4.16**		2.47	(0.80 - 7.67)	
Kogi	0.08**	(0.01 - 0.46)	0.09**	(0.01 - 0.55)	

	Kwara	0.27*	(0.08 - 0.93)	0.29+	(0.08 - 1.03)
	Lagos	0.05***	(0.01 - 0.19)	0.08***	(0.02 - 0.32)
	sarawa	1.65	(0.57 - 4.77)	1.43	(0.47 - 4.29)
	Niger	1.14	(0.36 - 3.61)	0.78	(0.24 - 2.57)
	Ogun	0.3	(0.07 - 1.35)	0.42	(0.09 - 1.97)
	Ondo	0.28*	(0.08 - 0.98)	0.33+	(0.09 - 1.22)
	Osun	1.37	(0.43 - 4.41)	2	(0.59 - 6.84)
	Oyo	0.19*	(0.05 - 0.70)	0.26*	(0.07 - 0.92)
	Plateau	0.33+	(0.09 - 1.22)	0.29+	(0.08 - 1.10)
	Rivers	0.4	(0.07 - 2.14)	0.69	(0.13 - 3.76)
	Sokoto	2.9+	(0.98 - 8.55)	1.59	(0.50 - 5.02)
	Taraba	0.18*	(0.04 - 0.82)	0.14*	(0.03 - 0.67)
	Yobe	1.11	(0.29 - 4.27)	0.75	(0.20 - 2.82)
	Zamfara	0.43	(0.12 - 1.51)	0.22*	(0.06 - 0.85)
	FCT Abuja	1.79	(0.65 - 4.93)	2.53+	(0.90 - 7.09)
Ethnicity	Hausa (reference)	1.00 (<0.001)			
	Igbo	0.32***	(0.22 - 0.45)		
	Yoruba	0.21***	(0.13 - 0.33)		
	Other ethnic group	0.54***	(0.38 - 0.75)		
Mother's education	None (reference)	1.00 (<0.001)		1.00 (<0.001)	
	Primary	0.42***	(0.29 - 0.60)	0.52**	(0.34 - 0.80)
	Secondary/-technical	0.26***	(0.20 - 0.35)	0.39***	(0.27 - 0.55)
	Higher	0.21***	(0.14 - 0.33)	0.36***	(0.21 - 0.62)
	Non-formal	1.15	(0.81 - 1.63)	1.01	(0.68 - 1.49)
Wealth quintile	Richest (reference)	1.00 (<0.001)		1.00(<0.05)	
	Poorest	4.96***	(3.36 - 7.32)	1.85*	(1.09 - 3.15)
	Poorer	3.36***	(2.28 - 4.94)	1.47	(0.89 - 2.43)
	Middle	2.31***	(1.54 - 3.46)	1.33	(0.84 - 2.12)
	Richer	1.22	(0.85 - 1.74)	0.87	(0.57 - 1.33)
Birth order	2 - 3(reference)	1.00 (<0.001)			
	1st	0.92	(0.67 - 1.26)		
	4-6	1.32+	(0.99 - 1.77)		
	7+	1.63**	(1.21 - 2.19)		
Mother's age at first birth	20-34 (reference)	1.00 (0.22)			
	<20	1.32+	(0.95 - 1.84)		
	35+	1.01	(0.73 - 1.41)		
Mother's last delivery in facility	Yes (reference)	1.00 (<0.001)			
	No	2.33***	(1.74 - 3.12)		

+ p-value<0.1, *p-value<0.05, **p-value<0.01, ***p-value<0.001. MCV vaccination status based on vaccination card or mother's recall.

Discussion and limitations

The aim of the analysis was to identify determinants associated with measles vaccination status among children aged 12 to 23 months and participation in SIAs among children vaccinated against measles aged 12-23 months. The results of the multivariable models suggest that measles vaccination status of children is associated with state, ethnicity, wealth quintile, mother's level of education, mother's age at first birth and place of delivery of mother's last child. Furthermore, these determinants are predominantly prevalent in northern states of Nigeria. These results could be used to better target communities with a certain risk profile. In addition, SIA participation was associated with state, mother's level of education and wealth quintile. A possible explanation for geographical differences in SIA participation could be that the exposure to SIA's are different across states. However - accounting for that in the multivariate model - the model still suggests that children from women who are higher educated and/or from a higher wealth quintile are less likely to participate in an SIA. Although SIA participation as included in this analysis is not specific for measles SIA, it might give some insight into participation in SIA in general.

The results of the analysis should be interpreted with caution. First of all, when working with survey data one should always be aware of recall bias. Recall bias might result in the misclassification of participants. For example, due to recall bias a child might be classified as immunized against measles when they are not, or not immunized against measles when they are. This type of misclassification is called 'differential misclassification' or 'non-random misclassification' and this can result in either an overestimation or underestimation of the reported associations. Second of all, a household survey by design excludes those children who are possibly the most vulnerable such as those in an orphanage or institutionalized in any other way.

Annex 8: Detailed stakeholder interview schedule

Table 14: Overview of respondents to be included for qualitative data collection on different levels of health system*		
Level and number of respondents	Number of respondents	Type of respondents
Federal level IDIs	N = 8	MTCC members, measles desk members, UNICEF, AFENET, CHAI, NCDC,
State Level IDIs	N = 6 per state	State immunization officer (SIO); Campaign Focal person (WHO/UNICEF/AFNET focal person); NEPI supervisor; monitoring and evaluation officer
Observations at health facilities	N = 6 per LGA	Observe activities of all stakeholders in a health facility
Observations during review meetings	N = 2 per LGA and N = 1 per state	Observations activities of all stakeholders during review meetings
LGA level IDIs	N = 3 per LGA	Local government immunization officers (LIO); social mobilization committee (SMC) member; cold chain/logistics officer
Facility level IDIs	N = 2 facilities per LGA and 4 IDIs per facility	2 vaccinators, 1 recorder and 1 mobiliser.
Ward Level IDIs	N = 2 per LGA	community leader, ward development committee (WDC) member
Community FGD's	N = 2 per LGA	older women (40 and above), or young women (15 – 39 but married with children) Or, older men (40 and above) and young men (15 – 39 but married with children)

- See next table 15 for a more detailed overview of the interviews, FGDs and observations

Table 14: Detailed information on the IDIs, observations and FGDs per state						
Sokoto State						
22 IDIs, 12 observations (6 per LGA) and 4 FGDs per state.						
LGA	State Level IDIs N = 6 per state	Observations at health facility N = 6 Per LGA	LGA level interviews IDIs N = 3 per LGA	Facility level IDIs 2 facilities per LGA N = 4	Ward Level IDIs N = 2 per LGA	Community FGD's N = 2 per LGA
Bodinga	<ol style="list-style-type: none"> 1. State immunization officer (SIO) 2. Campaign Focal person (WHO/UNICEF/AFNET focal person) 3. NEPI supervisor (if NEPI supervisor is same person as SIO – call to confirm replacement) 	<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 	<p>2 vaccinators, 1 recorder and 1 mobiliser.</p> <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 1. Community leader 2. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 1. Older women (40 and above) 2. young women (15 – 39 but married with children)
Tangaza	<ol style="list-style-type: none"> 4. Monitoring and Evaluation Officers 	<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 	<p>2 vaccinators, 1 recorder and 1 mobiliser.</p> <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 1. Religious leader 2. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 1. Men (married with children – men of reproductive age) 2. young women (15 – 39 but married with children)

Gombe State

22 IDIs, 12 observations (6 per LGA) and 4 FGDs per state.

LGA	State Level IDIs	Observations at health facility	LGA level interviews IDIs	Facility / out post level IDIs	Ward Level IDIs	Community FGDs
	N = 4 per state	N = 6 Per LGA	N = 3 per LGA	2 facilities per LGA N = 4 per LGA	N = 2 per LGA	N = 2 Per LGA
Kwami	<ol style="list-style-type: none"> 1. State immunization officer (SIO) 2. Campaign Focal person (WHO/Unicef/AFNET focal person) 3. NEPI supervisor (if NEPI supervisor is same person as SIO – call to confirm replacement) 4. Monitoring and Evaluation Officers 	<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 	<p>2 vaccinators, 1 recorder and 1 mobiliser.</p> <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 1. Community leader 2. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 1. Older women (40 and above) 2. young women (15 – 39 but married with children)
Shomgom		<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 	<p>2 vaccinators, 1 recorder and 1 mobiliser.</p> <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 1. Religious leader 2. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 1. Men (married with children – men of reproductive age) 2. young women (15 – 39 but married with children)

Niger State						
24 IDIs, 12 observations (6 per LGA) and 4 FGDs per state						
LGA	State Level IDIs N = 4 per state	Observations at health facility N = 6 Per LGA	LGA level interviews IDIs N = 4 per LGA	Facility level IDIs 2 facilities per LGA N = 4	Ward Level IDIs N = 2 per LGA	Community FGDs N = 2 per LGA
Chanchaga (Niger East)	<ol style="list-style-type: none"> 1. State immunization officer (SIO) 2. Campaign Focal person (WHO/UNICEF/AFNET focal person) 3. NEPI supervisor (if NEPI supervisor is same person as SIO – call to confirm replacement) 4. Monitoring and Evaluation Officers 	<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 4. NGO participating in the campaign 	<p>2 vaccinators, 1 recorder and 1 mobiliser.</p> <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 1. Community leader 2. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 1. Older women (40 and above) 2. young women (15 – 39 but married with children)
Agaie (Niger South)		<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 4. NGO participating in the campaign 	<p>2 vaccinators, 1 recorder and 1 mobiliser.</p> <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 1. Religious leader 2. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 1. Men (married with children – men of reproductive age) 2. young women (15 – 39 but married with children)

Imo						
24 IDIs, 12 observations (6 per LGA) and 4 FGDs per state.						
LGA	State Level IDIs	Observations at health facility	LGA level interviews IDIs	Facility level IDIs 2 facilities per LGA	Ward Level IDIs	Community FGDs
	N = 4 per state	N = 6 Per LGA	N = 4 per LGA	N = 4	N = 2 per LGA	N = 2 per LGA
Orlu (Orlu senatorial zone)	<ol style="list-style-type: none"> 1. State immunization officer (SIO) 2. Campaign Focal person (WHO/UNICEF/AFNET focal person) 3. NEPI supervisor (if NEPI supervisor is same person as SIO – call to confirm replacement) 4. Monitoring and Evaluation Officers 	<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 2. Local government immunization officers (LIO) 3. Social Mobilization Committee (SMC) member 4. Cold Chain/Logistics Officer 5. NGO participating in the campaign 	<p>2 vaccinators, 1 recorder and 1 mobiliser.</p> <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 3. Community leader 4. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 3. Older women (40 and above) 4. young women (15 – 39 but married with children)
Onuimo (Okigwe senatorial zone)		<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 4. NGO participating in the campaign 	<p>2 vaccinators, 1 recorder and 1 mobiliser.</p> <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 3. Religious leader 4. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 3. Men (married with children – men of reproductive age) 4. young women (15 – 39 but married with children)

Edo						
24 IDIs, 12 observations (6 per LGA) and 4 FGDs per state.						
LGA	State Level IDIs N = 4 per state	Observations at health facility N = 6 Per LGA	LGA level interviews IDIs N = 4 per LGA	Facility level IDIs 2 facilities per LGA N = 4	Ward Level IDIs N = 2 per LGA	Community FGDs N = 2 per LGA
OREDO Edo south	1. State immunization officer (SIO) 2. Campaign Focal person (WHO/UNICEF/AFNET focal person) 3. NEPI supervisor (if NEPI supervisor is same person as SIO – call to confirm replacement) 4. Monitoring and Evaluation Officers	1. Observe activities in a health facility	1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 4. NGO participating in the campaign	2 vaccinators, 1 recorder and 1 mobiliser. A total of 4 interviews at the health facility per LGA	1. Community leader 2. Ward Development Committee (WDC) member	1. Older women (40 and above) 2. Young women (15 – 39 but married with children)
Igueben (Edo Central)		1. Observe activities in a health facility	1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 4. NGO participating in the campaign	2 vaccinators, 1 recorder and 1 mobiliser. A total of 4 interviews at the health facility per LGA	1. Religious leader 2. Ward Development Committee (WDC) member	1. Men (married with children – men of reproductive age) 2. Young women (15 – 39 but married with children)

Oyo						
24 IDIs, 12 observations (6 per LGA) and 4 FGDs per state.						
LGA	State Level IDIs	Observations at health facility	LGA level interviews IDIs	Facility level IDIs 2 facilities per LGA	Ward Level IDIs	Community FGDs
	N = 4 per state	N = 6 Per LGA	N = 4 per LGA	N = 4	N = 2 per LGA	N = 2 per LGA
Afjio (central senatorial Zone)	<ol style="list-style-type: none"> 1. State immunization officer (SIO) 2. Campaign Focal person (WHO/UNICEF/AFNET focal person) 3. NEPI supervisor (if NEPI supervisor is same person as SIO – call to confirm replacement) 	<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 4. NGO participating in the campaign 	<ol style="list-style-type: none"> 2 vaccinators, 1 recorder and 1 mobiliser. <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 1. Community leader 2. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 1. Older women (40 and above) 2. Young women (18 – 39 but married with children)
Ibadan North (South senatorial Zone)	<ol style="list-style-type: none"> 4. Monitoring and Evaluation Officers 	<ol style="list-style-type: none"> 1. Observe activities in a health facility 	<ol style="list-style-type: none"> 1. Local government immunization officers (LIO) 2. Social Mobilization Committee (SMC) member 3. Cold Chain/Logistics Officer 4. NGO participating in the campaign 	<ol style="list-style-type: none"> 2 vaccinators, 1 recorder and 1 mobiliser. <p>A total of 4 interviews at the health facility per LGA</p>	<ol style="list-style-type: none"> 1. Religious leader 2. Ward Development Committee (WDC) member 	<ol style="list-style-type: none"> 1. Men (married with children – men of reproductive age) 2. Young women (18 – 39 but married with children)

Annex 8: Tools for qualitative Interviews

In-depth interview guide – State level actors

Example of respondents: State Immunization Officer (SIO), Health Educators, Campaign Focal persons, NEPI supervisor, Monitoring and Evaluation Officers, Cold Chain/Logistics Officers, NGOs, private organizations, WHO/UNICEF representatives

Introduction:

- Introduce yourself and explain the purpose of the interview
- Hand over the informed consent form and answer any questions raised by the respondent
- If the respondent signs the form proceed to the questions, otherwise thank the respondent for his/her time and say goodbye.

Questions:

Reminder:

- Make sure that you ask questions about this AND the previous campaign in 2015/2016. For ALL questions below please probe and ask: **“How about the previous Measles campaign? Are there any significant differences? Were any significant changes made for this campaign?”**
- Ask for all questions below ‘why questions’ and examples

1. What measles campaign activities are going on in your state at the moment?
2. What is your role in the measles campaign?
 - Explain your role in the current campaign
 - Explain your role in the past campaigns
3. Who was involved in the roll out (planning, mobilization and implementation) of the measles campaign? (Probe: community leaders, NGOs, private institutions, teachers, schools?)
 - What was their role?
 - Comparing the current campaign with past campaign is there a difference in the roles of these persons?
4. How do you relate with federal level for these campaigns?
 - How is contact organized? Did you get any support for the campaign and from whom?
Probe: for
 - Technical support?
 - Financial support?
 - Training support?
 - Supervision support?

Planning support?
Mobilization support?

- Comparing the current campaign with past campaign is there a difference in how you relate with federal level?
5. Are there any protocols/guidelines for the campaign and were they used?
 - Did you adapt them for your State? (Probe: were they useful? Can we see them and make a copy or picture?)
 - Were these available in previous campaign?
 - Have these protocols /guidelines changed since the former campaign? Improvement?
 6. How were the people informed about the measles campaign in the communities (Flyers, radio messages etc.?)
 - How were the people made aware of the fact that a campaign was going to occur?
 - When did this begin, who carried this out? Was this the only method used (Probe for others)
 - Were these available in previous campaign?
 7. What was the role of LGAs and Health Facility in this campaign?
 - Comparing the current campaign with past campaign is there a difference in their role?
 8. How were the logistics organized for the campaign? (Probe: are there extra vaccines, needles, syringes, sterilization materials, human resources, transport (fuel) and or allowances provided for staff (and community members?) Where there shortages?
 - Comparing the current campaign with past campaign is there a difference in how logistics was organized? What changed?
 9. How was the implementation monitored and documented? (Probe: can we see any documentation?)
 - Is there a difference in how this campaign is monitored and documented when compared with the previous campaign?
 10. What is the overall coverage for measles vaccination in your state and for other vaccinations? and the different LGAs? (Probe: did this change due to the campaign?) Coverage due to Routine Immunization and coverage due to campaign vaccination
 11. Who is/ was not coming for the vaccinations? (Probe: children from certain communities, religion, ethnic groups, vulnerable children (orphans, HIV infected)?
a: children who miss out during RI?
b: children who miss out during campaign
 - Are there children that were missed?
 12. What was been done to reach every ward and every child (Probe: did this work? Why not?)
 - Were any communities missed?
 13. What is the recording system for vaccinations during the campaign? (Probe: only tallying (specific per age group and gender?), in registers? Child vaccination cards? Added to routine information system (HMIS or DHIS2) or separately reported?)

14. Were there any activities after the campaign? (Probe: mop up (door-to door) vaccination activities, post coverage survey?) In all LGA's?
15. What was the objective of the campaign and have you reached it? Probe for objectives to change processes during the campaign and for the measles coverage)
16. What was successful about the campaign? Why, examples?
 - What was not and Why, give examples?
17. What problems were faced during the campaign?
 - How were they solved? (Probe: Were there any delays? Time or resources constraints? Probe for effect on routine vaccination programme)
18. Did you record any AEFI – adverse reactions on children following the vaccination? In the former campaign and in this campaign (may be too short interval to know... an abscess can take 3 days to develop...
 - If yes, how did you handle it?
 - Is it possible that some AEFI were missed? Why do you say so?
19. Did other campaigns (immunization, CHW etc) affect the measles campaign?
 - How?
20. Do you think that some campaigns can be combined eg, Child Health Days and Immunization campaign?
21. What did you like about the campaign? (Probe: Any unintended positive effects?)
 - What did you not like? (Probe: Any unintended negative effects?)
22. How will you describe the following activities during the campaign?
 - Training? Was it useful? adequate? Explain what you liked most about the training?
 - Supervision - from whom and how did it help you?
 - Planning – was it useful and what was different between planning for this campaign and the previous one?
23. How was waste management handled during the campaign at ward, LGA and State levels?
 - How is waste management for this campaign different from previous campaigns?
24. How have campaigns influenced changes in regular immunization program? (Probe: Reach Every Ward (REW) strategy, National Programme on Immunization (NPI), logic systems, communication among stakeholders, involvement of other stakeholders, positive and negative intended and unintended effects).
25. What lessons were learned during the last campaign?
 - Are they used during this campaign?
26. Are lessons learned documented?
 - Are the review meetings documented? How?

27. How would you improve the campaign?
28. Do you receive feedback from Federal Level about the results of your campaign?
29. Do you inform LGAs about the results of the campaign?
30. Do you participate in routine immunization?
- Are you able to keep the health posts open for routine immunization during campaigns?
 - In your opinion, how has campaigns (measles and other campaigns) impacted on routine immunization?
 - Are you able to continue to deliver general health services during the campaign at all health facilities?
31. How many campaigns have you participated in since the last 6 months? Did you receive any financial support for your participation?
32. Did you receive any payments / allowances for this current campaign?
- If yes, how and when and for what were you paid?
 - Eventually: how much was paid.
33. Can different immunization campaigns be combined and held as one? How and why?

Closure:

- Ask the respondent if he/she has any remaining comments or questions
- Thank the respondent for his/her time and participation in the study

In-depth interview guide – LGA level actors

Example of respondents: Local government immunization officers (LIO), Principal Medical Officers of Health (PMOH), Social Mobilization Committee (SMC) members and the Cold Chain/Logistics Officers, other organizations involved in campaigns like NGOs, private hospitals.

Introduction:

- Introduce yourself and explain the purpose of the interview
- Hand over the informed consent form and answer any questions raised by the respondent
- If the respondent signs the form proceed to the questions, otherwise thank the respondent for his/her time and say goodbye.

Questions:

Reminder:

- Make sure that you ask questions about this AND the previous campaign in 2015/2016. For ALL questions below please probe and ask: **“How about the previous Measles campaign? Are there any significant differences? Were any significant changes made for this campaign?”**
- Ask for all questions below ‘why questions’ and examples

1. What measles campaign activities are going on in your LGA at the moment?
2. What is your role in the measles campaign?
 - a. Explain your role in the current campaign
 - b. Explain your role in the past campaigns
3. How was and is the interaction with the State level? (probes, provision of materials, technical supervision, logistic support, feed-back from earlier campaigns etc.)
4. Who was involved in the roll out (planning, mobilization and announcement) and implementation, inclusive of post survey and mop up activities of the measles campaign? (Probe: community leaders, NGOs, private institutions, teachers, schools?)
 - a. What was their role?
 - b. Comparing the current campaign with the past campaign, is there a difference in the roles of these persons?
5. Did you get any support for the campaign and from whom? (Probe: for -
 - a. Technical support?
 - Financial support?
 - Supervision support?
 - Training support?
 - Planning support?

Mobilization support?

Did someone from state/LGA level visit you?

- b. Comparing the current campaign with the past campaign, is there a difference in the support received for the campaigns?
6. Are there any protocols/guidelines for the campaign? and
 - a. were they used? (Probe: were they useful? Can we see them and make a copy or picture?)
 - b. Who provided these guidelines?
 - c. Were they available in previous campaigns?
 - d. Have these protocols /guidelines changed since the former campaign? Improvement?
 7. How were the logistics organized for the campaign? (Probe: are there extra vaccines, needles, syringes, sterilization materials, human resources, transport (fuel) and or allowances provided for staff (and community members?) Where there shortages?
 - a. Comparing the current campaign with the past campaign, is there a difference in how logistics was organized? What changed?
 8. Which children were vaccinated? (Probe: Every child? Age range? Only those that were not vaccinated before?)
 9. What is the overall coverage in your area? High/low? (Probe: did this change due to the campaign?)
 10. Who is/ was not coming for the vaccinations? (Probe: children from certain communities, religion, ethnic groups, vulnerable children, distance (orphans, HIV infected)
 - a: children who miss out during RI?
 - b: children who miss out during campaign
 11. Was it possible to reach every ward/ child?
 - a. Are there children that were missed?
 - b. What was been done to reach every ward and every child (Probe: did this work? Why not?)
 - c. Comparing the current campaign with the past campaign, is there a difference in efforts to reach every child and ward? What is the difference?
 12. What is the recording system for the measles vaccinations during the campaign? (Probe: only tallying (specific per age group and gender?), in registers at child vaccination cards? Added to routine information system (HMIS or DHIS2) or separately reported?)
 13. How was the implementation monitored and documented? (Probe: can we see any documentation?)
 - a. Were you visited by monitors? If yes, from where?
 - b. Were you supervised? If yes by whom? Was it useful?
 - c. How do you document your activities?

14. Were there any activities after the campaign? (Probe: mop up (door-to door) vaccination activities, post coverage survey?)
15. What was the objective of the campaign and have you reached it? (probe, objective in coverage and may be specific objectives to change the planning or implementation of the campaign)
16. What was successful about the campaigns? Why? Give examples
 - a. What was not successful? Why? Give examples
17. What problems were faced during the campaigns?
 - a. How were they solved? (Probe: Were there any delays? Time or resources constraints?)
18. Did you record any AEFI – adverse reactions on children following the vaccination? In the former campaign? And this campaign?
 - a. If yes, how did you handle it?
 - b. Is it possible that some AEFI were missed? Why do you say so?
19. Did other immunization campaigns affect the measles campaign?
 - a. How?
20. What did you like about the campaign? (Probe: Any unintended positive effects?)
 - a. What did you not like? (Probe: Any unintended negative effects?)
21. How will you describe the following activities during the campaign?
 - a. Training? Was it useful? adequate? Explain what you liked most about the training?
 - b. Supervision - from whom and how did it help you?
 - c. Planning – was it useful and what was different between planning for this campaign and the previous one?
22. How was waste management handled during the campaign at ward, LGA and State levels?
 - a. How is waste management for this campaign different from previous campaigns?
23. How have campaigns influenced changes in regular immunization program? Reach Every Ward (REW) strategy, National Program on Immunization (NPI), logic systems, communication among stakeholders, involvement of other stakeholders, positive and negative intended and unintended effects).
24. What lessons were learned during the last campaign?
 - a. Are they used during this campaign?
25. Are lessons learned documented?
 - a. Are review meetings documented? How?
26. Do you receive feedback from State Level about the results of your campaign?
27. Do you inform Wards about the results of the campaign?
28. Do you participate in routine immunization?

- a. Are you able to keep the health posts open for routine immunization during campaigns?
 - b. In your opinion, how has campaigns (measles and other campaigns) impacted on routine immunization?
 - c. Are you able to keep all health facilities open during the campaign for general health services?
29. How many campaigns have you participated in since the last 6 months and did you receive any financial support for your participation?
30. Did you receive any payments / allowances for this current campaign?
- a. If yes, how and when and for what were you paid?
 - b. Eventually: how much was paid.
31. What are your suggestions to improve the campaign?
32. Did other campaigns (immunization, CHW etc) affect the measles campaign?
- a. How?
33. Do you think that some campaigns can be combined eg, Child Health Days and Immunization campaign?

Closure:

- Ask the respondent if he/she has any remaining comments or questions
- Thank the respondent for his/her time and participation in the study

In-depth interview guide – Facility health workers

Example of respondents: Ward focal persons on immunization, Ward Development Committee (WDC) members, community health extension workers

Introduction:

- Introduce yourself and explain the purpose of the interview
- Hand over the informed consent form and answer any questions raised by the respondent
- If the respondent signs the form proceed to the questions, otherwise thank the respondent for his/her time and say goodbye.

Questions:

Reminder:

- Make sure that you ask questions about this AND the previous campaign in 2015/2016. For ALL questions below please probe and ask: **“How about the previous Measles campaign? Are there any significant differences? Were any significant changes made for this campaign?”**
- Ask for all questions below ‘why questions’ and examples

1. Are there any measles campaign activities going on in your health facility/community at the moment? (Probe: Please describe, how did it look like?)
2. What is your role in the measles campaign?
 - a. Describe your role in the current campaign?
 - b. How about the previous campaign?
3. Who was involved in the roll out (planning, mobilization, announcement, implementation) of the measles campaign? (Probe: community leaders, NGOs, private institutions, teachers, schools? What was their role?)
 - a. What is their role?
 - b. Comparing the current campaign with the past campaign is there a difference in the roles of these persons?
4. Did you get any support for the campaign and from whom?
 - a. Technical support?
Financial support?
Training Support?
Supervision support?
 - b. Comparing the current campaign with the past campaign is there a difference in the way you were supported?

- c. What is the role of the LGA?)
5. Are there any protocols/guidelines for the campaign and were they used? (Probe: were they useful? Can we see them and make a copy or picture?)
 - a. Were these available in previous campaigns?
 6. Are there flyers or other material to inform the community? Radio messages? (pictures)
 7. How were the logistics organized for the campaign?
 - a. Did your Health Facility provide equipment and supplies or did these come separately? (Probe: are there extra vaccines, needles, syringes, sterilization materials, human resources, transport (fuel) and or allowances provided for staff (and community members?)
 - b. Comparing the current campaign with past campaign, is there a difference in how logistics was organized?
 8. Which children were vaccinated? (Probe: Every child? Age range? Only those that were not vaccinated before?)
 9. Who was not coming for the vaccinations? (Probe: children from certain communities, religion, ethnic groups, vulnerable children (orphans, HIV infected)
 - a. Are there children that were missed?
 10. What actions are taken to ensure every child is vaccinated? (probe: did this work? Why or why not?)
 11. What is the overall coverage for measles in your catchment area? And for other vaccinations? (Probe: did this change due to the campaign/How about the previous campaign?)
 12. What is the recording system for vaccinations during the campaigns? (Probe: only tallying (specific per age group and gender?), in registers? Child Vaccination Card? Added to routine information system (HMIS or DHIS2) or separately reported?)
 13. Were there any activities after the campaign? (Probe: mob up (door-to door) vaccination activities, post coverage survey?)
 14. Do you participate in routine immunization?
 - a. What is your role
 15. How do the campaign activities relate to your routine immunization activities?
 - a. Are you able to keep the health post open for routine immunization during campaigns?
 - b. In your opinion, how has campaigns (measles and other campaigns) impacted on routine immunization?
 - c. How many campaigns have you participated in since the last 6 months and did you receive any financial support for your participation?

16. Did you receive any payments / allowances for this current campaign?
 - a. If yes, how and when and for what were you paid?
 - b. Eventually: how much was paid.
17. Did the campaign have impact on your routine immunization activities and other work activities? (Probe: availability of materials/equipment, staff resources, work procedures)
18. Did you learn things during measles campaign that you now do differently in your normal work activities?
19. a. What was successful about the campaign? Explain with Examples
b. What was not successful? Explain with Examples
20. What problems were faced during the campaign? How were they solved? (Probe: Were there any delays? Time or resources constraints?)
21. a. What did you like about the campaign? (Probe: Any unintended positive effects?)
b. What did you not like? (Probe: Any unintended negative effects?)
22. What lessons were learned during the previous campaign? Are they used during this campaign?
23. Did you receive feedback from the LGA on the process and results of the campaign afterwards?
24. Are lessons learned documented?
 - a. Do you participate in review meetings?
 - b. Are review meetings documented?
25. How would you improve the campaign?
26. Can different immunization campaigns be combined and held as one? How and why?

Closure:

- Ask the respondent if he/she has any remaining comments or questions
- Thank the respondent for his/her time and participation in the study

In-depth interview guide –

Community leaders and Community Health Workers

Example of respondents: community leaders, religious leaders, Community Health Workers (and if involved in the campaigns may be TBA?)

Introduction:

- Introduce yourself and explain the purpose of the interview
- Hand over the informed consent form and answer any questions raised by the respondent
- If the respondent signs the form proceed to the questions, otherwise thank the respondent for his/her time and say goodbye.

Questions:

Reminder:

- Make sure that you ask questions about this AND the previous campaign in 2015/2016. For ALL questions below please probe and ask: **“How about the previous Measles campaign? Are there any significant differences? Were any significant changes made for this campaign?”**
- Ask for all questions below ‘why and how questions’ and examples

1. Are there any measles campaign activities going on in your community at the moment currently and in the past? (Probe: Please describe, how did it look like?)
2. Do you play a role in the measles campaigns?
3. Describe your role, activities in the campaign? Probe: How about in the past campaign?
4. Who are involved in the roll out of the measles campaign? (Probe: what was their role?)
5. Did you get any support for the campaign? (Probe: from whom?)
 - a. What kind of support did you receive?
 - Technical support,
 - Financial support?
 - Mobilization support?
 - Supervision support?
 - Training support?
6. a. Are there any protocols/guidelines for the campaign and were they used? (Probe: were they useful? Can we see them and make a copy or picture?)
 - a. Were these available in previous campaigns?

- b. Are there flyers or other materials to inform the community (Probe: were they useful? Can we see them and make a copy or picture?) Radio messages? Other social media for information?
7. Was the logistic part well organized?
 - a. Were there stock outs of materials or not enough staff so that children had to be sent home without immunization?
 - b. How were the logistics organized for the campaign?
 8. Do you know if most of the children receive their vaccination for measles?
 - a. Are you informed of how many children attended after the campaign? (Probe: did this change due to the campaign/How about the previous campaign?)
 - b. If you compare this type of campaign and going to the health centre to get immunization, which one do you and your community members prefer? And why?
 9. Who was not coming for the vaccinations (Probe: children from certain communities, religion, ethnic groups, vulnerable children (orphans, HIV infected)
 - a. Which children were missed?
 10. Do boys and girls children turn up to receive the measles vaccination during the campaign in the same way or is there a gender difference in attendance?
 11. What are the consequences for caregivers if their children do not come for vaccination?
 12. Where all children reached in your area?
 - a. What was been done to reach every child in your area?
 - b. Did this work? Why?
 13. Was the community motivated to participate? How were they motivated?
 14. Do you think the community appreciated the campaigns? Why, Examples?
 15. Did the campaign help your community in any way? (Probe: How? Positive/negative effects)
 16. Were there any activities after the campaign? (Probe: door to door vaccination activities, post coverage survey?)
 17. Do you think the campaign effected on normal routine vaccination activities and other health services? (Probe: Any unintended positive/negative effects? Stress with health workers, unavailability of regular services etc)
 - a. Is the health post open for routine immunization during campaigns?

- b. Are the health workers available at the health post during campaigns or are they all busy with the campaign?
18. What was successful about the campaign? Why?
 - a. What was not successful? Why?
 19. What problems were faced during the campaign?
 - a. How were they solved? (Probe: Poor Announcement, Cooperation of community)
 - b. Any delays in activities? Time or resources constraints?
 20. What did you like about the campaign? (Probe: Any unintended positive effects?)
 - a. What did you not like? (Probe: Any unintended negative effects?)
 21. What lessons were learned during the previous campaign?
 - a. Are they used during this campaign?
 22. How would you improve the campaign?
 23. In the last 6 months, how many campaigns have been conducted in your community?
 24. Did you receive any payments / allowances for this current campaign?
 - a. If yes, how and when and for what were you paid?
 - b. Eventually: how much was paid.
 25. Do you like the campaigns or will you prefer to go to the health post for all your children's immunization? Why?

Closure:

- Ask the respondent if he/she has any remaining comments or questions
- Thank the respondent for his/her time and participation in the study

Focus groups discussion guide – Male and female caretakers

Two focus group discussions per LGA:

1. Male caretakers
2. Female caretakers

Date, Time and Category of

Background Characteristics: Name, age of participants, occupation, number of children, age range of children/wards,

Introduction:

- Introduce yourself and explain the purpose of the focus group discussion and the ground rules
- Ask for oral informed consent and answer any questions raised by the respondent
- If any of the respondents do not want to participate, thank the respondent for his/her time and say goodbye. Thereafter proceed to the questions.
- Count the number of participants and note this down.

Questions:

Reminder:

- Make sure that you ask questions about this AND the previous campaign in 2015/2016. For ALL questions below please probe and ask: **“How about the previous Measles campaign? Are there any significant differences? Were any significant changes made for this campaign?”**
- Ask for all questions below ‘why and how questions’ and examples

1. Are there any measles campaign activities going on in your community at the moment? (Probe: Please describe? How did it look like? Who was involved?)
2. What did you like about the campaign? (Probe: Any unintended positive effects?)
 - a. What did you not like about the campaign? (Probe: Any unintended negative effects?)
3. Were your children vaccinated against measles during this measles campaign? (Probe:
 - a. Why did you go for vaccination?
 - b. Why did you not go for vaccination?
4. Which of your children were vaccinated? (Probe:
 - a. Every child irrespective of vaccination status?
 - b. Only those that were not vaccinated before?
 - c. What is the age range in months of your children that received vaccination?

5. What are the consequences if one does not get vaccinated?
6. Were many children vaccinated during this campaign? (Probe: Coverage in your community?)
7. Who was not coming for the vaccination (Probe: Children from certain communities, religion, ethnic groups, far distance etc.?)
 - a. Are there children that were missed?
8. Do boys and girls children turn up to receive the measles vaccination during the campaign in the same way or is there a gender difference in attendance?
9. What was been done to reach all children in this ward? Did this work?
10. Did the normal routine vaccination activities and other health services change due to the Measles campaign? (Probe: Any unintended positive/negative effects?)
11. Do you think the campaign effected on normal routine vaccination activities and other health services? (Probe: Any unintended positive/negative effects? Stress with health workers, unavailability of regular services etc.)
 - a. Is the health post open for routine immunization during campaigns?
 - b. Are the health workers available at the health post during campaigns or are they all busy with the campaign?
12. If you compare this type of campaign where a child receives one immunization and going to the health centre to get all immunization for your children, which one do you prefer? And why?
13. Are there any other things that you would like to share on Measles vaccination?

Closure:

- Ask the participants if they have any remaining comments or questions
- Thank the participants for their time and participation in the study

Annex 9: Coding book for analysis of qualitative data of the evaluation

Code	Description
1. Description of campaigns	Description of 2015 and 2017 campaigns.
2. Awareness	Is the respondent aware of activities in their state or region. Are there any activities happening in your area?
3. Role	Role of respondent or other stakeholders in 2015 (past) and 2017 (current) campaign
4. Interaction between levels (federal, state, local, community)	Provision of materials, technical supervision, logistic support from levels of government/health system
5. Implementing stakeholders	Who was involved: community leaders, NGOs, private institutions, teachers, schools
6. Support	Technical and/or financial support
7. Protocols & guidelines	Micro plan? (plans adapted to area of vaccination). Information acquired about the community to be vaccinated
8. Sensitisation community	How were people made aware of the campaign? Are there flyers or other materials to inform the community(Probe: were they useful? Can we see them and make a copy or picture?) Radio messages? Other social media for information?
9. Perception community	What did the community like about the campaign? What not? FGD community responses.
10. Respondent perception	What did you like about the campaigns? Personal response of the respondent.
11. Logistics	Are there extra vaccines, needles, syringes, sterilization materials, human resources, transport (fuel) and or allowances provided for staff. How was waste managed?

12. Monitoring	Use of tallying (specific per age group and gender), registered on child vaccination cards? Added to routine information system (HMIS or DHIS2) or separately reported?
13. Children vaccinated	Was every child vaccinated? Age range? Only those that were not vaccinated before?
14. Overall coverage	Respondent estimation of children vaccinated by percentage, High/low?
15. Missing children	Who was not coming for the vaccinations? (children from certain, religion, ethnic groups, vulnerable children, distance (orphans, HIV infected, disabled)
16. Difference in children gender	Is there a gender difference in attendance to campaigns? Are boys treated differently than girls or vice versa during vaccination process.
17. Consequences of no vaccination	What are the consequences for caretakers if their children do not come for vaccination? What are the health effects if a child is not vaccinated?
18. REW strategy	What was been done to reach every ward (REW) and every child? Community members going to homes to inform, etc.
19. Post Vaccination Activities	Mob up (door-to door) vaccination activities, post vaccination survey?
20. Successes and innovations	Successes during the campaign. Any changed processes during campaign.
21. Objectives Achieved	What were the objectives of the campaign, were they achieved?
22. Problems	Difficulties faced and/or solved? Delays or resource constrains
23. Adverse Effects	Did you record any AEFI – adverse reactions on children following the vaccination? In the former campaign and in this campaign (may be too short interval to know... an abscess can take

	<p>3 days to develop...If yes, how did you handle it?</p> <p>Is it possible that some AEFI were missed? Why do you say so?</p>
24. Unintended effects	Were there any unintended positive or negative effects in the campaign?
25. Relation to routine immunization system	How does the campaign relate to the routine immunization system? How does it compare to how vaccinations are usually done?
26. Influence on routine immunization system	How do campaign activities: REW strategy, NPI, logic systems, communication among stakeholders, involvement of other stakeholders, influence changes in the regular system?
27. Health worker lessons	Did you learn things during measles campaign that you now do differently in your normal work activities?
28. Compensation	Did you receive any payments / allowances for this campaign? If so, how, when and for what. How much?
29. Motivation	To what extent has the motivation of the health system/workers, at all levels, influenced the outcomes of the campaign?
30. Setting	What were the consequences of the changed institutional setting for the measles campaign 2017-2018?
31. Campaign Lessons learned	What were lessons learned (positive and negative) in 2015 and 2017?
32. Lessons learned documented	Were lessons learned written down in 2015 or 2017?
33. Lessons learned used	Whether lessons learned from 2015 or 2017 campaign were used to improve the campaign? Were lessons learned from 2015 campaign used to improve the 2017 campaign? Were lessons learned during the campaign e.g.

	on day one used to immediately improve activities on day two of the campaign?
34. Recommendations for improvement	Recommendations given to improve the campaigns.
35. Feedback results	Whether results of vaccination campaign were communicated by and to higher/lower level. For example does the LGA informs the State about the results/performance of the campaign. Or does the state inform the LGA how it performs compared to other LGAs? Is there any communication on this?
36. Other	All remaining data that did not fit under the other codes.
37. Other immunization campaigns	Did other immunization campaigns effect the current campaign? Should other immunization campaigns be combined?

Annex 10. Grading quantitative evidence

An assessment of the quality of the quantitative evidence was made using the GRADE criteria. These criteria are developed as a tool to appraise reported evidence. Although these criteria are initially developed for clinical studies, similar frameworks can be used to assess quality of evidence for other types of studies. The definitions of the criteria used by GRADE have been slightly adapted to fit the purpose of this evaluation, as it is not a clinical study. All evidence is graded from very low to high on the following indicators:

Risk of bias: Are the data sources used prone to bias which might affect the results or conclusions?

Imprecision: What level of precision is indicated by the 95% confidence interval of the produced estimates?

Inconsistency: Are the findings consistent, for example in time, space, conceptually or with other sources of data or evidence?

Indirectness: To what extent are the measures that are used an direct measure of the outcome or indicator of interest?

Publication bias: To what extent is the data used prone to publication bias.

An overview of the grading of evidence can be found in table 1, included a short description. It is important to note that although a single outcome might score low on either of these criteria, it can still be informative as part of a greater body of evidence, including the evidence that was derived from the qualitative study. A decision was made not to rank or grade in any way the evidence that was derived from the qualitative part of the evaluation as it was deemed unfit for the type of data. The methodology and limitation should inform on the strength of the qualitative evidence.

Table 1. Grading of quantitative evidence according to GRADE criteria

Evidence	Risk of bias	Imprecision	Inconsistency	Indirectness	Publication bias
Effect of measles campaigns on measles morbidity	High These data only reflect reported cases	NA No estimations were calculated, observational analysis only	Low Findings are consistent with other quantitative findings	Low Chosen data is a direct measure of outcome of interest	Low No evidence of publication bias
Effect of measles campaigns on measles mortality	High These data only reflect reported cases	NA No estimations were calculated, observational analysis only	Low Findings are consistent with other quantitative findings	Low Chosen data is a direct measure of outcome of interest	Low No evidence of publication bias
Effect of measles campaigns on routine immunization	High These data only reflect reported cases	NA No estimations were calculated, observational analysis only	Low Findings are consistent with other quantitative findings	Low Chosen data is a direct measure of outcome of interest	Low No evidence of publication bias
	Moderate	Moderate	Low	Low	Low

Evidence	Risk of bias	Imprecision	Inconsistency	Indirectness	Publication bias
Proportion of vaccinated children who received MCV1 for the first time during campaign	Household survey by design biased towards households and excludes institutionalized individuals Moderate	Based on estimates with high precision, but precision maybe impaired due to lack of raw data Moderate	Findings are consistent with other quantitative findings and show geographical consistency Low	Chosen data is a direct measure of outcome of interest Low	No evidence of publication bias Low
Proportion of zero-dose children who were reached by the campaign	Household survey by design biased towards households and excludes institutionalized individuals Moderate	Based on estimates with high precision, but precision maybe impaired due to lack of raw data Moderate	Findings are consistent with other quantitative findings and show geographical consistency Low	Chosen data is a direct measure of outcome of interest Low	No evidence of publication bias Low
Estimated percentage point decrease in proportion of zero-dose children	Household survey by design biased towards households and excludes institutionalized individuals Moderate	Based on estimates with high precision, but precision maybe impaired due to lack of raw data Moderate	NA Although there is no reason to assume inconsistency, for this indicator there we are unable to assess this criteria	Chosen data is a direct measure of outcome of interest Low	No evidence of publication bias Low
Difference in estimated vaccination coverage after the 2016 MVC and 2018 MVC among	Household survey by design biased towards households and excludes institutionalized individuals Moderate	Based on estimates with high precision, but precision maybe impaired due to lack of raw data Moderate	The 2016 MCV coverage as reported by MICS is different than the PMCCS 2016. Moderate	Chosen data is a direct measure of outcome of interest Low	No evidence of publication bias Low
Association between vaccination coverage and measles incidence	High The model was not adjusted for possible confounding factors	Low Estimates produced had narrow confidence intervals suggesting low level of imprecision	Low Conceptually consistend (we expect to find more measles cases where we have low coverag), and consistend with other studies.	Low Chosen data is a direct measure of outcome of interest	Low No evidence of publication bias
Risk analysis	Household survey by design biased towards households and excludes institutionalized individuals Moderate	Estimates produced had narrow confidence intervals suggesting low level of imprecision Low	The 2016 MCV coverage as reported by MICS is different than the PMCCS 2016. Moderate	Some indicators included are indirect measures of vulnerability Moderate	No evidence of publication bias Low