New Incentives Evaluation Baseline Report

June 3rd, 2019

Prepared by IDinsight
for GiveWell and New Incentives

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DATA. DECISIONS. DEVELOPMENT.

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ACRONYMS

BCG	Bacillus Calmette–Guérin (a tuberculosis vaccine)
CI	Confidence Interval
CSS	Compact Segment Sampling
CDC	US Center for Disease Control and Prevention
DHS	Demographic and Health Survey
GHS	General Household Survey
GPEI	Global Polio Eradication Initiative
HIB	Haemophilus Influenza Type B
HIV	Human Immunodeficiency Virus
IPA	Innovations for Poverty Action
JICA	Japanese International Cooperation Agency
LGA	Local Government Area
MICS/NICS	Multiple Indicator Cluster Survey/National Immunization Coverage Survey
NGO	Non-Governmental Organization
NSTOP	National Stop Transmission of Poliomyelitis
PCV	Pneumococcal Conjugate Vaccine
PENTA	Pentavalent Vaccine (diptheria, tetanus, pertussis, hepatitis B, HIB)
PPI	Poverty Probability Index
PPP	Purchasing Power of Parity
RCT	Randomized Controlled Trial
RI	Routine Immunization
SD	Standard Deviation
SRS	Simple Random Sampling
WHO	World Health Organization

EXECUTIVE SUMMARY

IDinsight is conducting a cluster randomized controlled trial (RCT) to assess the impact of delivering cash incentives to caregivers to bring their infants for routine immunization in North West Nigeria. The purpose of the evaluation is to determine the degree to which these incentives increase coverage rates for the vaccines included in Nigeria's routine immunization schedule.

From August to October 2017, IDinsight conducted a baseline study in the catchment areas of 130 Nigerian public health clinics in Katsina and Zamfara States to inform the program and evaluation designs for New Incentives' initiative providing conditional cash transfers for childhood immunizations.

The primary goal of the baseline was to measure vaccine coverage, allowing IDinsight to use stratified random assignment to ensure similar starting coverage in treatment and control groups. A secondary goal was to inform New Incentives' program and IDinsight's evaluation design more generally.

Data collection consisted of:

1. A household census to identify eligible infants and caregivers.
2. A household survey among a sample of eligible infants and caregivers to determine vaccination status.
3. Collection of clinic vaccination records to compare against self-reported vaccination.

To estimate vaccination coverage IDinsight analyzed three sources: 1) caregivers' self-report, 2) vaccination cards kept at home, and 3) vaccination registers stored at the clinic.

Our analysis provided further evidence of low vaccination coverage in North West Nigeria. Among the 12 to 16-month olds included in our survey the self-reported vaccination rates for three vaccines incentivized by New Incentives' program are as follows:

- 24% of 12 to 16-month olds received BCG, a vaccine to prevent tuberculosis,
- 21% of 12 to 16-month olds received at least one dose of pentavalent vaccine (a five-vaccine combination), and
- 15% of 12 to 16-month olds received the measles vaccine.

Low coverage was associated with lack of knowledge, ambivalence, and low wealth and education levels in the study clinics' catchments. There was little evidence that access to the clinic was the primary issue for most caregivers or that small existing incentives were correlated with coverage (cash or high value incentives were rarely reported).

Our recommendations are based on these findings as well as on our observations while conducting the baseline. Given that the factors measured at baseline only explain a small fraction of the variation in coverage rates across the sample, the recommendations are unlikely to increase program impact significantly. IDinsight sees them as opportunities for small improvements that New Incentives should consider as they expand their program.

IDinsight suggests New Incentives consider the following:

- **Utilize simple marketing efforts focused on disseminating basic information about vaccinations.** Lack of knowledge was the primary reason for caregivers not vaccinating their children (53.2%), while socio-cultural considerations (7.3%) and mistrust or fear of vaccination (5.5%) were less common. Promoting the benefits of and process of obtaining vaccinations may be more successful than more complex efforts focused on dispelling cultural or medical misconceptions.

•**Include, and where possible target, the most marginalized community members when marketing vaccination incentives**. Within a given catchment and generally across the sample, caregivers with low education and wealth (asset-based and self-reported) are less likely to vaccinate their children. Leaving out these community members when promoting the incentive would be a missed opportunity and may exacerbate health inequities.

•**Ensure caregivers know their settlement is eligible for incentives and how to access them.** A quarter of caregivers have never taken their child to a clinic and many caregivers go to clinics in other areas, especially major towns, for vaccination.

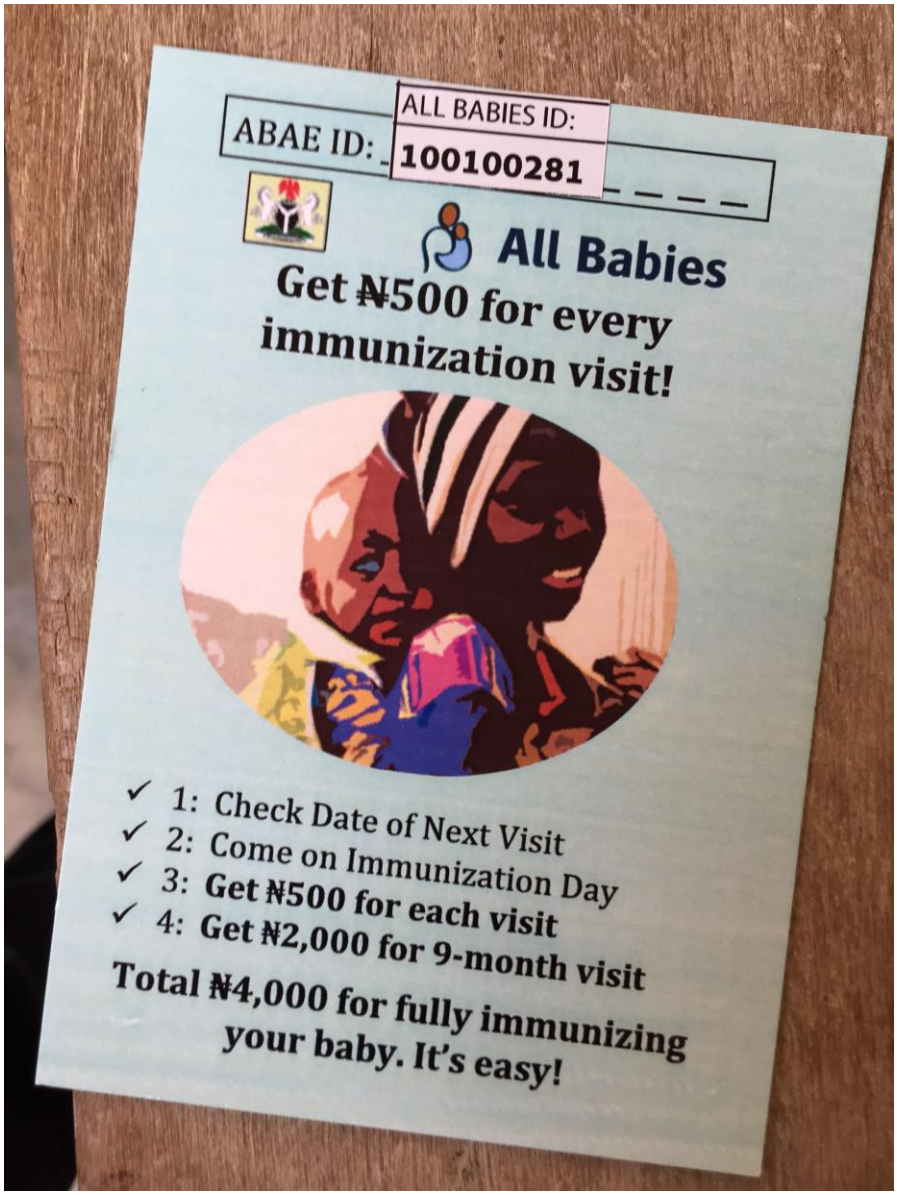
•**Encourage traditional leaders' support for vaccination.** Hearing positive messages from leaders is strongly correlated with vaccination, but only half of caregivers reported hearing positive messages about vaccination from traditional leaders and less than 10% reported hearing messages from religious leaders.

•**Promote vaccinations at the clinic when caregivers come for other services.** Clinic usage, especially facility delivery, is strongly correlated with vaccination, but few caregivers take their children to the clinic except when they are sick. Increasing clinic usage and ensuring vaccinations are advertised when caregivers do go to the clinic may have a positive effect on coverage.

Do not rely on monthly summary sheet totals combined with polio population data as an indicator of coverage. Coverage based on monthly summary sheet totals from clinic screenings and eHealth population data are a poor predictor of baseline coverage. Separately, IDinsight and New Incentives continue to assess alternative coverage data sources. The endline report will report these results.

• **Pay particular attention to outreach activities in Zamfara**. In general, both coverage rates and the percentage of caregivers that vaccinate at clinics are lower than in Katsina.

This document includes a description of the baseline methodology, the study findings, a discussion on limitations with the data and recommendations for future data collection, and more detailed program.


ABAE ID: _ _ _ _ _ _ _ _ _ _
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100100281
All Babies
Get ₦500 for every immunization visit!
✓ 1: Check Date of Next Visit
✓ 2: Come on Immunization Day
✓ 3: Get ₦500 for each visit
✓ 4: Get ₦2,000 for 9-month visit
Total ₦4,000 for fully immunizing your baby. It's easy!

1 INTRODUCTION

North West Nigeria has one of the highest fertility rates (6.7 births per woman (DHS 2013)) and lowest vaccination rates in the world (UNICEF 2017). The most recent National Immunization Coverage Survey found 5.9% and 4.9% of 12 to 23-month olds in the North West states of Katsina and Zamfara, respectively, had received all recommended childhood vaccines (MICS/NICS 2011).

Low immunization rates are a significant contributor to Nigeria's high under-five mortality rate (104 deaths per 1,000 live births[1]) – 40% of under-five deaths in Nigeria are from diseases that are preventable through vaccination (NRISP 2013). Due to its even lower immunization rates, the region of North West Nigeria is vulnerable to frequent measles outbreaks (NCDC 2016) and is one of the world's last locations with wild poliovirus (GPEI 2017).

In recent years, the donor community has invested substantially in improving supply-side infrastructure for routine immunization (NRISP 2013), but coverage rates remain low – the global immunization coverage target is 90% (WHO 2017). New Incentives, an international non-governmental organization (NGO), aims to boost demand for immunization by offering cash incentives to caregivers who have their child vaccinated at a program clinic.[2]

The goal of this study is to quantify the impact of New Incentives' conditional cash transfer on routine childhood immunization coverage rates in North West Nigeria. Charity evaluator GiveWell will use this information to determine New Incentive's cost-effectiveness relative to GiveWell's top charities, informing a decision on whether to make New Incentives a top charity.[3]

There are several studies[4] that find that incentives can have a significant impact on immunization coverage rates, especially in low baseline coverage settings. The landmark study is a randomized evaluation on in-kind incentives to increase immunization rates in Rajasthan State in India (Banerjee and Duflo 2010). The evaluation found the share of fully immunized children in villages with the incentives and reliable immunization camps was 33 percentage points higher compared to control villages. The Rajasthan intervention differed from New Incentives' model in that non-monetary incentives (lentils and *thalis* – dishware) were provided rather than cash, and the immunizations were provided at village camps rather than clinics.

A randomized controlled trial (RCT) from Adamawa State in North East Nigeria provides evidence for the impact of immunization incentives in Nigeria. The study found an 800 Naira[5] conditional cash transfer increased mothers' tetanus vaccine take-up by 28 percentage points (Sato and Takasaki 2016). To our knowledge, there has not yet been an RCT assessing the impact of conditional cash transfers on childhood immunizations in Nigeria.

This evaluation is a cluster RCT with baseline, midline, and endline rounds of data collection. This document contains the results of the baseline measurement.

[1] Nigeria has the 8th highest rate of under-five mortality in the world (UNICEF 2017).
[2] More details on the Nigerian routine immunization system, especially the structure of an average immunization visit day, can be found in in Annex 1 and in IDinsight's February 2017 site visit report.
[3] Top charity status could lead to funding in excess of $20 million.
[4] In addition to the research discussed below, see Loevinsohn 1986, Chandir 2010, and Gibson 2017. There is also a broader literature base on conditional cash transfers to encourage health intervention uptake summarized by Lagarde 2007.
[5] Equal to USD$5.70 at the time of the Sato and Takasaki (2016) study.

2 OBJECTIVES OF THE BASELINE

IDinsight conducted a baseline study from August to October 2017 in Katsina and Zamfara States in North West Nigeria to prepare for subsequent phases of the evaluation.[6] In particular, we sought to gain a better understanding of current vaccination coverage and its correlates in the target regions because other studies and administrative data sources provided limited or contradictory information. While the study will not track individuals between data collection rounds, data from the baseline was used to stratify randomization and will be used for controls at endline.[7]

The primary and secondary objectives[8] for the baseline study include:

Primary Objectives

1) Generate baseline coverage estimates to ensure balance on baseline vaccination coverage.
2) Analyze baseline coverage correlates.
3) Analyze quality of self-reported and record-based vaccination data.

Secondary Objectives

1) Understand the target population's socioeconomic status.
2) Analyze where caregivers vaccinate.
3) Examine attitudes towards vaccination.
4) Identify current immunization incentives.
5) Assess if compact segment sampling (CSS) identified a representative population.

[6] A third state, Jigawa, was added to the evaluation after baseline. It was not included at the outset of the baseline due to cost concerns, as well the upcoming Measles campaign in October 2017, which would have made it challenging to obtain baseline data on measles vaccination rates. Piloting activities to assess IDinsight's ability to conduct survey operations in Jigawa took place in February-March 2018.

[7] As there are no baseline data for Jigawa, the baseline coverage variable in the impact estimate regression requires some nuance. One is to give it the value of 0 for Jigawa clinics with coverage-driven variation absorbed by the state dummy variable. In any case, randomization in which state is one stratification variable ensures that this missing data will only introduce additional variance, not bias, to estimates of program impact. The pre-analysis plan and endline design documents will provide more detail.

[8] The objectives were developed by IDinsight in collaboration with GiveWell and New Incentives.

3 KEY STAKEHOLDERS

3.1 New Incentives

New Incentives is an international NGO that uses conditional cash transfers to achieve development goals. Since 2014, New Incentives has provided tens of thousands of conditional cash transfers to Nigerian mothers. At first, these incentivized giving birth in health facilities with the goal of limiting mother-to-child transmission of human immunodeficiency virus (HIV) in the southern State of Akwa Ibom. After re-evaluating which clinic healthcare service would be most cost-effective to incentivize, the shifted focus to routine childhood immunization in 2016. The details of New Incentives' immunization program will be discussed in Section 3 and in Annex 1.

3.2 GiveWell / Good Ventures

GiveWell is a charity nonprofit dedicated to finding the most cost-effective ways to improve lives globally. They are closely associated with the Good Ventures foundation which funds much of GiveWell's experimental and research work. Each year, GiveWell and Good Ventures identify new potential top charities and invest in their development and in further evaluation of their effectiveness. IDinsight's evaluation of New Incentives' program is one such effort and falls under a broader learning partnership between GiveWell and IDinsight.

3.3 IDinsight

IDinsight is leading the study and evaluating the New Incentives program.

IDinsight is a client-service organization that helps social sector actors generate and use evidence to inform decisions. Our team has coordinated over 80 impact evaluations in Africa and Asia using experimental and quasi-experimental methodologies and works with a wide range of government, not-for-profit, and for-profit organizations.

Evaluation independence

IDinsight will deliver an independent evaluation of the New Incentives conditional cash transfer program, and is completely independent from New Incentives.

The World Bank (2014a) identifies four keys areas of criteria for evaluation independence, each of which IDinsight meets and will continue to meet:

- **Organizational independence** – IDinsight is a separate organization from both the program implementer and the funder, GiveWell. IDinsight is able to report findings without fear of repercussions from either New Incentives or GiveWell.
- **Behavioral Independence** – IDinsight has the ability and willingness to issue high quality and candid reports. IDinsight's personnel management system is based on merit and not on study results.
- **Protection from outside interference** – Funding to IDinsight is not influenced by the results of the study. IDinsight's data collection for and judgments on the study are not subject to overruling or influence by an external authority.

- **Avoidance of conflicts of interest** – IDinsight and its staff do not have any official, professional, personal or financial relationships that will impact how the study is carried out.

3.4 Hanovia Medical Limited

Hanovia Medical Limited is a Nigerian research firm. Hanovia has extensive experience with randomized controlled trials and vaccination coverage surveys across Nigeria. Past clients include the World Health Organization (WHO), the World Bank, and the Japanese International Cooperation Agency (JICA). Hanovia was selected as part of a competitive bidding process to collect data on behalf of IDinsight. Hanovia worked closely with IDinsight for the duration of data collection operations in Nigeria.

4 OVERVIEW OF THE NEW INCENTIVES PROGRAM

4.1 New Incentives' Conditional Cash Transfer Program

New Incentives provides cash incentives to caregivers who bring their children for routine immunizations. The incentives follow the vaccination schedule provided in Table 1. These vaccinations were chosen due to their impact on reducing under-five mortality and improving health outcomes for children. The vaccinations are part of Nigeria's national immunization schedule.

North West Nigeria has relatively low mobile phone penetration and minimal mobile money penetration. Consequently, New Incentives must provide their incentives as physical cash unlike other comparable programs around the world. While distributing cash transfers increases operational complexity for New Incentives, receiving cash likely increases caregivers' chances to directly control the money they receive from the program.

TABLE 1: New Incentives and the Routine Immunization Schedule

Timing (age) for Visit	RI Schedule Vaccines for this Visit	Directly Incentivized	Indirectly Incentivized
At birth, or as close as possible	BCG, Hepatitis B Vaccine, Oral Polio Vaccine (OPV) 0	BCG	Hepatitis B Vaccine, Oral Polio Vaccine (OPV) 0
6 weeks	PENTA 1, PCV 1, OPV 1, Rotavirus 1	PENTA 1, PCV 1	OPV 1, Rotavirus 1
10 weeks	PENTA 2, PCV 2, OPV 2, Rotavirus 2	PENTA 2, PCV 2	OPV 2, Rotavirus 2
14 weeks	PENTA 3, PCV3, OPV 3	PENTA 3, PCV 3	OPV 3
9 months	Measles, Yellow Fever	Measles	Yellow Fever

To be eligible for an incentive, infants must have received the corresponding vaccine(s) in Table 1 at a New Incentives clinic[9] and reside in the catchment area of the clinic. Infants do not need to have received the previous vaccine in the schedule to be eligible.

While New Incentives staff ask each caregiver in which settlement they reside, New Incentives recognizes that the catchment area eligibility criteria is challenging to enforce faultlessly. To reduce the risk of primary caregivers travelling to treatment clinics from neighboring communities, New Incentives focuses on local advertising – current methods include town criers, advertising cards, posters, and SMS reminders.

New Incentives has a team of field officers responsible for disbursing incentives to primary caregivers. On each vaccination day, the field officers check vaccine quality and stock10 and prepare to disburse incentives. Incentives are paid in cash by a New Incentives' staff member who also ensures the infant meets the eligibility criteria outlined above.11

[9] Incentives can be received in the community as part of regular vaccination outreach organized by the clinic, when nurses go to the villages to administer vaccines.
[10] If the stock is low, New Incentives' staff encourage the clinic staff to procure more vaccines. If a vaccine runs out during the immunization day, New Incentives' staff tell caregivers to come back on the next routine immunization day.
[11] Remote workers confirm these validity determinations by reviewing images of the documentation and transaction itself.

4.2 Expansion Plans

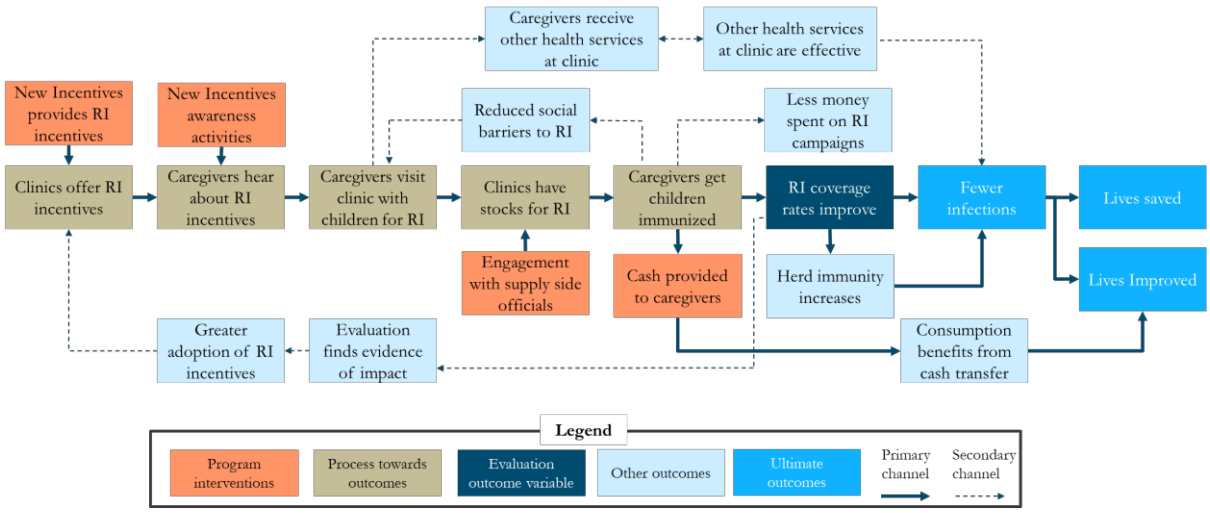
If the program is found to be effective, New Incentives plans to scale their program to states across North West Nigeria. It will first focus on Zamfara, Katsina, and Jigawa, the three states that are a part of the RCT.

At scale, New Incentives plans to operate at nearly all clinics in an area that offer routine immunization services. This geographic approach will allow New Incentives to experiment with radio and other untargeted advertising and reduce the risk of clinics becoming overcrowded with infants from outside their catchment area. The study will require New Incentives to operate at only one clinic in an area to prevent exposure of primary caregivers from control clinics to incentives from treatment clinics. This will force New Incentives to carefully restrict program eligibility to caregivers within each program clinic's catchment area during the evaluation. At scale, these restrictions will mostly be important at clinics on the edges of New Incentives' area of operations.

4.3 Theory of Change

The goal of New Incentives' program is to improve the health status of Nigerian children in a variety of ways, but the primary focus of the evaluation is the direct impact of the program on routine immunization (RI) coverage estimates for infants within the catchment of a clinic where New Incentives operates. Figure 1 outlines New Incentives' theory of change.

FIGURE 1: NEW INCENTIVES' THEORY OF CHANGE FOR EVALUATION DESIGN



5 METHODOLOGY

5.1 Baseline Study Overview

RCT Research Questions

In order to contextualize the baseline within the larger study context, we will briefly review the RCT research questions.

For the overall RCT, **the primary research questions are:**

1. What is the effect of New Incentives' program on the odds that a 12 to 16-month old in a community served by a program clinic received BCG compared to those in communities served by a control clinic?
2. What is the effect of New Incentives' program on the odds that a 12 to 16-month old in a community served by a program clinic received at least one dose of PENTA compared to those in communities served by a control clinic?
3. What is the effect of New Incentives' program on the odds that a 12 to 16-month old in a community served by a program clinic received Measles 1 compared to those in communities served by a control clinic?

The secondary research questions are:

1. What is the effect of New Incentives' program on the odds that a 12 to 16-month old in a community served by a program clinic is fully immunized[12] compared to those in communities served by a control clinic?
2. What is the effect of New Incentives' program on the timeliness of vaccination, particularly for Measles 1,[13] among 12 to 16-month olds in communities served by a program clinic compared to those in communities served by a control clinic?
3. What is the effect of New Incentives' program on the average number of vaccines[14] received per 12 to 16-month-old child in communities served by a program clinic compared to those in communities served by a control clinic?
4. What is the effect of New Incentives' program on the percentage of 12 to 16-month olds in communities served by a program clinic with BCG scars compared to those in communities served by a control clinic?
5. What is the effect of New Incentives' program on the percentage of 12 to 16-month olds in communities served by a program clinic that received at least one injectable vaccine compared to those in communities served by a control clinic?

Outcome Variable

There are three primary outcome variables for the RCT: **the percentage of 12 to 16-month-old infants in the catchment area of a treatment clinic who received 1) BCG, 2) any PENTA, or 3) Measles.** The clinic's catchment area is defined by the local government area (LGA) authorities

[12] For this outcome, fully immunized is defined as receiving BCG, at least one dose of PENTA, and Measles 1.
[13] Measles 1 is important because it results in the most lives saved in GiveWell's current cost-effectiveness model.
[14] The vaccines included in the average will be BCG, PENTA 1-3, PCV 1-3, and Measles.

as the list of settlements served by that clinic. This list can be found in the clinic's immunization microplan.[15]

The outcome variable will be measured using self-reported immunization, as opposed to child health cards and/or clinic registers. Due to the emphasis on recording information for the incentive payment, we expect the program will improve record keeping and increase the fraction of vaccines recorded in treatment clinics (relative to control clinics). As a result, administrative measures of coverage may include both an increase in recorded coverage as well as any actual increase in coverage. Since this may happen differentially between treatment and control clinics, this could bias our impact estimate.

The baseline outcome variable used to stratify clinics for randomization is **the percentage of 12 to 16-month-old children in a clinic's catchment area that ever received an injectable vaccination**. IDinsight selected this variable since there was variation in this outcome across clinics ensuring effective stratification, and caregivers were able to more accurately recall whether their child ever received an injectable vaccination than which specific vaccination their child received. We will continue to work towards improving how enumerators probe about specific vaccinations and to explore ways to increase the number of caregivers with child health cards to cross-reference.

5.2 Mapping and Sampling

Key definitions

The key geographical definitions used in the mapping and sampling approach are:

- **Catchment** – Each health clinic in Nigeria has a 'catchment' area which contains the population that the clinic is officially designated to serve.
    - Estimated catchment population sizes (in the study area) vary from fewer than 2,000 people to around 49,000 people.
- **Settlement**[16] – Within each catchment area, there are one or more 'settlements'. In many cases, settlements are defined through the local political process, typically corresponding to a natural community or geographical boundary. In other cases, settlements are defined by eHealth Africa, which uses settlements as the collection of households that form the lowest level of aggregation for immunization microplanning. When eHealth data bundles settlements together, we treat the set of bundled settlements as one settlement.[17]
    - There is an average of 6.1 settlements per catchment (in the study area).
    - Settlements vary by population size and area. The smallest settlement had a population of 1, and the largest settlement had a population of 49,000.

[15] We will include all clinics either identified by LGA authorities or the clinic in the sample, but settlements whose inclusion status is ambiguous (i.e. women from the settlement customarily go to the clinic, but the settlement name cannot be related to the microplan) may be served by New Incentives but excluded from the study. These ambiguous settlements are likely part of the microplan of a neighboring clinic, which New Incentives would also operate in at scale. Thus, focusing on official settlements should capture the impact at scale well, since every settlement is officially part of some clinic.

[16] Figures in this section come from bundled eHealth Africa estimates.

[17] eHealth Africa's dataset often "bundles" settlements together and provides an overall population total for the bundle of settlements, rather than individual population estimates for the smaller settlements that comprise the bundle. In most of these cases, we followed the eHealth bundling and did not divide the bundled population estimate into estimates for each settlement that was part of the bundle. In some relatively rare cases, when the eHealth bundle included many scattered Fulani settlements that were not in the clinic's catchment area, we estimated the population of the scattered settlements that were in the catchment area by extrapolating from the number and size of structures in the settlement (based on satellite maps).

- **Segment** – For the purposes of data collection and sampling for this study, we divided each settlement, into equal area[18] segments.
    - The process for determining how many segments a settlement was divided into is set out below (step 3).
    - Segment boundaries corresponded to physical infrastructure such as roads (to the extent possible), to facilitate enumerator fidelity to the segments.
    - The largest segment was 1.2 hectares, and the smallest 0.6 hectares.

Background to the compact segment sampling approach

The key sampling challenge was that there were no reliable population registers (including for the target population) for each clinic catchment area. A reliable population register would have allowed us to undertake simple random sampling, whereby each infant in each catchment would have been randomly selected from all infants in the catchment area (to be given the routine immunization survey). As a reliable population register was not available, and it was not financially feasible to create one, we used compact segment sampling (CSS), which emerged as the method best supported by the literature to address this sampling challenge. CSS avoids the need for a population register, by using geographic area as a primary sampling unit: if we intend to randomly sample 30% of a settlement's population, we randomly sample 30% of its geographic area.

Steps in the compact segment sampling approach

To implement the CSS method, we undertook a census survey in the selected segment/s of each settlement in each clinic catchment area. We then randomly selected a fixed number of eligible children from those identified in the catchment's census survey, to participate in the longer, 'routine immunization' survey.

The sampling process had the following steps:[19]

1. Identify clinic catchment areas (which together represent the entire target population for the New Incentives program and our evaluation of it) and the percentage of each catchment area to be sampled.
    a. Determine target number of households to survey: the target sample size per clinic catchment is 45 eligible children, based on power calculations.[20] Based on data from previous health surveys and our own pilot, we determined that we would need to survey 300 households, containing an expected total of 1,950 people to find 45 eligible children in a catchment.[21]
    b. Determine the percentage of the catchment population to census: we divided 1,950 by the catchment population.
2. Identify the settlements within each catchment area using eHealth data and data from New Incentives' initial clinic screening outlining clinics' microplans.
3. Divide each settlement into segments of equal area size, with the number of segments determined by the percentage of the catchment population that needs to be censused to find 300 households and 45 eligible children. For example, if 20% of the catchment

[18] Equal area segments will not always have the same population. Even if the population is unevenly distributed across the settlement, even random selection of segments means that we will sample more than the target population in some catchment areas and less than the target in others, but we expect that these differences will not be systematic by catchment type or treatment status.

[19] These steps may be refined for endline based on new information about population distribution that may be obtained between baseline and endline.

[20] Power calculations suggested that the increased power from adding more observations per cluster became minimal between forty and fifty observations per cluster.

[21] The 6.5 figure is based on data collected in the pilot stage of this study, and existing household surveys (the World Bank's 2015/2016 General Household Survey (GHS) and the Nigeria 2016 Demographic Health Survey (DHS)).

population should be censused, each settlements' segments should comprise 20% of the settlement area (in this example, each settlement would contain five segments).

4. Randomly select one segment for the census survey.[22]
5. Ensure census at least 300 households per catchment: if censusing in any segment/s revealed that the segment has fewer than the target number of households, we conducted the census in an additional randomly selected segment, until the target number of households for that settlement was reached.
6. Using the census results, randomly select 45 eligible infants per catchment from the total eligible infants identified in the census (since actual numbers often exceeded the expected 45).
    a. Survey the 45 eligible, censused, selected, infants using the routine immunization survey.

In summary, the process results in the censusing of at least 300 households in each catchment. The 300 households are made up of households from each settlement in the catchment. The number of households from each settlement is in expectation proportional to the contribution of that settlement to the overall population of the catchment (for example, if a settlement contains 25% of the population of a catchment, 25% of the population censused in the catchment comes from that settlement).

Modifications to the compact segment sampling approach made for baseline data collection

In practice, we modified the above process to expedite collection of data at baseline. This was mainly due to time pressure arising from the fact that we needed to conclude the baseline survey before the start of a government measles campaign in October 2017 for data quality purposes.

1. We used the anticipated number of households to census in each settlement[23] to determine the maximum target (110% of the anticipated number) and the minimum target (85% of the anticipated number) of households to census. This allowed surveyors to stop surveying before they exhausted a segment if they reached the maximum or to refrain from surveying the backup segment as long as the first segment that was exhausted contained at least the minimum number of households.[24,25] As a result, some segments were only partially censused. Enumerators were trained to start at a corner of the segment and visit each subsequent household. Though enumerators did not know ahead of time which segments would be partially censused, it is possible that this protocol may have given enumerators discretion as to which households to census.
2. The pre-pilot household census[26] revealed that approximately only one in 13 households (rather than one in 6-7, as expected) had an infant aged 12 to 16 months. We expanded the eligibility criteria to include infants 17 to 24 months of age in order to facilitate reaching

[22] For logistical reasons, we sometimes further divided segments in order to prevent their being too large, geographically; however, this did not change the proportion of land area we surveyed in each settlement. Specifically, if a settlement's segments drawn in line with the above rules were larger than 1.2 hectares, we divided each original segment into two new segments and randomly selected two segments. If the original segments were larger than 2.4 hectares, we divided each into three new segments and randomly picked three segments, and so on.

[23] This settlement level data was obtained from the Vaccination Tracking System (VTS) website: vts.eocng.org

[24] Without targets, surveying some catchment areas would have taken two or more days to complete, while (regardless of targets) others would have only taken a half day. However, due to travel distances, these half day catchment areas would have still occupied a team for an entire day, and so do not represent a saving in timing commensurate to the cost in time of comprehensively surveying large catchment areas. Thus, the overall data collection time may have increased by more than a third without the introduction of the targets.

[25] Therefore, if the segment had more households than expected, enumerators stopped censusing in this segment when they reached the maximum target number of households. If the segment had fewer households than expected, enumerators moved to a back-up segment (also randomly selected) to continue censusing until they reached the minimum number. The minimum target of 85% was set to ensure that even if we could not identify 40 children per catchment as required for power, we would at least be able to identify 20 12 to 16-month olds in order to be able to stratify for randomization.

[26] This was conducted in four non-study catchments ahead of the baseline survey.

sample size targets. Approximately 45% of our household census sample of infants between the age of 12 to 24 months was aged 12 to 16 months.

In most cases at baseline, we randomly selected the 45 eligible infants from all eligible infants identified in the catchment.[27] We first sampled among 12 to 16-month olds, and then sampled among 17 to 24-month olds to make a sample of 45 per catchment.

Limitations

The methods above have important limitations, all of which we will mitigate or avoid entirely at endline.

1. Fixing the *number* of households per catchment area leads us to under-sample catchment areas with larger populations (and over-sample catchment areas with smaller populations). We did this in order to ensure a sufficiently large sample of eligible infants in every catchment.
2. Including a stopping rule (maximum households to census in a segment) means that, in some segments, we did not census all households. Accordingly, our samples from primary segments that reach the maximum and all backup segments are not guaranteed to be representative of the settlement (since surveyors likely surveyed those households that were most convenient first). This method greatly reduced the time for baseline data collection, but we will not make this tradeoff at endline, where obtaining an unbiased impact estimate is paramount.[28]
4. Including 17 to 24-month olds might have increased measurement error in vaccination coverage rates.[29]

5.3 Data Collection Components

The baseline study comprised three data collection components:

1. **Household census –** This survey was conducted within the selected compact segment of each settlement in a clinic's catchment area to identify eligible 12 to 24-month-old children. These children composed our sampling frame for the household routine immunization survey.

2. **Household routine immunization survey –** Caregivers of a sample of 12 to 24-month-old children were asked about household characteristics, the child's immunization status, and the caregiver's attitudes about vaccinations.

3. **Clinic records verification –** This data collection activity cross-referenced information on vaccination from the routine immunization survey to the clinic records.

All three components took place from August to October 2017. IDinsight worked closely with Hanovia Medical Limited to train and manage enumerators. A team of 60 enumerators and 12 supervisors conducted the household census on 39,806 households and conducted the

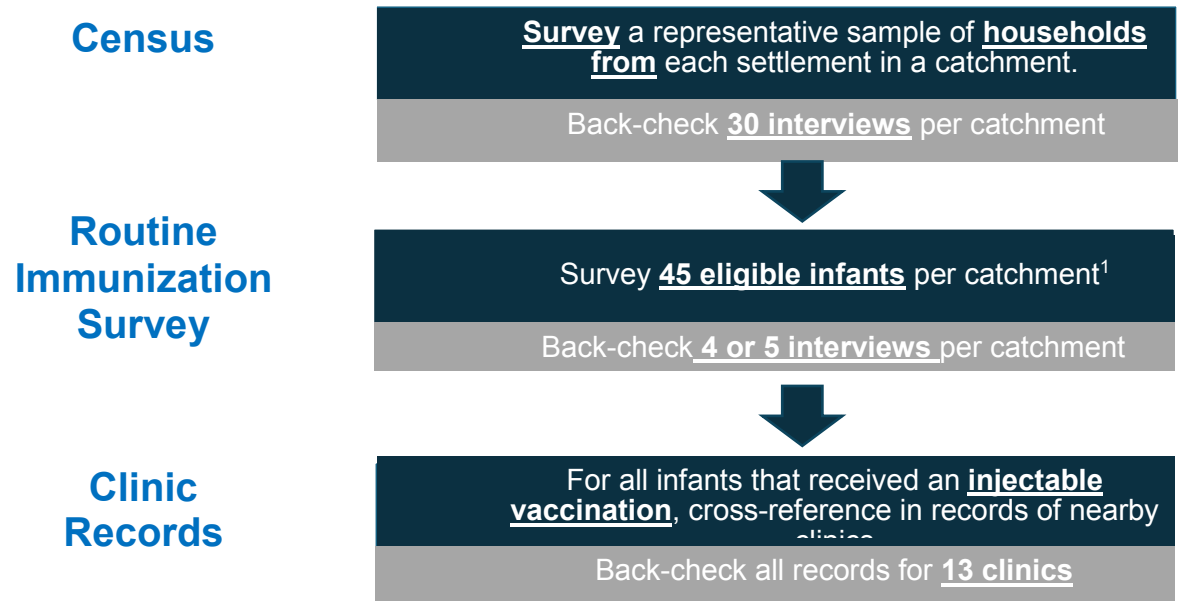
[27] For logistical reasons, we sometimes excluded remote settlements where very few eligibles had been identified, from routine immunization survey sample selection. At endline, we do not intend to exclude any settlements from the sample selection, regardless of the number of infants identified.
[28] This stopping rule likely did not have large implications at baseline since baseline vaccination rates were so low. Given that there is likely to be more variation within a settlement once the program has been in operation, and since the program may be more effective in pockets of a settlement, the implications of such a rule are likely to be greater at endline.
[29] It is possible that some 17 to 24-month olds received their immunizations after they were 16 months of age. If we had interviewed them when they were 12 to 16 months old, they would not have been immunized. This might have inflated our baseline coverage rates relative to what we would have found had we not expanded eligibility. It is also possible that caregivers of older children are more likely to have forgotten immunizations, causing us to underestimate vaccination coverage for older children.

household routine immunization survey with 5,787 caregivers of 12 to 24-month old infants. Additionally, the team conducted 6,301 census re-surveys and 121 routine immunization re-surveys, the majority of which occurred when a decision was taken to resurvey the entire first three days of census data collection. About 16% of the households were re-censused and 2% of the caregivers resurveyed due to quality concerns.

Data collection took place across the catchment areas of 60 clinics in Zamfara and 70 clinics in Katsina. There was also a separate team of 24 enumerators and two supervisors who conducted the clinic records verification in the 130 study clinics and in an additional 43 nearby non-study clinics (at which survey respondents reported having children vaccinated).

Each round of data collection was back-checked, and resurveys were conducted in the event of serious discrepancies. Data collection for the next component at a clinic would not start until data for the previous component had been back-checked and resurveyed, if necessary. The six-person back-check team conducted 4,377 household census back-check surveys and 675 routine immunization back-check surveys. The four-person clinic records back-check team conducted back-checks on all records at 13 clinics.[30] The flow of data collection is depicted in Figure 2.

Figure 2: Data Collection Flow



[1] We assume 10% attrition and planned to survey 40 eligible infants in a catchment area.

5.4 Study Setting and Target Population

The baseline was conducted in Katsina and Zamfara States in North West Nigeria. Katsina and Zamfara are two of the three states in which New Incentive will operate. The third state, Jigawa was not included in the baseline due to resource constraints – we piloted the survey in Jigawa

[30] All records were back-checked at 13 clinics, rather than a sample of records at more clinics, because clinics are geographically dispersed, and it was not feasible for the back-check team to visit more than 13 clinics in the time available. The purpose of the clinic records back-checks was primarily to verify how well clinic records enumerators could identify the vaccinated infants within clinics' administrative records.

after the baseline to test the data collection approach in Jigawa and to pilot slight modifications to the survey (see the Jigawa Addendum to this baseline report).[31]

New Incentives chose Katsina and Zamfara after an extensive state selection process that looked at factors such as the presence of other incentive programs, state responsiveness to research, and estimated baseline coverage rates.

In general, the clinics selected for the study cover nearly the entire geography of both states. In Katsina, there were study clinics in 31 out of 34 LGAs with one excluded because it contained New Incentives' pilot sites.[32] In Zamfara, the study covers 14 out of 14 LGAs. In Jigawa, the study clinics cover 25 out of 27 LGAs.

The baseline focused on identifying 12 to 16-month old children, as this will be the population fully exposed to the intervention at endline – that is, children eligible for the first vaccine after the start of the RCT window of program operations and old enough to have completed the vaccination schedule at endline.

We defined age eligibility based on birth month, as many caregivers are uncertain of their child's exact birth date. More details on age determination can be found in Annex 3 which analyzes age data in detail. Infants also needed to have lived in the settlement for more than six months to be eligible. In general, we observed very low migration among the infants. Around 96% were born in the settlement surveyed and 94% had not lived away from the settlement for more than a month.

To ensure balance between treatment and control arms on baseline immunization coverage, we assessed self-reported coverage estimates among 12 to 16-month olds (see Section 0 for more information on the balance checks). As described in section 5.4, we also collected data on a smaller sample of 17 to 24-month olds to reach our target sample size. This also allowed greater precision of non-coverage variables and allowed analysis of whether 12 to 16-month old coverage is similar to 12 to 24-month old coverage, the most common metric in the literature.

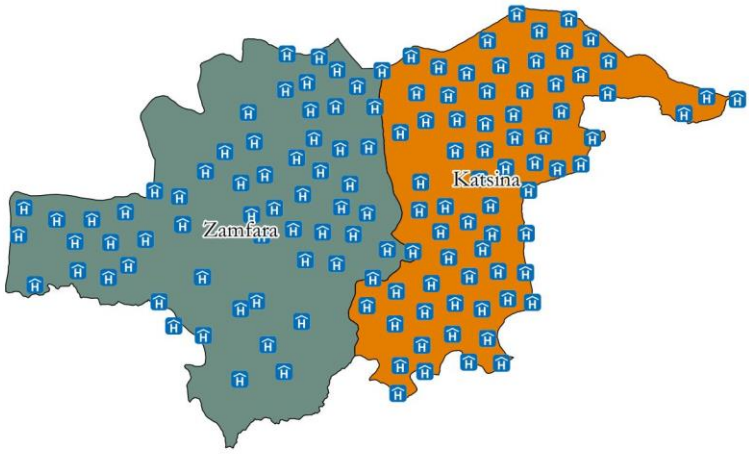
5.5 Clinic Selection

The primary goal of the clinic selection process was to create a sample of clinics for the study that are representative of New Incentives' operations at scale. Another goal was to ensure treatment and control clinics were spaced sufficiently far apart to minimize the risk of caregivers from control clinics visiting treatment clinics.

These two goals necessitated a relatively complex clinic screening process that required several iterations of identifying well-spaced clinics and screening to determine operability. This process continued until the maximum number of safe, operable, and well-spaced clinics in Katsina and Zamfara were identified. Figure 3 shows the distribution of the study clinics included in the baseline.[33]

[31] Eventually, New Incentives hopes to expand across North West Nigeria.
[32] The selection excluded the other two LGAs by chance given the small size of LGAs in Katsina. Figure 3 shows roughly even distribution of study clinics across the state.
[33] Note that some clinics surveyed at baseline New Incentives later divided would be unsafe for operations. Additionally, one clinic in Zamfara, not shown, was swapped for a safer nearby clinic after baseline data collection.

Figure 3: Distribution of Study Clinics at Baseline



5.6 Sample Representativeness

We validated the representativeness of the sample in two ways. First, we included questions in the routine immunization survey and household census survey that allowed us to compare our samples to variables included in the World Bank General Household Survey (GHS) and the 2013 Nigerian Demographic and Health Survey (DHS). These surveys provide state-level estimates at low precision, but did show that our sample (on key measures such as household size and number of eligible children) was consistent with these surveys.

Second, we surveyed the entire catchment area of three clinics (one in Katsina and two in Zamfara)[34] to test the representativeness of the CSS approach compared to simple random sampling (SRS) using a full census, which is the best approach to minimizing sampling error.[35]

The three clinics were selected due to their relatively large assumed population sizes – there is a greater risk of CSS bias in large population size catchments (as a smaller share of the population is censused). As a result, the analysis provides an upper bound for bias.

The analysis results show the error rates for the proportion of eligible infants and the proportion of children who have ever received an injectable vaccination using the CSS are low and comparable to the error rates from the simulated SRS approach.[36] See Annex 2 for a full description of this analysis.

In addition to information on variation between segments, these full censuses also provided further information on the accuracy of the population estimates from the polio campaign.

5.7 Questionnaires, Tools, and Data Collection

Census Questionnaire

The census questionnaire had a maximum of 42 questions, which covered:

- The number of residents in each household

[34] A full census of 12 other clinics in Katsina was completed incidentally, due to the 12 clinics' catchment areas having fewer than 300 households (no catchment areas in Zamfara had fewer than 300 households).
[35] Under 'simple random sampling' every individual in the population has an equal chance of being selected into the sample.
[36] Using over 10,000 simulations, the CSS methodology found an average of 14.3% of households included in the census survey had at least one 12 to 16-month old. When compared to the "true" proportion (when considering all available households from the full census enumeration) of 14.5%, the sampling error from CSS is 0.2 percentage points.

- The age and sex of each household resident
- Live births in the household 12 - 24 months prior to the date of the survey
- Detailed information on infants 12 to 24-months old in the household

The primary purpose of the census questionnaire was to identify eligible infants for the routine immunization survey. The census questionnaire also collected data used to estimate household size and composition, and catchment population.

Routine Immunization Questionnaire

The routine immunization survey had a maximum of 154 questions, including questions from standard and Nigerian health and poverty surveys[37] in addition to questions designed specifically for this evaluation. The survey had six sections:

- Demographics and Wealth[38]
- Immunization History
- Vaccination Perception
- Child Health
- Maternal Health
- Bed Nets

The primary focus of the routine immunization survey was the self-reported vaccination status section. Given the high oral polio coverage rates, enumerators asked caregivers if their child had ever received an injectable vaccination and showed them a picture of a baby receiving oral polio drops as well as a picture of a baby receiving an injection. If the caregiver answered yes, enumerators asked them about each of the routine immunization vaccinations individually.

Each immunization question followed a similar structure with identification of vaccinations by name, disease target(s), timing and location of administration on the body.[39] Enumerators also identified symptoms of each target disease in case the disease was known by an alternate name in certain communities. However, the most effective way for caregivers to identify vaccinations were injection sites. Enumerators pointed physically to vaccination sites on themselves or the baby when asking about individual vaccines. At the end of the routine immunization interview, enumerators asked respondents to bring out any documents they had with information for their infant. Enumerators recorded data from these cards on the child's date of birth, clinic, settlement, or vaccination history.[40]

Clinic Records

A separate clinic records team attempted to find the clinic records for every infant whose caregiver reported they had received an injectable immunization at a clinic in the vicinity. The clinic record review:

- verified whether a child received a vaccination when the caregiver reported that the child had received the vaccination, but

[37] Namely: the DHS wealth questionnaire, the USAID Nigeria poverty assessment tool, the USAID Household Food Insecurity Access Scale, and DHS Child Health and Nigeria Demographics and Health Survey.
[38] The Progress out of Poverty Index is based on an analysis of the assets most correlated with wealth in the general household survey. More details on wealth measurement can be found in Annex 4.
[39] An example of the structure used in the survey is as follows: First, caregivers were asked: "Has [child name] ever received an injectable vaccine to prevent him/her from getting five deadly diseases? This injection, known as the PENTA or DTP-Hep Vaccine B-Hib vaccine, would have been administered on the outer left thigh." If caregivers responded with "Yes", they were asked to report how many times the child had received PENTA at home, at a health facility, in the community during regular health facility outreach, in the community during a campaign, or at another location. A similar structure was followed for other immunization questions in the survey.
[40] 12.5% of children had a child health card, and 0.56% had another type of record (such as a vaccination history simply written on a scrap of cardstock).

- did not identify if a child did get vaccinated, if the caregiver reported that the child did not.

The clinic records team searched the child immunization registers of both the primary study clinics and most alternate clinics that respondents reported visiting. Not every alternate clinic was visited, however, as some were far away from the primary study clinics. The clinic records team matched respondents to records using names, dates of births, and settlement name.[41] Enumerators recorded the best match available.[42]

Coverage Rate Data Options

During the baseline, we collected three sources of information on vaccination coverage: self-report, child health cards, and clinic records. A goal of the baseline was to assess the reliability of each of these data sources to inform our endline measurement strategy.

Self-reported coverage was found to be the most reliable metric, particularly for comparing between treatment and control groups. While self-reported health behavior is always subject to inaccurate recall or social desirability bias, we do not expect significant differences in the accuracy of self-reported data between treatment and control groups. This means that the absolute coverage rates may have some error, but the difference between the two should still accurately reflect the program's impact. This will not be true, however, for the accuracy of immunization data from child health cards and child immunization registers.[43]

IDinsight plans to use self-reported coverage to measure the study's primary outcome, and other sources to understand the self-reported data's accuracy.

More details on comparing the different sources of vaccination coverage can be found in Section 6.8 and Annex 5. Additional tables with coverage rate information from child health cards and clinic registers are in Annex 9. The pre-analysis plan describes in more detail IDinsight's plans for data quality at endline.

5.8 Data Quality

IDinsight used a number of measures to ensure high quality data, including the back-checks[44] conducted by an independent Hanovia team. These back-checks would trigger resurveys if discrepancies were significant. The exact thresholds and results can be found in Annex 6.

As an additional quality check, IDinsight contracted independent field managers separate from Hanovia. These field managers performed spot checks,[45] conducted additional back-checks of both the Hanovia back-check team and the main Hanovia team, and listened to randomly selected audio clips from survey interviews. Hanovia and IDinsight back-check data only differed in 1% of resurveys.

IDinsight will consider focusing on other data quality activities such as audio audits combined with targeted back-checks for future rounds of data collection. More details on the results of these data quality efforts can be found in Annex 6.

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[41] In rare cases, phone numbers also facilitated the match, but phone numbers were sporadically recorded in registers.
[42] For example, if the birth date and settlement name didn't match, but there was only one infant whose name matched in the register, enumerators recorded the information for the matching name as clinic staff sometimes make errors recording dates of birth and settlements. In particular, they will record the data of BCG vaccination as the date of birth even if the child comes at a later date.
[43] This is because New Incentives' checks whether vaccinations administered to their beneficiaries are recorded accurately in clinic administrative records and on child health cards at their program sites.
[44] Back-checks refer to a re-survey of a random selection of respondents on key variables that should illicit similar responses from interview to interview.
[45] In spot checks, IDinsight staff observe interviews and make sure they adhere to survey protocols taught to enumerators during training.

IDinsight permanent staff also contributed to data quality through persistent on-the-ground monitoring. Two to four IDinsight staff members were on the ground in Katsina and Zamfara for the duration of the survey. These team members combined on-the-ground observations with data-based quality checks[46] to ensure a high degree of data quality throughout the data collection process.

5.9 Randomization Process

The primary use of the baseline data was to facilitate randomizing clinics into treatment and control groups that were balanced on baseline coverage, state, and security. IDinsight grouped clinics based on coverage rate and state and then randomly selected half of the clinics from each group, or strata, to be treated. To accommodate uncertainty around the exact clinic criteria New Incentives will use at scale and the security situation for some clinics, security-compromised clinics and marginally operable clinics were also grouped into separate strata for the purposes of randomization. IDinsight randomized[47] the security-compromised strata after the secure clinics to allow more time for New Incentives to assess the security situation at certain clinics before including them in the study. More details on the randomization process are in the pre-analysis plan.

[46] These included looking for outlier observations, checking census age distributions, monitoring coverage rates, and plotting GPS locations.
[47] 3ie provided an independent verification of the randomization code and results.

6 RESULTS

6.1 Study sample

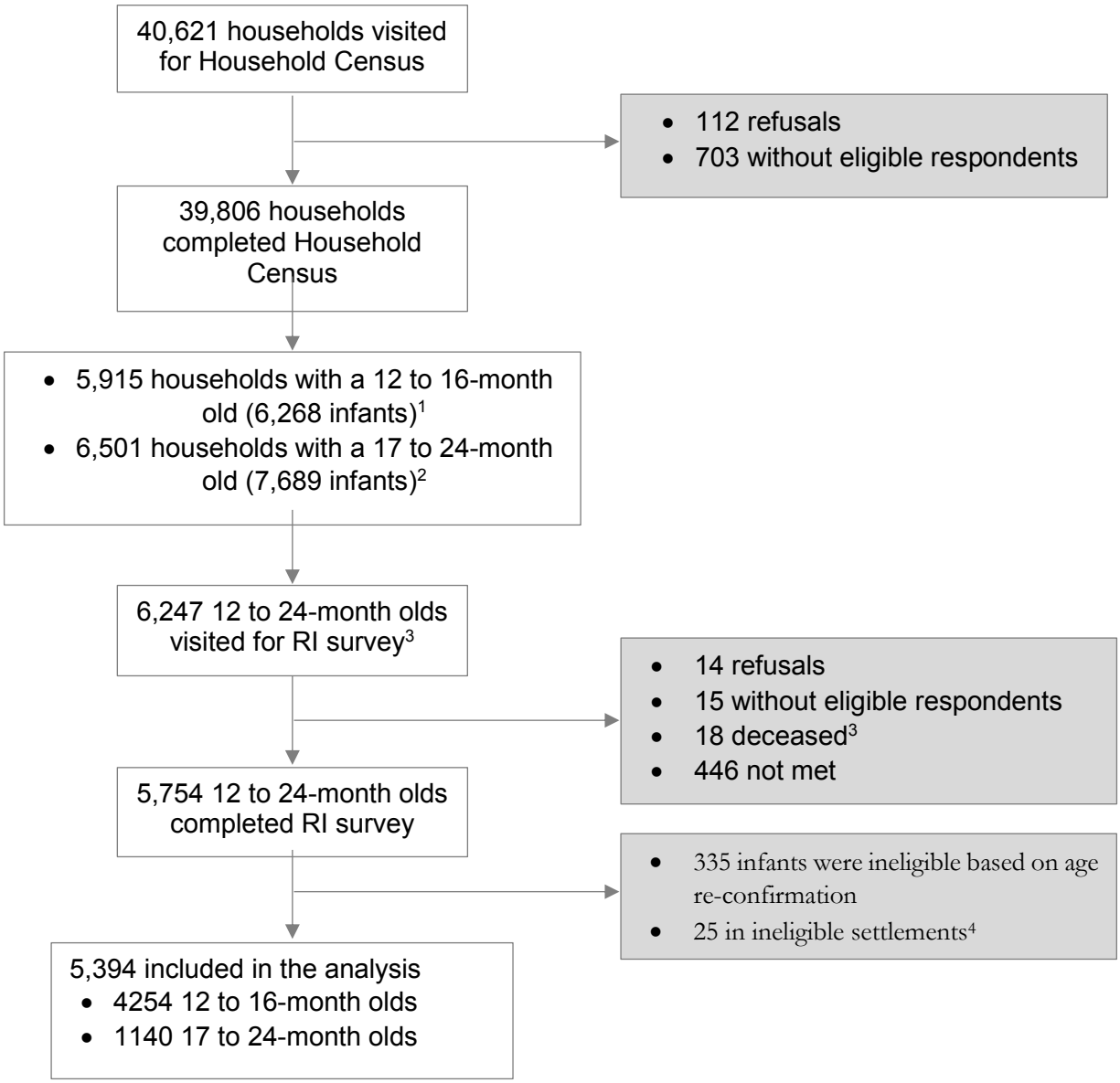
Between August 14 and October 17, 2017, 39,806 households participated in the Household Census across 130 clinic catchment areas in Katsina and Zamfara.[48] An additional 815 households were approached, but 703 (86%) households did not have an eligible respondent available at the time of the survey, and 112 (14%) households refused to participate.

The Household Census identified 6,268 12 to 16-month old children. For those clinics that did not have the required sample of 45 eligible 12 to 16-month olds present in the catchment area, some 17 to 24-month olds were added to the sample.[49]

In total, 6,247 12 to 24-month olds were visited for the routine immunization survey, with 5,787 caregivers of 12 to 24-month-old infants completing the survey – 5,394 (93%) were used for analysis. Interviews with ineligible respondents (not caregivers), caregivers of ineligible infants (not 12 to 24-months or deceased), and ineligible interview locations (caregivers later established to be living in non-catchment settlements) were dropped.[50] Figure 4 summarizes the flow of study participation.

[48] One clinic was surveyed at baseline, but was later replaced by a nearby clinic for security purposes. Data from the original clinic is still included in the analysis even though this clinic will not be included at endline.
[49] The reduction in infants is due to sampling discussed in Section 5.
[50] This corresponds to 15 not eligible respondents, 18 deceased infants, 335 infants not of eligible age based on re-confirmation of age by the routine immunization enumerator, and 25 in ineligible settlements.

Figure 4: Flow Chart of Study Participation



[1] 33,294 households did not have an eligible child 12 to 16-months old.
[2] These are households with only a 17 to 24-month old.
[3] Children who died between the census and the routine immunization survey were excluded to respect mourning families.
[4] One settlement with 25 respondents was surveyed and was later found to be definitively not in the clinic's catchment.

6.2 Vaccination Coverage

We explored several aspects of vaccination coverage for 12 to 24-month-old children in our sample, including:

- BCG coverage

- Pentavalent coverage (partial and full)[51]
- Measles coverage
- Full routine immunization coverage[52]
    - Loose (BCG, Polio, any PENTA and Measles)
    - Strict (BCG, Polio, PENTA 1, PENTA 2, PENTA 3, and Measles)
- Coverage of at least one injectable vaccine ("ever vaccinated")

We define coverage as a binary variable indicating vaccination status. This study uses self-reported coverage rates for the reasons described in section 5.7.4.[53] Annex 9 includes additional tables with coverage rate information from child health cards and clinic registers and assesses the self-reported data for its accuracy.

Although our sample spans 12 to 24-month olds, our target population was 12 to 16-month olds (this age group accounted for 79% of the sample).[54] The average age of our sample is 15.3 months (Standard Deviation (SD) = 3.0).[55]

Our survey found that **routine immunization coverage across Katsina and Zamfara is low**. A third of 12 to 16-month olds (33.6%, 95% confidence interval (CI): 32.2%, 35.0%) have received at least one injectable vaccine (Table 2a) and only 10.2% (95% CI: 9.1%, 10.9%) of 12 to 24-month olds are fully immunized (loose definition). The coverage rate for all three doses of PENTA is only half of the rate for any PENTA.

The impact of this low coverage can be seen in the 63% of respondents who reported that someone in their community has died from measles in the past five years. Of the 130 clinics included in the study, 81 (62.3%) reported at least one community-wide measles outbreak in the past five years; 72 of the clinics had a measles outbreak in the past three years. Measles coverage was 6.3 percentage points lower (95% CI: 3.5, 9.0; p-value < 0.01) among caregivers who reported that there had been a child in their community with measles within the past five years compared to those who did not.[56] These figures highlight the importance of vaccination in preventing measles and indicate the potential for impact that New Incentives could have through its cash transfer program.

[51] To be fully vaccinated for PENTA, all three doses of the series must be taken. Due to the difficulty caregivers have remembering the exact number of PENTA doses the child received, we define partial coverage for PENTA as the receipt of at least one PENTA vaccination, and full coverage as the receipt of all three doses of the series.
[52] We have two definitions for a fully immunized child, to account for the difficulty caregivers have remembering the exact number of PENTA doses. Respondents that reported 1 or 2 PENTA vaccines were classified as fully immunized under the "loose" definition, whereas only those that reported 3 or more PENTA vaccines were classified as fully immunized under the "strict" definition. Respondents who did not know if their child had received any PENTA vaccines or any of the other vaccines, were classified as not fully immunized.
[53] Primarily because we expect the program will increase the fraction of vaccines recorded on child health cards and clinic registers in treatment clinics. Self-report data is similarly reliable compared to recorded data from administrative records.
[54] In the catchment areas where we did not find a large enough sample of 12 to 16-month olds, we surveyed 17 to 24-month olds.
[55] The average age of 12 to 16-month olds in the sample (n=4,266) was 14 months; the average age of 17 to 24-month olds (n=1,149) was 20 months.
[56] This estimate excludes the 437 respondents who said they did not know if there had been a child with measles in their community within the past five years.

Table 2a: Immunization Coverage for 12 to 16-month olds Across Katsina and Zamfara

Immunization Status	KATSINA Clinics N = 70 Children N = 2303		ZAMFARA Clinics N = 60 Children N = 1951		TOTAL Clinics N = 130 Children N = 4254		P-value[1]
	N	%	N	%	N	%	
Ever received injectable vaccination	935	40.6	495	25.4	1430	33.6	**<0.01**
BCG	747	32.5	282	14.7	1029	24.4	**<0.01**
Any PENTA	673	29.7	219	11.4	892	21.4	**<0.01**
Full PENTA	204	8.9	38	1.9	242	5.7	**<0.01**
Measles	446	19.6	199	10.4	645	15.4	**<0.01**
Fully immunized child (any PENTA)	336	14.6	91	4.7	427	10.0	**<0.01**
Fully immunized child (full PENTA)	146	6.3	24	1.2	170	4.0	**<0.01**

Table 2b: Immunization Coverage for 12 to 24-month olds Across Katsina and Zamfara[2]

Immunization Status	KATSINA Clinics N = 70 Children N = 2863		ZAMFARA Clinics N = 60 Children N = 2531		TOTAL Clinics N = 130 Children N = 5394		P-value[1]
	N	%	N	%	N	%	
Ever received injectable vaccination	1186	41.4	671	26.5	1857	34.4	**<0.01**
BCG	936	32.8	383	15.4	1319	24.7	**<0.01**
Any PENTA	842	29.8	290	11.7	1132	21.4	**<0.01**
Full PENTA	248	8.7	58	2.3	306	5.7	**<0.01**
Measles	572	20.2	276	11.1	848	16.0	**<0.01**
Fully immunized child (any PENTA)	425	14.8	123	4.9	548	10.2	**<0.01**
Fully immunized child (full PENTA)	178	6.2	38	1.5	216	4.0	**<0.01**

[1]P-values measure the statistical significance of the differences between the two states. We calculated these from a t-test on the coverage differences between the two states accounting for clustering at the clinic level.
[2]Our sample intentionally had more 12 to 16-month olds than 17 to 24-month olds – these numbers may not be fully representative of the 12 to 24-month old population in Katsina and Zamfara.

Between the two states, Katsina had higher coverage across all vaccinations with 14.8% (95% CI: 11.2%, 17.8%)[57] of 12 to 16-month old children being fully immunized with any PENTA compared to 4.9% (95% CI: 3.0%, 6.3%) in Zamfara (Table 2b). The difference was larger for 12 to 24-month old children that received at least one injectable vaccine with 41.4% (95% CI: 37.3%, 45.5%) in Katsina and 26.5% (95% CI: 22.5%, 30.5%) in Zamfara.

[57] Confidence intervals account for clustering at the clinic level.

The differences between the two states were statistically significant for all coverage outcomes and across both age groups. Sections 6.3 through 6.5 provide greater detail on demographic characteristics such as socioeconomic status, education, and vaccination attitudes across the two states and how these variables correlate with coverage rates. In Section 6.7, we also compare IDinsight's coverage data with external studies and surveys. In Section 6.8, we examine the individual and clinic characteristics that are associated with coverage.

6.3 Balance Checks

This section presents summary statistics for key coverage variables, as well as clinic and individual characteristics for the treatment and control groups in Katsina and Zamfara.[58] We focused on individual characteristics which were found to be meaningfully correlated with vaccination coverage, as detailed in Section 6.8.3, as well as some key clinic characteristics. The results are presented for the treatment and control groups separately, indicating the balance of the groups at baseline before New Incentives began operating at the study clinics.

While randomization should result in treatment and control groups that are similar on observable and unobservable characteristics on average, it is still possible to have statistically significant differences between treatment and control by chance. However, as the bivariate p-values in Table 3 indicate, even at a 10% level of significance, there are no statistically significant differences between treatment and control with regard to the proportion of children who had received BCG, PENTA, Measles, or the proportion of fully immunized children (with either at least one dose of PENTA or the full 3 doses of PENTA).[59]

[58] This analysis applies to the 106 clinics in Katsina and Zamfara that have been randomized in Wave 1 and 2.
[59] Randomization was done by stratifying clinics on baseline coverage of any injectable vaccine, clinic screening criteria, and security.

Table 3: Baseline Self-Reported Coverage Across Treatment and Control Groups Among 12 to 16-Month Old Children

Coverage Measure	Control (N=1640)		Treatment (N=1780)		P-value[1]
	N	%	N	%	
Ever received a vaccination					
No	1041	63.5	1127	63.3	0.96
Yes	599	36.5	653	36.7	
BCG					
No	1192	73.2	1281	72.7	0.89
Yes	437	26.8	481	27.3	
PENTA					
No	1233	76.1	1312	75.6	0.88
Yes	387	23.9	424	24.4	
Received all 3 PENTA doses					
No	1542	94.0	1655	93.0	0.55
Yes	98	6.0	125	7.0	
Measles					
No	1347	82.9	1448	82.7	0.96
Yes	278	17.1	302	17.3	
Fully immunized (any PENTA)					
No	1456	88.8	1568	88.1	0.78
Yes	184	11.2	212	11.9	
Fully immunized (full PENTA)					
No	1571	95.8	1690	94.9	0.53
Yes	69	4.2	90	5.1	

***Note on missing values**: All missing values in the table relate to "Don't know" responses to the BCG, PENTA and Measles self-report questions. The number of "Don't know" responses for each vaccine is as follows: BCG: N=11(Control), N=18(Treatment); PENTA: N=20(C), N=44(T); Measles: N=15(C), N=T(30). These missing values are treated as "No" for "Received all 3 PENTA doses" and the "Fully immunized" variables.*

[1]P-values were calculated using a t-test with standard errors clustered at the clinic level.

Further, at baseline and in the absence of the New Incentives' program, the treatment and control 12 to 16-month old children are balanced on a variety of key clinic and individual characteristic variables, as shown in Table 4. The clinic-level characteristics included geographic setting, the presence of a UNICEF volunteer community mobilizers (VCM) program, the catchment area, reported immunization incentives, and security screening status.[60] The individual-level characteristics included ethnicity, education, household size, and the Poverty Probability Index (PPI) score.[61] Though none of the variables were statistically significantly different between control and treatment groups, noticeable differences exist in the clinic setting, presence of a VCM program, and whether vaccination incentives were reported; for example, 65.1% of respondents in the control arm reported receiving no incentives, compared to 45.0% in the treatment arm. However, as the individual
p-values in Table 4 suggest, these differences are not statistically significant at a 5% level of significance.

[60] The security screening status was based on New Incentives' security assessment as of November 6, 2017.
[61] The construction of the PPI score is described in greater detail in Section 6.3 and in Annex 4.

Table 4: Clinic and Individual Characteristics Across Treatment and Control Groups Among 12 to 16-Month Old Children

Clinic/Individual Characteristics	Control (N=1640)		Treatment (N=1780)		P-value[1]
	N	%	N	%	
Clinic setting					0.32
In village (rural)	1496	91.2	1433	80.5	
In town (urban)	15	0.9	36	2.0	
Outskirts of town (semi-urban)	129	7.9	311	17.5	
Presence of VCM program					0.10
No	925	56.4	705	39.6	
Yes	715	43.6	1075	60.4	
Catchment area					0.68
Small (<4.67 sq. km)	881	53.7	882	49.6	
Large (≥4.67 sq. km)	759	46.3	898	50.4	
Incentives received					0.19
None	1067	65.1	801	45.0	
Bed Net Only	324	19.8	569	32.0	
Medicine	23	1.4	102	5.7	
Low-Value Items (Food, Soap, etc.)	226	13.8	308	17.3	
Number of vaccination staff					0.78
One vaccinator	906	55.2	932	52.4	
More than one vaccinator	734	44.8	848	47.6	
Security screening status					0.99
No Security Issues	1400	85.4	1519	85.3	
Some Security Issues	240	14.6	261	14.7	
Attended Primary School					0.53
Yes	239	14.6	238	13.4	
No	1401	85.4	1542	86.6	
Attended Secondary School					0.90
Yes	73	4.5	82	4.6	
No	1567	95.6	1698	95.4	
Heard Positive Messages from Local Leader					0.84
Yes	1033	64.7	1102	63.9	
No	564	35.3	622	36.1	
Child born at a health facility					0.74
Yes	147	9.0	151	8.5	
No	1493	91.0	1629	91.5	
	Mean	**SD**	**Mean**	**SD**	
Total household size (mean)	9.48	5.76	9.15	4.60	
Caregiver's age (mean)	26.8	7.15	27.4	7.74	
PPI score (mean)	32.75	10.69	32.85	11.41	

Note on missing values: *The following variables had missing values: PPI score: N=32(C), N=46(T). Positive messages from local leader: N=43(C), N=56(T).*

[1] *To test whether individual/clinic characteristics differ significantly between treatment and control, we estimate a logit model, regressing this characteristic on treatment, and use a Wald test to examine whether the characteristic is a significant predictor of treatment status. We report the p-value in this table.*

6.4 Religion, Ethnicity, Education, and Socioeconomic Status of Target Population

In addition to questions about vaccination status, the baseline survey collected data on several socioeconomic variables such as wealth and education to describe the sample as well as understand whether these variables are correlated with vaccination coverage. Socioeconomic variables could also be important covariates to be controlled for in the final analysis of impact. This section describes our sample at baseline along four key variables – wealth, education, ethnicity and religion.[62]

Religion and Ethnicity

Key Results

- Using the $1.25 /day poverty line (2005 purchasing power parity, or PPP), 52.6% of the sample falls below the poverty line. On average, our sample is relatively poorer than both Nigeria as a whole as well as the North West Nigeria region.
- Only 17.4% of respondents said they had received a formal education. Of those, the majority attended up to the primary school level. The majority of respondents (77.3%) reported attending Islamic school.
- Education and socioeconomic status (both self-perceived and poverty probabilities) are strong correlates of coverage. Most notably, those with any education have higher ever vaccinated coverage by 18.4 percentage points compared to those with no education.

North West Nigeria is fairly homogeneous in terms of religion and ethnicity. In terms of religion, 99.8% of respondents in our sample identified as Muslim, while 0.2% identified as Catholic or Other Christian. Further, 89.8% of respondents said they were Hausa, 8.1% Fulani, and 2.1% Barebari or other ethnicities. Fulani communities are often pastoral and move about with their cattle for much of the year, although some are also settled in villages or cities. They have historically had limited access to the health system and are in relatively remote parts of rural areas. As Table 5 shows, coverage for Fulani caregivers is slightly lower than the majority Hausa population. There is no statistically significant relationship between coverage rates and the different ethnicities (p-values not shown), though this may be due to the low sample size.

Table 5: Immunization Coverage Across Ethnicities

Ethnicity	N: 12 to 24-month olds	Ever received injectable vaccination	BCG	Any PENTA	Full PENTA	Measles	Fully immunized child (full PENTA)
Hausa	4734	34.9%	25.1%	21.6%	5.8%	16.4%	4.1%
Fulani	426	30.3%	21.6%	20.1%	4.9%	11.9%	3.8%
Other	111	34.2%	24.3%	20.6%	5.4%	16.5%	3.6%

Note on missing values: *123 observations were missing a response for ethnicity. All missing values for the coverage outcomes relate to "Don't know" responses to the BCG, PENTA and Measles self-report questions. The number of "Don't know" responses for each vaccine is as follows: BCG: N=51; PENTA: N=98; Measles: N=84. "Don't know" was recoded as "no" for full PENTA and fully immunized child (full PENTA).*

The target communities are typically patriarchal. One manifestation of this in our survey was that 91.2 % of mothers said they wait for their husband to decide whether a child should seek medical

[62] There are 103 observations that have missing values for all variables analyzed in this section.

help. However, religion and ethnicity do not seem to influence many respondents' attitudes toward vaccination, and most respondents did not mention socio-cultural reasons for not vaccinating their child.

Education

Since education levels of the caregiver are often cited as an important determinant of health-seeking behavior, the survey also asked caregivers about their education levels.

Only 17.4% of respondents had attended formal school[63], while 79.1% had attended Islamic school. As set out in Table 6, most formal school attendees also attended Islamic school; however most Islamic school attendees did not attend formal school.

Attending Islamic school, and separately attending formal school, are associated with higher vaccine coverage. As Table 6 shows, those who attended Islamic school had significantly higher coverage (36.0%, 95% CI: 34.6%, 37.5%, p-value < 0.01[64]) than those who did not.

Table 6: School Attendance and Immunization Coverage

	Did attend Formal School	Did not attend Formal School	Total
Did attend Islamic School	15.7%	63.4%	79.1%
Did not attend Islamic School	1.7%	19.2%	20.9%
Total	17.4%	82.6%	100%

	N: 12 to 24-month olds	Ever vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized child (full PENTA)
Islamic School							
Did attend	4168	36.0%	26.3%	22.6%	6.1%	17.0%	4.4%
Did not attend	1103	28.8%	18.8%	16.9%	4.2%	12.5%	2.6%
Formal School							
Did not attend	4239	31.1%	21.3%	18.4%	4.4%	13.7%	2.8%
Primary	649	49.9%	40.3%	33.9%	11.7%	24.6%	8.8%
Secondary	226	54.9%	47.1%	42.3%	10.6%	35.4%	10.2%
Post-Secondary	14	64.3%	64.3%	64.3%	28.6%	50.0%	28.6%

Note on missing values: *123 observations were missing a response for whether the caregiver attended Islamic school. All missing values for the coverage outcomes relate to "Don't know" responses to the BCG, PENTA and Measles self-report questions. The number of "Don't know" responses for each vaccine is as follows: BCG: N=51; PENTA: N=98; Measles: N=84. "Don't know" was recoded as "no" for full PENTA and fully immunized child (full PENTA).*

Overall, as Table 7 indicates, caregivers' education levels exhibit a strong relationship with coverage with 50% (95% CI: 47.8%, 54.3%, p-value < 0.01[65]) of caregivers that ever-attended primary school or above reporting that their child has been vaccinated. Without knowing the curriculum, one possible explanation for this correlation is that higher education covers topics on health, including the benefits of immunization. The literature also strongly supports this correlation, where a caregiver's higher education status is associated with improved health outcomes for their children (Desai & Alva, 1998; Gakidou, Cowling, Lozano & Murray, 2010).

[63] Of those that attended formal school, 72% attended school up to the primary level, 25.7% attended up to secondary school and 1.7% attended post-secondary school.
[64] P-value was calculated from a bivariate regression with clustered standard errors at the clinic-level.
[65] P-value calculated from a bivariate regression.

Table 7: Immunization Coverage Across Education Levels

Caregiver's Education	N: 12 to 24-month olds	Ever received injectable vaccination	BCG	Any PENTA	Full PENTA	Measles	Fully immunized child (full PENTA)
None	4354	31.1%	21.1%	18.3%	4.4%	13.7%	2.9%
Primary	665	49.5%	39.8%	33.5%	11.6%	24.3%	8.6%
Secondary	236	54.7%	46.8%	41.8%	10.6%	35.2%	10.2%
Post-Secondary	16	62.5%	62.5%	62.5%	31.3%	50.0%	31.3%

Note on missing values: *123 observations were missing a response for the caregiver's education level. All missing values for the coverage outcomes relate to "Don't know" responses to the BCG, PENTA and Measles self-report questions. The number of "Don't know" responses for each vaccine is as follows: BCG: N=51; PENTA: N=98; Measles: N=84. "Don't know" was recoded as "no" for full PENTA and fully immunized child (full PENTA).*

Wealth

To assess the overall wealth in our sample, the survey asked respondents about their perceived wealth and collected data on several household assets. We used this data to create poverty probability scores based
on the framework of Innovation for Poverty Action's (IPA) Poverty Probability Index®.[66] Together, these measures help estimate our sample's wealth at baseline.

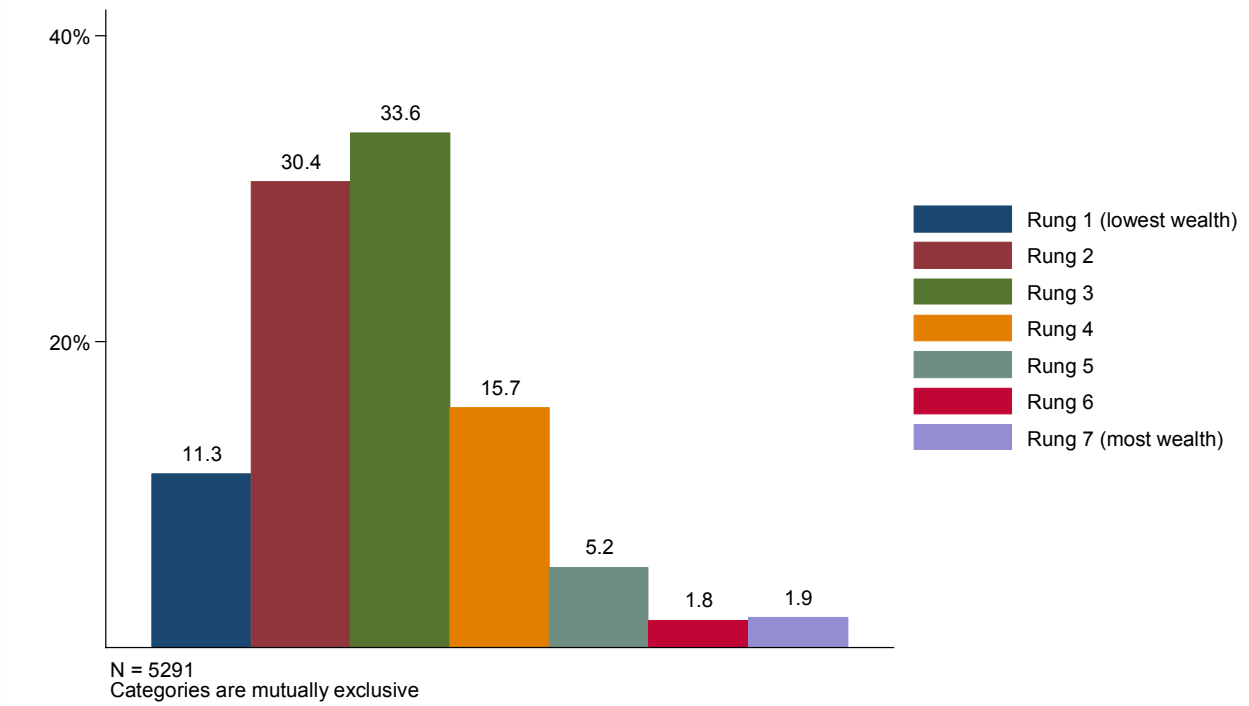
Our results for both indicators reveal our sample is poorer than both Nigeria's average population as well as the population in North West Nigeria. This is to be expected as the North West is poorer than the rest of Nigeria, Katsina and Zamfara are some of the poorer states in the North West, and our study slightly over-sampled rural areas, which tend to be poorer (World Bank, 2014b; GHPS 2012/2013).

Self-Perceived Wealth

The first measure of self-perceived wealth asks caregivers to place themselves on a seven-step ladder where the lowest rung (rung 1) corresponds to the poorest people and the highest rung (rung 7) corresponds to the richest people. On average, caregivers placed themselves somewhere between rung 2 and 3, implying that while caregivers did not perceive themselves to be the poorest members of their community, they still saw themselves as fairly low on this poverty ladder. The distribution of responses across the seven rungs of the ladder can be seen in Figure 5. Approximately 64% of responses were clustered around rungs 2 and 3 with a skew towards rung 3.

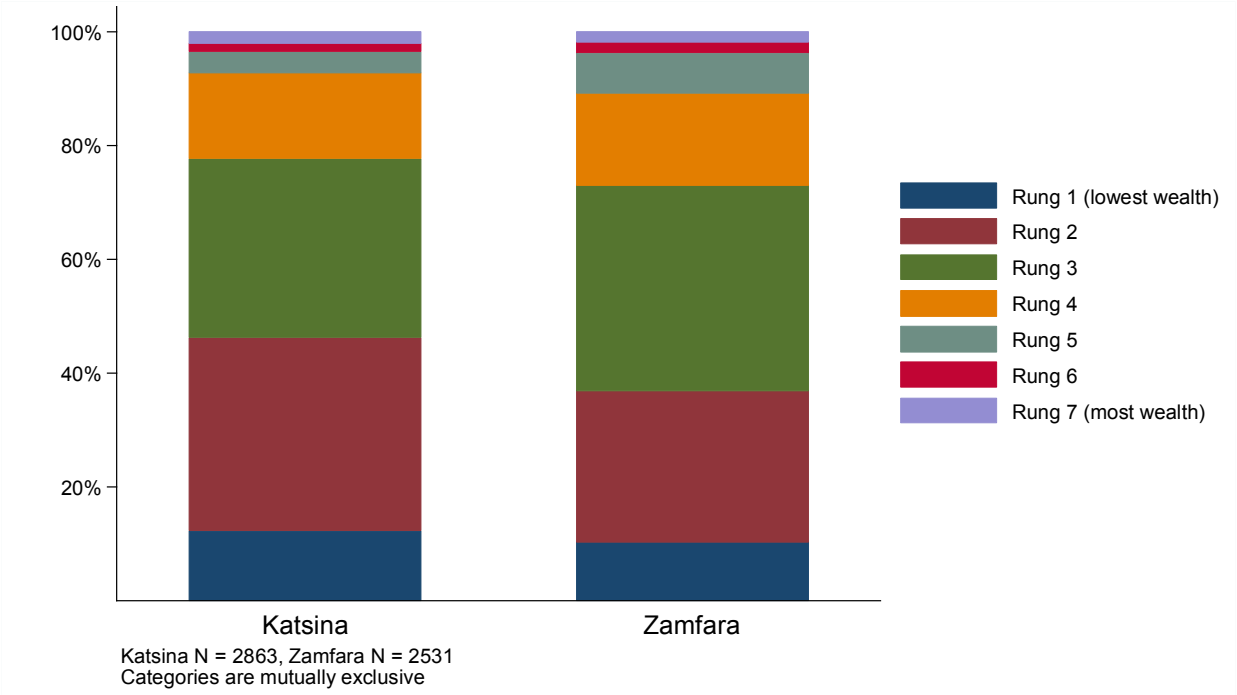
[66] Further details on the index and construction of poverty probability scores are provided in Annex 4.

Figure 5: Self Perceived Wealth



As seen in Figure 6, there are also some differences[67] in self-perceived wealth by state, with a larger share of respondents in Zamfara placing themselves in rung 3 (36.2%) compared to Katsina (31.4%). Katsina residents were more likely to place themselves in rung 2 (34.0%) than residents in Zamfara (26.4%). Fewer people in Zamfara placed themselves in the lowest two rungs, indicating that our sample in Zamfara perceived themselves as wealthier.

Figure 6: Self Perceived Wealth by State



[67] A Wald test of independence between the ladder response and state returned a p-value of <0.01, indicating that the difference distribution of the ladder responses across states is statistically significant.

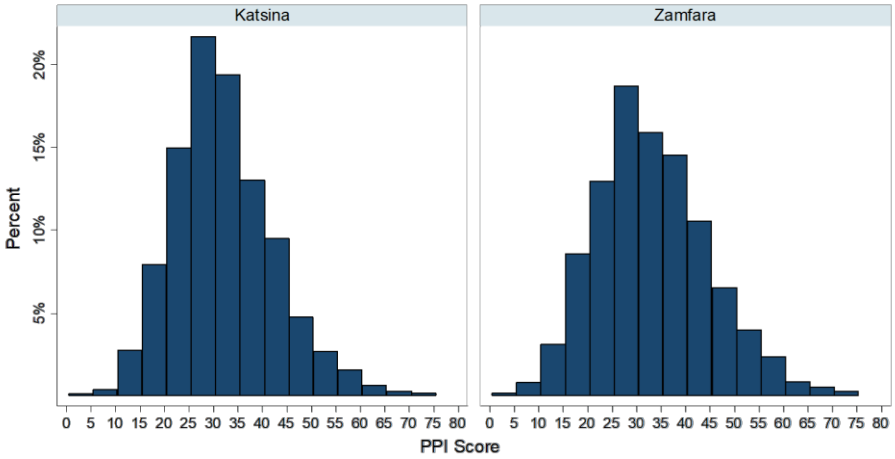
Poverty Probabilities

The survey collected data on 21 different household characteristics and assets to allow for the construction of a household level poverty index. The index, which is constructed using the framework set out in IPA's Poverty Probability Index for Nigeria (Schreiner, 2015), helps translate concrete household characteristics such as the type of toilet used, roof materials, involvement in agricultural activities, and the possession of assets such as televisions, stoves, and mobile phones,[68] into the likelihood of an individual falling under the poverty line. For the purposes of comparison with other studies, the poverty line of $1.25/day (2005 PPP) was chosen.

The results of this analysis show that the poverty rate in our sample is 52.6% (95% CI: 52.4%, 52.8%). Given that the poverty headcount for Nigeria is 33.1% (World Bank, 2014b) this statistic reveals that our sample is relatively poorer than Nigeria as a whole. This result is expected given that our sample resides in the North-West, where poverty rates are typically higher than the rest of the country and our sample includes Zamfara, which is one of the poorer states in North West Nigeria. Notably, our sample is even poorer on average than North West Nigeria – the region's poverty headcount is 45.9% (World Bank, 2014b) This difference may be because our study slightly over-sampled rural areas, which tend to be poorer, overall. It may also be driven by the fact that our study sample is from Katsina and Zamfara, which are the poorer regions of North West Nigeria (compared to Kano, for example). Our figures for the poverty rates in Nigeria and North West Nigeria are from the World Bank's Nigeria Economic Report (World Bank, 2014b) which uses the same survey (GHPS 2012/2013) that the poverty index construction is based on, although we use an indirect framework to calculate poverty scores. More details on the construction of poverty scores can be found in Annex 4.

Households' poverty scores are based on the household's characteristics and assets, seen in Figure 7. The average PPI Score for a given household in the sample is 32.7 (95% CI: 32.4, 33.0.) For both Katsina and Zamfara, the PPI score distribution has a slight positive skew, meaning that more people fall on the lower end of the wealth spectrum. Poverty scores in Zamfara are also more spread out compared to Katsina, where there is less variation.

Figure 7: Distribution of PPI Scores by State



Comparing our sample to the study population of a similar study on incentives for routine immunization in India (Banerjee et.al., 2010), we found that our sample was likely poorer than the population of rural Rajasthan, where the poverty rate by the $1.25/day (2005) metric was 26.1% (Schreiner, 2012). When compared to the population of the study site by Gibson et.al in rural

[68] More details about the construction of the index can be found in Annex 4.

Western Kenya where the poverty rate is 61.3% (Schreiner, 2011), our sample is relatively less poor.

Understanding the wealth distribution of the sample is important as higher wealth was correlated with vaccination coverage, as Table 8 shows. Higher socioeconomic status, both self-reported and the calculated PPI, were indicators of higher coverage rates. To better compare self-reported wealth with the PPI quintiles, we combined rungs 4-6 into one category due to smaller sample sizes.[69] A higher socioeconomic status represents greater resources and possibly time to commute to a nearby clinic to vaccinate a child.

Table 8: Immunization Coverage Across Socioeconomic Status

Wealth Measure	N: 12 to 24-month olds	Ever received injectable vaccination	BCG	Any PENTA	Full PENTA	Measles	Fully immunized child (full PENTA)
Self-Reported Wealth (Low to High, 1-5)							
1	600	26.3%	18.8%	15.2%	2.3%	10.5%	1.3%
2	1611	33.7%	23.4%	20.5%	6.1%	15.2%	4.3%
3	1780	35.7%	26.1%	22.3%	5.6%	17.4%	4.0%
4	1198	37.4%	27.2%	23.9%	6.8%	17.9%	4.7 %
5	102	42.2%	28.7%	27.5%	7.8%	18.8%	6.9%
Socioeconomic Status (PPI)							
Lowest Quintile	1067	27.8%	19.5%	15.8%	3.3%	13.7%	2.2%
Second Quintile	1163	33.1%	22.4%	20.2%	5.7%	14.3%	3.7%
Middle Quintile	983	32.7%	22.5%	19.5%	4.9%	13.5%	3.4%
Fourth Quintile	1121	36.3%	26.5%	23.2%	6.8%	17.3%	5.2%
Highest Quintile	954	43.5%	33.6%	28.9%	7.9%	22.1%	5.8%

Note on missing values: *103 observations were missing a response for the self-reported wealth, and 106 observations were missing a response for PPI. All missing values for the coverage outcomes relate to "Don't know" responses to the BCG, PENTA and Measles self-report questions. The number of "Don't know" responses for each vaccine is as follows: BCG: N=51; PENTA: N=98; Measles: N=84. "Don't know" was recoded as "no" for full PENTA and fully immunized child (full PENTA).*

[69] The reason for not grouping the highest (7th) rung despite its small sample size was to capture the effect of those who believed that they were the richest relative to those around them.

6.5 Sources of Vaccination

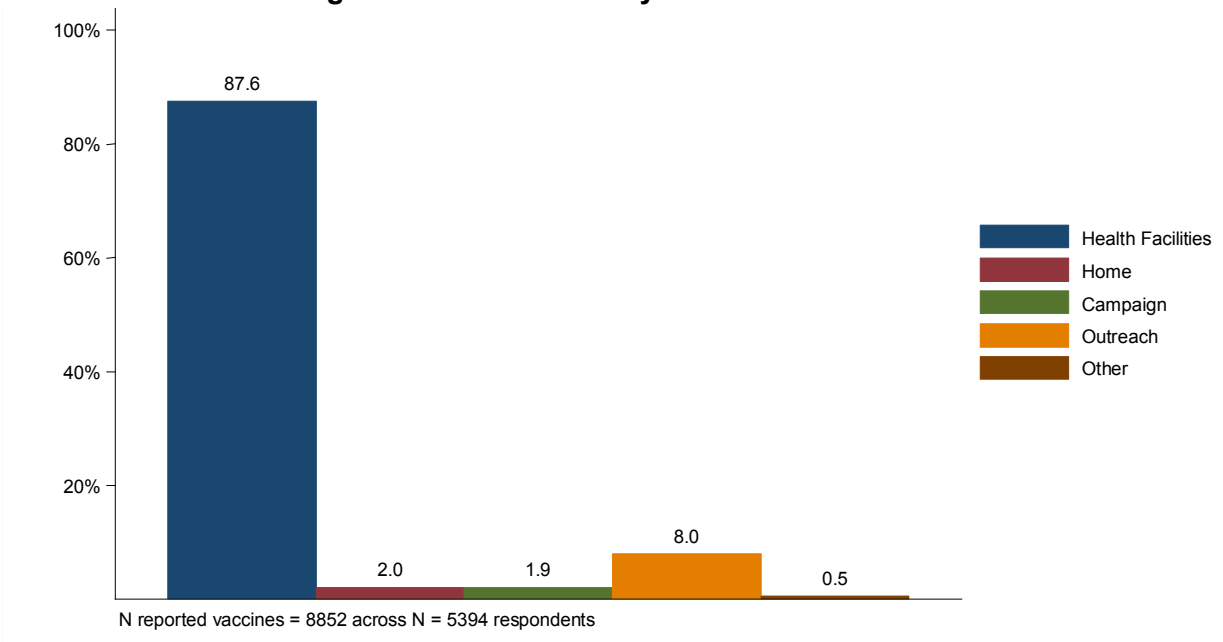
To understand the main locations at which people vaccinate their children, the survey asked caregivers how many injectable vaccinations[70] of each kind they received at the following locations: health facility, home, campaign, outreach, and other.[71] This section describes the main locations where caregivers got vaccinations.

Key Results

- The majority of vaccinations take place at health facilities (87.6%).
- For vaccinations that are received outside of health facilities (12.5%), the most frequently reported location is in the community during clinic outreach activities – 8% of reported vaccinations took place at these outreach activities.
- Caregivers did not strictly adhere to the clinic assigned to their catchment for vaccination-related services – 7.5% of respondents who reported receiving one or more vaccines at a health facility said they did not receive them at the study clinic.
- There are significant differences in where vaccinations were received by state and security status of the clinic. Tailoring program outreach by state and the security status of clinics may help improve uptake of facility-based vaccinations.

As seen in Figure 8, health facilities were the most common location at which to receive a vaccination; 87.6% of reported vaccinations occurred at these sites. The second most common location for vaccination was during health facilities' community outreach activities, although only 8.0% of reported vaccinations took place there. The remaining 4.4% of vaccinations took place either at home, during community campaigns, or at miscellaneous "other" locations.

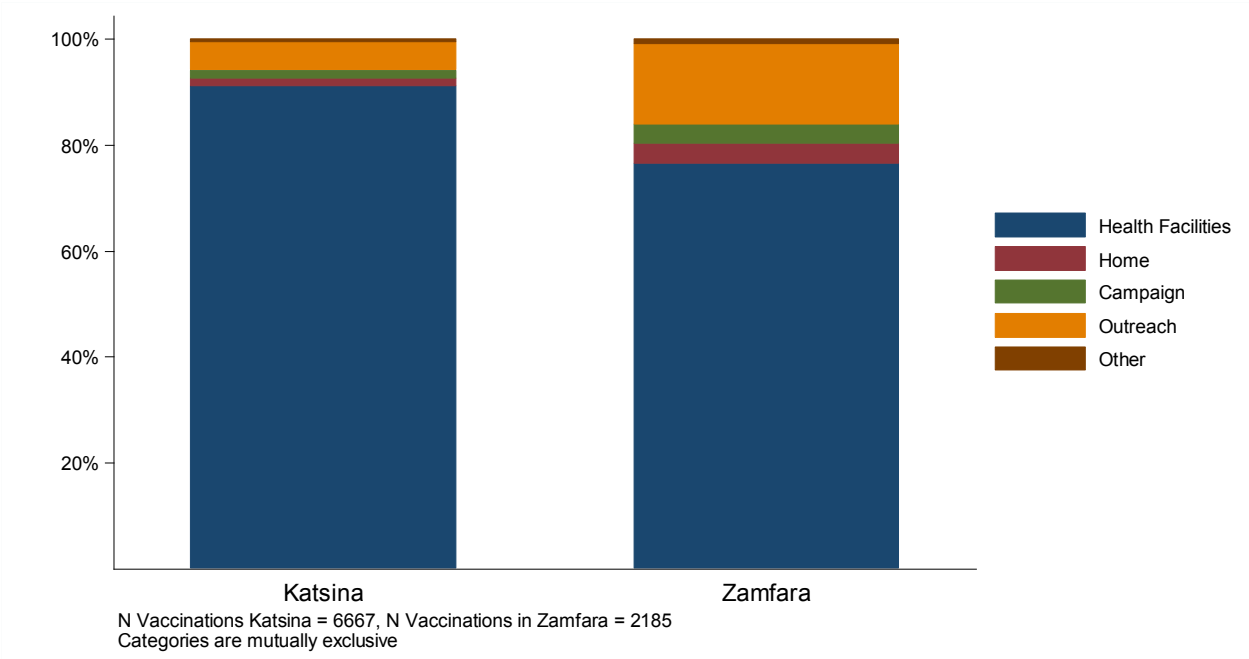
Figure 8: Vaccinations by Location Received



[70] Oral polio is not included because most oral polio vaccinations occur as a door-to-door campaign activity, which would skew the overall location distribution.
[71] Most respondents did not specify what this "other" location was.

Though the percentage of vaccinations that occurred at a health facility is high, there is some variation by state, as seen in Figure 9. In Katsina, 91.2% of reported vaccinations took place in health facilities, compared to 76.5% in Zamfara.[72] Correspondingly in Zamfara, 15.2% of vaccinations took place during outreach activities compared to 5.0% in Katsina, which may be driven by a host of factors, including security (Zamfara is more insecure) or the geographic spread of clinics (which is greater in Zamfara).[73]

Figure 9: Vaccinations by Location Received by State



Vaccination locations differed by the security status of the clinic (as defined by New Incentives[74]), shown in Figure 10. Outreach is a more common source of vaccinations in areas assessed as having 'Some Security Issues' and 'Serious Security Issues' compared to areas with 'No Security Issues'. Despite this, outreach accounts for a minimal number of vaccinations in the least secure catchments, with 97.5% of vaccinations in 'No Go Zones' taking place at health facilities.

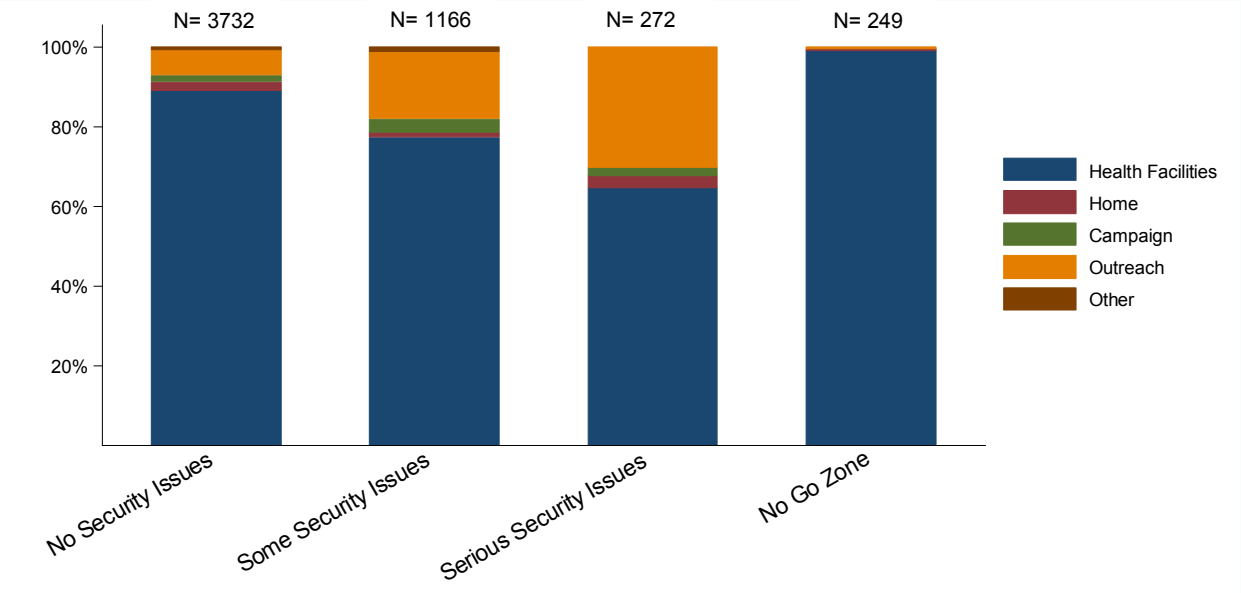
It is difficult to interpret these results, although they may suggest that while community campaigns and outreach can still take place in areas with serious security issues, this is simply not possible for areas classified as No Go Zones. In No Go Zones therefore, health facilities have an even greater importance compared to relatively safe areas.

[72] This difference is statistically significant at a 5% level of significance.
[73] This difference is *not* statistically significant at a 5% or even 10% level of significance.
[74] Clinics were placed into one of four possible security categories by New Incentives in their security screenings process. The four security categories were defined by New Incentives as follows (and corresponding share of surveyed caregivers residing in each type of clinic area):

(1) No Security Issues: no robberies or armed violence on the way to or close to clinic in the past two months. (68.9% of caregivers)
(2) Some Security Issues: armed violence on way to or close to clinic but without deaths in the past two months. (21.5%)
(3) Serious Security Issues: armed violence with deaths on way to or close to clinic, but not during daytime (past two months). (5.0%)
(4) No Go Zone: frequent armed violence with deaths on way to clinic or close to clinic during daytime (past two months). (4.6%)

Ever vaccinated rates were negatively correlated with the security status of clinics (38.5% at 'No Security Issues' clinics, 27.1% at 'Some Security Issues', 22.4% at 'Serious Security Issues', and 21.3% at 'No Go Zone'). This emphasizes the importance and challenge of improving coverage rates in poor security catchments.

Figure 10: Vaccination Location by Clinic Security Status



The key takeaway remains that most vaccinations occur at health facilities rather than at other locations - 70% of caregivers reported vaccinating their children *exclusively* at health facilities. Table 9 provides some additional breakdowns of vaccinations that occur at health facilities. Overall, 74.9% of caregivers reported going to a health facility for a vaccination. The average child received 1.43 vaccinations at a health facility, which indicates that many who did go to health facilities for vaccinations received more than one vaccination there. This trend suggests caregivers may be more likely to return to a health facility with their child after going the first time.

Table 9: Health Facility Vaccinations

Facility Vaccinations	N	%
Vaccinations received at a health facility	7796	87.6%
Respondents who reported receiving vaccinations at a health facility	1390	74.9%
Respondents who reported receiving at least 1 vaccination at the study clinic	1167	62.7%
Respondents who reported receiving at least 1 vaccination at other clinics	302	20.6%
Average number of vaccinations received at a health facility per child:	1.43 [95% CI 1.34 – 1.51]	

Notes: *Number of total reported vaccinations: 8852. Number of caregivers who ever vaccinated their children: 1857. All "Don't know" responses are counted as "No".*

To get a sense of which clinics caregivers frequent, the survey asked caregivers specifically whether they had received vaccinations at the clinic that serves their settlement (the study clinic). The results show that 62.7% of caregivers who vaccinated their child at least once said they had

received at least one vaccination at a study clinic.[75] Further, 79.2% of caregivers said they had received at least one vaccination either at the study clinic or at outreach activities organized by the study clinic,[76] indicating that the majority of respondents are familiar with the clinic that serves their area.

The discrepancy between the share of respondents going to a health facility for vaccinations (74.9%) and the share who reported getting vaccinations at the study clinic (62.7%) suggests that at least insofar as vaccination services are concerned, caregivers do not strictly adhere to the clinic that serves their catchment. However, for the majority of respondents who reported going to a non-study clinic, these clinics are located far enough from the study catchment areas such that overlapping or adjacent catchments are not an issue.

Respondents are likely visiting these non-study clinics because they are accustomed to going to these clinics – many of these non-study clinics are in a nearby big town. In cases where these non-study clinics are relatively close or are complementary to the study clinics, operating at these clinics and ensuring that caregivers are well informed about their catchments could help the program reach a wider target population and ensure that clinic catchments assigned to treatment receive the full treatment.

One potential data limitation is that the distinction between community outreach by clinics, and large-scale vaccination campaigns in the community, was poorly understood by respondents, likely because both can occur door-to-door. Furthermore, the baseline survey was conducted before the start of the measles campaign in Katsina and Zamfara (meant to begin in October 2017) – the distribution of vaccination locations is likely to look different in the months after the measles campaign. Nonetheless, the key takeaway remains that health facilities were the most frequently reported location where caregivers go to get their children vaccinated.

6.6 Attitudes Toward Vaccination

To better understand the underlying attitudes driving vaccination behaviour, respondents were asked to state the main reasons why they chose to vaccinate or not vaccinate their children. Without probing, enumerators, marked all the reasons mentioned by the caregiver from a pre-

Key Results

- Of the respondents who either never vaccinated their children or skipped certain vaccinations, 64% cited ‘lack of knowledge’ or ‘ambivalence’ as the main reason for *not* vaccinating their children.
- For those respondents who skipped one or more routine vaccinations, access and service delivery issues were also cited as a barrier.
- Of the respondents who did vaccinate their child at least once, 79% cited health concerns as the main reason for doing so.
- For respondents who had their child fully immunized, external influence from community leaders or family members played a much smaller role than the desire to prevent illness, disease or death.

[75] Caregivers were asked directly if their child had ever received an injectable vaccine at the clinic which served their settlement.
[76] Although it is likely that caregivers found it difficult to distinguish between which clinics conducted the outreach activities.

specified list of items. In the analysis, these responses were further categorized into themes. The results of this analysis are summarized in this section.[77]
As described in Section 6.1, 34.4% of caregivers reported having vaccinated their child at least once – the remaining 65.6% had never vaccinated their child with an injectable vaccine. Further, 89.8% of caregivers had either never vaccinated their child or had missed one or more routine vaccinations.[78]

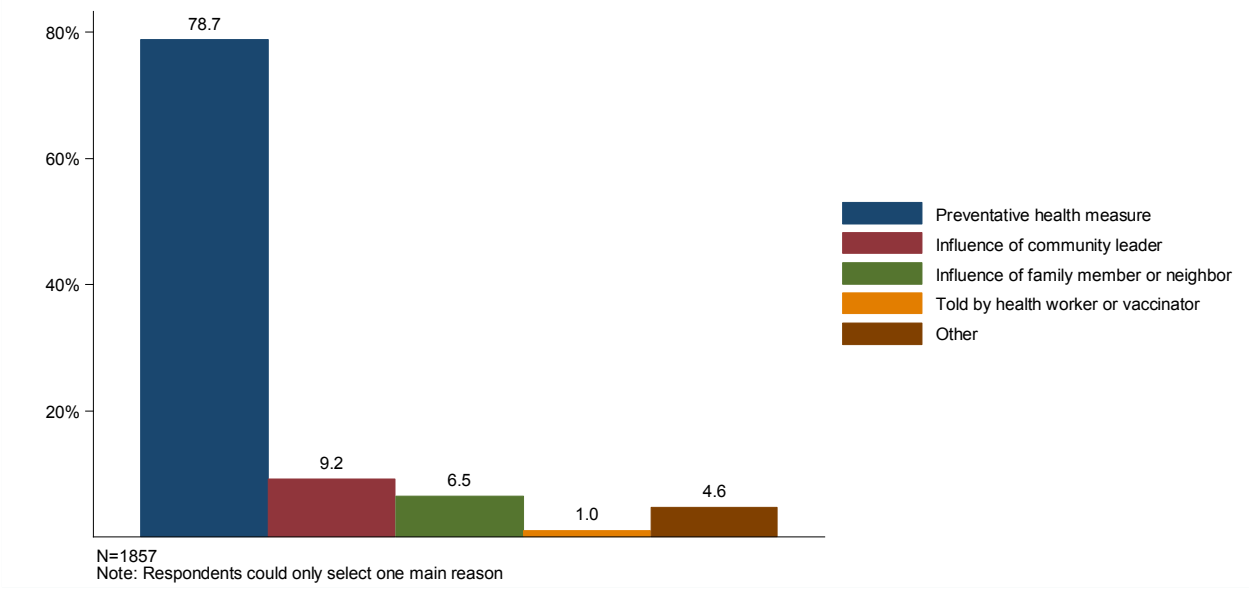
Main reasons for vaccinating children

For caregivers who reported having vaccinated their child at least once, the responses to the question, "What is the main reason that you decided to vaccinate your child?" were categorized in the analysis according to the following themes:

- Preventative health measure
- Influence of community leader
- Influence of family member or neighbor
- Told by health workers or vaccinators
- Other

As seen in Figure 11, caregivers cited health reasons as the primary reason for vaccinating their children, with nearly 79% of respondents stating that they did so to prevent illness, disease, or death. This general attitude indicates that additional awareness activities to inform caregivers and community members about the merits of vaccination may be beneficial.

Figure 11: Main Reasons for Vaccinating Children



[77] One consideration while interpreting these results is that the responses to questions on attitudes towards vaccination are prone to bias. For example, respondents may not want to admit that the main reason they vaccinated their children was to receive an incentive. Respondents may also hesitate to admit that they didn't vaccinate their children because of their husband's or other family members' influence. These pressures may increase the response rate for reasons such as "didn't know" or "no reason".

[78] The survey asked about other vaccines apart from BCG, PENTA and Measles to help mitigate a situation where caregivers mistakenly reported vaccinations that were not BCG, PENTA or Measles as a BCG, PENTA or Measles vaccination. These other vaccines (DTP, IPV, PCV, and Yellow Fever) were also included to ensure comparability with other studies. Attitudes with respect to all vaccines are analyzed in this section to gain a richer understanding of why people did or did not vaccinate.

An additional 9.2% of respondents said the main reason they vaccinated their children was the influence of community leaders. This was the second most important reason after health reasons. This may indicate that communication about the New Incentives' program from traditional leaders could be well-received by caregivers, and while 64.9% of respondents said they had already heard positive messages about vaccination from local leaders, the remaining third of caregivers could be an effective target group for the program.

Only three out of the 1,857 caregivers (0.16%) who said they vaccinated their child stated that they did so because they wanted to get an incentive, although 23.8% of caregivers who vaccinated their children reported receiving incentives of some sort. As explored in the next section, the majority of the incentives received by respondents were items (such as sweets or soap) valued under 500 Naira. Low-value items may not be substantial enough to be the main reason why caregivers vaccinate their children. It is also possible that these numbers are driven by desirability bias: respondents do not want to be seen as only vaccinating their child to receive a personal benefit. Further, it is also possible that respondents associated the small incentive with the clinic visit rather than as the result of vaccinating their child.

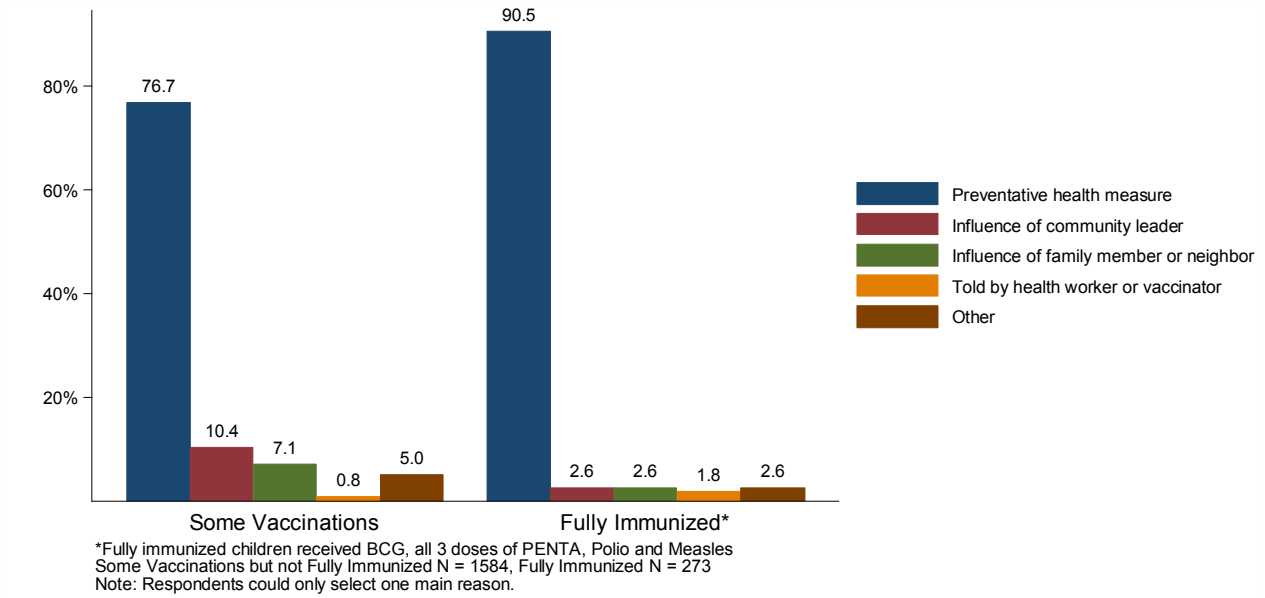
Very few caregivers (1.0%) reported that their main reason for vaccinating their child was because a health worker or vaccinator encouraged them to do so, and only 10.0% said they had heard positive messages about vaccination from health workers. Mothers are often informed about routine immunization during antenatal visits or at the time of birth; the low facility delivery rate (8.4%) among our sample may explain why few caregivers said they vaccinated their child on the advice of a health worker or vaccinator.

One possible interpretation of the data is that given the share of caregivers vaccinating due to external influence is relatively low, there could be high intrinsic motivation to vaccinate children to improve their health for those who vaccinated their child at least once. As the New Incentives program is aiming to increase coverage rates, it is possible that caregivers with no previous history of vaccinating their children will respond to incentives to vaccinate their children – these caregivers may be more likely respond to extrinsic motivation than those reporting vaccinations at baseline. Even if many caregivers did in fact hear about vaccinations from health workers or other external influencers but reported vaccinating their child for health reasons, this is a positive outcome and could indicate the impact of vaccination education. To the extent that lack of knowledge explains the gap between those who did and did not vaccinate their child, targeted awareness programs and outreach could help improve health-seeking behavior and encourage caregivers to vaccinate their child.

We also compared the attitudes of caregivers who had their children fully immunized with those who only received some vaccinations and found that attitudes are distributed differently in the two groups.[79] Caregivers who reported receiving all vaccinations overwhelmingly reported that they did so as a preventative health measure. As seen in Figure 12, 90.9% of caregivers in the fully immunized group reported vaccinating their children as a preventative health measure, compared to 76% for the group of caregivers who got certain vaccines but skipped others. For the 'some vaccinations' group, the influence of a community leader was cited by 10.8% of caregivers, versus only 2.87% in the group of caregivers who got all vaccinations.

[79] A chi-squared test of attitude themes on the subgroup variable (which had a value of 1 of the child was fully immunized and 0 if they only had some vaccinations out of BCG, PENTA, DTP, IPV, PCV, Measles, or Yellow Fever) returned a p-value of <0.01, indicating that the distribution of attitudes between the two subgroups is statistically significantly different.

Figure 12: Main Reasons for Vaccinating Children by Subgroup



Analyzing attitudes by state, we observed that more caregivers in Katsina reported vaccinating their children as a preventative health measure than in Zamfara (84% vs. 71%), as demonstrated in Figure 13. Community leader influence seemed to be a more prominent reason in Zamfara than in Katsina (14% vs. 7%). These differences are also statistically significant[80] and indicate that there could be some gains to adapting outreach strategies by state, perhaps by making a concerted effort to encourage community leaders to advocate for vaccination and help bridge the awareness gap in Katsina. In fact, as Table 10 shows, across both states, community leaders had a substantial influence on vaccination behavior, even if few respondents explicitly cited their influence as the main reason they vaccinated their child. Among community leaders, traditional leaders were most frequently cited in this regard. Paying attention to the messages that are being delivered by local leaders and ensuring their support has the potential to make a positive impact on vaccination coverage.

[80] A chi-squared test of attitude themes on state returned a p-value of <0.01, indicating that the distribution of attitudes between the two states is statistically significantly different.

Figure 13: Main Reasons for Vaccinating Children by State

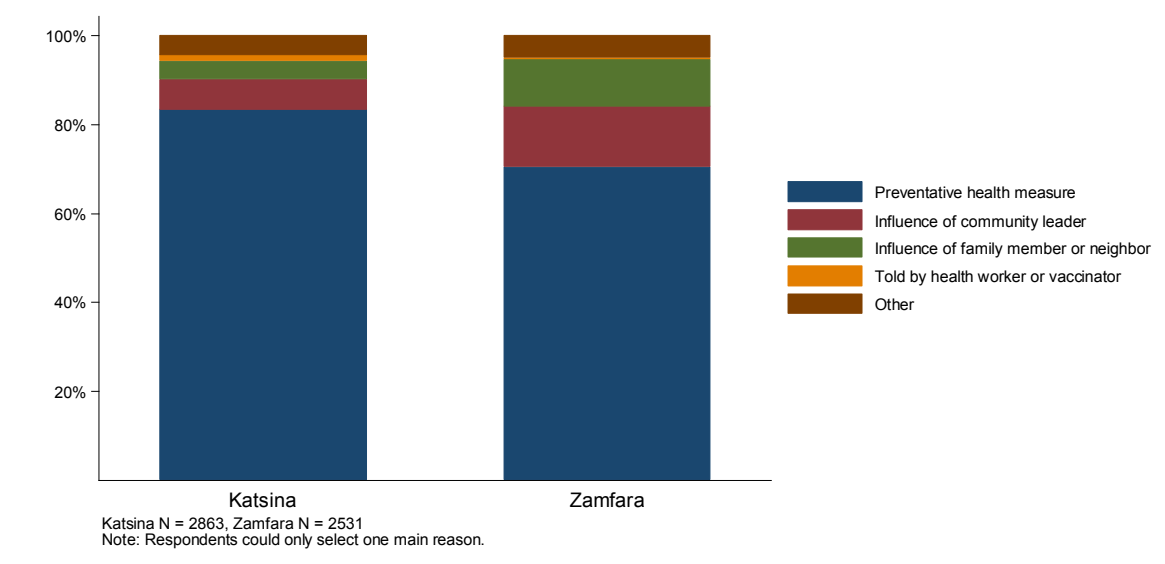


Table 10: Immunization Coverage Across Local Leader Messaging

Local Leader Attitudes	N: 12 to 24-month olds	Ever received injectable vaccination	BCG	Any PENTA	Full PENTA	Measles	Fully immunized child (full PENTA)
Have Heard Positive Messages	3415	39.1%	28.2%	24.9%	11.4%	19.2%	6.2%
Have Not Heard Positive Messages	1843	26.0%	18.4%	15.1%	5.9%	10.5%	3.1%

Despite these state differences, the takeaway remains that at baseline and in the absence of any other cash incentives, health reasons seem to be the main motivation for caregivers who did vaccinate their children. Whether and how this changes in the presence of cash incentives will be something to track over the course of the study.

Main reasons for not vaccinating children

Respondents who had either never vaccinated their children or had missed one or more vaccinations[81] (89.8% of the sample), were asked the question "Why have they not received these vaccinations?". Responses were categorized by enumerators into one of 18 possible categories, including "don't know the vaccination schedule" or "went to clinic but vaccine ran out" to "heard or read negative media" or "fear of needles." For our analysis, these responses were further grouped into the following themes[82]:

- Lack of knowledge
- Service delivery issues
- Mistrust or fears

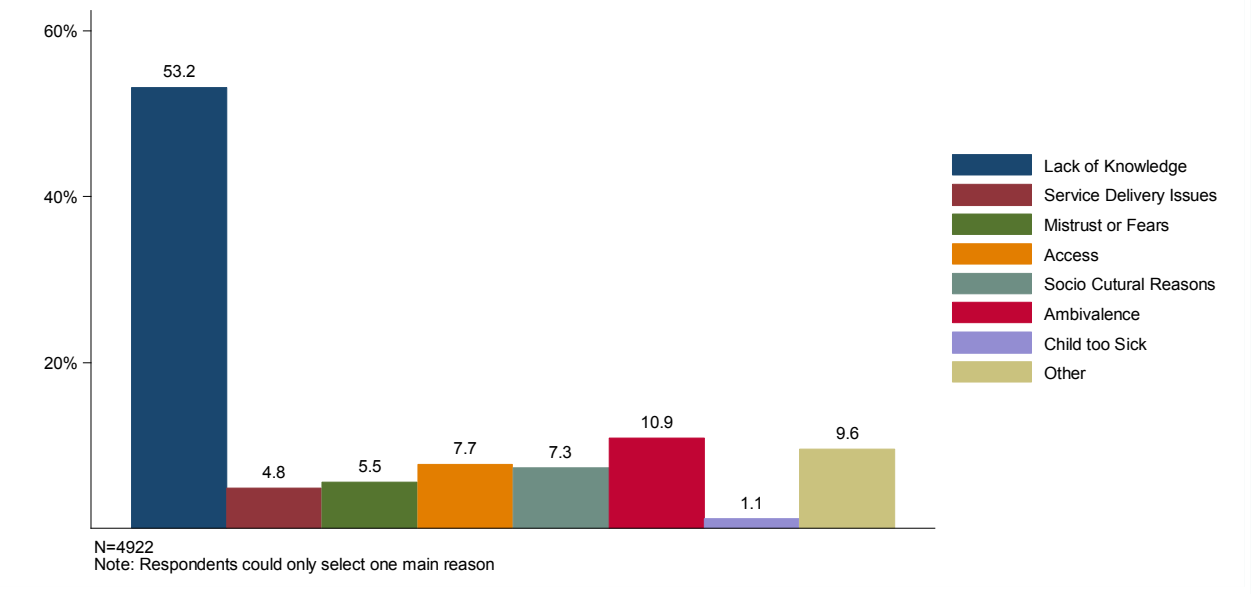
[81] The survey asked about other vaccines apart from BCG, PENTA and Measles to help mitigate a situation where caregivers mistakenly reported vaccinations that were not BCG, PENTA or Measles as a BCG, PENTA or Measles vaccination. These other vaccines (DTP, IPV, PCV, and Yellow Fever) were also included to ensure comparability with other studies.

[82] A more detailed description of how the 18 survey responses fit into the various themes can be found in Annex 7.

- Access
- Socio-cultural reasons
- Ambivalence[83]
- Child too sick
- Other

The distribution of these responses across the respondents (91.3% of the sample) who either never vaccinated their children or who skipped one of the vaccinations asked about in the survey, can be seen in Figure 14.[84]

Figure 14: Main Reasons for *Not* Vaccinating Children

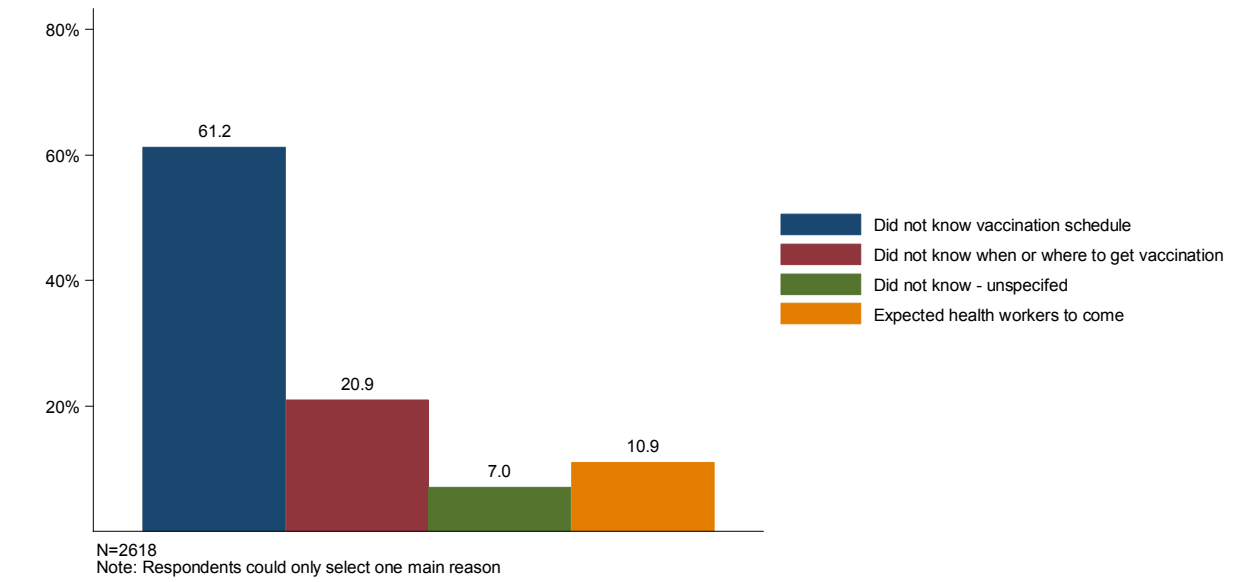


Lack of knowledge was the primary reason for caregivers (53.2%) not vaccinating their children. The lack of knowledge category includes reasons such as not knowing where and when to get vaccines, as well as misconceptions like not needing to vaccinate healthy children. As Figure 15 below shows, being unaware of the vaccination schedule and not knowing where to get vaccinations done together account for 82.1% of responses in the lack of knowledge category.

Another theme that emerged in this analysis was that some caregivers (5.8% of the entire sample, and 10.9% of those in the 'lack of knowledge' category) do not go to the clinic to vaccinate because they expect or wait for health workers to come to them to administer vaccines. As many of the children during the polio campaigns are given the oral polio vaccine at home or in their communities, the prevalence of this response indicates that caregivers may be misunderstanding how injectable vaccines are administered in Nigeria (that is, mostly in health clinics).

[83] This likely covers attitudes such as indecisiveness, conflicting feelings about immunization and a lack of motivation to immunize.
[84] There are 9 missing values across the responses reported in this part of the section (i.e. for caregivers who either never vaccinated their child or skipped certain vaccinations).

Figure 15: Breakdown of Lack of Knowledge Category



The second most prominent category of reasons for not vaccinating children was ambivalence, with 10.9% of respondents citing reasons such as "no reason". Ambivalence was cited more often than access issues such as transportation and unavailability of caregivers, which accounted for 7.7% of responses. Ambivalence was also cited more often than supply-side issues such as the unreliability of clinics and poor customer service, which accounted for less than 5% of all responses (see Figure 14 above).

Stock-outs and unreliability of clinics (3.7%) and poor customer service by clinic staff (0.5%) do not seem to be primary contributors to respondents' lack of motivation to vaccinate their child. Elsewhere in the survey, 12.4% of all caregivers reported that they went to a health facility intending to get a child vaccinated but were not able to do so, mostly due to supply-side issues. Such supply-side pressures may become more important barriers to vaccination if a higher volume of children attend clinics for vaccinations due to the New Incentives' program.

Socio-cultural considerations such as lack of permission from the husband or religious reasons were cited as the main reason for skipping vaccinations by only 7.3% of caregivers, suggesting that the majority of respondents are not opposed to vaccinations for socio-cultural reasons – or at least do not say so explicitly.

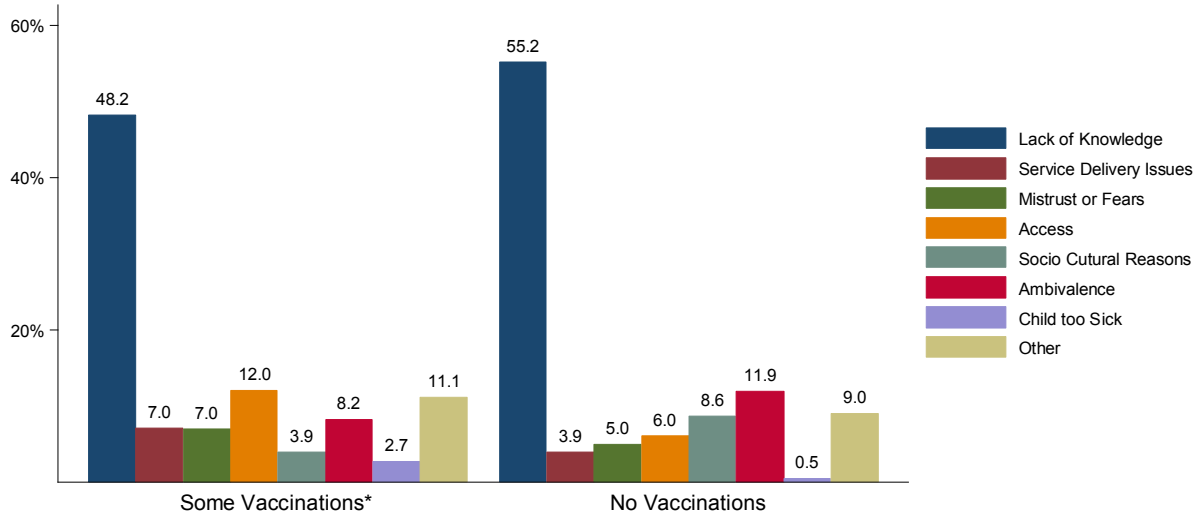
A final category of interest was the mistrust or fear of vaccination, which was the most infrequently cited reason for not vaccinating children – only 5.5% cited medical reasons such as fears of side effects, bad reactions to previous vaccinations, or a fear of needles. This low percentage indicates that allaying fears around side effects may not be a crucial element to include in awareness campaigns.

Further exploration of the difference between caregivers who did not vaccinate their child at all[85] and those who reported receiving some vaccinations,[86] indicates that the distribution of attitudes differed between the two groups and that this difference is statistically significant. As Figure 16 demonstrates, caregivers who never vaccinated their child reported lack of knowledge and ambivalence more often (55.2% and 11.9% respectively) than caregivers whose infants received some vaccinations (48.2% and 8.2%). Socio-cultural reasons were also a bigger contributor for

[85] That is, those who responded "No" to the question: "Has [child name] ever received any injectable vaccinations to prevent him/her from getting a disease?".
[86] That is, all those who skipped any one out of BCG, PENTA, Measles or Polio.

the group who never vaccinated their child (8.6%) than for those who had (3.9%). Conversely, service delivery and access issues were cited as a barrier more often by caregivers who had vaccinated their child (7% and 12.0% respectively) than for those who had not (3.9% and 6.0%). These results suggest that addressing a lack of knowledge and ambivalence may be helpful when targeted towards caregivers who have never vaccinated their child. For caregivers who have vaccinated their child, helping resolve access and service delivery issues may have greater impact in improving coverage rates.

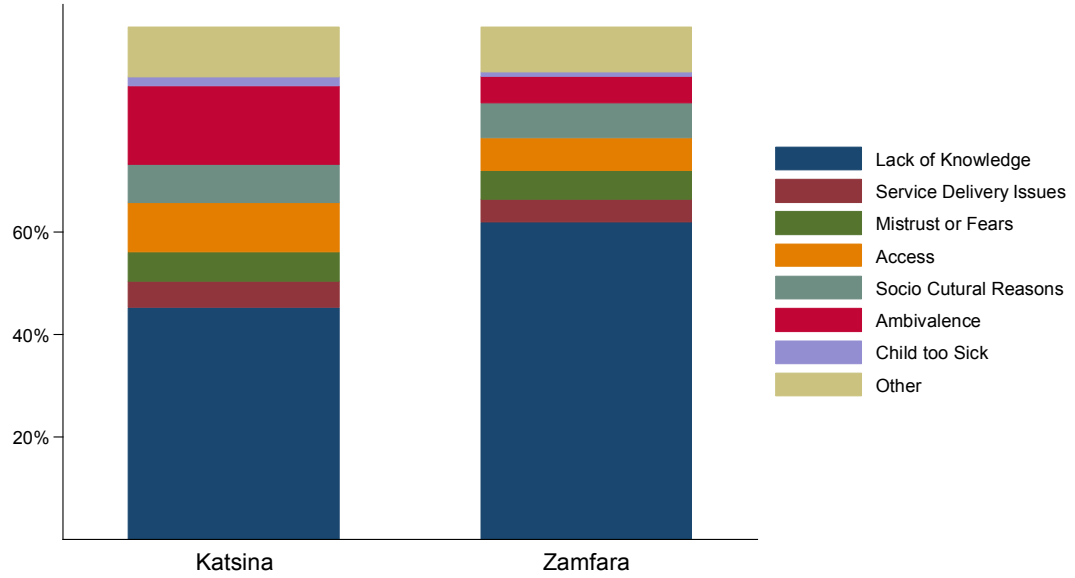
Figure 16: Main Reasons for *Not* Vaccinating Children by Subgroup



*Excludes respondents who are fully immunized; Missing Values = 9
Some Vaccinations N = 1391 No Vaccinations N = 3531
Note: Respondents could only select one main reason

As with the previous section, there were statistically significant differences in attitudes towards vaccination by state, particularly regarding the proportion of caregivers citing lack of knowledge and ambivalence. Lack of knowledge about immunization seemed to be a more important reason in Zamfara than in Katsina (61.5% vs 44.9%). Ambivalence on the other hand was a more common reason for missing vaccinations in Katsina than in Zamfara (15.6% vs 5.8%). Caregivers cited access as a barrier more often in Katsina than in Zamfara, which is surprising considering clinics are spread further apart in Zamfara than in Katsina. These differences suggest that there could be some gains to adapting outreach and awareness strategies to each state's conditions.

Figure 17: Main Reasons for *Not* Vaccinating Children by State



Katsina N = 2888, Zamfara N = 2531
Note: Respondents could only select one main reason

Understanding vaccination attitudes across different types of caregivers and calibrating outreach strategies based on these insights is especially important given that attitudes towards vaccination are a strong correlate of low coverage. Due to the nature of this question, we created Table 11 to show the coverage for those who did not vaccinate across the mains reasons for missing vaccinations. Among caregivers who cited lack of knowledge as the main reason for not vaccinating their child, 74.3% (95% CI: 72.7%, 76%, p-value< 0.01[87]) did not give their child an injectable vaccination. Similarly, a large proportion of caregivers who cited ambivalence (79.1%, 95% CI: 75.7%, 82.7, p-value < 0.01) and socio-cultural reasons (84.9%, 95% CI: 81.2%, 88.7%, p-value < 0.01) did not ever vaccinate their children.

While socio-cultural reasons are difficult to change, New Incentives could direct efforts towards increasing awareness and reducing ambivalence towards vaccinations. Given that these are correlated with coverage even across a large sample such as ours, targeting efforts in this direction could help improve attitudes towards vaccination and in turn improve vaccination coverage.

Key Results

- IDinsight's coverage rates are consistent with UNICEF's Multiple Indicator Cluster Survey (MICS) and DHS suggesting these sources can be reliable data sources for determining coverage. Our data has the advantage of a larger sample size, and specifically samples infants in Katsina and Zamfara.

[87] P-value from a bivariate logistic regression between ever vaccinated coverage and the main reasons for not vaccinating.

Table 11: Immunization Coverage for Caregivers by Reasons for Not Vaccinating[1]

Main Reason for Not Vaccinating	N: 12 to 24-month olds	Never Vaccinated	No BCG	No Any PENTA	No Full PENTA	No Measles
Access	389	56.3%	65.7%	74.9%	91.5%	93.0%
Ambivalence	512	79.1%	85.5%	88.3%	96.7%	92.4%
Child too sick	67	35.8%	47.8%	52.3%	83.6%	92.5%
Lack of Knowledge	2625	74.3%	85.8%	88.6%	95.7%	89.9%
Mistrust or Fears	335	66.9%	75.8%	81.2%	94.3%	94.0%
Other	403	67.0%	77.2%	77.8%	91.3%	89.1%
Service Delivery Issues	240	58.3%	69.5%	72.8%	90.4%	84.6%
Socio Cultural Reasons	351	84.9%	91.7%	94.3%	98.9%	96.6%

[1] *The data in this table apply to caregivers who either never vaccinated their child or missed one or more routine vaccinations.*

6.7 Presence of Other Incentives

To understand the landscape of immunization incentives, the survey asks caregivers with a child that has received any immunization, including non-injectable polio drops, whether they received incentives for vaccinating their child.[88] This section explores the presence of other incentives for vaccination for caregivers in our sample.

Key Results

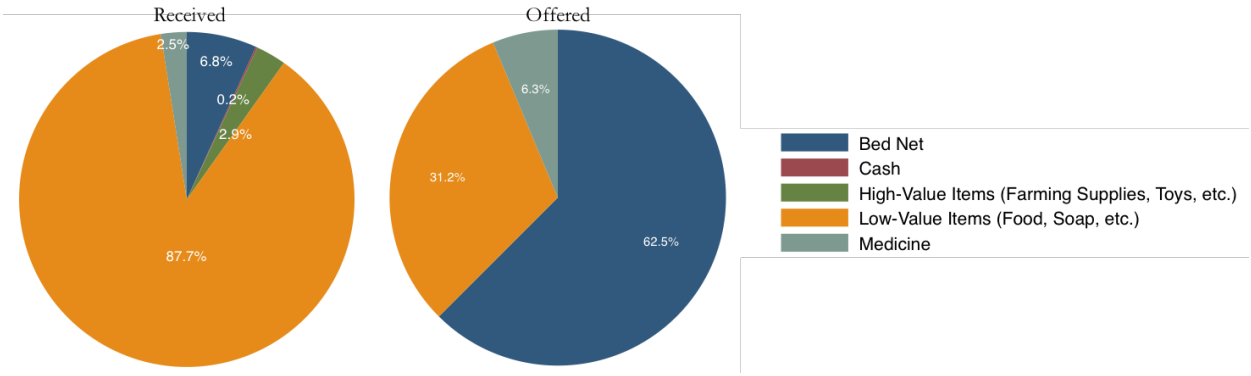
- Overall, 22.7% of caregivers received some incentive for vaccinating their child.
- The majority of the incentives received by caregivers were low-value items (food, soap, etc.). The second most common incentive is bed nets.
- Only 2 caregivers reported receiving a monetary incentive.

Almost a quarter of these caregivers (22.7%) reported receiving incentives. The majority of caregivers received one incentive; only 69 caregivers (6%) reported receiving more than one.[89] In descending order and shown in Figure 18, the values of incentives are: high-value items (above 500 Naira or approximately $1.40 USD), low-value items (below 500 Naira), medicine[90], and bed nets (periodically distributed for free). At 88%, the vast majority of these caregivers reported receiving low-value items for vaccinating their child. This is not surprising as incentives like sweets and soap are low-cost, easy to store and distribute, and useful to those who receive them.

We also examined New Incentives' data on incentives that clinics reported offering to caregivers in exchange for immunizing their children. Of all 130 clinics surveyed, 59 clinics (45.8%) reported offering incentives. The majority of clinics distributing incentives offered bed nets (62.5%), which is a discrepancy from the majority of caregivers who reported receiving low-value items. As we discuss below and in Annex 8, there are some credibility issues regarding the incentives reported by clinics.

[88] This question was asked only to caregivers of children who have received either polio drops and/or injectable vaccinations. Only 98 caregivers did not need to answer the incentives questions because their children received neither.
[89] For simplicity, when a caregiver reported receiving more than one incentive, we denote the primary incentive as the incentive of the highest value. For example, if a caregiver reported receiving medicine and low-value items, then the low-value item would be their primary incentive.
[90] "Jasimol" and "Midol" were the main medicines used as incentives.

Figure 18: Distribution of Incentive Types



As seen in Figure 19, nearly twice the number of caregivers in Zamfara (N=761) reported receiving incentives for vaccinating their children than in Katsina (N=408) – the discrepancy between the two states is even greater at the clinic level with many more clinics in Zamfara reporting to offer incentives. Only 14.3% of respondents in Katsina reported receiving an incentive, compared to 30% of the respondents in Zamfara, which likely indicates a greater number of incentive initiatives in Zamfara.

Among those who reported receiving an incentive, the percentage of caregivers who reported receiving medicine and bed nets is higher in Katsina than Zamfara. Despite these state differences, the distribution of the types of incentives across the two states is similar.

Figure 19: Distribution of Incentive Types by State

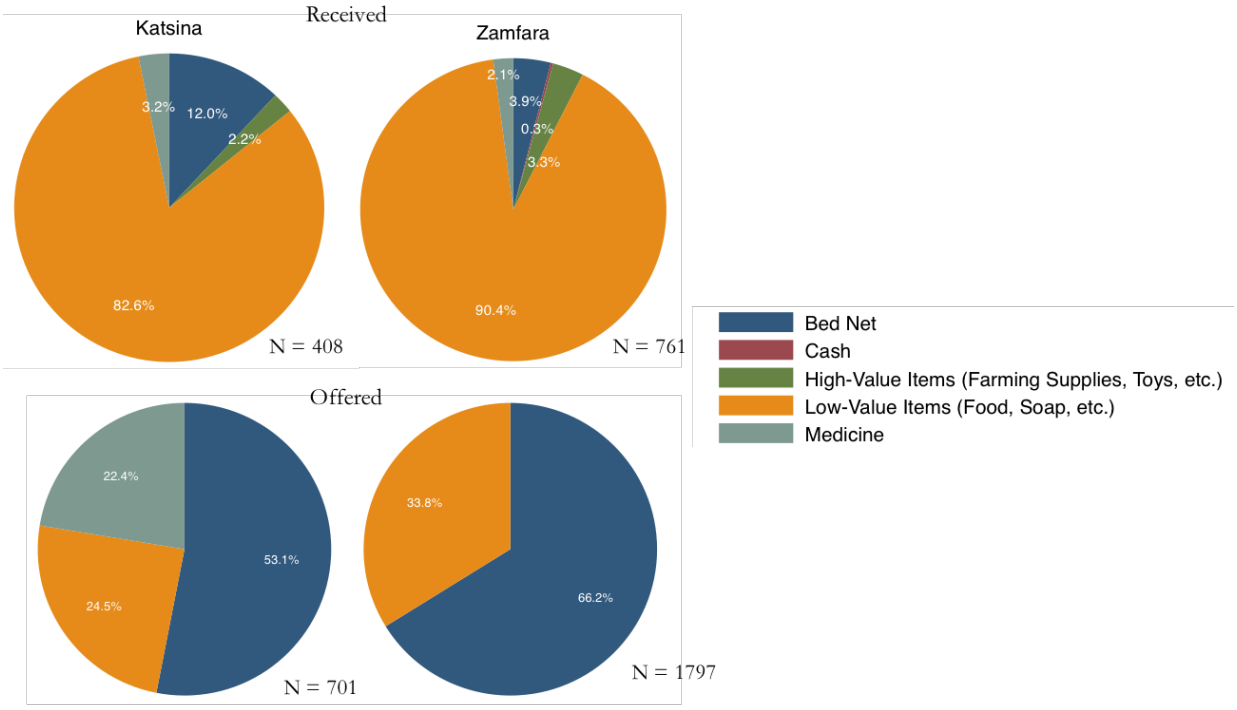


Table 12: Immunization Coverage Across Incentives Received by Caregivers

Incentives Received	N: 12 to 24-month olds	Ever received injectable vaccination	BCG	Any PENTA	Full PENTA	Measles	Fully immunized child (full PENTA)
No	4093	34.7%	24.7%	21.0%	5.4%	15.9%	3.7%
Yes	1205	36.3%	26.5%	24.4%	7.2%	17.5%	5.3%
Bed Net	79	91.1%	84.8%	83.5%	30.4%	67.1%	24.1%
Medicine	29	86.2%	75.9%	69.0%	17.2%	37.9%	13.8%
Low-Value Items[1]	1025	30.8%	20.5%	18.6%	5.1%	12.8%	3.7%
High-Value Items[2]	34	47.1%	35.3%	35.3%	8.8%	29.4%	5.9%
Cash	2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

[1] *These include items such as food, soap, etc.*
[2] *These items such as farming supplies, toys, etc.*

For those caregivers that did receive an incentive, coverage rates for all immunizations were about 1.6 percentage points higher (95% CI: 0.5, 3.7, p-value=0.13). While this difference is not statistically significant, the coverage breakdown for specific incentives shows that receiving a bed net or medicine is associated with high coverage rates. While we cannot say for certain, these items are likely given as part of a vaccination demand generation initiative, which suggests that the population may respond well to further initiatives to encourage vaccination.

Table 13: Immunization Coverage Across Incentives Offered by Clinics

Incentives Offered	Number of clinics	N: 12 to 24-month olds	Ever received injectable vaccination	BCG	Any PENTA	Full PENTA	Measles	Fully immunized child (full PENTA)
No	71	2896	38.9%	29.3%	26.6%	7.2%	19.0%	5.2%
Yes	59	2498	30.1%	20.1%	16.2%	4.0%	13.4%	2.6%
Bed Net	37	1561	26.9%	19.0%	15.4%	3.3%	12.2%	2.2%
Medicine	4	157	46.6%	31.6%	28.5%	7.6%	19.8%	3.8%
Low-Value Items	18	780	33.0%	19.7%	15.1%	4.5%	14.4%	3.3%

It is puzzling that coverage is higher for clinics that do not offer incentives. One way to interpret this result is that caregivers' attitudes towards incentives are not well-established. In our survey, no caregivers listed incentives as the main benefit of vaccinations, suggesting that incentives are not the main motivation for caregivers to vaccinate their children. Alternatively, our theory for causality could be reversed. Clinics may start offering incentives because they realize that coverage in their catchment is low, leading to fewer caregivers reporting they received incentives than the number of clinics reporting to offer incentives.

We examined the data for clinics that offered incentives. Some clinics reported incentives offered during campaigns, as opposed to incentives offered on a normal basis. This confusion possibly explains the dominance of bed net incentives, which are offered during campaigns. There may also be a desirability bias where clinic staff want to portray their clinic as active in their marketing and outreach for routine immunizations. All these factors may contribute to overall unreliability of these clinic-reported data.

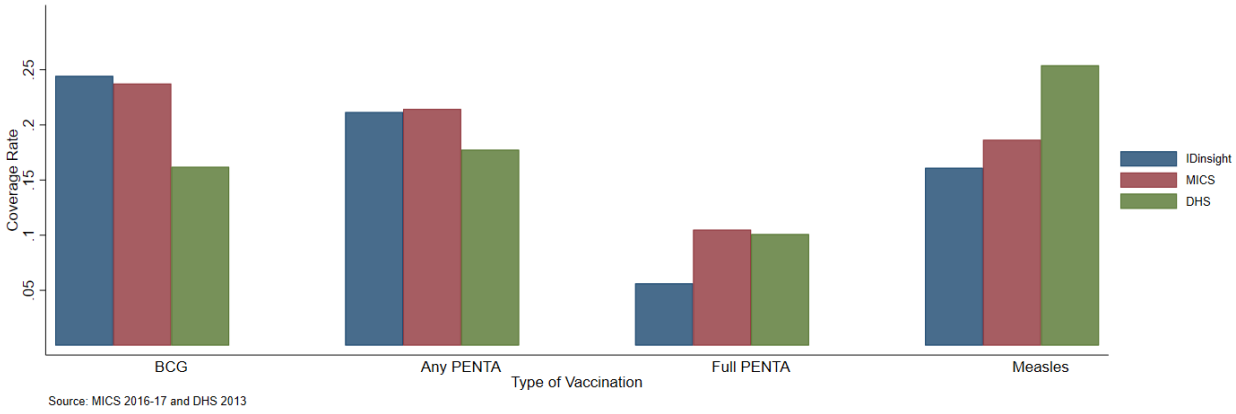
6.8 Comparison to Coverage Estimates from the DHS, MICS, and CDC/NSTOP Surveys

This section compares our self-reported coverage estimates to data from other routine immunization surveys conducted in North West Nigeria.

Comparison with External Survey Coverage

Other studies have also collected data on vaccination coverage rates through surveys in Nigeria, particularly the DHS, UNICEF's MICS, and the United States' Centre for Disease Control and Prevention's National Stop Transmission of Poliomyelitis (CDC/NSTOP) program.[91] The former two surveys collect population, nutrition, and health data for women and children across developing nations and are trusted sources of global health data. CDC/NSTOP is a study that collected coverage data of particular LGAs across Nigeria. Thus, we compared the coverage rates from our survey with these sources to check the reliability of our data. The coverage rates of Katsina and Zamfara extracted from the MICS 2016-17 and the DHS 2013 are shown in Figure 20. For the comparison with CDC/NSTOP, we restricted our dataset to the LGAs that CDC/NSTOP surveyed in Figure 21. We compare coverage rates for BCG, Any PENTA, Full PENTA, and Measles found by IDinsight, MICS, and DHS surveys.[92]

Figure 20: Comparing Coverage Across IDinsight, MICS, and DHS [93]

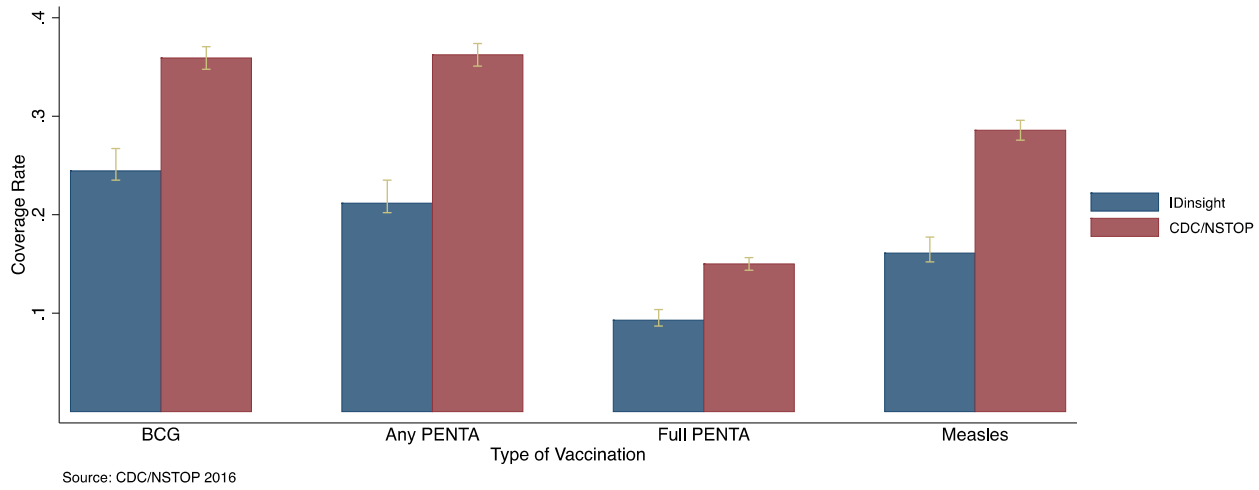


[91] Sato and Takasaki 2016 was an RCT that focused on the peer network effect in coverage across Andamawa RCT. However, we did not incorporate it into our analysis because it only reported tetanus coverage rates.

[92] Both external studies have coverage rates for children who are "fully vaccinated." However, their definition of full vaccinated includes more immunizations than our definition, making it difficult to properly extrapolate a comparable "fully vaccinated" coverage rate without individual-level data.

[93] Standard error from DHS spans across the entire northwest region of their survey, including states beyond Katsina and Zamfara. Thus, it is likely that the error bars for DHS are larger than shown. MICS did not publish standard errors for their coverage rates.

Figure 21: Comparing Coverage between IDinsight and CDC/NSTOP



Source: CDC/NSTOP 2016

Across all vaccination types, IDinsight coverage estimates were closest to that of MICS. The coverage estimates from MICS[94] were within the error bars of the coverage rates from our survey. The differences were larger with DHS. Across routine immunizations, our data reported lower coverage than that of Gunnala et al. 2016. These differences are likely the result of sample size differences. All three studies survey a large region of Nigeria, whereas we only use data from the states of Zamfara and Katsina. Therefore, the sample sizes are small (N=781 for MICS, N=615 for DHS, and N=2265 for CDC/NSTOP) compared to our study (N=5398).[95]

Overall, our numbers are consistent with those of external studies that also surveyed routine immunization coverage rates across northern Nigeria. IDinsight's data is more precise as our sample size is almost seven times greater than that of other studies, and we specifically targeted coverage in the states of Katsina and Zamfara.

[94] There are no error bars for MICS because standard errors were not published in the MICS 2016-17 report.

[95] It is also noteworthy that MICS and DHS used a similar measurement methodology to our study, but CDC/NSTOP used the random walk technique. For more information on the technique, refer to Annex 5 in IDinsight's Evaluation Design Report.

6.9 Correlates of Coverage

This section further explores the relationship between vaccination status, and individual and community characteristics. We first outline caregiver and infant characteristics that are correlated with increased coverage rates. Second, we highlight clinic characteristics associated with increased coverage rates. Finally, we use a logistic regression to better understand the relationship between clinic and individual correlates of coverage, and having ever-vaccinated an infant, as well as the three primary outcome variables for the study.

Key Results

- Relative to caregivers with no formal education, caregivers with primary and secondary education had 68% and 87% greater odds of having ever-vaccinated their child, respectively.
- As caregivers' socio-economic status increased, the odds that they ever-vaccinated their child increased.
- Caregivers who cited traditional leader support had 71% greater odds of having ever vaccinated their child, compared to caregivers reporting no traditional leader support.
- Incentives received by caregivers, particularly bed nets and medicines, were correlated with caregivers having ever vaccinated their child.
- Lack of knowledge, ambivalence, and socio-cultural reasons were negatively correlated with caregivers having ever vaccinated their child.

Individual-Level Comparison

Sections 6.3 and 6.5 examined demographic characteristics of our sample and how these attributes corresponded with coverage rates. Several individual characteristics from that analysis were associated with coverage, including caregivers' education (both formal and Islamic school), socio-economic status (both self-perceived and asset-based), local leader support, incentives received, and a belief in protecting the infant's health. To better capture the variation in coverage rates, we examined other measurable individual characteristics. Table 14 breaks down coverage across these additional individual-level characteristics collected from the census survey.

Table 14: Immunization Coverage Across Individual-Level Characteristics[1]

	N: 12 to 24-month olds	Ever Vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized (Full PENTA)
Total	**5394**	**34.4%**	**24.7%**	**21.4%**	**5.7%**	**16.0%**	**4.0%**
Child's Gender							
Female	2774	32.6%	23.1%	19.8%	5.2%	14.6%	3.5%
Male	2620	36.4%	26.4%	23.1%	6.2%	17.4%	4.5%
Caregiver's Age							
Below 20	571	29.2%	20.5%	16.3%	4.0%	12.8%	3.0%
20-29	2351	35.6%	26.0%	22.7%	5.8%	15.8%	4.3%
30-39	1441	37.5%	27.9%	24.4%	7.5%	18.8%	5.1%
Above 40	387	39.0%	25.8%	22.5%	5.2%	18.3%	2.8%
Household Size							
Small (<7 members)	1724	33.4%	23.6%	20.0%	5.0%	15.3%	3.7%
Medium (7-10 mem.)	1851	32.3%	23.0%	19.3%	5.5%	13.8%	3.9%
Large (>10 members)	1817	37.5%	27.4%	24.7%	6.5%	18.8%	4.5%
Parity							
Small (<3)	1602	32.1%	23.4%	19.8%	5.1%	13.8%	4.1%
Medium (3-4)	1359	33.5%	23.0%	20.0%	5.0%	15.3%	3.1%
Large (>4)	2224	37.2%	27.2%	23.7%	6.7%	18.5%	4.5%
Number of Other Eligibles at Home[2]							
No Other Eligible	4835	34.3%	24.7%	21.3%	5.5%	15.9%	3.9%
One Other Eligible	508	34.8%	24.5%	22.3%	7.3%	16.4%	5.3%
Two Other Eligible	51	43.1%	29.4%	19.6%	3.9%	21.6%	0.0%
Child Born in Clinic							
No	4725	32.8%	23.0%	20.2%	5.5%	15.3%	3.7%
Yes	461	53.6%	44.6%	35.7%	8.2%	25.3%	6.9%

Note on missing values: *The following variables had missing values: Caregiver's age: N=644 (because the respondent was not the caregiver); Household size: N=2; Parity: N=209; Child born in clinic: N=208. All missing values for the coverage outcomes relate to "Don't know" responses to the BCG, PENTA and Measles self-report questions. The number of "Don't know" responses for each vaccine is as follows: BCG: N=51; PENTA: N=98; Measles: N=84. "Don't know" was recoded as "no" for full PENTA and fully immunized child (full PENTA).*

[1]Correlates on individual-level characteristics can be found in Table 16, in the multivariate regression analysis. Correlates' p-values are bolded.

Our analysis shows that there are gender inequalities in coverage. Males have higher coverage rates across all routine immunizations. Notably, there is a 1.0 percentage point (pp) (95% CI: 0.02 pp, 2.11 pp, p-value < 0.06) difference in full immunization with full PENTA and a 3.8 percentage point (95% CI: 1.1 pp, 6.5 pp, p value < 0.01) difference in ever-vaccinated children. It is possible that males receive more attention, care and priority from their families in Northern Nigerian communities. Therefore, caregivers may be more likely to take male children to health facilities for reasons including immunizations.

Caregivers' age and parity (number of previous births) are also associated with coverage. The older the caregiver and the more children she has had, the more likely it is that her child was vaccinated across all the routine immunizations. The ever-vaccinated coverage difference between caregivers below age 20 and above age 40 is large, with a difference of 9.8 percentage points (95% CI: 3.5pp, 16.1pp, p-value <0.01.

Larger household size also correlates with higher coverage. This result is consistent with a study in Adamawa state in northern Nigeria that posited that social interactions, particularly female friendships, encouraged take-up under a cash incentive immunization program (Sato and

Takasaki 2016). We may be observing the same effect with large household sizes creating a network of knowledge and information sharing across co-wives and other families. It is notable that additional eligible (12 to 24-month old) children in the same household does not seem to have a strong relationship with coverage. While caregivers with two additional eligible infants in their household report higher rates of immunization, the relationship is not significant. One may hypothesize that two children around the same age within a household would get the same information and health treatment. However, it appears that having children across many ages provides more exposure to the clinic over time.

Children born at health facilities have significantly higher vaccination rates than those born outside of clinics. Children born at clinics have a 3.2 percentage points (95% CI: 0.6pp, 5.8pp, p-value = 0.02) greater coverage rate for full immunization than those who were not born at a clinic. The difference is even greater for children that have ever been vaccinated at 20.8 percentage points (95% CI: 14.9pp, 26.5pp, p-value < 0.01). These stark differences are possibly due to caregivers' exposure to routine immunization (children receive the BCG vaccination at birth), exposure to health facilities and staff, and health knowledge shared when giving birth at a clinic. It is also likely that caregivers who go to a clinic for childbirth are more knowledgeable about health in general and thus be more likely to return for subsequent visits.

Based on the results from Sections 6.3, 6.5, and 6.6, we conclude that the primary individual-level correlates of coverage were child's sex, caregivers' demographics (age, parity, education, socioeconomic status), household size, views towards vaccination (caregiver's and local leader messages), child born in clinic, and incentives received. The individual-level variables that were not significantly correlated with coverage were the number of eligible children in the same household and ethnicity (mentioned in Section 5.5). One thing to note is that the majority of these correlates are characteristics specific to the caregiver and the community around them.

We also examined the relationships between coverage and clinic-level characteristics. Table 15 shows how coverage varies across different subpopulations based on all measurable clinic characteristics. New Incentives compiled these clinic characteristics when conducting their clinic screenings from July - August 2017.

Clinic-Level Comparison

Table 15: Immunization Coverage Across Clinic-Level Characteristics

	N: Clinics	N: 12 to 24-month olds	Ever Vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized (full PENTA)
Total	**130**	**5394**	**34.4%**	**24.7%**	**21.4%**	**5.7%**	**16.0%**	**4.0%**
Clinic Setting								
In town (urban)	2	76	40.8%	36.8%	30.7%	5.3%	24.0%	5.3%
In village (rural)	114	4762	34.3%	24.5%	21.1%	5.4%	15.8%	3.7%
Outskirts of town (semi-urban)	14	556	34.4%	24.3%	22.2%	8.1%	16.7%	6.3%
Catchment Area								
Large (>4.67 sq. km)	65	2681	31.4%	21.7%	18.0%	4.7%	13.7%	3.0%
Small (<4.67 sq. km)	65	2713	37.4%	27.7%	24.7%	6.6%	18.2%	5.0%
Total Staff								
Small (1)	6	238	31.1%	16.5%	16.5%	2.9%	13.0%	0.8%
Medium (2-3)	78	3224	36.3%	27.7%	24.0%	6.8%	16.9%	4.7%
Large (>3)	46	1932	31.7%	20.5%	17.5%	4.2%	14.8%	3.2%
Total Vaccinators								
Small (1)	67	2782	35.2%	25.5%	22.6%	5.6%	16.2%	3.9%
Large (>1)	63	2612	33.6%	23.8%	20.1%	5.7%	15.7%	4.1%
Security								
No Security Issues	89	3707	38.5%	28.7%	25.1%	7.0%	18.5%	5.0%
Some Security Issues	28	1166	27.1%	17.6%	15.2%	2.9%	11.5%	1.9%
Serious Security Issues	7	272	22.4%	9.4%	4.9%	0.4%	6.3%	0.0%
No Go Zone	6	249	21.3%	15.0%	13.0%	4.4%	10.2%	3.2%
Incentives Offered								
No	71	2896	38.5%	28.8%	26.1%	7.1%	18.6%	5.2%
Yes	59	2498	29.7%	19.9%	15.9%	4.0%	13.0%	2.6%
Bed Net	37	1561	26.5%	18.5%	14.7%	3.3%	11.6%	2.2%
Medicine	4	157	47.8%	33.8%	31.1%	7.6%	20.0%	3.8%
Low-Value Items (Food, Soap, etc.)	18	780	32.6%	19.9%	15.1%	4.5%	14.2%	3.3%
Operations from UNICEF VCM								
No	67	2783	31.6%	21.3%	17.7%	4.3%	13.6%	2.8%
Yes	63	2611	37.5%	28.3%	25.3%	7.2%	18.5%	5.2%

Security[96] is the strongest predictor of coverage. The difference in full immunization (full PENTA) coverage between clinics with no issues and clinics with some security issues is 3.1 percentage points (95% CI: 1.3pp, 5.0pp, p-value < 0.01). For infants who had ever received a vaccine, this difference was even larger at 11.4 percentage points (95% CI: 4.2pp, 18.6pp, p-value < 0.01). With increasing risk of danger or death in a settlement catchment area, caregivers may avoid traveling with their children outside the home and/or the level of outreach activities provided may be lower.

A clinic's location does not significantly correlate with coverage. There is a small difference in coverage between village (rural) and outskirts of town (semi-urban) clinics, although there is a larger difference between urban clinics and the other two groupings. This is not a statistically significant difference in the bivariate regression, likely due to the small sample size of urban clinics. Nonetheless, the hypothesis that urbanization improves health outcomes is reasonable, likely due to better infrastructure and shorter travel times improving access to health facilities.

Catchment area has a negative relationship with coverage with clinics responsible for larger catchments exhibiting lower coverage. We defined catchment area as small or large relative to the median (4.67 square kilometers). Between the two sizes, the ever-vaccinated difference is 6.0 percentage points, just above the threshold for statistical significance (95% CI: -0.1pp, 12.3pp, p-value = 0.06). Clinics with smaller catchment areas serve a smaller physical area, which likely means better accessibility for caregivers and fewer challenges with outreach.

The majority of clinics have between two to five staff members, with staff numbers ranging from one to 25. Across the total number of clinic staff, a bivariate regression yields a significant positive relationship between ever vaccinated coverage and clinic staff numbers (p-value < 0.01). This is contrary to the number of vaccinators per clinic which does not seem to influence coverage rates. The vast majority of clinics have either one or two vaccinators, but the difference in coverage rates between the two is not significant.

The UNICEF Volunteer Community Mobilizer (VCM) program involves door-to-door education and encouragement for families to get immunizations, and its presence is associated with higher coverage rates. UNICEF VCM is the primary program identified in New Incentives' clinic screenings and it operates in 63 clinics, almost evenly split across Katsina and Zamfara. Clinics with UNICEF VCM have 5.9 percentage points (95% CI: -0.4%, 12.1%, p-value = 0.07) more children ever vaccinated than clinics without the program. Although there does seem to be some overlap between VCM and New Incentives' work, the impact and presence of VCM is well-documented and we can control for VCM's program at endline. Furthermore, Table 4 shows that the present sample is balanced with respect to VCM presence.

We conclude that the primary clinic-level correlates of coverage are catchment area, total staff, security, and the presence of UNICEF VCM. The clinic-level variables that did not significantly correlate with coverage are clinic setting and total vaccinators, which is moderately surprising as one could expect urbanization and more vaccinators to increase coverage. Variables that we will

[96] New Incentives categorized security with this rubric for events occurring between September and October 2017:

- **Some Security Issues:** armed violence on way to or close to clinic but without deaths.
- **Serious Security Issues:** armed violence with deaths on way to or close to clinic, but not during.
- **No Go Zone:** frequent armed violence with deaths on way to clinic or close to clinic during daytime.

measure at endline, but did not at baseline (such as staff quality and service at clinics), may better fit the variation in coverage.

Individual and Clinic Level Multivariate Regression

By combining clinic and individual level characteristics, we model the degree to which variables measured at baseline can predict coverage. To assess the strength of the relationship between our primary clinic and individual correlates of coverage, we evaluated them in a multivariate regression displayed in Table 16, below. For this analysis, we used a logistic regression due to the binary nature of our outcome variables (having ever received a vaccination, BCG, Measles, and PENTA).

Table 16: Multivariate Logistic Regression of Individual and Clinic Characteristics

	EVER VACCINATED			MEASLES		
Covariates	**Odds Ratio**	**95% CI**	**P-value**	**Odds Ratio**	**95% CI**	**P-value**
State						
Katsina	*Ref*			*Ref*		
Zamfara	0.58	(0.43 - 0.78)	**<0.01**	0.55	(0.38, 0.81)	**<0.01**
Gender						
Female	*Ref*			*Ref*		
Male	1.18	(1.03 - 1.35)	**0.02**	1.24	(1.05, 1.45)	**<0.01**
Caregiver's Education						
None	*Ref*			*Ref*		
Primary	1.68	(1.37, 2.04)	**<0.01**	1.59	(1.23, 2.05)	**<0.01**
Secondary	1.87	(1.39, 2.52)	**<0.01**	2.77	(1.83, 4.17)	**<0.01**
Post-secondary	0.99	(0.21, 4.6)	0.99	1.96	(0.34, 11.22)	0.45
Caregiver's Age	1.02	(1.01, 1.03)	**<0.01**	1.02	(1.01, 1.03)	**<0.01**
Household size	1.03	(1.01, 1.04)	**<0.01**	1.04	(1.02, 1.06)	**<0.01**
Islamic School	1.09	(0.88, 1.36)	0.42	1.12	(0.84, 1.48)	0.44
Self-Reported Wealth	1.08	(1.02, 1.14)	**0.01**	1.08	(1.01, 1.15)	**0.03**
Poverty Probability Index (PPI)[1]	0.99	(0.98, 0.99)	**<0.01**	0.99	(0.98, 1)	**<0.01**
Child Born at Health Facility	1.79	(1.41, 2.27)	**<0.01**	1.32	(0.98, 1.77)	0.07
Traditional Leader Support	1.71	(1.41, 2.06)	**<0.01**	1.87	(1.48, 2.35)	**<0.01**
Incentive Received						
None	*Ref*			*Ref*		
Bed Net	15.41	(4.55, 52.19)	**<0.01**	8.86	(4.68, 16.77)	**<0.01**
Medicine	28.56	(6.74, 121)	**<0.01**	4.05	(1.98, 8.28)	**<0.01**
Low-Value Items	0.92	(0.75, 1.13)	0.43	0.86	(0.63, 1.17)	0.33
High-Value Items	1.88	(0.9, 3.94)	0.09	2.17	(0.99, 4.78)	0.05
Cash	*Omitted*			*Omitted*		
# of Staff	1.00	(0.98, 1.03)	0.76	1.00	(0.94, 1.05)	0.92
Security						
No Security Issues	*Ref*			*Ref*		
Some Security Issues	0.86	(0.59, 1.26)	0.44	0.85	(0.55, 1.31)	0.47
Serious Security Issues	0.99	(0.47, 2.09)	0.97	0.70	(0.23, 2.12)	0.53
No Go Zone	0.85	(0.32, 2.22)	0.74	0.97	(0.27, 3.55)	0.97
UNICEF VCM	1.19	(0.93, 1.54)	0.17	1.28	(0.92, 1.78)	0.15
Catchment Area (sq. km)	1.00	(0.99, 1.01)	0.65	1.00	(0.99, 1.02)	0.44
Constant	0.18	(0.12, 0.27)	**<0.01**	0.04	(0.03, 0.07)	**<0.01**
Observations		4,613			4,550	

[1]Since PPI is on a scale from 0-100, we still detect significance despite an odds ratio of 0.99

The model is a comparison across individual and clinic characteristics. P-values below 0.05 reveal the most significant characteristics that appear to be the key correlates of coverage. The variables that are consistently significant across coverage specifications include state, gender, caregiver's education, caregiver's age, wealth, traditional leader attitudes, and incentives received.

Looking at the odds ratios, the most meaningful variable seems to be incentives received, particularly bed net and medicine incentives. The odds of receiving an injectable vaccine for those who reported receiving medicine incentive are 29 times greater than those who did not receive any incentive. Such high coverage from bed net and medicine incentives may be the result of targeted outreach or other initiatives that distributed these incentives. Alternatively, these health-based incentives are only given out for routine immunizations. Caregivers who value health may seek out health-based incentives and also vaccinate. These results should be taken with a grain of salt, however, as those who received medicine and bed nets were a small portion of our sample with 29 and 79 caregivers reporting medicine and bed nets, respectively. Thus, it would be helpful for New Incentives to track the activity of bed net and medicine incentives across the clinics they operate at to gain a better picture of how these incentives are marketed and distributed.

Local leaders' positive attitudes towards vaccination is a strong correlate across all coverage rates. Their positive attitudes were associated with 71% greater probability of infants receiving vaccinations. This result highlights the importance of local power structure in these communities. Connecting this idea with the prevalence of lack of knowledge as the main reason why people do not vaccinate, it is an opportunity for New Incentives to take advantage of local leaders to spread messages to overcome social norm barriers. Based on this result, IDinsight recommends New Incentives incorporate local leaders into outreach activities and marketing for their program.

It is notable after combining individual- and clinic-level characteristics none of the clinic-level variables are significant correlates of coverage. This may suggest that individual characteristics explain more of the variation in coverage than clinic characteristics. To examine this further, we removed the clinic level characteristics from the multivariate regression in Table 16 and compared the R-squared values in Table 17.

Table 17: Adjusted R-Squared[1] of Regressions with and without Clinic Level Variables

Regression	Ever Vaccinated	BCG	Any PENTA	Measles
Individual variables only	0.087	0.113	0.129	0.089
Individual and clinic variables	0.089	0.116	0.134	0.092

[1]Because our model is a logit regression, we calculated McFadden adjusted R-squared values for comparison.

Comparing the R-squared values of the model with or without the clinic level variables, it is evident that the clinic level variables we included in the regression have a minimal effect on the fit of model.

However, while individual variables are more meaningful correlates, they still explain little of the variation of our outcomes. Because of the low adjusted R-squared values, we are hesitant to draw strong conclusions on individual level variables. This means that we should interpret regression results with caution as omitted variables may be explaining much of the healthcare decision-making in northern Nigeria. Together, our primary characteristics do not explain the majority of the variation in coverage, but they are still statistically significant as correlates. Thus, the takeaway for New Incentives is that they should not restrict their programmatic attention at the clinic level and consider devoting more efforts towards ensuring a cross-section of the community is being served in every clinic. Activities such as awareness and outreach should target individuals of low socioeconomic status and low education levels, and those in more rural areas. Awareness activities will also need to inform caregivers of their child's eligibility, the location of the clinic at which the incentive is available and the amount of the incentive.

7 RECOMMENDATIONS FOR DATA COLLECTION

This section outlines issues and recommendations related to data quality assurance, safety and security, logistical preparation and planning, and enumerator morale to guide future data collection for the New Incentives study. These are based on IDinsight's experience with baseline data collection in Katsina and Zamfara during the months of August through October 2017. Many of the recommendations listed below were incorporated in the Jigawa Pilot activities in February and March 2018.

7.1 Data Quality Assurance

Challenge #1

Establishing child immunization status is difficult even when question probes based on vaccination site on the infant's body are used to determine which vaccine was received. Determining where a vaccine is received is also challenging as caregivers sometimes confuse outreach activities with vaccination campaigns, and caregivers other than the primary caregiver bring infants to facilities.

IDinsight's recommendations to mitigate this are to:

- Avoid surveying shortly after campaigns, if possible, to reduce caregivers' confusion between campaigns and outreach activities.
- Structure the routine immunization section questions around vaccination site on an infant's body rather than the routine immunization schedule (caregivers more often remembered the location of an injection rather than its name or timing).
- Consider supporting clinics to avoid child health card stock outs in partnership with a third party.
- Encourage enumerator teams to speak with the primary caregiver and understand why someone else was responsible for taking the child for vaccination.

Challenge #2

Identifying eligible children is a time-consuming and difficult process. Initial projections of interview length were overly optimistic. Differences in the order of probing questions used by enumerators led to back-check discrepancies.

IDinsight's recommendations to mitigate this are to:

- Create a clear algorithm for household determination. This should begin with asking about the number of wives, step wives, aunts, uncles, cousins, and children present in the household, before probing on which people eat from the same pot.
- Work with local guides to assist with the household division process during the census.
- Encourage multiple respondents for the initial section of the Household Census survey to determine household members.
- Allow enumerators to enter Islamic dates directly onto the tablets. The tablet will then calculate the appropriate date in the English calendar to determine the child's birth date.
- Create clearer guidelines on the process of age probing. This will begin with asking for the Islamic date of birth. If that is unknown, enumerators will probe further for major holidays

around which the child may have been born. If further probing is necessary, enumerators should move to seasons related to the cultural context.

7.2 Safety & Security

Challenge #1

It can be challenging to find secure lodging near all clinics, sometimes necessitating three, four, or even five-hour travel times to certain clinics. These long journeys combined with the dispersed nature of houses within some settlements can make the survey extremely exhausting for the survey team.

IDinsight's recommendations to mitigate this are to:

- Increase survey firm staffing to the extent possible.
- Allow enough microplanning flexibility such that teams have sufficient time to survey very remote clinics. This could manifest as additional survey days for remote clinics or more enumerator teams going to remote sites to finish them in one day.

Challenge #2

Security often posed challenges for data collection, sometimes preventing survey teams from meeting their targets or placing survey teams in danger as they traveled after dark returning from sites.

IDinsight's recommendations to mitigate this are to:

- Call local authorities and clinic/LGA officials to calibrate local security threats at regular intervals and use multiple sources to verify information as applicable.
- Discuss strategies with the survey firm to complete data collection within a safe window of time during the day where enumerators teams arrive back at their accommodation locations before dark.

7.3 Logistic Preparation & Planning

Challenge #1

Access to clinics and settlements can be challenging both from a logistical and a socio-cultural perspective. The survey firm was sometimes unaware of the most efficient route to clinic catchment sites and local populations were sometimes not prepared for visits from the survey firm. We only had the contact information of political leaders and clinic staff but not of traditional leaders. Some communities were hostile to the survey firm visits or, in the case of Fulani settlements, had already moved from the designated survey site.

IDinsight's recommendations to mitigate this are to:

- Send an advance team from the survey firm to determine access routes, perform advocacy, and make introductions with local leaders, including Fulani leaders.
- If the advance team pre-identifies difficult communities, deliberately assign specific enumerators to survey them who are familiar with the local context and speak the appropriate language or dialect.

Challenge #2

Administrative population data and settlement maps are sometimes inaccurate which can lead to segments that have a far smaller catchment than anticipated.

IDinsight's recommendations to mitigate this are to:

- Continue to search for the most accurate population and settlement data possible. Consider consulting the polio campaign planners to better understand their data and approach.
- Conduct an on-the-ground map verification process prior to the start of surveying to verify or adjust population estimates and subsequently adjust survey targets for the site.

7.4 Enumerator Morale

Challenge #1

Enumerator teams became demotivated during data collection due to the long nature of the study.

IDinsight's recommendations to mitigate this are to:

- Consider using two waves of enumerators for endline data collection.
- Instill motivation through consistent daily debriefs with team supervisors as well as more frequent communication with IDinsight staff.
- Employ incentives for high-performing enumerators and enumerator teams based on data quality spot checks and consistently meeting targets.

8 PROGRAM RECOMMENDATIONS

The baseline analysis points toward possible program recommendations. We categorized recommendations into three groups: marketing vaccinations, marketing incentives, and targeting resources. When considering these recommendations, it is important to remember the limitations of drawing too much inference from correlations alone. This is especially true given that our multivariate regression explains less than 20% of the variation in vaccination coverage. For example, our recommendation to focus advertising on basic facts about vaccination rather than addressing more complex misconceptions could be an artefact of caregivers being too embarrassed to volunteer socio-cultural reasons for not vaccinating.

8.1 Marketing Vaccinations

- Marketing efforts should focus on sharing basic information about vaccinations rather than addressing social, cultural, and medical misconceptions about vaccination.

Lack of knowledge and ambivalence were the two most common reasons caregivers cited for not vaccinating their child, accounting for 53% and 11% of all caregivers who do not self-report fully vaccinating their child. Ensuring caregivers have basic information about the routine immunization could be an “easy win” in terms of increasing coverage. For example, many caregivers think that vaccinators will come to their doors as in the polio campaigns, and others think no vaccinations are necessary beyond the regular OPV doses children receive through campaigns. Some of this lack of knowledge may stem from the fact that many families live outside the clinic system with a quarter of children having never been to a clinic and only 8.6% born in facilities. Consequently, health workers have few opportunities to explain immunization. While social and cultural reasons for not vaccinating do affect a number of caregivers, these issues can be difficult to address directly. Perhaps increasing the number of caregivers who vaccinate their children through incentives and better basic information about the vaccination, will overtime reduce societal taboos around vaccination as much as any direct intervention. Regardless, based on the baseline, it seems that for many caregivers, knowledge alone is the biggest barrier.

- Support of community leaders remains crucial.

Hearing positive messages about vaccination from community leaders, is a significant correlate of vaccination in the regression model. As only 65% of caregivers stated that they had heard positive messages about vaccinating from community leaders, there is an opportunity to reach additional leaders and include them in advocacy efforts to increase vaccination. While there is room to involve more leaders of all types in vaccination, religious leaders are particularly unrepresented relative to traditional leaders (54% vs 8% of all respondents reported hearing about vaccination from traditional and religious leaders, respectively). Ensuring both religious and traditional leaders support vaccinations may lead to increases in coverage.

- Marketing should reach all eligible caregivers, even the most marginalized in a community.

Unsurprisingly, caregivers with low education and wealth, are less likely to vaccinate their children (Table 16). It is important that New Incentives continues to ensure marketing materials are accessible to illiterate caregivers and reach the most marginalized caregivers. Low-status caregivers’ tendency to not vaccinate may be enhanced by the social nature of vaccination days, which have large crowds of women present. While to some extent the cash nature of the incentive will implicitly target the poorest in the community, there is not a perfect correlation between wealth,

education, and standing in the community.[97] New Incentives should take care to ensure messaging is spread across all social groups in a community.

- Vaccination should be more highly encouraged when caregivers access health facilities for other reasons.

Around 77% of caregivers from our sample took their infants to a clinic at some point, but only 11% of caregivers reported hearing messages about vaccination from health workers. Caregivers visiting a facility for other reasons on non-vaccination days presents an ideal opportunity for vaccination-related marketing. Further, there is some evidence that clinic attendance is correlated with vaccination. For example, the odds of a child being vaccinated are 79% greater if the child is born in a facility (Table 16, p-value< 0.01). In general, the use of many clinic services is low.[98] Thus, it may make sense to combine vaccination marketing at facilities with messaging that encourages caregivers to visit facilities in general.

8.2 Marketing Incentives

- New Incentives should ensure caregivers know their settlement is eligible for incentives.

Since a quarter of caregivers have never taken their child to a clinic, it is likely that many caregivers do not know their catchment clinic. Further, even when caregivers use a clinic, it is not always the catchment clinic. Only 63% of caregivers whose infants received one injectable vaccination received a vaccination at the catchment clinic. While an additional 16% were able to identify they received vaccinations at an outreach of the catchment clinic, the remaining 21% could not link their vaccination to the study clinic. Some of these caregivers visit other clinics or received vaccinations at outreaches they did not link to the study clinic. New Incentives should consider visiting each catchment settlement early in the ramp-up phase so that caregivers are clearly informed of their eligibility, relevant clinic location, and how to receive an incentive payment.

- New Incentives should continue to emphasize that their program provides cash rather than other small incentives such as soap, sweets, and Indomie.

Eighteen percent of caregivers reported receiving small incentives for vaccination such as Indomie or soap, only 5% reported they received more valuable items such as bed-nets or farming equipment, and only 2 received cash. However, despite its prevalence, receiving a small incentive has little correlation with vaccination status (Table 16, p-value = 0.42). Only two caregivers received cash. While these incentives are likely from the polio campaign rather than routine immunization, it is nonetheless worthwhile to emphasize the cash nature of New Incentives' incentives, as many caregivers may be expecting small in-kind incentives rather than cash, based on their experience.

[97] For example, according to the PPI score the average probability of those who selected the lowest rung on the ladder living on less than $1.25 a day is only 7% lower than those that selected the third rung, which was the majority of the sample and only 10% lower than those that selected the 5th rung.

[98] Only 52% of infants visited a clinic in the past 3 months. 75% of these visits were for treating illness alone. An additional 13% got malaria testing as part of the visit, 3% got nutrition screening as part of the visit, 3% went for well child visits, and the rest, aside from the 2 infants that got HIV screening, went for other reasons/received other services mainly fever, diarrhea, and blood transfusions.

8.3 Targeting Resources

- New Incentives should pay particular attention to outreach activities in Zamfara.

Coverage rates are generally lower in Zamfara. The measles vaccination rate is 20.2% in Katsina and 11.1% in Zamfara (p-value<.001) In addition to the difference in overall vaccination rates, the percentage of vaccinations received in outreach relative to facilities is significantly higher in Zamfara (15% vs 5%). Consequently, New Incentives may have to direct extra resources to Zamfara operations, ensuring there are sufficient resources to participate fully in outreach activities in Zamfara.

- Clinic staffing and the security environment may better identify low-baseline coverage clinics than coverage estimates based on monthly summary sheet totals from clinic screenings.

Administrative data from New Incentives' clinic screening is not a reliable source of coverage.. It is unclear whether this lack of correlation is due to poor population estimates or poor recording of vaccination doses delivered. Other clinic characteristics such as security status or staffing, which correlate strongly with coverage rates, may be a better proxy for identifying clinics with low coverage catchments (see Table 15). Thus, when evaluating how to target resources, New Incentives should consider these factors along with other operational considerations over administrative coverage estimates. New Incentives should be targeting program resources based on operational need, rather than trying to predict baseline coverage.

- New Incentives should continue work with clinics to ensure that clinics advertise their vaccination schedule and have an adequate stock of vaccinations available on a regular basis.

Nineteen percent of caregivers whose children ever received an injectable vaccination reported going to the facility with the intention of vaccinating their child and not being able to do so. Additionally, 9% of caregivers whose children never received an injectable vaccination attempted to vaccinate and failed. While the single most common issue was a lack of vaccine (35%), responses indicating confusion on when caregivers could access vaccination services were also prevalent (36%). These responses include the clinic was closed, the vaccinator was not there, or that the visit was not on a vaccination day. This suggests that simply ensuring a consistent, well-publicized vaccination schedule may reduce some supply-side bottlenecks. Continued vigilance against stock-outs remains especially important as New Incentives' program will likely place further strain on vaccine supply chains and clinic staff.

9 CONCLUSION

The results of baseline are promising from both a measurement and programmatic perspective. Statistically, low baseline coverage, good balance, and the small amount of variation in coverage that is explained by clinic characteristics all suggest the study is well powered to detect New Incentives' impact. The biggest risk we see from a measurement perspective is the reliance on self-reported data.[99] In future rounds of data collection and piloting, we will continue to explore ways to improve the reliability of self-reported data.

Programmatically, New Incentives' theory of change continues to look promising. First, the sources of vaccinations measured align with the program. Outside of the national measles campaigns, almost all infants receive vaccinations from the sources New Incentives' program will cover: health facilities and health facility outreach. Second, most caregivers cited lack of knowledge or ambivalence and relatively few caregivers cited socio-cultural reasons or mistrust and fear, as reasons for not vaccinating. It seems likely that an incentive, coupled with awareness-raising activities, can overcome these stated reasons for not vaccinating. Finally, New Incentives' program appears to be unique. While small incentives are relatively common, incentives worth more than 500 Naira are rare and only two caregivers received cash in our sample.

While the results do suggest some program changes would be beneficial (outlined in Section 8), the variables we measured did not explain a large fraction of the variation in vaccination. Before making any programmatic decisions, New Incentives should carefully weigh how a change could affect other correlates of coverage we could not capture well.

The key recommendations are:

- Utilize simple marketing efforts focused on basic information about vaccinations.
- Include the most marginalized community members when marketing vaccination incentives.
- Ensure caregivers know their settlement is eligible for incentives.
- Secure traditional leaders' support, especially religious leaders.
- Consider promoting vaccinations at the clinic when caregivers come for other services.
- When targeting resources, be cautious of using constructed administrative coverage estimates.
- Ensure outreach activities in Zamfara are not neglected.

The RCT of New Incentives' conditional cash transfer for vaccination program is well placed to measure New Incentives' program's impact. While minor changes to the program may achieve even greater impact, the baseline results are broadly promising and suggest that the program in its current form could achieve impact. New Incentives will be operating in a poor, low coverage environment where cash incentives are novel and have a real chance to overcome many caregivers' stated barriers to vaccination.

[99] When designing the evaluation, we hoped to be able to cross-reference more infants to administrative records, but ultimately, we only found records for 52% of infants. Since the program will improve record keeping, to avoid bias we will use self-reported data as the study's outcome.

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11 ANNEXES

Annex 1: Details of an Immunization Visit

Clinics frequently have a designated day or days reserved for immunizations. The New Incentives' conditional cash transfer program is designed to fit into the typical flow of a childhood immunization visit. This annex outlines the steps of an immunization visit in a program clinic.

Step 1: Arrival
When caregivers arrive at the clinic, they are given numbers that determine the order in which their infants will be vaccinated. Before the vaccinations begin, clinic staff deliver a health talk explaining the importance of immunization and the routine immunization schedule. New Incentives' staff also explain the incentive system to the assembled caregivers.

Step 2: Paperwork
Caregivers are called sequentially according to their numbers, and a nurse will complete paperwork:

1. Fill out the **clinic child health register.** This contains a child's complete vaccination history, phone number, and follow-up address.
2. Fill out the infant's **child health card**, which the caregiver is supposed to keep at home between visits. If this has been lost, the caregiver is issued a new one using the information in the child health register, or a duplicate card kept at the clinic.
3. Tally vaccine doses on a **tally sheet**, which is aggregated through the local government area and state administrative areas to determine coverage rates.

This is the stage where the nurse determines which vaccinations a child is supposed to receive on the particular immunization day. This is based off the child's date of birth and vaccination history. For example, at some clinics, if an unvaccinated child over nine months old arrives at a clinic they will receive both Measles and BCG on the first visit.[100]

Step 3: Vaccination
Caregivers are referred to nurses who administer the appropriate vaccines. These nurses put a gold dot on the infant's child immunization card to confirm that the vaccine was provided. This prevents caregivers from going directly to the incentive table and skipping the vaccination station.

Step 4: Enrolment
To be eligible for enrolment in the cash transfer program, infants must have been never vaccinated.[101] Further, the settlement on the child health card must be within the clinic's catchment area. New Incentives' staff are trained to ask again about the settlement to reduce the risk of nurses fraudulently recording settlements. Caregivers can enrol in the incentive program at any stage in the vaccination schedule. When enrolled, caregivers receive a New Incentives card that illustrates the incentive structure and has a sticker with their unique ID bar code, which is also placed on the infant's child health card.

Step 5. Payment

[100] New Incentives pays the incentive for the highest value vaccine received in any visit. In the case above, the caregiver would receive 2000 Naira for the visit.
[101] This can be easily verified by the absence of a BCG scar.

Once an infant's eligibility is confirmed, the New Incentives' staff member gives the caregiver the appropriate cash transfer amount. The payment is recorded three times: 1) New Incentives' staff records it electronically on a smart phone, 2) a photo is taken of the caregiver holding the cash transfer, and 3) a photo of the caregiver's child health card is taken so that other New Incentives' staff can verify that the field staff is correctly determining eligibility. A blue dot is applied to the child health card to guard against double payment. The card is also stamped to guard against card forgery.[102]

Annex 2: Compact Segment Sampling Verification

This Annex outlines the approach taken to the compact segment sampling verification exercise and discusses the results.

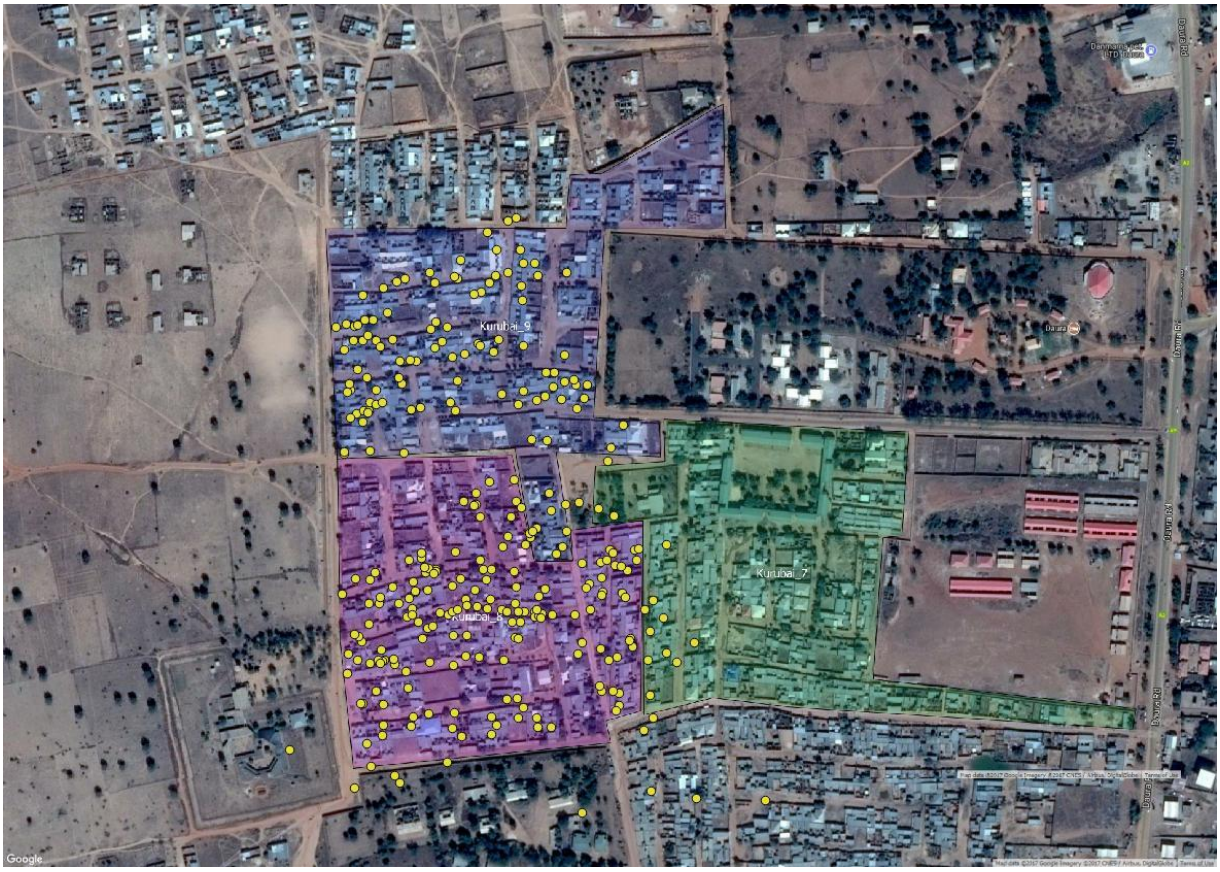
Background/Motivation

One crucial determinant of a coverage survey's representativeness is the methodology used to sample from a population of eligible infants. Simple random sampling, where every individual in the population has an equal chance of being selected into the sample, represents the gold standard for minimizing sampling error. However, in contexts where a reliable birth register is unavailable, simple random sampling from the population is infeasible without first conducting an exhaustive census to establish a sampling frame. As discussed extensively in the Evaluation Design document for this RCT, however, the time and cost of conducting such a census would have been prohibitive and the associated logistical and survey management risks would have been disproportional to any expected increase in the overall rigor of the study.

Among the alternative sampling methodologies reviewed, compact segment sampling (CSS) emerged as the method best supported by the literature. The CSS method we employed is described in Section 5.2. Figure 22 illustrates the CSS data collection for one settlement (Kurubai) in the catchment area of Daura General Hospital in Katsina. The household census of the selected segments then yielded a sampling frame of eligible children in each clinic's catchment area. Forty-five of these eligible children were randomly selected across the catchment area to receive the routine immunization survey.

[102] The 9-digit IDs applied as stickers to the cards also guard against forgery – in the rare cases where fraudulent IDs could be generated (unlikely due to the sticker printing process), NI would be informed through the reviewer system.

Figure 22: Compact Segment Sampling – GPS Tags of Census Surveys conducted in Kurubai



Note: Yellow Dots represent enumeration instances. Due to limited GPS accuracy, some enumeration areas appear outside the compact segments. The compact segment shaded in green represents one that was not randomly selected for enumeration.

CSS has been used extensively for coverage surveys in developing countries since it is a viable rigorous alternative to simple random sampling. The risk of getting an unrepresentative sample that would bias the overall study was predicted to be minimal, as we would be able to use baseline data to control for any serious differences in balance.

Methodology

The Full Census

To examine the accuracy of estimates produced by the CSS method, IDinsight conducted a full census in three clinics' catchment areas[103] toward the end of baseline operations in October 2017. The three clinics were selected due to their relatively large assumed population sizes – there is a greater risk of CSS bias in large population size catchments (as a smaller share of the population is censused). As a result, the analysis provides an upper bound for bias.

[103] The three clinics chosen were Muniya Health Clinic in Katsina and Dosara Health Facility and Damaga PHC in Zamfara. These clinics all represented relatively large catchment populations, and all had at least one large settlement with multiple segments.

For each of the three clinics, the CSS technique otherwise used to conduct the household listing was replaced by a full enumeration exercise, where enumerators administered the household census to every available household in the catchment area and then went back to administer the RI survey to caregivers of every eligible child found in the catchment area.

This exercise provided a sampling frame from which we could simulate an alternative sampling methodology, such as simple random sampling – this would not have been available otherwise. Table 18 summarizes the number of census and RI surveys conducted in the three full census clinics. The minimum survey targets that would have been in place had we applied the CSS technique to these clinics are also presented for reference. Since we performed a full census, we have census data for all available households in the catchment area and coverage data for every eligible child within that population.

Table 18: Full Census Clinics

Clinic Name	State	Number of Settlements	Total Number of Segments	Average Number of HHs per Segment	Listing Surveys[1] (Households)		RI Surveys (12-24 month olds)	
					Full Census	CSS Minimum Target[2]	Full Census	CSS Target
Muniya Health Clinic	Katsina	1	7	59	412	255	71	45
Dosara Health Facility	Zamfara	9	18	31	553	257	72	45
Damaga PHC	Zamfara	1	4	163	653	281	90	45

[1]'Listing Surveys' and 'RI Surveys' refer both to what was found during the full census and requisite number of HH and RI surveys needed for our power estimates.
[2]Minimum targets represent 85% of the catchment target of approximately 300.

Simulating CSS and SRS Samples from Population Data

With the data from the full census clinics, we were able to simulate several CSS and SRS segment samples, compare these estimates to population figures for each variable of interest, and measure the extent of bias in each simulated sample. The main steps used in this approach are outlined below:

1. 10,000 simulated samples of census data and RI data were generated using the CSS method.
2. 10,000 simulated samples of RI data were generated using the SRS method.
3. For each simulated sample, the mean and variance for the following variables[104] were stored in a larger dataset:
    a. Proportion of households with at least one 12 to 16-month old
    b. Proportion of households with at least one 12 to 24-month old
    c. Household size
    d. Proportion of households who own a mobile phone
    e. Proportion of children who had ever received an injectable vaccine
4. For both sampling methods, we summarized the results to obtain the overall mean and variance for these five variables across simulations.
5. The CSS and SRS statistics were then analyzed with three "performance indicators". These indicators are all different measures of sampling error and are defined below:
    a. **Error**: Sample mean (from either CSS or SRS) minus the population mean.

[104] Since the objective of the census was to find eligible children for the main RI survey, the SRS simulation was only performed for the RI data. In the SRS simulation, 45 eligible children were randomly picked from the catchment population to generate the RI sample. Consequently, the only variable of interest in the SRS simulation was the proportion of children who had ever received a vaccination.

b. **Sampling Variance:** Variance of the sampling mean.
c. **Error Rate**: The proportion of samples in which the population mean does not fall within the 95% Confidence Interval of the sampling mean.

6. Finally, the performance indicators for CSS were compared with the indicators for SRS.

Results

The results, outlined in Table 19, exhibit low error rates for the proportion of eligible infants and the proportion of children who have ever received an injectable vaccination using either sampling method. Using over 10,000 simulations, the CSS methodology found an average of 14.3% of households included in the census survey had at least one 12 to 16-month old. When compared to the "true" proportion (when considering all available households from the full census enumeration) of 14.5%, the sampling error from CSS is 0.2 percentage points. The sampling variance for this variable, which measures the variability of the sample average over the 10,000 simulated samples is also extremely low, at 0.000077. Table 19 details the error and the variance for each of the five variables of interest. For the eligibility variables and the coverage variable in particular, the CSS error rate is very low (less than 2%).

Table 19: Results of Compact Segment Sampling Simulations

Variable	Population Mean	CSS Mean	SRS Mean[1]	Sampling Error		Sampling Variance		Error Rate	
				CSS	SRS	CSS	SRS	CSS	SRS
Proportion of households with at least one 12 to 16-month old	14.50%	14.30%	-	-0.002	-	0.0000	-	0.27%	-
Proportion of households with at least one 12 to 24-month old	30.75%	30.27%	-	-0.005	-	0.0001	-	1.74%	-
Household size	6.66	6.53	-	-0.131	-	0.0133	-	12.20%	-
Proportion of household who own a mobile phone	20.79%	18.96%	-	0.018	-	0.0012	-	38.82%	-
Proportion of children who had ever received an injectable vaccine	26.63%	27.40%	26.13%	0.008	-0.005	0.0009	0.0006	0.23%	0.24%

[1] The SRS mean for the variables that come from the listing survey are blank because they have not been calculated as part of the simulation. This is because in order to do SRS, we would need to first conduct a full census to have a sampling frame, in which case we would simply have the true population measures for these variables.

The error rate percentage, which measures the fraction of samples in which the population mean does not lie within the 95% confidence interval of the sample mean, is between 0.23% (for the proportion of children who had ever received an injectable vaccination) and 38.82% (for mobile phone ownership). A high error rate across the simulated samples would cast some doubt on the ability of CSS to consistently estimate population parameters. Most importantly, Table 19 illustrates that the error rates are low for the outcome variables (ever receiving vaccination) and for the proportion of eligible children being identified, suggesting that these sample means are consistently representative of the general population. Furthermore, these results represent the

error among only the 3 health facilities chosen for the full census. Averaged across the 167 study clinics, this error is likely to be even smaller.

As Table 19 shows, CSS slightly overestimates the proportion of children who had ever received an injectable vaccine (by 0.8 percentage points) while SRS slightly underestimates this parameter (by 0.5 percentage points). From these results, it is clear that the difference in accuracy on this key variable is minimal and would likely not justify the substantially higher costs that would come with applying the SRS method. As mentioned above, SRS cannot be performed without a sampling frame, which in the context of our study would necessitate carrying out a full census for each clinic. As a rough estimate, this would increase the costs of surveying at baseline (and endline) by at least three times; performing full census on moderately sized clinics took one entire day for the full team of enumerators, whereas with CSS, enumerators were able to survey three clinics a day.

Overall, the results of our analysis support the conclusion that the CSS methodology produces estimates that are representative and credible, while also greatly minimizing survey costs. While alternative methodologies such as SRS could produce slightly more accurate estimates, the magnitudes of difference between CSS and SRS revealed by this analysis suggest that it is very unlikely that the relative advantages of SRS over CSS would justify the additional cost.

Annex 3: Details on Age Determination for the Household Census

To determine how many eligible infants a household had, the survey form prompted enumerators to extensively probe for accurate ages of all infants less than three years old in a household.

Eligibility for the study was based on birth month. For example, for all those surveyed in September, babies born between May 2016 and September 2016 were considered eligible based on the 12 to 16-month criteria. We used birth month rather than the specific birth date due to many caregivers' uncertainty around the exact day of the child's birth. Enumerators coded 20% of days of birth as "don't know", and many more were approximated. Enumerators were trained to put caregivers' best guess even if it was simply the beginning or end of the month.[105]

The age used for the eligibility calculation was determined using a multi-part process.

1. Enumerators asked caregivers for their child's age in cumulative months, or years and months. If caregivers struggled to estimate age, enumerators used a diagram illustrating age in terms of moons (moon is also the Hausa word for month).
2. Enumerators then asked caregivers for the child's date of birth. If mothers struggled with estimating the date of birth, enumerators used a diagram illustrating the timing of major local holidays and seasons to help approximate when the child was born (Figure 23) as well as an Islamic calendar including Hausa and Arabic month names (Figure 24). Enumerators considered 64% of recorded dates of birth as exact, but only 9.1% of dates of birth were provided directly using the English calendar or an official document.[106]

[105] 1.43% of infants did not have a known month of birth and 0.41% did not have a known year of birth.

[106] Both Hanovia and IDinsight had initially expected a much higher proportion of respondents would respond using English dates. Based on this expectation, we coded the form to take only English dates so that enumerators would not accidently confuse English and Islamic months when inputting data. However, given the predominance of Islamic dates, we plan on coding the form to take Islamic dates in future rounds of data collection.

Enumerators reported the following sources to determine dates of birth, seen in Table 20.

Table 20: Sources of Birth Dates

Source	Percentage
Any Source Combined with Official Documents	2%
English Calendar Alone	7%
Islamic Calendar[107] Alone	39%
Estimated Using Major Event Alone	2%
Estimated Using Major Event and Islamic Calendar	34%
Estimate using count of months alone	2%
Other (includes moon diagram[108] and other combinations)	14%

3. If there was a discrepancy between the given age and given birth month provided in the date of birth section, the form prompted enumerators to probe further and determine which age was more accurate. This happened in 9% of the cases. Respondents were more likely to select the date of birth (59%) than the age (41%.)

This process was followed on both the household census to identify eligible 12 to 24-month olds and again on the routine immunization survey to confirm eligibility.

[107] Includes cases where enumerators listed both English and Islamic calendar as some enumerators would list English calendar as a source for each date since they had to convert the dates to English dates.
[108] Only 115 (0.35%) ages were determined using the moon diagram as a source.

Figure 23: Major Event Calendar

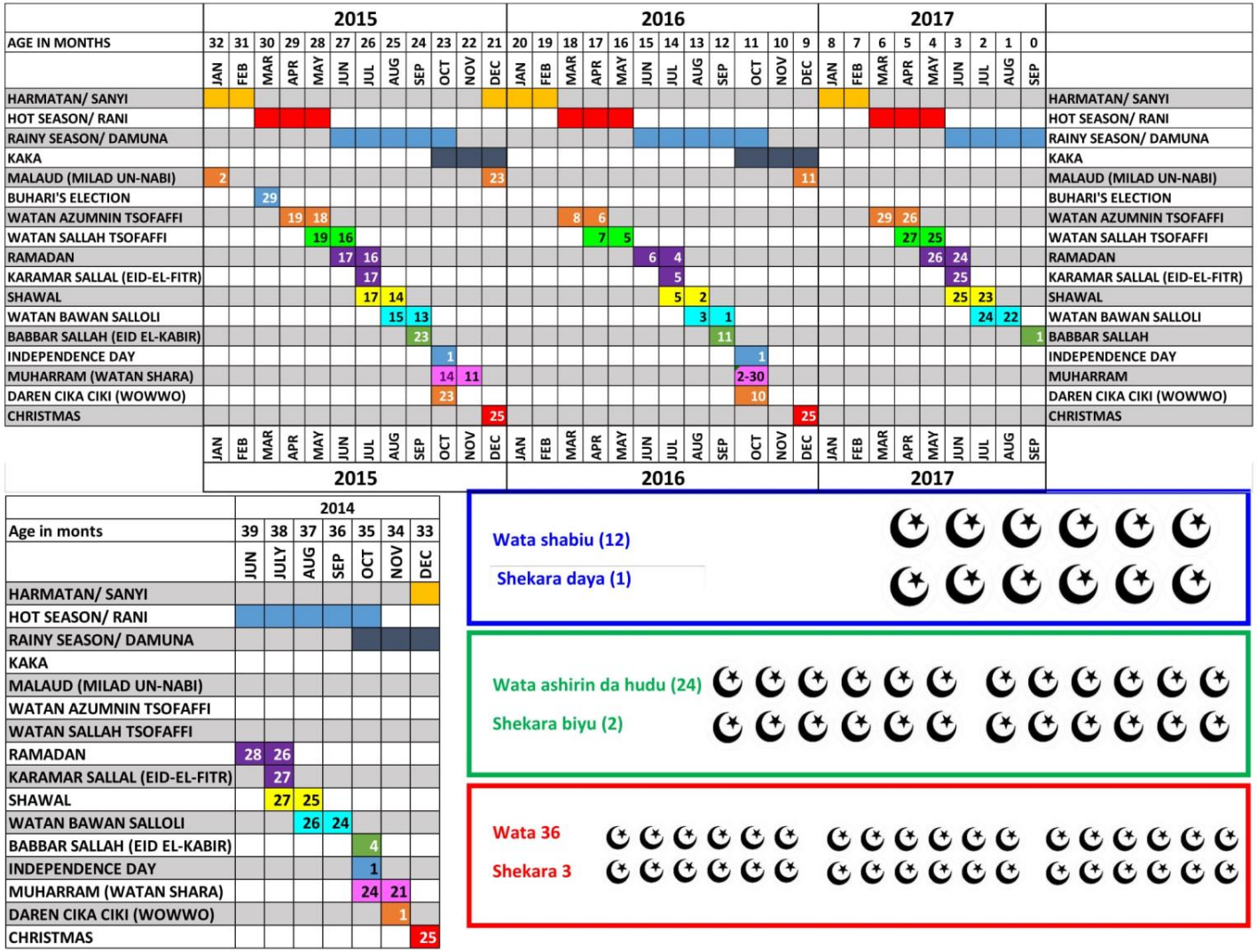
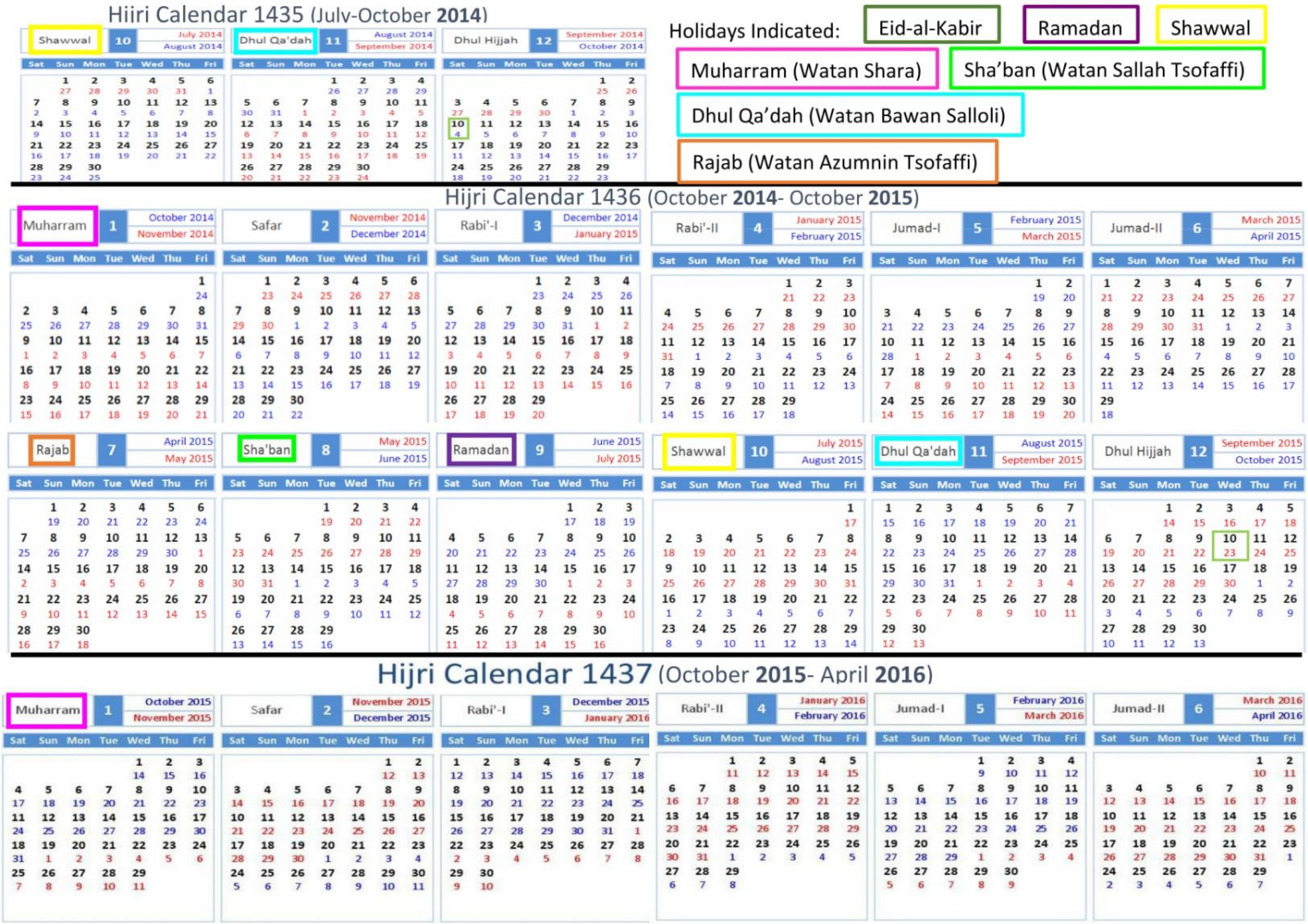


Figure 24: Islamic Calendar



Annex 4: Wealth Measurement

New Incentives' program targets people living in some of the most remote and underserved areas in North West Nigeria, for whom access to the healthcare system has historically been poor. To capture the poverty rate in our sample at baseline, we collected data on both objective and subjective measures of wealth.

Poverty Probability Index

Wealth indices are commonly used to translate objective data on the assets and economic activities of the household or individual into a measure of wealth or poverty. As described in Section 5.3, this report uses the Poverty Probability Index (PPI), which is a measure of the likelihood of an individual falling under the internationally recognized $1.25/day (2005 PPP[109]) poverty line. The PPI is country-specific, and documentation on the PPI currently exists for 60 countries. The Nigeria specific documentation can be found here.[110]

Using the framework set out in the Simple Poverty Scorecard® for Nigeria (Schreiner, 2015), the survey asked respondents to answer 10 simple questions relating to a variety of household characteristics, assets, as well as the household's involvement in agricultural activities. The scored responses to the 10 questions arrive at a single poverty "score" for each household. The list of questions and scores for each associated response is presented in Table 21 below.

Using a lookup table,[111] each poverty score is then converted to a poverty probability, which varies depending on which poverty line is used. Our choice of the $1.25/day (2005) poverty line was based on a few considerations. Firstly, we wanted to choose a poverty line that could be used to compare the poverty rate in our sample to that of the overall population in Nigeria as well as in North West Nigeria - the most recent estimates for which are available from the World Bank's Nigeria Economic Report, 2014.[112] The PPI is based on data from the Nigeria's 2012/2013 General Household Panel Survey (GHPS). The most recent comparable data on poverty that uses this same survey is from the World Bank's Nigeria Economic Report, 2014, where the poverty line is $1.4/day (2005 PPP). This is close to the $1.25/day (2005) line. Secondly, we also wanted to compare the poverty rate in our sample to the study populations of studies conducted in India and Kenya that also examined the impact of incentives on increasing immunization. For this second comparison, we used the poverty rates by the $1.25/day line as set out in the Simple Poverty Scorecards for India and Kenya, respectively.

We then averaged household poverty probabilities using household size as weights, to arrive at the individual poverty rate in the sample. As described in Section 5.3, the poverty rate in our sample was 52.6% (95% CI 52.40, 52.78). Next, we compared individual poverty rates to the poverty headcounts for Nigeria and North-West Nigeria as reported in the Nigeria Economic

[109] Purchase Power Parity
[110] http://www.microfinance.com/English/Papers/Scoring_Poverty_Nigeria_2012_EN.pdf
[111] The relevant lookup table can be found on page 96 of the Simple Poverty Scorecard® for Nigeria (Schreiner, 2015).
[112] Although a more recent poverty headcount is available from the World Bank, it is based on Nigeria's Living Standards Survey from 2009/10, which is a different survey than the one used to define the PPI, and has also been said to underestimate consumption (World Bank, 2013).

Report (World Bank, 2014b), as well as to the poverty headcounts for rural Western Kenya[113] and for rural Rajasthan[114], where the studies in Kenya and India were conducted respectively.

Table 21: Simple Poverty Scorecard for Nigeria

Question	Response	Points
1. How many members does the household have?	Ten or more	0
	Eight or nine	5
	Seven	10
	Six	11
	Five	17
	Four	19
	Three	25
	One or two	32
2. How many rooms does this household occupy excluding bathrooms, toilet, garage or store rooms?	One	0
	Two	4
	Three	5
	Four	6
	Five or more	7
3. What is the main construction material used for the roof of your dwelling?	Mud/Mud Bricks	0
	Thatch (Grass or Straw)	0
	Wood/Bamboo	0
	Clay Roofing Tiles	0
	Asbestos or Plastic Sheets	0
	Corrugated Iron, Aluminum, or Zinc Sheets	4
	Cement/Concrete	4
4. What type of toilet/latrine is mainly used by your household?	None (a bush, the fields, or a cleared corner of the compound)	0
	Toilet on water (toilet suspended over open water body or pit)	0
	Pail/bucket	0
	Uncovered Pit latrine	3
	Ventilated improved pit latrine (VIP) Latrine (enclosed, roofed, structure with a large, 110mm, PVC ventilation pipe.)	3
	Covered pit latrine	6
	Flush to sewer (pipe or conduit used to remove sewage)	15
	Flush to septic tank (a water-tight system for domestic sewage, consisting of one or more compartments in which sanitary flow is detained.)	15
5. Does your household have a working stove, gas cooker or microwave?	No	0
	Yes	3
6. How many mattresses in good condition does your household own?	None	0
	One	6
	Two	8
	Three or more	10
7. Does your household have a working television?	No	0
	Yes	8
8. How many mobile phones in working condition are owned by members of your household?	None	0
	One	2
	Two	5
	Three or more	7
9. Does the household have a working motorbike or car?	No	0
	Only motorbike	3
	Car (regardless of motorbike)	11
10. Does any member of this household practice any agricultural	Farms or has uncultivated land but no sprayers, wheelbarrows or sickles.	0

[113] Poverty rates for Western Kenya can be found on pg. 80 of the Simple Poverty Scorecard® for Kenya (Schreiner, 2011).
[114] Poverty rates for Rajasthan can be found on pg. 480 of the Simple Poverty Scorecard® for India (Schreiner, 2012).

activity such as crop, livestock, or fish farming, or own agricultural land that is not cultivated? Does the household any sprayers, wheelbarrows or sickles?	Farms or has uncultivated land and has sprayers, wheelbarrows or sickles.	3
	Does not farm nor has uncultivated land	3

This comparison found that our sample is poorer than Nigeria as a whole, as well as North West Nigeria, in particular. Although our study population was poorer than that of the India study, the true poverty in the India study population is likely to be higher than that measured for rural Rajasthan since the villages in that sample were representative of the implementing organization's catchment area, a particularly impoverished and underserved area. Our sample was less poor than rural Western Kenya, although it is possible that the per person poverty rate for rural Western Kenya is not entirely representative for that study's sample since the Kenya study relied partly on mobile phone reminders and therefore only sampled households with mobile phones.

Economic Ladder

A complementary approach we used was to measure self-perceived wealth. Studies show that such subjective measures could produce different classifications of poverty compared to more objective wealth indices (Huttley et al. 2011) and take into account respondents' own assessment of value with regard to household assets and characteristics, as well as other components of economic wellbeing not captured by the questions in the poverty probability index. Assessing self-perceived wealth involved asking respondents to imagine a 7-step ladder where on the bottom, the first step, stand the poorest people, and on the highest step, the seventh, stand the richest. Respondents are then asked which step they felt they were on that day.[115] Enumerator reports from the field indicated that this question was sometimes difficult for respondents to understand, although a visual aid shown with this question helped clarify what the question was asking (see Figure 25.)

Figure 25: Visual Aid for Ladder Question

The distribution of responses across the 7 rungs of the ladder can be seen in Table 22 below. The majority of respondents (75.4%) placed themselves on rung 3 or below. Very few (8.9%) placed themselves on rung 5 or above.

[115] This was adapted from Ravallion, M., Loshkin, M. 1999. *Subjective economic welfare*. Policy, Research working paper; no. WPS 2106. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/996191468757792826/Subjective-economic-welfare

Table 22: Distribution of Responses to the Ladder Question

Rung	Number of Respondents (N=5291)	% of Respondents	Cumulative %
Rung 1 (least wealth)	600	11.34	11.34
Rung 2	1,611	30.45	41.79
Rung 3	1,780	33.64	75.43
Rung 4	829	15.67	91.10
Rung 5	276	5.22	96.31
Rung 6	93	1.76	98.07
Rung 7 (most wealth)	102	1.93	100.00
Mean	2.8 (95% CI: 2.82, 2.89; SD 1.25)		

Annex 5: Sources of Vaccination Coverage

Coverage Source for Stratification and Outcome Variables

During the baseline, we collected three sources of information on vaccination coverage: self-report, child health cards, and clinic records. A goal of the baseline was to assess the reliability of each of these datasets to inform our endline measurement strategy.

Understanding Self-Reported Vaccination Status

We determined self-reported vaccination status through the survey questions that asked caregivers if their infant has received injectable vaccinations,[116] which is illustrated by an image of a baby being vaccinated (Figure 26). The tablets displayed this image for enumerators to show to caregivers. We also instructed enumerators to clarify the difference between medical injections for sick children and vaccinations for all children to caregivers. The questionnaire identified vaccinations primarily by location on the body, but also included information on the name of the vaccine and the disease it prevents. IDinsight gave enumerators a tool (Figure 27) to help them identify vaccination sites on the infant's body for caregivers.

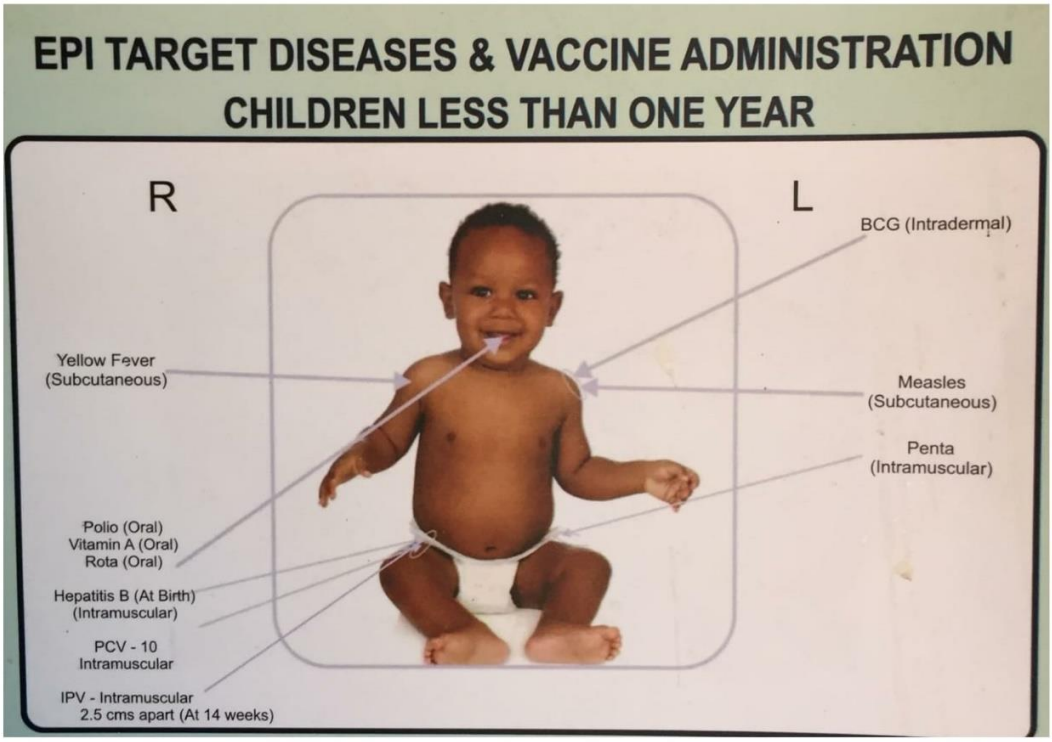
Figure 26: Tool to Facilitate Determining Whether an Infant ever Received an Injectable Vaccination

[116] The survey questionnaire also asks caregivers if their infant has ever received oral polio vaccine.

Figure 27: Tool to Determine which Vaccinations an Infant Received

Information to Facilitate Probing **DO NOT SHOW RESPONDENT**

Point at locations on yourself, child, or mother. Act out injection (noted as intradermal, subcutaneous, and intramuscular on chart) or oral. **DO NOT SIMPLY SHOW MOTHER IMAGE**



Use to understand official schedule. However, many infants may not be immunized according to this schedule. **DO NOT** assume a child has received a vaccination because they are past the age for these vaccinations.

AGE	ANTIGEN	DESCRIPTION
At Birth	BCG, OPV0, HEB B0,	BCG prevents Tuberculosis, OPV is Oral Polio Vaccine, HEB BO prevents Hepatitis B
6 weeks (1 month 1 and a half weeks)	OPV 1, PENTA 1, PCV1	PENTA is a combination of 5 vaccines which prevents Diphtheria, Tetanus, Whooping cough, Hepatitis B and Haemophilus influenza type B all through a single dose. PCV (Pneumococcal conjugate vaccine) prevents infection caused by *Streptococcus pneumonia* or *Pneumococcus*
10 weeks (2 months 1 week)	OPV 2, PENTA 2, PCV 2	
14 weeks (3 months 1 week)	OPV 3, PENTA 3, PCV 3, IPV	Inactivated Polio Vaccine (IPV)
9 months	MV , YF	Measles vaccine , Yellow fever vaccine

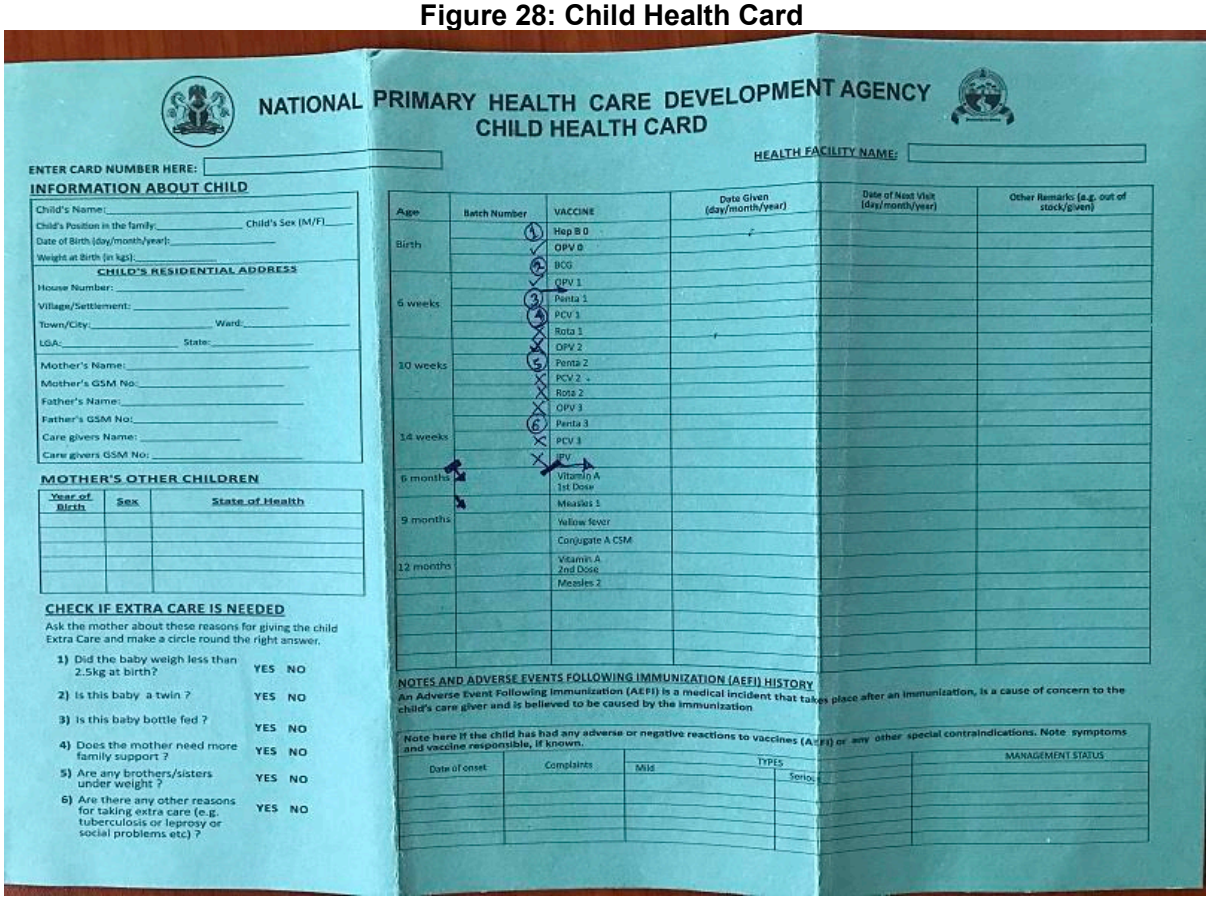
Child Health Card Vaccination Status

At the end of the routine immunization survey, enumerators asked caregivers to bring all cards with health information on the eligible infant. Enumerators were then instructed to identify cards

with vaccination information and input the relevant information. Child health cards were the most common source of vaccination information (Figure 28).

There were a few reasons why caregivers did not have child health cards. First, 40% of caregivers who said their infants had received injectable vaccinations reported never receiving a card with vaccination information and 28% reported never receiving any cards specific to their child from any source. The fact that some caregivers never received cards aligns with the finding from New Incentives' clinic screenings that 32% of study clinics had card stockouts in the past 4 weeks. However, 71% of these clinics said the stockouts occur once every few months or not at all, rather than once every few weeks (17%) or all the time (12%). Of the caregivers that did report receiving a card, 37% had lost the cards. Of caregivers that had lost their child's health card, 35% said that the card existed, but couldn't be found at the time of the visit, and another 7% said the card was in a locked room. The remaining 58% had other responses, including that the card was permanently unavailable for a variety of reasons.

Figure 28: Child Health Card



NATIONAL PRIMARY HEALTH CARE DEVELOPMENT AGENCY
CHILD HEALTH CARD

ENTER CARD NUMBER HERE:

HEALTH FACILITY NAME:

INFORMATION ABOUT CHILD

Child's Name:
Child's Position in the family: Child's Sex (M/F)
Date of Birth (day/month/year):
Weight at Birth (in kgs):

CHILD'S RESIDENTIAL ADDRESS

House Number:
Village/Settlement:
Town/City: Ward:
LGA: State:

Mother's Name:
Mother's GSM No:
Father's Name:
Father's GSM No:
Care givers Name:
Care givers GSM No:

MOTHER'S OTHER CHILDREN

Year of Birth	Sex	State of Health

CHECK IF EXTRA CARE IS NEEDED

Ask the mother about these reasons for giving the child Extra Care and make a circle round the right answer.

1) Did the baby weigh less than 2.5kg at birth? YES NO
2) Is this baby a twin ? YES NO
3) Is this baby bottle fed ? YES NO
4) Does the mother need more family support ? YES NO
5) Are any brothers/sisters under weight ? YES NO
6) Are there any other reasons for taking extra care (e.g. tuberculosis or leprosy or social problems etc) ? YES NO

Age	Batch Number	VACCINE	Date Given (day/month/year)	Date of Next Visit (day/month/year)	Other Remarks (e.g. out of stock/given)
Birth	1	Hep B 0			
		OPV 0			
	2	BCG			
6 weeks		OPV 1			
	3	Penta 1			
	4	PCV 1			
		Rota 1			
10 weeks		OPV 2			
	5	Penta 2			
		PCV 2			
		Rota 2			
14 weeks		OPV 3			
	6	Penta 3			
		PCV 3			
		IPV			
6 months		Vitamin A 1st Dose			
		Measles 1			
9 months		Yellow fever			
		Conjugate A CSM			
12 months		Vitamin A 2nd Dose			
		Measles 2			

NOTES AND ADVERSE EVENTS FOLLOWING IMMUNIZATION (AEFI) HISTORY

An Adverse Event Following Immunization (AEFI) is a medical incident that takes place after an immunization, is a cause of concern to the child's care giver and is believed to be caused by the immunization

Note here if the child has had any adverse or negative reactions to vaccines (AEFI) or any other special contraindications. Note symptoms and vaccine responsible, if known.

Date of onset	Complaints	TYPES		MANAGEMENT STATUS
		Mild	Serious	

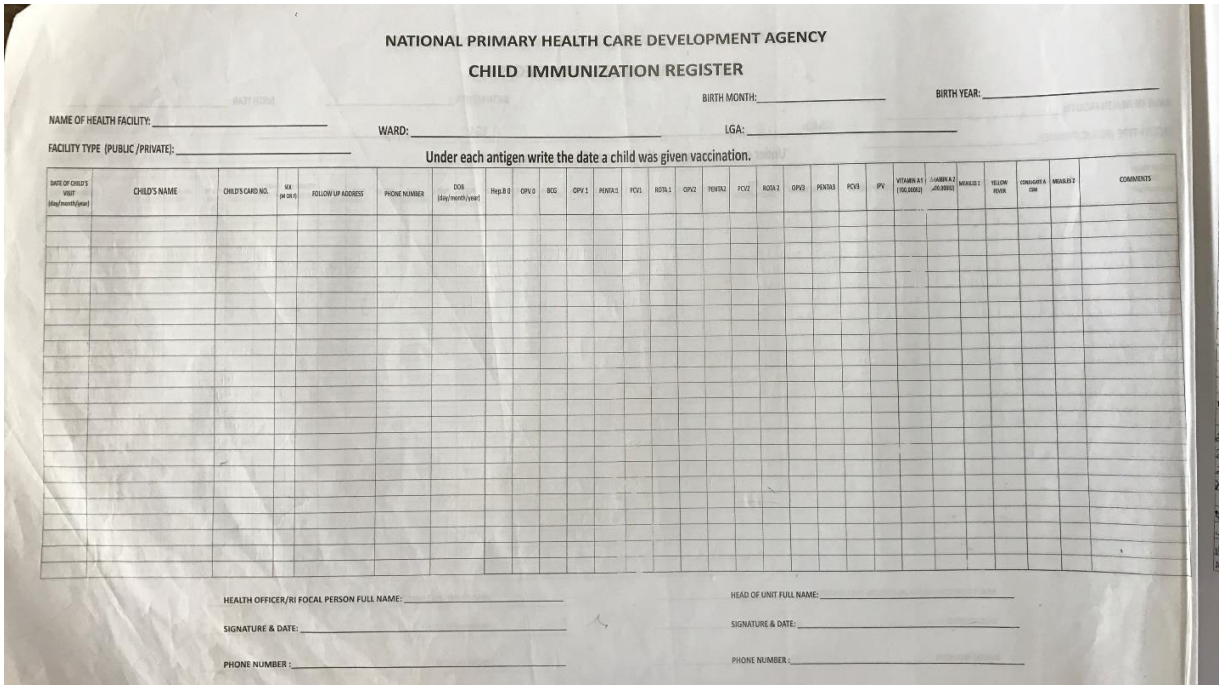
Clinic Record Vaccinations

Clinics record the vaccination history of each infant they vaccinate in the clinic child immunization register (Figure 29). Enumerators matched infants who reported receiving a vaccine at a given clinic to that clinic's register based on settlement, infant name, and date of birth. However, not all

of these matches were exact, and it is possible some of the discrepancies between the child health card and clinic register results from enumerators matching infants to the wrong records.[117]

Child immunization registers also may not be complete. For 11% of clinics, old registers were not available or only sporadically filled out. Some clinic staff admitted to not including every infant on registers since they are too busy or they forgot to bring registers to outreach days.

Figure 29: Child Immunization Register


NATIONAL PRIMARY HEALTH CARE DEVELOPMENT AGENCY

CHILD IMMUNIZATION REGISTER

BIRTH MONTH:_____ BIRTH YEAR:_____

NAME OF HEALTH FACILITY:_____ WARD:_____ LGA:_____

FACILITY TYPE (PUBLIC /PRIVATE):_____

Under each antigen write the date a child was given vaccination.

DATE OF CHILD'S VISIT (day/month/year)	CHILD'S NAME	CHILD'S CARD NO.	SEX (M OR F)	FOLLOW UP ADDRESS	PHONE NUMBER	DOB (day/month/year)	Hep.B 0	OPV 0	BCG	OPV 1	PENTA 1	PCV1	ROTA 1	OPV2	PENTA2	PCV2	ROTA 2	OPV3	PENTA3	PCV3	IPV	VITAMIN A 1 (100,000IU)	VITAMIN A 2 (200,000IU)	MEASLES 1	YELLOW FEVER	CONJUGATE A CRM	MEASLES 2	COMMENTS

HEALTH OFFICER/RI FOCAL PERSON FULL NAME:_____ HEAD OF UNIT FULL NAME:_____

SIGNATURE & DATE:_____ SIGNATURE & DATE:_____

PHONE NUMBER:_____ PHONE NUMBER:_____

Comparing Vaccination Data Sources

Administrative records are not always the most accurate source of immunization rates. In particular, clinic staff sometimes fail to record measles immunization in child immunization registers, as it can be difficult to find older infants in the registers, which are organized by date of first visit. For infants whose records were found in a child immunization register and had measles vaccinations indicated in child health cards, only 62% had measles indicated on the register. Even BCG vaccinations were not recorded fully; only 88% of people with BCG scars who had matches to clinic records and said they received BCG at the matched clinic had BCG recorded in the clinic register.

Child health cards seem to be more accurate, with 92% of people who had BCG marked on child health cards having scars. When comparing the cards to the register, there is approximately 90% correspondence for all vaccines aside from measles. Discrepancies with the other self-reported vaccinations are more likely errors with the self-reported data, than errors on the cards. Around 75% of infants that reported getting measles had measles marked on their child health cards. For PENTA 3, this figure was 78%. If we look at whether the infant received any dose of PENTA, one of the evaluation outcome variables, the agreement is 89%. That being said, there is a risk some

[117] The discrepancy is likely less than 10%, which is the consistent discrepancy rate between clinic registers and child health cards for any PENTA and BCG scars, as well as the discrepancy between clinic registers and BCG self-report error rate.

of the correspondence between self-report and cards is from enumerators simply using the cards to fill out the self-report section of the survey, despite being coached not to and being aware that their tablet may have been recording random audio audits.

One way to assess the accuracy of self-reported data for vaccines aside from measles, where register quality is low, is to compare self-reported vaccination status to the register for infants without cards. The agreement between these two sources is 79% for both BCG and receiving any PENTA vaccination among infants without child health cards. If we include all infants, the agreement increases to 83%.

We focused on receipt of any PENTA vaccination as there is a high degree of inaccuracy in caregivers' ability to remember doses. For infants with PENTA 3 on child health cards, 90% of caregivers reported their infant received PENTA, but only 45% reported their infant received three doses of PENTA. Conversely, 79% of caregivers that reported receiving three doses of PENTA had PENTA 3 recorded on their cards. When we restricted our analysis to those who reported three doses of PENTA at a health facility, then 97% had PENTA 3 on their cards.[118]

PCV is difficult to measure based on self-report since it is given in the same location as PENTA. While 92% of infants with PENTA marked on their cards had PCV also marked, only 71% of caregivers that reported PENTA reported PCV.

In a similar vein, nurses administer measles on the same arm as BCG but administer yellow fever on a separate arm, usually on the same visit. While caregivers are generally better at differentiating BCG and measles, since BCG leaves a scar and measles does not, there is still some evidence that caregivers may over-report measles. The yellow fever self-reported coverage rate was 11% and the self-reported measles coverage rate was 15%, while the there was no difference in coverage rate among infants with cards for both vaccines. This discrepancy could be due to the fact that caregivers can remember receiving measles more clearly as it is a more salient disease in the community, or that nurses automatically mark measles and yellow fever together on child health cards even when there are yellow fever stock outs.

Given baseline learnings, IDinsight will use self-reported coverage to measure the study's primary outcomes at endline. This is because **self-report is likely to be the least biased data source at endline.** While self-reported health behavior is subject to inaccurate recall or social desirability bias, we do not expect significant differences in the accuracy of self-reported data between treatment and control groups. This means that the absolute coverage rates may have some error, but the difference between the two should still accurately reflect the program's impact. This will not be true, however, for the accuracy of immunization data from child health cards and child immunization registers. Since New Incentives' program provides caregivers with child health cards and checks child immunization registers, we expect the program will increase the number of children in treatment areas who have child health cards, as well as the accuracy and regularity with which clinic staff fill out the immunization register. Thus, the bias in measuring coverage through data other than self-reported data may substantially affect the study's outcome, and thus, IDinsight will use self-reported coverage to measure the study's primary outcomes. While self-report will be the only source used for the study's outcome variable, the other sources of coverage are still important to understand the self-reported data's accuracy.

[118] This may be due to inconsistencies in recording when caregivers receive vaccinations from multiple sources.

For the purposes of stratification, we focused on the percentage of infants who have ever received an injectable vaccination due to the relative simplicity of the underlying question and the fact that it was nearly normally distributed. However, for the outcome variable at endline, we recommend focusing on BCG, PENTA, and measles coverage because these are most important for evaluating New Incentives' cost-effectiveness. We will continue to work to improve the accuracy of this measure, which requires significant recall by caregivers in future rounds of data collection.

Annex 6: Back-Check Details

The back-check system during the baseline study included two kinds of back-checks: 1) those implemented by Hanovia on 10% of the sample and 2) a smaller sample of IDinsight back-checks implemented by field managers employed independently. Both of the independent field managers had primarily worked with other firms in the past with only limited experience working with Hanovia. Due to timing constraints and the simpler nature of clinic records review, the independent field managers only back-checked the household census and household routine immunization survey components of data collection.

The main back-check took place immediately after primary data collection. Field managers' back-checks took place after the main back-checks as they sampled both primary surveys (50%) and back-checked surveys (50%). We based resurveying off the results of the main back-checks because re-surveying had to occur before the next phase of data collection i.e. the routine immunization survey could not proceed until any census re-surveys were completed. Note, there was no resurvey for clinic record reviews due to the relative simplicity of the exercise, low error rate, and timing. The resurvey rules evolved slightly throughout the study, but the final rules are outlined below:

Household Census Resurvey Rule:

1. A household census form was considered an error form if there were three or more discrepancies with the five variables determining the approximate age breakdown of the household,[119] or there was a discrepancy in the number of total eligible 12 to 24-month olds and one other discrepancy.
2. An enumerator's work for a clinic was resurveyed if the back-check team identified two or more error forms from that enumerator's work and error forms made at least 15% of all forms back-checked.

Routine Immunization Re-Survey Rule:

1. A routine immunization form was tagged as an error form if 15% of the total back-check variables had a discrepancy. For a full back-check where both the enumerator and back-checker found a card, that meant 7 out of 44 back-check variables[120] must have discrepancies.

[119] The number of 5 to 18-year olds and number of male and female adults had to be accurate within two individuals, due to caregiver's difficulty distinguishing those under and over 18 while the number of children under 5 and under 3 had to be an exact match. Note other variables such as those associated with deceased children were sensitive and excluded from the back-check.

[120] The entire vaccination history section, both card and self-report, was back-checked in addition to the five asset questions and the question on whether the child had ever been to a facility.

2. If an enumerator had more than two error forms from a given clinic their work at that clinic would be resurveyed.

Back Check Results

In terms of error forms tagged for resurvey, the field manager and main back-checks were fairly consistent. Note that the numbers used for comparison are lower than the number of back-checks reported in fieldwork updates as we dropped cases from the analysis where we were not sure the back-checker actually interviewed the same respondent as the initial enumerator.[121] Table 23 illustrates the relative rates of forms identified as having errors for the Hanovia and IDinsight teams. For the census, we have included two standards: 1) the one used by the resurvey rule and 2) a stricter standard that is simply a discrepancy in the number of total children 12 to 24-months old.

Table 23: Percent of Forms Flagged with An Error Flag

Error Rate	Field Managers Back-Check	Main Back-Check	Difference (p-value)[122]
Census Re-Survey Discrepancy	4.7% (N=191)	5.0% (N=3,231)	0.3% (.81)
Census Eligible Discrepancy	8.4% (N=191)	8.8% (N=3,231)	0.4% (.84)
Routine Immunization Survey	13% (N=39)	9.0% (N=672)	4.0% (.43)

The field managers did have some discrepancies with the main back-check team, but as is evident above, this did not result in a systemic bias in error rates relative to the primary survey. While none of the 10 back-checks of the routine immunization survey main back-checks resulted in an error flag, 10 out of the 109 census back-checks resurveyed by field managers were flagged for error. The higher discrepancy between field managers and back-checkers as opposed to the main survey team may simply be an artifact of the small sample. The discrepancy may also relate to respondents getting impatient and being more prone to give incomplete or false responses the third time enumerators ask them the same questions.

To analyze individual questions, we used discrepancies as well as the percentage of forms with differences between the back-check and the main survey. On the census form the most substantial discrepancy was around the overall number of children under-five. The discrepancy was 20% for main back-check and 25% for field managers, which seems to be largely due to the fact that caregivers report age inconsistently.[123] The discrepancy rate for the overall total number of household members was only 8% for the main back-check and 7% for the field managers. This suggests the primary problem for the under-five variable was age classification (rather than leaving children off the survey completely).

Given the small sample of field manager back-checks for the routine immunization survey, quantitatively comparing them to the main back-check team with respect to individual questions on routine immunization is not statistically sound. Further, we tried to target field managers' back-

[121] This could be due to discrepancies in the respondent name or a comment by the enumerator suggesting they are not positive they are at the right household.
[122] Proportions were compared using a two-sample proportion test.
[123] Enumerators were not asked to probe extensively for age on this question.

checks of the routine immunization survey to teams or enumerators where we had data quality concerns. That fact may also explain the difference in error rate in Table 23.

In the main back-check, the most common non-vaccination discrepancies were the number of rooms (25%) which can be difficult to define in multi-family compounds, the presence of a working radio (17%) which likely had to do with different definitions of "working", and whether the household received nets (19%). In terms of vaccination variables back-checked, there was a large discrepancy for measles (20%), but not BCG (10%) or ever receiving an injectable vaccine (6%). The measles coverage based on the back-checkers' surveys is 20% versus 16% among the surveys that were back-checked. A likely cause of this discrepancy is that caregivers confused measles with other vaccinations after BCG that were not asked in the back-check survey, such as PCV, IPV, or PENTA. There was also a substantial discrepancy (19%) in whether the caregivers reported ever receiving a card with their child's name on it. However, the discrepancy in terms of finding a child health card was only 5%, which suggests caregivers struggled to consistently remember if they had received cards in the past.

Back Check Challenges

The primary questions on the census survey included the number of household members and their ages. While seemingly straightforward, it is difficult to get consistent responses for these questions in the African context. Households tend to be part of large multifamily compounds – sometimes these structures contain over 20 households – making it difficult to determine the division of individuals into households. In families with many wives, it is often unclear whether to consider each wife as a separate household or to treat them as one. Respondents also often forgot non-blood relatives or children of divorced wives still living in the household. The difficulties of age determination are discussed in Annex 3.

Finding the selected households to back-check was another challenging aspect of the process. The initial plan of conducting back-checks for a given clinic across several enumerators had to be altered due to logistical constraints. Instead, each clinic's back-checks were limited to one settlement per clinic. Investigations into discrepancy cases sometimes found respondents admitting they had told different things to the back-checker and the primary enumerator. It is unclear why respondents did this, but one theory is that it had to do with varying levels of trust inspired by each individual enumerator. Alternatively, it may stem from the fact that for practical reasons, back-checkers often used local guides to lead them from house to house. This guide may have influenced the way a respondent answered.

Thoughts on the Role of the Independent Field Manager

As noted in the results section, the field managers' back-check results did not differ significantly from the main back-check. However, many of the qualitative insights into the source of the discrepancy did come from the field managers. Also, IDinsight found the independent field managers most helpful for targeted back-checks of specific enumerators to investigate further issues identified by the main back-check, audio-audits, or the field-manager spot check. These targeted back-checks could help explain unexpected results such as a strong enumerator tagged for a resurvey. However, the back-checks did not reveal any general differences with the Hanovia back-checks to inform survey decision-making. Going forward, IDinsight proposes that we organize independent field managers' back-checks on an ad-hoc basis to investigate specific issues. While a low minimum target for field manager back-checks over the course of the study may make sense, it is important to provide survey staff with definitive back-check information when decisions are made regarding individual enumerators. Weekly targets do not allow sufficient flexibility for field manager back-checks to be targeted where they are most valuable

Annex 7: Vaccination Attitude Themes

As described in Section 6.5, responses to the questions “What is the main reasons you decided to vaccinate your child?” and “You have indicated that [childname] has not received some vaccinations. Why have they not received these vaccinations?” were categorized into different attitude “themes”, in order to facilitate analysis. Details of how each survey response fitted into these attitude themes are presented in Tables 24, 25, 26 and 27 below. Tables 25 and 27 outline the full breakdown of the reasons *for* and *for not* vaccinating respectively.

Table 24: Reasons for Vaccinating Children

Theme grouping of reasons for vaccinating child into themes
Note: Attitude themes are in bold, with a list of each survey response that fits into the theme listed below.
Preventative health measure
To prevent disease / illness
To prevent death
Influence of a community leader
Community leaders tell us to vaccinate
Influence of a family member or neighbor
Family member pressured me or took the decision to go
Family member or neighbor had a vaccine-preventable disease / illness
Told by a health worker of vaccinator
If other specify responses contained the words "vaccinator(s)", "health worker(s)" or "health personnel".
Other
All other responses

Table 25: Full Breakdown of Reasons for vaccinating child

	Option	Frequency	Percentage of Respondents
1	To prevent disease / illness	1433	77.2%
2	To prevent death	29	1.6%
3	Family member or neighbor had a vaccine-preventable disease / illness	27	1.5%
4	Wanted to get the incentive	1	0.1%
5	Family member pressured me or took the decision to go	93	5.0%
6	Community leaders tell us to vaccinate	171	9.2%
7	Other	103	5.5%
	Total number of respondents	1857	100%

Table 26: Reasons for *not* vaccinating children

Theme grouping of reasons for *not* vaccinating child into themes
Note: Attitude themes are in bold, with a list of each survey response that fits into the theme listed below.
Lack of Knowledge
Don't know the vaccination schedule
Did not know where or when to get vaccination
Service Delivery Issues
Went to clinic but vaccine ran out
Afraid of long wait at clinic
Had a bad experience with previous vaccinator/health clinic
Someone else told me they/their child had a bad experience with the vaccinator/health clinic
Access
Place of vaccination too far
Too busy
Transport cost
Mistrust or Fears
Heard or read negative media
Had a bad experience or reaction with previous vaccination
Did not think the vaccine was effective
Did not think the vaccine was safe/concerned about side effects
Someone else told me they/their child had a bad reaction
Fear of needles
Socio Cultural Reasons
Inappropriate for first child to go to clinic
Religious reasons
Husband or other family member doesn't allow
Ambivalence
If the other specify responses contained the words: "no reason", "nothing", "just like that", "just didn't"
"just don't", "no any", "didn't go", "did not take", "lazy", "feel like", "not interested", "negligence", "important".
Child too sick
If the other specify responses contained the word "sick" (corrections for caregivers being sick were also made).
Other
All other responses which could not be coded into the above categories

Table 27: Full Breakdown of Results for Reasons for *not* Vaccinating

	Option	Frequency	% of respondents
1	Don't know the vaccination schedule	1614	32.8%
2	Did not know where or when to get vaccination	550	11.2%
3	Went to clinic but vaccine ran out	184	3.7%
4	Afraid of long wait at clinic	21	0.4%
5	Place of vaccination too far	51	1.0%
6	Too busy	222	4.5%
7	Transport cost	52	1.1%
8	Heard or read negative media	5	0.1%
9	Did not think the vaccine was effective	61	1.2%
10	Did not think the vaccine was safe/concerned about side effects	55	1.1%
11	Had a bad experience with previous vaccinator/health clinic	14	0.3%
12	Had a bad experience or reaction with previous vaccination	112	2.3%
13	Someone else told me they/their child had a bad experience with the vaccinator/health clinic	14	0.3%
14	Someone else told me they/their child had a bad reaction	34	0.7%
15	Fear of needles	61	1.2%
16	Inappropriate for first child to go to clinic	6	0.1%
17	Religious reasons	3	0.1%
18	Husband or other family member doesn't allow	293	6.0%
19	Other[124]	1570	31.9%
	Total number of respondents	4922	100%

[124] The majority of the "other" responses actually fit one of the available options, and during data analysis were recoded to reflect this. As described in section 6.5, the "true" percentage of other responses is 9.6%.

Annex 8: Incentives Received and Offered

When comparing incentives received and offered, there are some discrepancies. A majority of incentive-offering clinics reported that they only offer bed nets as the incentive for vaccinations. The second-most offered incentive are low-value items such as sweets, soaps and food, with half as many clinics offering them.

This information seems to be contradictory to the majority of caregivers who reported receiving low-value items in Figure 18. To examine this disagreement, we matched the incentives that caregivers reported receiving with the incentives that their corresponding clinics reported offering.

Figure 30: Verified Incentive Offered[125]

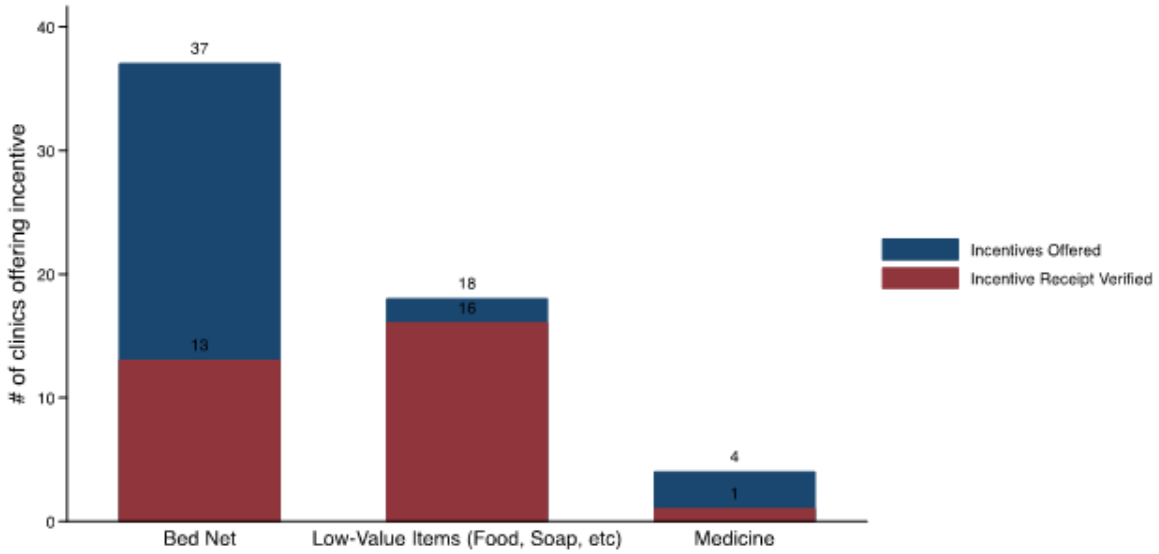


Figure 30 presents both the distribution of the different types of incentives that clinics reported offering, and the distribution after verifying the incentive with caregivers who reported receiving them.[126]

It becomes evident that there is a disparity particularly between bed nets offered and received. Of the 37 clinics that reported offering bed net incentives, only 13 clinics had been verified. The possible explanations for the low verification could be that caregivers underreport bed net receipt and/or clinics did not actually distribute the nets. Analyzing questions specific to bed nets from the survey reveals that 76.3% of all bed nets are obtained from health facilities. 62.3% of caregivers who have received a bed net from a clinic have received it as an incentive for vaccination. Such high percentages imply that clinics are the primary place for people to get bed nets, and that there is reliability in the caregivers' ability to recall where they get their bed nets. Thus, it seems unlikely for caregivers to underreport bed net incentives, making it more probable that clinics claimed to have offered bed nets as incentives when it was not the case.

It is also noteworthy that some clinics responded to this question with incentives that they offered during campaigns as opposed to incentives offered on a normal basis. This confusion possibly explains the dominance of bed net incentives, which are offered during campaigns.

[125] We verified clinics' reports that they offered incentives against self-report data on incentives from caregivers.
[126] If even one caregiver from the clinic catchment reported receiving an incentive that matched with the incentive the clinic was offering, then it is considered verified.

With this large majority of bed nets circulating from clinics to individuals, the impact of the cash transfer program from New Incentives is potentially larger than getting children vaccinated. As they encourage more caregivers to go to clinics, there is a potential positive impact on increasing the number of bed nets distributed to these families across the region. However, distribution of bed nets does not imply proper use so it is difficult to properly monitor this benefit.

In contrast to bed nets, the near perfect verification of clinics offering low-value items explains the prominence of low-value items reported by caregivers (as seen earlier in Figure 18). In fact, low-value items seem to be so dominant that no clinic reported offering high-value items as incentives for vaccinations. The campaign confusion could be one explanation for the lack of high-value items. With campaigns unlikely to incur the higher costs of items such as toys or farming supplies, the recipients of high-value items may be outliers for special cases. The other missing category in Figure 30 is cash. The two caregivers who reported getting cash incentives received it for polio drops which are not administered at clinics.

Annex 9: Additional Tables

Annex 9 includes additional tables with coverage rate information from child health cards and clinic registers, as well as assesses the self-reported data for its accuracy.

Table 28: Self-Reported Immunization Coverage Across Individual Characteristics

	N: 12 to 24-month olds	Ever Vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized (any PENTA)	Fully immunized (full PENTA)
Total	**5394**	**34.4%**	**24.7%**	**21.4%**	**5.7%**	**16.0%**	**10.2%**	**4.0%**
Gender								
Female	2774	32.6%	23.1%	19.8%	5.2%	14.6%	9.0%	3.5%
Male	2620	36.4%	26.4%	23.1%	6.1%	17.4%	11.4%	4.5%
Caregiver's Education[1]								
None	4239	31.1%	21.3%	18.4%	4.4%	13.7%	8.1%	2.8%
Primary	649	49.9%	40.3%	33.9%	11.7%	24.6%	17.6%	8.8%
Secondary	226	54.9%	47.1%	42.3%	10.6%	35.4%	27.9%	10.2%
Post-Secondary	14	64.3%	64.3%	64.3%	28.6%	50.0%	50.0%	28.6%
Caregiver's Age[1]								
Below 20	571	29.2%	20.5%	16.3%	4.0%	12.8%	8.1%	3.0%
20-29	2351	35.6%	26.0%	22.7%	5.8%	15.8%	10.3%	4.3%
30-39	1441	37.5%	27.9%	24.4%	7.5%	18.8%	12.3%	5.1%
Above 40	386	39.1%	25.9%	22.6%	5.2%	18.4%	11.1%	2.8%
Household Size								
Small (<7 members)	1726	33.4%	23.7%	20.1%	5.0%	15.3%	9.8%	3.7%
Medium (7-10 members)	1851	32.3%	23.0%	19.3%	5.5%	13.8%	8.9%	3.9%
Large (>10 members)	1817	37.5%	27.4%	24.7%	6.5%	18.8%	11.8%	4.5%
Children Birthed by Caregiver[1]								
Small (<3)	1573	32.2%	23.3%	19.8%	5.0%	13.7%	9.4%	4.0%
Medium (3-4)	1337	33.5%	23.2%	20.0%	5.0%	15.4%	8.8%	3.1%
Large (>4)	2194	37.2%	27.3%	23.8%	6.7%	18.5%	12.0%	4.5%
Number of Other Eligibles at Home								
No Other Eligible	4835	34.3%	24.7%	21.3%	5.5%	15.9%	10.2%	3.9%
One Other Eligible	508	34.8%	24.5%	22.3%	7.3%	16.4%	10.0%	5.3%
Two Other Eligible	51	43.1%	29.4%	19.6%	3.9%	21.6%	5.9%	0.0%
Child Born in Clinic								
No	4725	32.8%	23.0%	20.2%	5.5%	15.3%	9.4%	3.7%
Yes	461	53.6%	44.6%	35.7%	8.2%	25.3%	19.7%	6.9%
Ethnicity								
Hausa	4734	34.9%	25.1%	21.5%	5.8%	16.4%	10.5%	4.1%

Fulani	426	30.3%	21.6%	20.1%	4.9%	11.9%	8.2%	3.8%
Other	111	34.2%	24.3%	20.6%	5.4%	16.5%	9.9%	3.6%
Respondent Attended Islamic School								
No	1103	28.8%	18.8%	16.9%	4.2%	12.5%	6.7%	2.6%
Yes	4168	36.0%	26.3%	22.6%	6.1%	17.0%	11.2%	4.4%
Self-Reported Wealth (Low to High, 1-5)								
1	600	26.3%	18.8%	15.2%	2.3%	10.5%	6.2%	1.3%
2	1611	33.7%	23.4%	20.5%	6.1%	15.2%	9.8%	4.3%
3	1780	35.7%	26.1%	22.3%	5.6%	17.4%	11.0%	4.0%
4	1198	37.4%	27.2%	23.9%	6.8%	17.9%	11.5%	4.7%
5	102	42.2%	28.7%	27.5%	7.8%	18.8%	13.7%	6.9%
Socioeconomic Status (PPI)								
Lowest Quintile	1067	27.8%	19.5%	15.8%	3.3%	13.7%	7.5%	2.2%
Second Quintile	1163	33.1%	22.4%	20.2%	5.7%	14.3%	8.6%	3.7%
Middle Quintile	983	32.7%	22.5%	19.5%	4.9%	13.5%	8.9%	3.4%
Fourth Quintile	1121	36.3%	26.5%	23.2%	6.8%	17.3%	11.2%	5.2%
Highest Quintile	954	43.5%	33.6%	28.9%	7.9%	22.1%	15.6%	5.8%
Reasons for Not Vaccinating								
Access	389	43.7%	34.3%	25.1%	4.1%	7.0%	3.6%	1.3%
Ambivalence	512	20.9%	14.5%	11.7%	2.7%	7.6%	2.9%	1.0%
Child too sick	67	64.2%	52.2%	47.7%	11.9%	7.5%	1.5%	0.0%
Lack of Knowledge	2625	25.7%	14.2%	11.4%	1.8%	10.1%	2.8%	0.7%
Mistrust or Fears	335	33.1%	24.2%	18.8%	3.3%	6.0%	3.0%	1.2%
Service Delivery Issues	240	41.7%	30.5%	27.2%	6.3%	15.4%	6.3%	2.5%
Socio Cultural Reasons	351	15.1%	8.3%	5.7%	0.0%	3.4%	0.3%	0.0%
Other	403	33.0%	22.8%	22.2%	6.2%	10.9%	6.0%	2.5%
Local Leader Attitudes								
Have Heard Positive Messages	3415	39.1%	28.2%	24.9%	6.9%	19.2%	12.3%	5.0%
Have Not Heard Positive Messages	1843	26.0%	18.4%	15.1%	3.4%	10.5%	6.7%	2.3%
Incentives Received								
No	4093	34.7%	24.7%	21.0%	5.4%	15.9%	10.0%	3.7%
Yes	1205	36.3%	26.5%	24.4%	7.2%	17.5%	11.6%	5.3%
Bed Net	79	91.1%	84.8%	83.5%	30.4%	67.1%	59.5%	24.1%
Medicine	29	86.2%	75.9%	69.0%	17.2%	37.9%	24.1%	13.8%
Low-Value Items (Food, Soap, etc)	1025	30.8%	20.5%	18.6%	5.1%	12.8%	7.6%	3.7%
High-Value Items (Farming Supplies, Toys, etc.)	34	47.1%	35.3%	35.3%	8.8%	29.4%	17.6%	5.9%
Cash	2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

[1]*Only includes children whose caregiver responded to the survey*

Table 29: Self-Reported Immunization Coverage Across Clinic Characteristics

	N: Clinics	N: 12 to 24-month olds	Ever Vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized (any PENTA)	Fully immunized (full PENTA)
Total	**130**	**5394**	**34.4%**	**24.7%**	**21.4%**	**5.7%**	**16.0%**	**10.2%**	**4.0%**
Clinic Setting									
In town (urban)	2	76	40.8%	36.8%	30.7%	5.3%	24.0%	21.1%	5.3%
In village (rural)	114	4762	34.3%	24.5%	21.1%	5.4%	15.8%	9.8%	3.7%
Outskirts of town (semi-urban)	14	556	34.9%	24.3%	22.2%	8.1%	16.7%	11.7%	6.3%
Catchment Area									
Small (<4.67 sq. km)	65	2713	37.4%	27.7%	24.7%	6.6%	18.2%	12.6%	5.0%
Large (>4.67 sq. km)	65	2681	31.4%	21.7%	18.0%	4.7%	13.7%	7.7%	3.0%
Total Staff									
Small (1)	6	238	31.1%	16.5%	16.5%	2.9%	13.0%	3.8%	0.8%
Medium (2-3)	78	3224	36.3%	27.7%	24.0%	6.8%	16.9%	11.7%	4.7%
Large (>3)	46	1932	31.7%	20.5%	17.5%	4.2%	14.8%	8.4%	3.2%
Total Vaccinators									
Small (1)	67	2782	35.2%	25.5%	22.6%	5.6%	16.2%	10.3%	3.9%
Large (>1)	63	2612	33.6%	23.8%	20.1%	5.7%	15.7%	10.0%	4.1%
Security									
No Security Issues	89	3707	38.5%	28.7%	25.1%	7.0%	18.5%	12.5%	5.0%
Some Security Issues	28	1166	27.1%	17.6%	15.2%	2.9%	11.5%	5.7%	1.9%
Serious Security Issues	7	272	22.4%	9.4%	4.9%	0.4%	6.3%	1.1%	0%
No Go Zone	6	249	21.3%	15.0%	13.0%	4.4%	10.2%	6.4%	3.2%
Incentives Offered									
No	71	2896	38.5%	28.8%	26.1%	7.1%	18.6%	12.6%	5.2%
Yes	59	2498	29.7%	19.9%	15.9%	4.0%	13.0%	7.3%	2.6%
Bed Net	37	1561	26.5%	18.5%	14.7%	3.3%	11.6%	7.2%	2.2%
Medicine	4	157	47.8%	33.8%	31.1%	7.6%	20.0%	10.8%	3.8%
Low-Value Items (Food, Soap, etc.)	18	780	32.6%	19.9%	15.1%	4.5%	14.2%	6.8%	3.3%
Operations from UNICEF VCM									
No	67	2783	31.6%	21.3%	17.7%	4.3%	13.6%	7.6%	2.8%
Yes	63	2611	37.5%	28.3%	25.3%	7.2%	18.5%	12.9%	5.2%

Table 30: Immunization Coverage from Child Health Cards and Clinic Registers Across Individual Characteristics

	N: 12 to 24-month olds	Ever Vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized (any PENTA)	Fully immunized (full PENTA)
Total	**5394**	**17.8%**	**13.7%**	**15.0%**	**9.3%**	**7.5%**	**6.2%**	**5.8%**
Gender								
Female	2774	16.7%	12.6%	14.1%	8.8%	7.0%	5.9%	5.5%
Male	2620	18.9%	14.9%	16.0%	9.9%	7.9%	6.5%	6.1%
Caregiver's Education[1]								
None	4239	15.1%	11.6%	12.7%	7.5%	5.8%	4.7%	4.4%
Primary	649	30.5%	23.1%	25.4%	17.4%	14.5%	12.3%	11.9%
Secondary	226	33.6%	29.6%	31.9%	23.9%	21.2%	19.0%	18.1%
Post-Secondary	14	28.6%	28.6%	21.4%	14.3%	14.3%	14.3%	14.3%
Caregiver's Age[1]								
Below 20	571	14.4%	11.2%	12.3%	7.5%	6.3%	5.4%	5.3%
20-29	2351	19.1%	14.7%	16.0%	9.6%	7.7%	6.2%	5.6%
30-39	1441	20.0%	16.3%	17.1%	11.0%	9.0%	7.8%	7.5%
Above 40	386	17.4%	12.2%	15.0%	9.8%	8.0%	6.5%	6.5%
Household Size								
Small (<7 members)	1726	16.7%	12.9%	14.5%	9.2%	7.6%	6.5%	6.1%
Medium (7-10 members)	1851	16.2%	12.6%	13.7%	8.8%	6.8%	5.8%	5.6%
Large (>10 members)	1817	20.3%	15.7%	16.9%	10.0%	8.0%	6.2%	5.7%
Children Birthed by Caregiver[1]								
Small (<3)	1573	16.7%	13.0%	13.7%	8.2%	6.8%	5.9%	5.3%
Medium (3-4)	1337	17.8%	12.9%	14.9%	9.0%	7.4%	5.8%	5.5%
Large (>4)	2194	19.1%	15.3%	16.5%	10.8%	8.4%	7.0%	6.8%
Number of Other Eligibles at Home								
No Other Eligible	4835	17.6%	13.7%	14.9%	9.3%	7.4%	6.2%	5.8%
One Other Eligible	508	19.1%	13.6%	16.7%	10.2%	8.5%	6.9%	6.5%
Two Other Eligible	51	19.6%	15.7%	15.7%	5.9%	0.0%	0.0%	0.0%
Child Born in Clinic								
No	4725	16.9%	12.8%	14.2%	8.7%	7.1%	5.8%	5.4%
Yes	461	28.0%	25.4%	23.9%	16.5%	12.4%	11.7%	11.3%
Ethnicity								
Hausa	4734	17.9%	13.9%	15.1%	9.3%	7.5%	6.3%	5.9%
Fulani	426	17.4%	14.1%	14.6%	9.9%	6.8%	5.6%	5.2%
Other	111	14.4%	10.8%	11.7%	9.9%	9.9%	7.2%	7.2%

Attended Islamic School								
No	1103	12.6%	9.1%	10.7%	6.1%	4.7%	3.7%	3.2%
Yes	4168	19.1%	15.1%	16.2%	10.2%	8.3%	6.9%	6.6%
Self-Reported Wealth (Low to High, 1-5)								
1	600	13.8%	10.0%	12.2%	6.8%	5.0%	4.2%	4.2%
2	1611	17.9%	14.1%	15.6%	9.6%	6.8%	5.9%	5.6%
3	1780	18.0%	13.7%	14.7%	9.4%	7.6%	6.3%	6.0%
4	1198	19.0%	15.2%	16.4%	10.4%	9.2%	7.3%	6.7%
5	102	20.6%	16.7%	14.7%	9.8%	10.8%	9.8%	7.8%
Socioeconomic Status (PPI)								
Lowest Quintile	1067	13.7%	10.5%	10.6%	6.5%	5.5%	4.2%	3.8%
Second Quintile	1163	15.4%	11.5%	13.2%	8.0%	5.4%	4.4%	4.2%
Middle Quintile	983	17.2%	11.8%	13.9%	8.1%	6.4%	5.0%	4.7%
Fourth Quintile	1121	20.7%	16.1%	17.5%	11.6%	9.5%	8.0%	7.6%
Highest Quintile	954	22.6%	19.6%	20.8%	13.1%	11.1%	10.0%	9.3%
Reasons for Not Vaccinating								
Access	389	21.9%	16.7%	17.7%	8.2%	4.9%	3.9%	3.1%
Ambivalence	512	9.8%	7.4%	7.6%	3.9%	1.6%	0.6%	0.6%
Child too sick	67	43.4%	38.8%	37.3%	19.4%	4.5%	4.5%	4.5%
Lack of Knowledge	2625	9.9%	6.0%	7.8%	3.7%	3.0%	2.0%	1.7%
Mistrust or Fears	335	17.6%	13.4%	14.3%	6.3%	3.3%	2.7%	2.4%
Service Delivery Issues	240	26.3%	20.4%	22.5%	11.7%	8.3%	6.3%	5.8%
Socio Cultural Reasons	351	6.6%	4.8%	3.7%	0.6%	1.1%	0.0%	0.0%
Other	403	16.9%	11.7%	13.4%	7.2%	5.2%	3.0%	2.7%
Local Leader Attitudes								
Have Heard Positive Messages	3415	20.2%	15.7%	17.1%	10.8%	9.0%	7.5%	7.0%
Have Not Heard Positive Messages	1843	13.1%	10.3%	11.1%	6.7%	4.8%	4.1%	3.9%
Incentives Received								
No	4093	18.4%	14.4%	15.6%	9.7%	7.8%	6.4%	6.0%
Yes	1205	17.1%	12.6%	14.4%	9.0%	6.9%	5.8%	5.4%
Bed Net	79	54.4%	44.3%	50.6%	38.0%	31.6%	25.3%	22.8%
Medicine	29	48.3%	34.5%	41.4%	27.6%	27.6%	27.6%	20.7%
Low-Value Items (Food, Soap, etc.)	1025	13.6%	9.6%	10.8%	6.4%	4.7%	3.9%	3.8%
High-Value Items (Farming Supplies, Toys, etc.)	34	29.4%	26.5%	29.4%	11.8%	5.9%	5.9%	5.9%
Cash	2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

[1]*Only includes children whose caregiver responded to the survey*

Table 31: Immunization Coverage from Child Health Cards and Clinic Registers Across Clinic Characteristics

	N: Clinics	N: 12 to 24-month olds	Ever Vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized (any PENTA)	Fully immunized (full PENTA)
Total	**130**	**5394**	**17.80%**	**13.70%**	**15.00%**	**9.30%**	**7.50%**	**6.20%**	**5.80%**
Clinic Setting									
In town (urban)	2	76	22.40%	21.10%	18.40%	11.80%	9.20%	9.20%	9.20%
In village (rural)	114	4762	17.70%	13.30%	15.00%	9.00%	7.30%	6.00%	5.50%
Outskirts of town (semi-urban)	14	556	17.30%	16.00%	15.30%	11.70%	8.30%	7.40%	7.40%
Catchment Area									
Small (<4.67 sq. km)	65	2713	19.80%	15.20%	17.20%	11.20%	9.00%	7.70%	7.30%
Large (>4.67 sq. km)	65	2681	15.70%	12.20%	12.80%	7.50%	5.90%	4.70%	4.30%
Total Staff									
Small (1)	6	238	17.20%	6.70%	15.50%	7.60%	5.00%	3.40%	2.90%
Medium (2-3)	78	3224	20.10%	15.90%	17.40%	11.00%	8.40%	7.00%	6.60%
Large (>3)	46	1932	13.90%	10.90%	11.00%	6.80%	6.20%	5.10%	4.80%
Total Vaccinators									
Small (1)	67	2782	19.20%	14.00%	16.40%	9.70%	7.50%	6.00%	5.70%
Large (>1)	63	2612	16.20%	13.40%	13.60%	8.90%	7.40%	6.30%	5.90%
Security									
No Security Issues	89	3707	21.10%	16.70%	18.20%	11.80%	8.90%	7.70%	7.30%
Some Security Issues	28	1166	12.50%	8.60%	9.70%	5.00%	5.50%	3.90%	3.30%
Serious Security Issues	7	272	4.80%	2.90%	2.60%	1.50%	1.10%	0.40%	0.40%
No Go Zone	6	249	7.20%	5.60%	6.00%	2.00%	2.00%	1.20%	1.20%
Incentives Offered									
No	71	2896	22.30%	16.90%	19.20%	11.80%	9.30%	7.90%	7.50%
Yes	59	2498	12.50%	10.10%	10.20%	6.40%	5.30%	4.10%	3.80%
Bed Net	37	1561	11.90%	9.80%	10.40%	7.20%	5.60%	4.60%	4.40%
Medicine	4	157	22.30%	19.10%	14.00%	8.30%	7.60%	5.70%	4.50%
Low-Value Items (Food, Soap, etc.)	18	780	11.80%	8.80%	9.00%	4.60%	4.40%	2.80%	2.40%
Operations from UNICEF VCM									
No	67	2783	15.40%	11.50%	13.10%	7.80%	6.20%	4.90%	4.70%
Yes	63	2611	20.20%	16.10%	17.10%	10.90%	8.80%	7.50%	7.00%

Table 32: Immunization Coverage Verified Between Self-Report and Health Cards/ Registers Across Individual Characteristics

	N: 12 to 24-month olds	Ever Vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized (any PENTA)	Fully immunized (full PENTA)
Total	**5394**	**17.5%**	**12.9%**	**12.8%**	**1.6%**	**6.1%**	**4.9%**	**0.9%**
Gender								
Female	2774	16.4%	11.8%	12.0%	1.4%	5.8%	4.7%	0.9%
Male	2620	18.7%	14.0%	13.6%	1.8%	6.4%	5.1%	0.9%
Caregiver's Education[1]								
None	4239	15.0%	10.8%	10.7%	1.3%	4.7%	3.6%	0.7%
Primary	649	29.7%	22.2%	22.0%	3.5%	11.4%	9.9%	2.0%
Secondary	226	33.6%	29.6%	29.6%	3.1%	18.6%	16.8%	2.7%
Post-Secondary	14	28.6%	28.6%	21.4%	0.0%	14.3%	14.3%	0.0%
Caregiver's Age[1]								
Below 20	571	14.4%	10.7%	10.0%	0.9%	5.6%	4.6%	0.7%
20-29	2351	18.8%	13.9%	13.5%	1.5%	6.2%	4.8%	0.9%
30-39	1441	19.7%	15.4%	15.3%	2.6%	7.3%	6.2%	1.5%
Above 40	386	17.1%	10.6%	12.4%	1.3%	6.0%	4.1%	0.5%
Household Size								
Small (<7 members)	1726	16.6%	12.2%	12.2%	1.1%	6.4%	5.3%	0.8%
Medium (7-10 members)	1851	15.9%	11.9%	11.5%	1.6%	5.4%	4.6%	0.8%
Large (>10 members)	1817	20.0%	14.5%	14.7%	2.1%	6.5%	4.8%	1.1%
Children Birthed by Caregiver[1]								
Small (<3)	1573	16.5%	12.5%	11.5%	1.0%	5.7%	4.7%	0.6%
Medium (3-4)	1337	17.4%	11.7%	12.3%	1.3%	6.0%	4.6%	0.8%
Large (>4)	2194	18.9%	14.4%	14.5%	2.4%	6.8%	5.5%	1.3%
Number of Other Eligibles at Home								
No Other Eligible	4835	17.4%	12.9%	12.6%	1.5%	6.0%	4.9%	0.8%
One Other Eligible	508	18.9%	12.4%	14.8%	2.2%	7.3%	5.7%	1.6%
Two Other Eligible	51	19.6%	15.7%	11.8%	3.9%	0.0%	0.0%	0.0%
Child Born in Clinic								
No	4725	16.6%	11.9%	12.1%	1.5%	5.8%	4.5%	0.9%
Yes	461	27.8%	24.3%	21.0%	2.6%	10.4%	9.5%	1.3%
Ethnicity								
Hausa	4734	17.6%	12.9%	12.8%	1.6%	6.1%	4.9%	0.9%
Fulani	426	17.1%	13.4%	12.7%	1.2%	5.6%	4.7%	0.9%
Other	111	14.4%	10.8%	11.7%	2.7%	9.0%	7.2%	1.8%
Attended Islamic School								

No	1103	12.3%	8.3%	9.1%	0.9%	3.8%	2.7%	0.3%
Yes	4168	18.9%	14.2%	13.8%	1.8%	6.8%	5.5%	1.1%
Self-Reported Wealth (Low to High, 1-5)								
1	600	13.7%	8.8%	8.5%	0.5%	3.0%	2.3%	0.3%
2	1611	17.6%	13.1%	12.8%	2.1%	5.6%	4.7%	1.1%
3	1780	17.8%	12.9%	13.1%	1.6%	6.5%	5.2%	1.1%
4	1198	18.8%	14.5%	14.4%	1.7%	7.6%	5.8%	0.8%
5	102	20.6%	16.7%	13.7%	1.0%	9.8%	8.8%	1.0%
Socioeconomic Status (PPI)								
Lowest Quintile	1067	13.5%	9.9%	9.0%	1.2%	4.5%	3.3%	0.6%
Second Quintile	1163	15.0%	10.4%	10.9%	1.3%	4.3%	3.4%	0.7%
Middle Quintile	983	16.9%	10.9%	11.4%	1.4%	4.9%	3.9%	0.5%
Fourth Quintile	1121	10.5%	15.2%	15.0%	2.4%	7.5%	6.1%	1.6%
Highest Quintile	954	22.4%	18.9%	18.4%	1.8%	9.9%	8.5%	1.3%
Reasons for Not Vaccinating								
Access	389	21.6%	16.2%	12.9%	0.8%	0.8%	0.5%	0.0%
Ambivalence	512	9.6%	6.4%	5.1%	1.0%	1.0%	0.2%	0.2%
Child too sick	67	41.8%	34.3%	32.8%	10.4%	1.5%	0.0%	0.0%
Lack of Knowledge	2625	9.6%	5.0%	5.9%	0.4%	1.9%	0.9%	0.1%
Mistrust or Fears	335	17.6%	12.5%	11.3%	0.6%	1.5%	1.2%	0.0%
Service Delivery Issues	240	26.3%	19.6%	17.9%	2.1%	5.8%	3.3%	0.4%
Socio Cultural Reasons	351	6.6%	4.8%	2.8%	0.0%	1.1%	0.0%	0.0%
Other	403	16.9%	11.2%	12.9%	1.7%	4.5%	2.2%	0.5%
Local Leader Attitudes								
Have Heard Positive Messages	3415	19.9%	14.8%	14.8%	2.0%	7.4%	6.0%	1.3%
Have Not Heard Positive Messages	1843	13.0%	9.5%	9.1%	1.0%	3.7%	3.1%	0.3%
Incentives Received								
No	4093	18.2%	13.4%	13.0%	1.6%	6.3%	5.0%	0.9%
Yes	1205	16.7%	12.1%	13.3%	1.8%	6.1%	5.1%	0.9%
Bed Net	79	54.4%	44.3%	48.1%	3.8%	30.4%	24.1%	2.5%
Medicine	29	48.3%	34.5%	41.4%	6.9%	17.2%	17.2%	3.4%
Low-Value Items (Food, Soap, etc.)	1025	13.1%	9.0%	9.8%	1.6%	4.1%	3.4%	0.7%
High-Value Items (Farming Supplies, Toys, etc.)	34	29.4%	26.5%	29.4%	2.9%	5.9%	5.9%	2.9%
Cash	2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 33: Immunization Coverage Verified Between Self-Report and Health Cards/Registers Across Clinic Characteristics

	N: Clinics	N: 12 to 24-month olds	Ever Vaccinated	BCG	Any PENTA	Full PENTA	Measles	Fully immunized (any PENTA)	Fully immunized (full PENTA)
Total	**130**	**5394**	**17.5%**	**12.9%**	**12.8%**	**1.6%**	**6.1%**	**4.9%**	**0.9%**
Clinic Setting									
In town (urban)	2	76	22.4%	21.1%	17.1%	1.3%	7.9%	7.9%	1.3%
In village (rural)	114	4762	17.5%	12.5%	12.6%	1.6%	5.9%	4.7%	0.9%
Outskirts of town (semi-urban)	14	556	16.9%	14.6%	13.7%	2.0%	7.6%	6.5%	1.1%
Catchment Area									
Small (<4.67 sq. km)	65	2713	19.5%	14.6%	15.0%	1.9%	7.6%	6.5%	1.2%
Large (>4.67 sq. km)	65	2681	15.5%	11.1%	10.6%	1.3%	4.6%	3.3%	0.6%
Total Staff									
Small (1)	6	238	16.4%	6.3%	10.9%	0.8%	3.8%	1.7%	0.0%
Medium (2-3)	78	3224	20.0%	15.1%	14.9%	2.1%	6.8%	5.5%	1.2%
Large (>3)	46	1932	13.5%	9.9%	9.5%	0.8%	5.2%	4.2%	0.6%
Total Vaccinators									
Small (1)	67	2782	18.9%	13.0%	13.7%	1.7%	6.0%	4.6%	0.9%
Large (>1)	63	2612	16.0%	12.7%	11.8%	1.5%	6.2%	5.2%	0.9%
Security									
No Security Issues	89	3707	20.8%	15.8%	15.7%	2.2%	7.4%	6.2%	1.3%
Some Security Issues	28	1166	12.3%	7.9%	8.0%	0.3%	4.1%	2.5%	0.1%
Serious Security Issues	7	272	4.8%	1.8%	1.1%	0.0%	1.1%	0.4%	0.0%
No Go Zone	6	249	7.2%	5.2%	5.6%	0.0%	2.0%	1.2%	0.0%
Incentives Offered									
No	71	2896	22.1%	16.0%	16.6%	2.3%	7.7%	6.4%	1.5%
Yes	59	2498	12.2%	9.2%	8.4%	0.8%	4.2%	3.1%	0.2%
Bed Net	37	1561	11.6%	8.9%	8.6%	0.9%	4.5%	3.7%	0.3%
Medicine	4	157	21.7%	18.5%	12.7%	1.9%	4.5%	3.8%	0.6%
Low-Value Items (Food, Soap, etc.)	18	780	11.5%	7.9%	7.0%	0.3%	3.5%	1.9%	0.0%
Operations from UNICEF VCM									
No	67	2783	15.1%	10.8%	10.6%	1.1%	4.7%	3.6%	0.6%
Yes	63	2611	20.1%	15.1%	15.2%	2.2%	7.6%	6.2%	1.3%

Table 34: Multivariate Regression of Individual and Clinic Characteristics (Self-Report)

Covariates	EVER VACCINATED			BCG			ANY PENTA			MEASLES		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
State												
Katsina	*Ref*			*Ref*			*Ref*			*Ref*		
Zamfara	0.56	(0.42 - 0.76)	**<0.01**	0.39	(0.27, 0.56)	**<0.01**	0.28	(0.19, 0.43)	**<0.01**	0.51	(0.34, 0.77)	**<0.01**
Gender												
Female	*Ref*			*Ref*			*Ref*			*Ref*		
Male	1.18	(1.03, 1.35)	**0.02**	1.17	(1.02, 1.35)	**0.03**	1.25	(1.06, 1.47)	**0.01**	1.23	(1.05, 1.45)	**0.01**
Caregiver's Education[1]												
None	*Ref*			*Ref*			*Ref*			*Ref*		
Primary	1.70	(1.39, 2.07)	**<0.01**	1.77	(1.43, 2.18)	**<0.01**	1.55	(1.24, 1.94)	**<0.01**	1.6	(1.23, 2.06)	**<0.01**
Secondary	1.90	(1.41, 2.55)	**<0.01**	2.22	(1.59, 3.09)	**<0.01**	2.28	(1.56, 3.32)	**<0.01**	2.77	(1.84, 4.17)	**<0.01**
Post-secondary	1.03	(0.22, 4.82)	0.97	1.74	(0.38, 7.94)	0.47	2.53	(0.51, 12.46)	0.26	1.99	(0.34, 11.77)	0.45
Caregiver's Age[1]	1.02	(1.01, 1.03)	**<0.01**	1.02	(1.01, 1.04)	**<0.01**	1.02	(1.01, 1.04)	**<0.01**	1.02	(1.01, 1.03)	**<0.01**
Household size	1.03	(1.01, 1.04)	**<0.01**	1.02	(1, 1.03)	0.07	1.02	(1, 1.04)	**0.02**	1.04	(1.02, 1.06)	**<0.01**
Islamic School	1.09	(0.88, 1.35)	0.43	1.19	(0.94, 1.49)	0.15	1.07	(0.84, 1.37)	0.57	1.11	(0.84, 1.46)	0.48
Self-Reported Wealth	1.12	(1.04, 1.21)	**<0.01**	1.12	(1.05, 1.21)	**<0.01**	1.15	(1.05, 1.25)	**<0.01**	1.15	(1.05, 1.25)	**<0.01**
Poverty Probability Index (PPI)	1.17	(1.10, 1.25)	**<0.01**	1.19	(1.1, 1.28)	**<0.01**	1.21	(1.12, 1.32)	**<0.01**	1.16	(1.06, 1.27)	**<0.01**
Child Born at Health Facility	1.78	(1.40, 2.25)	**<0.01**	1.88	(1.45, 2.44)	**<0.01**	1.47	(1.12, 1.93)	**0.01**	1.30	(0.97, 1.73)	0.08
Traditional Leader Support	1.71	(1.42, 2.06)	**<0.01**	1.65	(1.34, 2.02)	**<0.01**	1.8	(1.44, 2.24)	**<0.01**	1.86	(1.48, 2.34)	**<0.01**
Incentive Received												
None	*Ref*			*Ref*			*Ref*			*Ref*		
Bed Net	15.51	(4.59, 52.43)	**<0.01**	14.54	(6.31, 33.52)	**<0.01**	19.14	(7.64, 47.94)	**<0.01**	8.94	(4.73, 16.9)	**<0.01**
Medicine	27.64	(6.73, 113.53)	**<0.01**	18.35	(6.02, 55.94)	**<0.01**	16.22	(4.76, 55.21)	**<0.01**	4.04	(1.95, 8.37)	**<0.01**

Low-Value Items	0.92	(0.75, 1.12)	0.39	0.94	(0.75, 1.18)	0.59	1.11	(0.85, 1.44)	0.46	0.85	(0.63, 1.16)	0.32
High-Value Items	1.92	(0.92, 4)	0.08	2.73	(1.13, 6.6)	**0.03**	3.73	(1.64, 8.47)	**<0.01**	2.18	(0.97, 4.89)	0.06
Cash	*Omitted*			*Omitted*			*Omitted*			*Omitted*		
# of Staff	1.09	(0.84, 1.41)	0.51	1.11	(0.83, 1.48)	0.49	1.16	(0.81, 1.67)	0.41	1.17	(0.8, 1.7)	0.41
Security												
No Security Issues	*Ref*			*Ref*			*Ref*			*Ref*		
Some Security Issues	0.87	(0.60, 1.26)	0.45	0.92	(0.59, 1.44)	0.72	1.05	(0.63, 1.77)	0.84	0.86	(0.56, 1.32)	0.49
Serious Security Issues	1.00	(0.47, 2.12)	1.00	0.77	(0.37, 1.63)	0.50	0.46	(0.2, 1.06)	0.07	0.72	(0.25, 2.11)	0.55
No Go Zone	0.85	(0.33, 2.17)	0.74	1.00	(0.41, 2.44)	1.00	1.21	(0.49, 3.01)	0.68	0.97	(0.29, 3.26)	0.96
UNICEF VCM	1.18	(0.92, 1.52)	0.19	1.25	(0.94, 1.68)	0.12	1.34	(0.96, 1.87)	0.08	1.25	(0.89, 1.76)	0.19
Catchment Area(sq. km)	1.00	(0.99, 1.01)	0.65	1.00	(0.98, 1.01)	0.78	1.00	(0.98, 1.02)	0.87	1.00	(0.99, 1.02)	0.43
Constant	0.07	(0.04, 0.12)	**<0.01**	0.04	(0.02, 0.07)	**<0.01**	0.03	(0.01, 0.05)	**<0.01**	0.02	(0.01, 0.03)	**<0.01**
Observations		**4,612**			**4,572**			**4,531**			**4,549**	

[1]Only includes children whose caregiver responded to the survey

Table 35: Multivariate Regression of Individual and Clinic Characteristics (Child Health Card and Register)

Covariates	EVER VACCINATED			BCG			ANY PENTA			MEASLES		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
State												
Katsina	*Ref*			*Ref*			*Ref*			*Ref*		
Zamfara	0.31	(0.21, 0.46)	**<0.01**	0.30	(0.20, 0.48)	**<0.01**	0.30	(0.20, 0.46)	**<0.01**	0.39	(0.22, 0.68)	**<0.01**
Gender												
Female	*Ref*			*Ref*			*Ref*			*Ref*		
Male	1.17	(0.98, 1.4)	0.08	1.24	(1.03, 1.49)	**0.02**	1.16	(0.96, 1.4)	0.12	1.12	(0.91, 1.38)	0.27
Caregiver's Education[1]												
None	*Ref*			*Ref*			*Ref*			*Ref*		
Primary	1.68	(1.34, 2.09)	**<0.01**	1.48	(1.15, 1.91)	**<0.01**	1.53	(1.20, 1.96)	**<0.01**	1.91	(1.40, 2.61)	**<0.01**
Secondary	2.01	(1.38, 2.93)	**<0.01**	2.06	(1.41, 3.01)	**<0.01**	2.23	(1.51, 3.28)	**<0.01**	3.06	(1.86, 5.05)	**<0.01**
Post-secondary	0.88	(0.22, 3.58)	0.86	1.06	(0.27, 4.1)	0.93	0.63	(0.10, 4.08)	0.63	0.85	(0.10, 7.06)	0.88
Caregiver's Age[1]	1.01	(1.00, 1.03)	**0.02**	1.01	(1.00, 1.03)	0.05	1.02	(1.01, 1.03)	**<0.01**	1.03	(1.01, 1.04)	**<0.01**
Household size	1.02	(1.00, 1.03)	**0.01**	1.02	(1.01, 1.04)	**0.01**	1.01	(1.00, 1.03)	**0.04**	1.01	(0.99, 1.03)	0.40
Islamic School	1.29	(0.97, 1.71)	0.08	1.35	(0.99, 1.85)	0.06	1.27	(0.95, 1.7)	0.10	1.35	(0.93, 1.97)	0.12
Self-Reported Wealth	1.08	(1.00, 1.18)	0.06	1.08	(0.98, 1.19)	0.11	1.04	(0.95, 1.14)	0.36	1.17	(1.03, 1.32)	**0.01**
Poverty Probability Index (PPI)	1.17	(1.08, 1.28)	**<0.01**	1.20	(1.09, 1.31)	**<0.01**	1.24	(1.14, 1.36)	**<0.01**	1.20	(1.07, 1.36)	**<0.01**
Child Born at Health Facility	1.30	(1.00, 1.69)	0.05	1.56	(1.2, 2.02)	**<0.01**	1.25	(0.95, 1.63)	0.11	1.16	(0.81, 1.68)	0.42
Traditional Leader Support Incentive Received	1.64	(1.3, 2.06)	**<0.01**	1.57	(1.23, 2.01)	**<0.01**	1.61	(1.28, 2.03)	**<0.01**	1.89	(1.43, 2.49)	**<0.01**
None	*Ref*			*Ref*			*Ref*			*Ref*		
Bed Net	4.20	(2.08, 8.47)	**<0.01**	3.41	(1.83, 6.35)	**<0.01**	4.37	(2.25, 8.48)	**<0.01**	3.58	(1.58, 8.1)	**<0.01**
Medicine	6.26	(2.25, 17.38)	**<0.01**	4.23	(1.33, 13.48)	**0.02**	5.72	(2.22, 14.71)	**<0.01**	5.91	(2.07, 16.88)	**<0.01**

Low-Value Items	0.84	(0.63, 1.13)	0.24	0.76	(0.57, 1.03)	0.07	0.78	(0.57, 1.06)	0.11	0.67	(0.45, 1.01)	0.06
High-Value Items	3.25	(1.38, 7.65)	**0.01**	3.58	(1.48, 8.65)	**0.01**	3.96	(1.67, 9.39)	**<0.01**	1.06	(0.24, 4.73)	0.94
Cash	*Omitted*			*Omitted*			*Omitted*			*Omitted*		
# of Staff	1.07	(0.75, 1.52)	0.73	1.25	(0.82, 1.89)	0.3	0.99	(0.66, 1.48)	0.96	1.15	(0.67, 1.98)	0.60
Security												
No Security Issues	*Ref*			*Ref*			*Ref*			*Ref*		
Some Security Issues	0.96	(0.56, 1.66)	0.89	0.85	(0.50, 1.47)	0.57	0.91	(0.53, 1.55)	0.72	1.00	(0.59, 1.69)	0.99
Serious Security Issues	0.59	(0.22, 1.55)	0.28	0.45	(0.12, 1.67)	0.23	0.35	(0.12, 1.07)	0.07	0.34	(0.08, 1.36)	0.13
No Go Zone	0.72	(0.35, 1.51)	0.39	0.71	(0.36, 1.41)	0.33	0.74	(0.38, 1.46)	0.38	0.51	(0.18, 1.43)	0.20
UNICEF VCM	1.22	(0.88, 1.68)	0.24	1.28	(0.87, 1.89)	0.22	1.22	(0.85, 1.74)	0.28	1.23	(0.72, 2.08)	0.45
Catchment Area(sq. km)	1.01	(0.99, 1.02)	0.31	1.01	(0.99, 1.03)	0.31	1.01	(0.99, 1.03)	0.22	1.01	(0.99, 1.03)	0.25
Constant	0.04	(0.02, 0.08)	**<0.01**	0.02	(0.01, 0.04)	**<0.01**	0.03	(0.01, 0.06)	**<0.01**	0.01	(0, 0.01)	**<0.01**
Observations	**4,612**			**4,612**			**4,612**			**4,612**		

[1]*Only includes children whose caregiver responded to the survey*

Table 36: Multivariate Regression of Individual and Clinic Characteristics (Verified Self-Report and Card/Register)

Covariates	EVER VACCINATED			BCG			ANY PENTA			MEASLES		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
State												
Katsina	*Ref*			*Ref*			*Ref*			*Ref*		
Zamfara	0.31	(0.21, 0.46)	**<0.01**	0.28	(0.17, 0.45)	**<0.01**	0.27	(0.17, 0.42)	**<0.01**	0.35	(0.19, 0.65)	**<0.01**
Gender												
Female	*Ref*			*Ref*			*Ref*			*Ref*		
Male	1.19	(1.00, 1.42)	0.05	1.23	(1.02, 1.49)	0.03	1.16	(0.96, 1.39)	0.12	1.07	(0.87, 1.32)	0.52
Caregiver's Education[1]												
None	*Ref*			*Ref*			*Ref*			*Ref*		
Primary	1.62	(1.29, 2.03)	**<0.01**	1.51	(1.17, 1.95)	**<0.01**	1.57	(1.23, 2.00)	**<0.01**	1.80	(1.30, 2.5)	**<0.01**
Secondary	2.03	(1.40, 2.97)	**<0.01**	2.22	(1.51, 3.27)	**<0.01**	2.44	(1.64, 3.62)	**<0.01**	3.05	(1.80, 5.15)	**<0.01**
Post-secondary	0.89	(0.22, 3.6)	0.87	1.13	(0.29, 4.45)	0.86	0.71	(0.11, 4.70)	0.73	0.94	(0.12, 7.62)	0.96
Caregiver's Age[1]	1.01	(1.00, 1.03)	0.04	1.01	(1.00, 1.03)	0.09	1.02	(1.01, 1.04)	**<0.01**	1.02	(1.00, 1.04)	**0.02**
Household size	1.02	(1.01, 1.03)	**0.01**	1.02	(1.00, 1.04)	0.02	1.02	(1.00, 1.03)	0.05	1.01	(0.99, 1.03)	0.47
Islamic School	1.28	(0.97, 1.7)	0.09	1.35	(0.99, 1.85)	0.06	1.21	(0.89, 1.65)	0.22	1.27	(0.86, 1.89)	0.23
Self-Reported Wealth	1.08	(0.99, 1.17)	0.07	1.11	(1.01, 1.22)	0.04	1.11	(1.01, 1.22)	0.04	1.22	(1.07, 1.40)	**<0.01**
Poverty Probability Index (PPI)	1.18	(1.08, 1.28)	**<0.01**	1.20	(1.09, 1.32)	**<0.01**	1.25	(1.13, 1.38)	**<0.01**	1.22	(1.06, 1.39)	**<0.01**
Child Born at Health Facility	1.30	(1.00, 1.7)	0.05	1.53	(1.17, 2.02)	**<0.01**	1.25	(0.94, 1.66)	0.12	1.18	(0.81, 1.70)	0.39
Traditional Leader Support	1.64	(1.31, 2.07)	**<0.01**	1.59	(1.23, 2.05)	**<0.01**	1.62	(1.27, 2.07)	**<0.01**	1.96	(1.42, 2.7)	**<0.01**
Incentive Received												
None	*Ref*			*Ref*			*Ref*			*Ref*		
Bed Net	4.25	(2.11, 8.56)	**<0.01**	3.76	(1.99, 7.1)	**<0.01**	4.79	(2.35, 9.78)	**<0.01**	4.23	(1.7, 10.48)	**<0.01**
Medicine	6.35	(2.28, 17.72)	**<0.01**	4.77	(1.46, 15.65)	**0.01**	7.41	(2.85, 19.24)	**<0.01**	3.76	(1.17, 12.04)	0.03
Low-Value Items	0.83	(0.62, 1.1)	0.19	0.81	(0.60, 1.09)	0.17	0.92	(0.66, 1.28)	0.61	0.77	(0.49, 1.20)	0.25
High-Value Items	3.28	(1.4, 7.72)	**0.01**	4.09	(1.67, 10.03)	**<0.01**	5.21	(2.15, 12.64)	**<0.01**	1.36	(0.3, 6.18)	0.69
Cash	*Omitted*			*Omitted*			*Omitted*			*Omitted*		
# of Staff	1.06	(0.75, 1.49)	0.76	1.25	(0.81, 1.92)	0.32	1.06	(0.68, 1.68)	0.79	1.24	(0.67, 2.31)	0.49
Security												
No Security Issues	*Ref*			*Ref*			*Ref*			*Ref*		
Some Security Issues	0.96	(0.56, 1.66)	0.89	0.87	(0.50, 1.52)	0.64	0.93	(0.53, 1.63)	0.80	0.95	(0.55, 1.66)	0.87
Serious Security Issues	0.60	(0.23, 1.59)	0.31	0.36	(0.10, 1.37)	0.14	0.23	(0.06, 0.92)	0.04	0.47	(0.12, 1.86)	0.28
No Go Zone	0.74	(0.35, 1.54)	0.42	0.73	(0.36, 1.46)	0.37	0.85	(0.45, 1.60)	0.61	0.66	(0.24, 1.80)	0.41
UNICEF VCM	1.23	(0.89, 1.71)	0.20	1.25	(0.83, 1.87)	0.29	1.32	(0.9, 1.96)	0.16	1.40	(0.79, 2.50)	0.25
Catchment Area(sq. km)	1.01	(0.99, 1.02)	0.28	1.01	(0.99, 1.03)	0.34	1.01	(0.99, 1.03)	0.23	1.01	(0.99, 1.03)	0.32
Constant	0.04	(0.02, 0.08)	**<0.01**	0.02	(0.01, 0.04)	**<0.01**	0.02	(0.01, 0.04)	**<0.01**	0.00	(0.00, 0.01)	**<0.01**
Observations	**4,612**			**4,612**			**4,612**			**4,612**		

[1]*Only includes children whose caregiver responded to the survey*