

**Impact Evaluation of the Nigeria State Health Program Investment Credit
(NSHPIC)**

Concept Note

**Federal Ministry of Health
World Bank**

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Introduction and Background

Despite years of human and financial investment in the Nigerian Health Sector, the country may not achieve the health-related millennium development goals (MDGs) by 2015. According to a 2010 UNDP MDG report, the likelihood that the country will achieve MDG 4 (reducing under-five mortality by two-thirds between 1990 and 2015) and MDG 5 (reducing maternal mortality ratio by three quarters between 1990 and 2015) is average at best. Although the under-five mortality rate fell by a fifth in five years, from 201 deaths/1,000 live births in 2003 to 157 deaths/1,000 live births in 2008, and the maternal mortality ratio fell by 32 percent (800 deaths/100,000 live births in 2003 to 545 deaths/100,000 live births in 2008); these figures do not come close to the two-thirds and three quarters level set for the MDGs. The main challenges to achieving these goals have been identified as “declining resources, ensuring universal access to an essential package of care, improving the quality of healthcare services and increasing demand for health services and providing financial access especially to vulnerable groups” (UNDP 2010).

To overcome these challenges and accelerate the progress of the country to achieving the health-related MDGs, innovative approaches are needed to effectively manage the Nigeria health system and improve on its efficiency to enhance the health status of the population. The World Bank and the government of Nigeria are in the process of preparing a results-based financing (RBF) project which provides incentives for improving performance at critical levels within the Nigerian health system and aims to address some of these challenges. A key feature of the RBF project in the Nigerian context is the provision of financial incentives to States and Local Government Agencies (LGA) based on results achieved. In addition, select health facilities will also receive performance incentives, a scheme called “Performance-based Financing” or “PBF”. This approach aims to build institutional capacity for health system management while introducing a culture of performance excellence at the health facility level and higher levels of health systems management.

Given the innovative nature of the proposed project interventions, the World Bank and the Government of Nigeria seek to nest a rigorous impact evaluation in the project to provide evidence that can be used to inform decisions on whether to scale up the innovations implemented under the project. The primary goal of the impact evaluation of the RBF project in Nigeria is to determine if providing financial incentives linked directly to performance increases the quantity and quality of maternal and child health (MCH) services. In addition, it is anticipated that the impact evaluation should provide answers that are generalizable to specific regions in Nigeria.

When introducing performance-based financing at the health facility level, the resulting effects could be the result of two effects: first, there can be an income effect from having more funds available at the facility level, and second, there is a conditionality effect from having the additional funds being tied to performance. If we compare results-based financing to “nothing”, we will not know whether the impacts come from the fact that the facilities had more financing overall, or from the fact that their financing was tied with performance. Ideally, we would want to disentangle the two effects, so that we can answer the question of whether it is better to give additional funds under the form of block grants, or whether it is better to tie them to performance. Tying financing to performance (as opposed to giving block grants) is quite costly administratively because reported results need to be verified, and then one needs another level of counter-verification to verify the verifiers, etc.

So the policy question is “when putting additional funding into the hands of the facilities, is it worth incurring the additional expenses that come with performance-based financing compared to block grants”. In other words, the question is not so much whether we want to channel more funds to the facilities, but how to do that in a way that will improve results.

In a nutshell, the proposed impact evaluation attempts to equalize as much as possible the average amount of funding between health facilities that receive results-based financing, and their comparisons, by using as comparisons a set of facilities that will receive so-called “Decentralized Facility Financing” or “DFF”, a type of block grant that compensate the income effect for the comparison facilities that do not receive the PBF program.¹ Hence we are trying two ways of increasing funds - block grants (DFF) or conditional contracts (PBF). We randomize LGAs to DFF or PBF to evaluate the conditionality. In addition, the impact evaluation will attempt to evaluate the impact of the DFF and PBF schemes against the pure control case.

Overview of NSHPIC and Proposed RBF interventions

Project Development Objective: To increase the delivery and use of high impact maternal and child health interventions and improve quality of care at selected health facilities in the project states.

Target population: Project interventions will benefit the entire populations of the states of Adamawa, Nasarawa, and Ondo, about 9.4 million people in total. Each of these states was chosen to represent and serve as a demonstration for one of the six geo-political zones in Nigeria. The following table captures some key indicators of these three states.

Table 1: Characteristics of Participating States

Parameter	Adamawa	Nasarawa	Ondo
Zone	North West	North Central	South West
Population	3.6 million	1.9 million	3.9 million
No. of LGAs	21	13	18
No. of wards	226	147	203
Infant Mortality Rate	109	77	59
% ANC (at least one visit)	61.2	65.1	70
% births attended by skilled personnel	14.6	42.7	50.1
Number of women to be benefited over 5 years	795,000	400,000	850,000
Number of children <5 years to be benefited over 5 years	636,000	375,000	775,000

Sources: State HMIS Data and PAD

The intervention States (i.e., project states) were selected by applying a range of filters: (i) excluding states with weak governance (ii) prioritizing states with greater health needs (iii) prioritizing states with willingness to use a performance financing approaches and (iv) ensuring geo-political representation and filling gaps in donor support (as well as avoiding duplication). Several rounds of consultations with partners and careful data analyses have suggested that the 3 most appropriate States

¹ Other examples of compensatory financing in the comparison group are the Rwanda P4P evaluation (Basinga et al 2011), and the Indonesia Community based RBF (Olken et al 2011).

for both components of the intervention are Adamawa from the North West Zone; Nasarawa from the North Central Zone and Ondo from the South West Zone.

PDO Level Results Indicators: Achievement of the Project Development Objective (PDO) will be measured by the following key performance indicators:

1. Proportion and number of 12-23 month old children fully immunized
2. Proportion and number of birth attended by skilled health providers
3. TB Case detection Rate
4. Proportion of health facilities showing improvement in quality
5. Number of curative care visits by children under five
6. Number of Direct Project Beneficiaries who are women

Indicators 1-3 will be disaggregated by wealth quintiles.

Project Components: The project will have two components:

- Component 1: Program financing that will make use of two mutually reinforcing incentive approaches: Disbursement Linked Indicators (DLIs) at the State and Local Government Area (LGA) levels, and Performance-Based Financing (PBF) at health facility level.
- Component 2: Technical Assistance that will support reforms; institutional strengthening; and implementation of PBF and DLI at the State, LGA and facility levels; and monitoring and evaluation (M&E).

In each of the three selected States, Component 1 will finance the following interventions:

- Performance incentives to State Government and Local Government (LGA) agencies that are triggered by Disbursement Linked Indicators (DLIs) that reflect strengthened supervision and enhanced operational support for improving health systems performance. These performance incentives would be paid out on an annual basis to State and Local Governments.
- In half of the LGAs in each state, one facility per ward will receive Performance-Based Financing (PBF) wherein payments are made directly to individual health facilities based on the quantity and quality of a set of pre-defined services provided by each facility. These performance incentives would be paid out on a quarterly basis.
- In the other half of the LGA's in each state one facility per ward will receive Decentralized Facility Financing (DFF) or equivalent financing that is not be linked to any service delivery targets. These payments would be made on a quarterly basis.

Performance Based Financing for Health Centers in Nigeria²

Performance Based Financing (PBF) : At least one primary healthcare centre per ward and one General Hospital per selected LGA (in 50% of LGAs in each of the 3 states) and one secondary hospital per State will be contracted by the State Primary Health Care Development Agency (SPHCDA) or an alternate institution, to deliver specified services at an agreed price. Selection of which services to focus on is based on the PDO indicators, which in turn were chosen based on the

² This section of the concept note is extracted from the NSHPIC Project Appraisal Document. Please refer to the Project Appraisal Document for more information on the Performance Based Financing scheme.

priorities identified by FGN and the states in the NHSDP 2010-2015. Prices for each service are currently approximate, and based on shadow prices of providing the service. Further data will be collected on this aspect in the context of different states, and these prices will also be adjusted based on implementation experience.

PBF will operate as follows: In the example described in table 2, if a health facility fully immunizes 100 children in a quarter, they could earn US\$500 (100 x \$5 per child fully vaccinated). The total amount would be adjusted for the remoteness or difficulty of the facility (equity bonus), since urban or peri-urban facilities could earn a disproportionate amount. In the example below, this particular facility would earn 50% more because of the difficulties it faces. The total would also be adjusted by a quality score based on a checklist administered at the facility every quarter. This facility would earn 60% of what it would be entitled to due to the quality correction. Annex 2 contains a list of quality indicators included in the quality score.

Table 2: Example of Performance Based Financing (PBF) in a Health Facility

Service	Number Provided	Unit Price	Total Earned
Child fully vaccinated	100	\$5	\$500
Skilled birth attendance	20	\$10	\$200
Curative care <5 years of age	1,000	\$0.5	\$500
Total			\$1,200
Remoteness (Equity) Bonus	+50%		\$1,800
Quality correction	60%		\$1,080

In order to incentivize improvements in quality of care at the secondary level, including referral from PHC facilities, the project will test a similar PBF approach in secondary hospitals. This will start with the MCH Hospital, Ondo, whereby the cost of services will be reimbursed on a fee-for-service basis, conditional on the quality of care as independently measured. Based on lessons learned, this approach will be rolled out to one hospital in Adamawa and Nasarawa.

Community Involvement in Use of Funds: Payments to facilities will be made quarterly through the Ward/Facility Health Committees. Facilities can use these funds for: (i) health facility operational costs (about 50%), including maintenance and repair, drugs and consumables, outreach and other quality-enhancement measures; and (ii) performance bonus for health workers (up to 50%) according to defined criteria.

Information Communication Technology (ICT) solutions and Ex Ante Verification: ICT solutions such as on line entry of information and cloud computing will be used to improve transparency, allow faster processing and facilitate continuous monitoring of performance. The quantity of services delivered will be verified prior to making the payment. Each PBF facility will report regularly on delivery of agreed outputs through a standard invoice. The quantities reported will be systematically verified by visits by a SPHCDA team to the facility and checking of the registers. The PHC departments of the LGAs will be contracted to verify quality of service delivery through the use of a quality checklist on a quarterly basis. A formally established steering committee (comprising LGA, State Ministry of Health, and civil society representatives), will use the available performance data (both on quantity and quality) to determine the amount to be paid to each PBF health facility.

Independent ex-post verification: This will be carried out in two ways: (i) third parties including civil society will be recruited to visit homes of randomly chosen patients selected from the registers in facilities to determine whether they exist and whether they received the services specified. Clearly defined actions will be taken in case discrepancies are found between the facility's invoice and the findings of the third party. Measures of client satisfaction will be included in this verification exercise; and (ii) health facility and household surveys (described under component 2) will provide further assurance that invoiced services were actually provided and resulted in improved quantity and quality of services.

Decentralized Facility Financing (DFF) in Nigeria³

Selected health facilities in the remaining 50% of LGAs (not implementing PBF) will receive DFF payments. The DFF will finance the same packages of services as under the PBF based on the same contracting, verification and payment mechanisms, except that (i) although DFF facilities will be subject to the same quarterly quantity and quality supervision as the PBF facilities, payments will be fixed at the estimated average earned by PBF facilities without quality and remoteness (equity) bonuses; and (ii) funds can be used to finance operational costs but not for performance bonuses to staff.

One health facility per ward would be selected for DFF using the same criteria for selection as under PBF. Role of the health facility management committees and autonomy to use additional resources (except for performance bonuses) would also be at par with PBF facilities. DFF facilities would also be required to use the standard HMIS forms to report utilization of services; though payments would not be conditioned on this. Performance of DFF facilities will not be subjected to third party verification.

Table 3: Comparison of DFF and PBF interventions

Characteristic	PBF	DFF	Comment
Number of participating health facilities per ward	1	1	Selected using the same criteria
Health Facility Management Committee	Yes	Yes	Would function according to same rules & standards
Autonomy of the Health Facility	Yes	Yes	Same amount of autonomy in use of funds, HR function etc. except for bonuses to staff
Use of standard HMIS forms	Yes	Yes	DFF will be encouraged to use agreed HMIS formats but in PBF HFs it will be a condition of payment
Bank accounts managed by facility committee	Yes	Yes	Similar committees in both PBF and DFF
Disbursement linked indicators at the state level	Yes	Yes	
Disbursement linked indicators at the LGA level	Yes	Yes	

³ This section of the concept note is extracted from the NSHPIC Project Appraisal Document.

<i>Maximum amount of funds provided to Health Facility, per capita</i>	<i>\$2</i>	<i>\$1</i>	<i>The DFF rate is pegged at average of what the PBF facility are expected to receive. It is expected that \$1 per capita of the maximum received by the PBF facility would be used for performance bonuses while the remaining \$1 would be for operational costs. DFF facilities will receive a rate pegged to the average spent on operational costs by the PBF facilities.</i>
<i>Funds can be used to provide bonuses to staff</i>	<i>Yes</i>	<i>No</i>	<i>DFF centers would not be allowed to use their funds to pay bonuses to their staff.</i>
<i>Quarterly invoice</i>	<i>Yes</i>	<i>Yes</i>	<i>For PBF facilities, an invoice is condition of payment while for DFF facilities this submission would be highly encouraged</i>
<i>Monthly verification of quantity</i>	<i>Yes</i>	<i>No</i>	<i>In PBF, Technical Assistance firm visits health facilities monthly to verify quantity of services. In DFF, there are no verification visits.</i>
<i>Quarterly supervision by LGA</i>	<i>Yes</i>	<i>Yes</i>	<i>LGA staff receive bonuses based on conducting visits for both PBF and DFF facilities.</i>
<i>3rd party verification of quantity</i>	<i>Yes</i>	<i>No</i>	<i>In PBF, Technical Assistance firm hired CSO to visit households to verify existence of patients.</i>
<i>3rd party verification of quality</i>	<i>Yes</i>	<i>No</i>	<i>In PBF, Technical Assistance firm ensures conduct of independent quality assessments.</i>
<i>Training and other support provided to strengthen management</i>	<i>Yes</i>	<i>No</i>	<i>In PBF, Technical Assistance firm will support health facilities.</i>

Implementation Timeline: The RBF scheme will be implemented in a phased manner, as follows:

- The first stage is the pre-pilot which will serve to develop and customize systems for PBF in the Nigerian context. 1 LGA from each of the 3 project states⁴ will be selected to participate in the pre-pilot. Selected facilities within these chosen LGAs will receive PBF. The pre-pilot will span 15 months from its anticipated start in January 2012 (i.e., the pre-pilot will begin before the project is approved by the board).
- The project is expected to be approved by the board in February 2012. Disbursements to states and LGAs are expected to begin in May 2012, at which point states and LGAs will begin to receive DLI funds.
- In April 2013, at the end of the 15 month pre-pilot, all the remaining LGAs (i.e., those LGAs that were not part of the pre-pilot) will be randomly selected to participate in either PBF or DFF. 50% will be randomized to PBF and the remaining to DFF. One health facility per ward in PBF and DFF LGAs will be selected to receive PBF or DFF respectively.

⁴ The pre-pilot LGAs are Wamba (in Nassarawa), Ondo East (in Ondo) and Fufore (in Adamawa).

- The PBF and DFF pilots will be implemented for approximately 2.5 years (about 30 months) before endline data collection for the impact evaluation begins. Results from the impact evaluation would be used to determine the impact and cost-effectiveness of both interventions, and the Government of Nigeria will take a decision on which pilot to scale up, if any, during the fifth and final year of the project.

Research Questions

The **primary objective of the impact evaluation** is to provide evidence of whether the project's interventions contribute to an improvement in (i) the availability, utilization and coverage of maternal, child, reproductive and disease control health interventions (hereafter priority Maternal and Child Health (MCH) services), particularly among the poor, and (2) the quality of care, in publicly-financed health facilities.

The **research questions** in this impact evaluation are generally of the following structure:

What is the impact of **treatment P** on **outcome Y**?

where *treatment P is the program or intervention to be evaluated*

outcome Y is the outcome of interest

For the purpose of this evaluation, we distinguish **three different treatments P** to be evaluated:

- The “PBF package” consisting of PBF at the health center level, plus Disbursement Linked Indicators at the State Level, plus disbursement linked indicators at the LGA level
- The “DFF package” consisting of DFF at the health center level, plus Disbursement Linked Indicators at the State Level, plus Disbursement Linked Indicators at the LGA level
- The “PBF conditionality” consisting of making payments to health facilities conditional on performance, but within an environment of comparable levels of overall financing.

In the evaluation of P3, the difference between the PBF and DFF interventions is crucial and was outlined in Table 3. Hence, differences between the outcomes in the areas served by the two schemes should be attributable to those differences.

For the purpose of this evaluation, we distinguish the following **primary outcomes of interest Y**:

- The availability of maternal, child, reproductive and disease control health interventions (hereafter priority Maternal and Child Health (MCH) services)
- The utilization of priority MCH services, particularly by the poor (quantity per provider)
- The coverage of priority MCH services, particularly among the poor (quantity per capita)
- Quality of care of priority MCH services
- Select infant and child health outcomes that are defined as a priority in the National Strategic Health Development Plan (NSHDP), including height and weight Z-scores for children under-five, malaria incidence among children under five and diarrhea incidence among children under-five.

In addition, we distinguish the following **secondary outcomes of interest** **Y**:

- Knowledge of providers of priority MCH services
- Motivation of health workers
- Availability, utilization and quality of non-incentivized services at project-supported health facilities
- Availability, utilization and quality of health services in health facilities that are located in a project state but do not directly receive PBF or DFF financing.
- Select Infant and child health outcomes that are defined as a priority in the National Strategic Health Development Plan (NSHDP), but for which the impact evaluation is unlikely to be able to demonstrate any impact due to lack of power, including under-five mortality rate, infant mortality rate. To the extent possible, these outcomes will be measured by the impact evaluation to establish a baseline for future research.

In addition to the above research questions, a number of additional research questions will be addressed by this study:

- How cost-effective are the PBF and DFF packages?
- Do the PBF and DFF packages affect the various segments of the population differentially (i.e. effect disaggregated by socioeconomic status and gender)?
- In the PBF package, only one facility per ward will receive PBF incentives while the other facilities in that ward will not receive any PBF incentives. Is P1 associated with improvements in the availability, utilization and quality of priority MCH services in health facilities located in project states that do not receive PBF funds?

Furthermore, the following areas are of interest to the Federal Government of Nigeria and are currently being discussed for inclusion in the study. These are:

- Implications of PBF and DFF packages for institutional capacity (functionality and coordination between different institutional structures), human resources (recruitment processes, skill-mix) and fiscal sustainability respectively. The parameters along which these three are to be measured are to be determined in consultation with the FGoN
- How effective is the combination of PBF and NHIS approach as compared to only PBF?

In addition, this study could provide opportunities for nesting other studies to test management or organizational interventions as well as any other secondary research questions of relevance.

Study Design and Identification Strategy

Each state in Nigeria consists of Local Government Areas (LGAs) which are, in turn, comprised of wards. Wards normally include one so-called “model health facilities”, as well as a number of other health centers, clinics and posts. In general however, it is expected that only the model health facilities currently provides the types of services that are targeted by this program.

Three of the 36 states in Nigeria – Nasarawa, Adamawa and Ondo – have been purposively selected for inclusion in the NSHPIC project using a set of four criteria (see NSHPIC section for more details).

Because of the unique socio-political environment and health system factors in each of the intervention States and the geo-political zones they present, the Government of Nigeria has requested that the evaluation study be able to identify impact separately for each of the three states, in addition to being able to compute the average impact for the three project states.

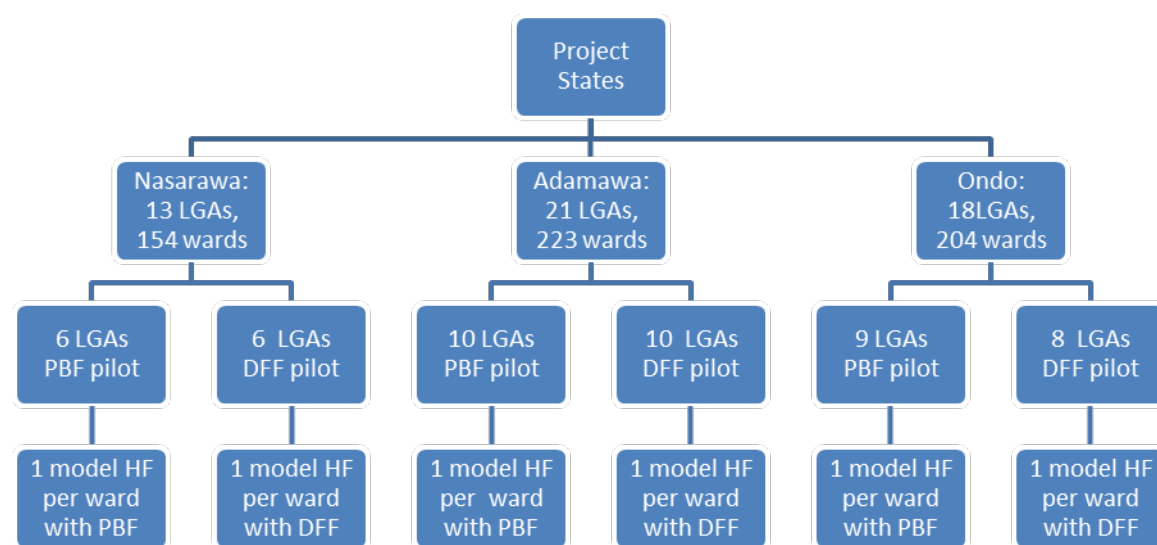
Identifying the impact of the PBF conditionality

NSHPIC proposes to randomly assign LGAs in each of the three project states to receive either the PBF package or the DFF package. In each ward, one (rarely two) model health facility will be selected to receive either PBF or DFF. The other health centers in that ward would not receive DFF or PBF, but they could serve as “satellite” centers or subcontractors to the model health facility. Figure 1 illustrates the geographic setup in the three project states. Note that each State has 1 LGA that has been assigned to the pre-pilot and will not be included in the impact evaluation; hence the number of experimental LGAs in each state is one less than the total number of LGAs in the state.

The impact evaluation will rely primarily on experimental assignment to identify the effect of the PBF conditionality. The effect of the PBF conditionality will be identified by comparing outcomes in the PBF LGAs and DFF LGAs in the three project states. In each of these three States, the LGAs will be randomly assigned to either the PBF package or to the DFF package. The assignment will result in 25 LGAs in the PBF pilot, and 24 LGAs in the DFF pilot.

To ensure wide support for the randomized assignment of LGAs to either the DFF pilot or the PBF pilot, the randomized assignment will be done in an open and transparent manner. One option under discussion is to hold a lottery to assign LGAs to different groups at the project launch, in presence of MOH officials, donors and the Bank.

Figure 1: Project States and LGAs



Regression model

While LGAs will be randomly assigned to either the PBF or DFF package, the total number of LGAs to be assigned (especially when looking at one state) may not be sufficient to equalize treatment and comparison group characteristics. Hence, we will treat the evaluation as a quasi-experimental design and will use the baseline to correct for imbalances in the starting situation of the LGAs in the PBF and DFF groups. The model for the differences-in-differences analysis is

$$y_{ijt} = \alpha + \beta \cdot PBF_j + \gamma \cdot Post_t + \delta \cdot PBF_j \cdot Post_t + \varepsilon_{ijt}$$

Where:

- y_{ijt} is the outcome y for household/person/health center i in LGA j at time t
- PBF_j is a dichotomous variable that takes value 1 if LGA j has been allocated to the PBF pilot, and 0 otherwise
- $Post_t$ is a dichotomous variable that takes value 1 if time t is after the start of the PBF pilot
- ε_{ijt} is the error term for person i in LGA j at time t

Potential threats to internal validity

For the evaluation of the PBF conditionality, the proposed level of randomization of financing scheme (PBF or DFF) is the LGA. There are various potential concerns for cross-LGA contamination of the research design, for example through demotivation of health staff in DFF areas who are aware of PBF (or vice-versa), care-seeking shifts across LGAs boundaries if quality in PBF facilities increases, etc.

In the case of Nigeria, LGAs usually have a population of between 150 and 250 thousand inhabitants. A number of measures would be taken to control for/measure potential contamination:

In the household survey, households will be asked where they seek care, and an attempt will be made to check if there is any cross-boundary seeking of care.

The staff demotivation topic would be included in the qualitative component, as well as in the quantitative health staff survey. However, the team acknowledges that it may be difficult to separate staff demotivation due to the current situation in the facilities, from staff demotivation that is due to knowledge about PBF. On the other hand, it is not clear that staff demotivation would go a particular way – DFF facilities will get block grants that are not linked to performance.

Staff migration is another potential issue. Staff level 7 and below are contracted by LGAs so they would need to get a job in a different LGA in order to move between PBF and DFF, which seems hard in practice.

Spillover effects

As mentioned above, the PBF and DFF interventions would include one model health facility per ward; many wards have an additional 5-10 other facilities which would not be included. However, there is some evidence that many of these facilities are non-functional and do not have adequate personnel. In that sense, the fact that there are non-PBF clinics in a ward is seen as a feature of the program rather than an undesired effect of the evaluation – most of the facilities are very small and ideally they should be “sub-contracted” by the main facility to provide services in collaboration with the main facility, as a type of outreach post. In the evaluation, this would mean that we need to measure both the primary impact on the main facility and the secondary or derived effect on the smaller facilities.

Identifying the impact of the PBF package and the DFF package

Ideally, to evaluate the PBF package and DFF package against “no intervention”, one would want to have “pure control” LGAs within the treatment state. However, this is not feasible due to 2 reasons (1) there not sufficient LGAs within each treatment state to be able to randomly assign LGAs to PBF, DFF and pure control groups and still expect to balance out characteristics; (2) Both the PBF and the DFF package include a number of interventions at the state level, which could not be “removed” for pure control LGAs. As a result, all LGAs in the 3 project states will be in one of the treatment groups, and there will be no comparison LGAs within the project states.

To be able to identify the impact of the PBF and DFF packages against the pure control, comparable LGAs must be identified from the remaining 33 states. Three comparison states, one for each of the three project states, are therefore to be chosen and LGAs within these states are to be selected to act as comparison LGAs for LGAs that will receive the PBF and DFF packages.

We use two sources of information to identify the comparison States and LGAs: the 2008 DHS survey (representative at the state level) and the 2008/2009 NHLSS (representative at the LGA level). We first compared the 3 treatment states to all other states using the DHS data, and came up with the following comparisons:

- Benue or Plateau for Nasarawa
- Taraba for Adamawa
- Ogun for Ondo

Since Plateau and Taraba are bordering Nasarawa, some combination of LGAs from those states could also be used as a comparison group for either Nasarawa.

Table 4: Basic Indicators for the 3 project states and 3 comparison states, DHS 2008

	T	C	T	C	T	C
	Nasarawa	Benue	Adamawa	Taraba	Ondo	Ogun
Median completed years of education	5.1	5.2	2.2	3.5	5.9	5.2
Improved water source, % HH	47.9	47	23.2	19.3	63.2	66.2
Improved sanitation, % HH	38.2	14.5	21.3	9.5	14.7	12.5
Access to electricity, % HH	26.1	15	32.5	18.6	48.2	65.7
birth registration	51.5	44.3	33.3	73.2	38.8	36.2
guinea worm prevalence	3.9	0.1	0.1	0.4	0.1	0.2
schistosomiasis prevalence	1.8	7.3	1.3	4.3	0.6	0.3
literacy, % women	42.3	43.6	36.2	42.2	75.4	68.4
reads newspaper once per week, % men	38.1	12.9	26	16.2	21.6	29.6
reads newspaper once per week, % women	7.2	7.5	43	3.8	9.6	15
employment, % women	65.8	78.7	69.6	62.2	63.4	77.9
TBC spread, % women	85.5	61.7	45.6	76.8	61.2	65.2
total fertility rate	4.7	5.9	6.8	5.9	4.9	5.4
teen childbearing	19.7	22.7	24.3	21.5	7.7	12
modern contraception % women	11.4	12.5	2.3	3.9	15.3	12.6
PNC skilled	72.6	63.2	61.2	39.3	70.1	89.9
tetanus protection last birth	35.3	46	42.2	33.7	64.2	72.8
institutional delivery	32.9	50.9	10.7	21.1	46.9	63.8
all basic vaccinations	16.1	18.8	119.1	14.1	37	23.1
fever prevalence	9.7	16.7	11.9	20.3	7.6	7.7
diarrhoea prevalence	7.2	7.3	9	15.8	6.6	8
stunted under 5	44.1	37.1	42.4	43	32	41.5
wasted under 5	5.6	5.5	21.4	9.3	6	7.3
underweight under 5	16.6	13.2	30.7	18.2	11.3	18.2
at least one ITN in HH	14.4	3.1	4.1	8.7	5.1	5.1
IPT2	12.5	1.9	1.6	5.2	4.5	5.7

Using the 2009 NHLSS Household survey data (which are representative at the LGA level⁵), we then sought to improve the likeness between LGAs in the treatment and comparison states through ex ante matching of LGAs. We computed the propensity scores of an LGA being in a project states, pairwise for different sets of possible comparison states. At the time of the concept note revision (Jan 2012), the 2008/2009 NHLSS data are partially available (the consumption module is not available). The variables used to compute the propensity scores are:

- Insecticide Treated Bed Nets: The proportion of children under the age of five who slept under either an insecticide treated bed net or a long lasting insecticide treated net the night prior to the survey.
- Antenatal care: The proportion of women aged 15-49 and are pregnant now or were pregnant in the last 12 months who received antenatal care during their last or current pregnancy.
- Birth in Facility: The proportion of children less than two years of age who were born at either a hospital or maternity home.
- Fever prevalence: The proportion of children under the age of five who were reported to have a fever in the two weeks prior to the survey.
- Diarrhea Prevalence: The proportion of children under the age of five who were reported to have diarrhea in the two weeks prior to the survey.

⁵ This survey is generally representative at the LGA level, since the sample includes a random sample of 100 households in each LGA.

- Modern Contraception Usage: The proportion of women between 15 and 49 who reported using the pill, condoms, injection, IUD, female or male sterilization, norplant, foaming tab, diaphragm, or foam jelly as their main method of contraception.
- Full Immunization: The proportion of children less than two years of age and greater or equal to 1 year old that had reportedly received three boosters of DPT, three polio boosters, BCG, and a measles vaccine.

Running the propensity score regressions on the basis of these indicators reveals that none of the above indicators are predictive of assignment of the treatment and control groups, either individually (P value) or as a group (chi square value) when one uses Plateau and Taraba as joint comparison groups for Nasarawa and when using Ogun as a comparison group for Ondo. (Cfr. **Annex 4**) This basically means that there is no demonstrable correlation between the 7 LGA level health indicators defined above, and the LGA's assignment to the treatment and comparison groups. For the Adamawa-Taraba comparison, a number of differences remain, esp in diarrhea prevalence and institutional birth. However, further analysis of the data shows that this seems to be driven by an outlier in the data, nl. Yola north LGA in the treatment group. This LGA could be left out in the impact analysis if the outlier status is confirmed at the time of the baseline survey.

The LGAs to be surveyed within the comparison states are therefore to be selected from within the comparison states on a random basis.

- 7 comparison LGAs in Plateau (for Nasarawa)
- 10 comparison LGAs in Taraba (for Adamawa and Nasarawa)
- 8 comparison LGAs in Ogun (for Ondo)

The study will have a pre-post with comparison design. Apart from the pre-pilot LGAs (which will not be included in the evaluation), the program will not be implemented till May 2012, and a baseline survey will be implemented in all study LGAs (treatment and comparison) before that time. A follow-up survey will be implemented after the PBF and DFF packages have been implemented for approximately 2.5 years. Subject to the availability of funding a mid-term survey will also be implemented in the intervention and comparison LGAs.

The impact of the PBF package and the impact of the DFF package will be evaluated using a differences-in-differences methodology. The differences-in-differences method uses the trend in the comparison LGAs as an estimate of the counterfactual for the trend in the treatment LGAs. As such, the method controls for time-invariant unobservable differences between the treatment and comparison LGAs. However, the absence of time-variant unobservable differences has to be assumed and cannot be demonstrated. Unfortunately, no data are currently available at the LGA or State level that would permit verifying time trends in health data.

In case the baseline reveals that there is a significant difference between the treatment and comparison households, the fall-back option is to match households in the treatment group to similar households in the comparison group.

The impact of the PBF package would be evaluated as follows:

For household/person/health center i in LGA j that belong to either the PBF pilot or the comparison states:

$$y_{ijt} = \alpha + \beta \cdot PBF_j + \gamma \cdot Post_t + \delta \cdot PBF_j \cdot Post_t + \varepsilon_{ijt}$$

Where:

- y_{ijt} is the outcome y for household/person/health center i in LGA j at time t
- PBF_j is a dichotomous variable that takes value 1 if LGA j has been allocated to the PBF pilot, and 0 otherwise
- $Post_t$ is a dichotomous variable that takes value 1 if time t is after the start of the PBF pilot
- ε_{ijt} is the error term for person i in LGA j at time t

The impact of the DFF package would be evaluated as follows:

For household/person/health center i in LGA j that belong to either the DFF pilot or the comparison states:

$$y_{ijt} = \alpha + \beta \cdot DFF_j + \gamma \cdot Post_t + \delta \cdot DFF_j \cdot Post_t + \varepsilon_{ijt}$$

Where:

- y_{ijt} is the outcome y for household/person/health center i in LGA j at time t
- DFF_j is a dichotomous variable that takes value 1 if LGA j has been allocated to the DFF pilot, and 0 otherwise
- $Post_t$ is a dichotomous variable that takes value 1 if time t is after the start of the PBF pilot
- ε_{ijt} is the error term for person i in LGA j at time t


The small number of randomization units will require adjustment to the standard errors – we propose to use WILD bootstrapping and permutation tests to do this.

Summary of the evaluation strategy


The following table summarizes the evaluation strategy: the evaluation will include three types of LGAs (PBF package, DFF package and comparison), which will be used to do three types of comparisons: PBF package versus DFF package, PBF package versus pure comparison, and DFF package versus pure comparison.

Table 4: Impact evaluation comparisons


	Receiving the following interventions.....			
	State DLIs	LGA DLIs	Additional financing to health facilities	Financing to facilities is conditional on performance
PBF LGAs	Yes	Yes	Yes	Yes
DFF LGAs	Yes	Yes	Yes	No
Comparison LGAs	No	No	No	No



Evaluate
condi-
tionality



Evaluate
DFF
package



Evaluate
PBF
package

Other interventions

There are a number of other interventions that are either currently under way that could potentially affect the evaluation areas, including the Midwife Services Scheme, the National Health Insurance Scheme and the MenAfriVac. The team will coordinate with those initiatives to avoid confounding from other programs. The Midwife Services Schemes would cover both treatment and comparison areas, and the team is currently analyzing data to determine the overlap in the facilities.

Data

Before the start of project implementation in mid- 2012, a baseline survey will be fielded in the PBF LGAs, DFF LGAs and the comparison LGAs in the comparison states. In the first half of 2016, a follow-up survey would be fielded in the same areas. Depend confirmation of the availability of government funding, the team is also planning to implement a mid-line survey. Beyond July 2016, the Government of Nigeria would take a decision with respect to the continuation or extension of one or both of the pilots, depending on the outcomes of the impact evaluation.

Survey data will be collected at the health facility, household and community levels. Please refer to tables 5, 6 and 7 below for a brief description of the main outcome indicators of interest and how these data will be collected.

Table 5: Primary outcomes of interest- priority MCH service availability, utilization and coverage

Priority MCH service	Service availability indicator	Service utilization	Service coverage
Immunizations	% of health facilities that offered EPI immunizations on the week of the survey	# of immunizations offered in the 30 days preceding the survey	% of children 12-23 month old children who are fully immunized.
Skilled birth attendance	% of health facilities that offer delivery services in facility or skilled birth attendance in the community	# of facility deliveries or deliveries in communities attended by skilled personnel in the 30 days preceding the survey	% of births attended by skilled personnel in the two years preceding the survey
ITN distribution	-	-	% of children under 5 years who slept under an ITN the night preceding the survey
ANC	% of health facilities that offered ANC services on the week of the survey	# of ANC visits in the 30 days preceding the survey	% of pregnant women who received 4 or more ANC visits (in the two years preceding the survey)
Curative care for children		# of curative care visits from children aged under five in the 30 days preceding the survey	-

Table 6: Data sources for impact evaluation

Survey	Module	Respondents/Subjects	Key Data	Type	Source	Survey Instrument	Frequency
Household	Women	Currently pregnant women; Women who have had a child in the 2 years preceding the survey n=18,000 households	Health service use, health care seeking behaviors and barriers to use for MCH services, health expenditures, perceptions of health service quality	Quantitative	Primary	Household survey instrument tailored to Nigeria context and policy priorities	Baseline, midline, endline
Household	Children	Children under five n=18,000 households	Anthropometry (height and weight) and biomarkers (Rapid diagnostic tests for malaria & anemia)	Quantitative	Primary	Integrated in household survey instrument	Baseline, midline, endline
Facility	Facility assessment	Facility in-charge n=900	Facility staffing, infrastructure, drugs supply, equipment, supervision, HMIS reporting and management, user charges, facility revenue	Quantitative	Primary	Adapted HRITF health facility questionnaire	Baseline, midline, endline
Facility	Health care workers	Health care workers n=2700	Staff work load, compensation, motivation, satisfaction and knowledge Measurement of knowledge using neo-Natalie simulations and/or vignettes depending on the care area	Quantitative	Primary	Adapted HRITF Health Facility Questionnaire	Baseline, midline, endline
Facility	Direct observations, TBC	First time ANC clients New under-5 patients for curative care	Patient-provider observation (Under-five & ANC) Treatment and counseling provided to patients.	Quantitative	Primary	Adapted HRITF Health Facility Questionnaire	Baseline, midline, endline
Facility	Patient exit interviews	First time ANC clients New under-5 patients for curative care New over-5 patients for curative care	Patient exit interviews : Patient's (or caretaker's) perception of quality of care and satisfaction	Quantitative	Primary	Adapted HRITF Health Facility Questionnaire	Baseline, midline, endline
Facility	Costing	Facility in-charge	Incremental costs of implementing PBF or comparison group interventions : Costs incurred in implementing PBF or comparison group interventions	Quantitative	Secondary	Administrative records and reporting	Periodic reporting as PBF commences
Qualitative	Systems	Key stakeholders: policy makers, health facility staff, health sector managers at ward, LGA, State and FGoN levels	Health systems implications of RBF : Implications of interventions for institutional capacity, human resources and fiscal sustainability	Qualitative	Primary	Key informant interviews; Focus group discussions	Endline
LGA&State	Costing	LGA/State informants	Incremental costs of implementing PBF or DFF	Quantitative	Primary+ Secondary	Costing survey tool	Midline+Endline

Health facility based measures

Sampling Frame

Most states in Nigeria seem to have a substantial private sector – data in Annex 3 show that the private sector accounts for 38% of patients in Nasarawa and 28% in Ondo⁶. However, it is beyond the scope of this evaluation to survey the quality of care in the private sector, for the following reasons:

- Including the private sector would mean that the team would have to raise additional funding, as the government funds are meant for surveys in the public sector. Given the extent of the survey work, adding another group of facilities to be surveyed would make the work unmanageable.
- Household surveys will reflect utilization rates, cost of treatment etc from private health facilities but will not provide information on the quality of care from private providers. This could be done under a separate study.

Therefore, the health facility surveys would include only public and faith based/ non-profit institutions that are eligible to participate in the PBF mechanism.

The sample frame for the health facility surveys would comprise of all functioning model health facilities in each selected LGA. The frame would exclude all private health facilities as well as other secondary and tertiary public facilities. The following table summarizes the number of model health facilities in the applicable states. For Nasarawa, Ondo and Adamawa, the reported numbers are the estimated number of facilities that exist, and therefore the numbers are a, upper bound on the sample size for health facilities in those states.

Table 7: Sampling frame for health facility surveys

State name	Number of LGAs	Number of wards	Estimated number of model health facilities	Estimated max sample size - treatment facilities	Estimated max sample size - comparison facilities
Nasarawa	12	144	144	72	72
Ondo	17	193	193	97	96
Adamawa	20	213	213	107	106
Plateau	7	72	72	0	72
Ogun	10	97	97	0	97
Taraba	8	107	107	0	107
Total			826	276	550

⁶ The team mapped private and public providers in Nasarawa and Ondo. From the maps, it appears that private providers are more concentrated geographically in the main population centers, while public facilities appear to be much more spread out.

Sample Size Calculations

The following power calculations are for the comparison between the DFF and PBF packages. For indicators that are measured at the level of the health facility, the evaluation is a two-level cluster randomized trial, that is, a study in which units are nested within clusters and the clusters are randomly assigned to the treatment or control condition. In this case, health facilities are nested within LGAs and LGAs are randomly assigned to the treatment or control condition.

Following Spybrook, Raudenbush, Congdon and Martinez (2011), we use power calculation specifications for a two-level cluster randomized trial with either binary or continuous outcomes.

For continuous outcomes, the F-statistic for testing the null hypothesis of no impact follows a central F distribution with 1 degree of freedom for the numerator and J-2 degrees of freedom for the denominator.

$$F = E(\text{MS treatment})/E(\text{MS LGA}) = 1 + \lambda = (J\delta^2)/(4(\rho - (1-\rho)/n))$$

Where ρ is the inter-class correlation, n is the number of facilities per LGA, J is the number of LGAs and δ is the standardized effect size. We currently have no health center-level information on continuous data, and hence are unable to perform those power calculations at this time.

For binary outcomes, the test statistic is $\gamma_{01}/\sqrt{4(\tau + \sigma^2/n)/J}$.

Where γ_{01} is the treatment effect in log odds, σ^2 is a function of the probability of success in the treatment group (ϕ_C) and the probability of success in the comparison group (ϕ_T), and τ is the between cluster variance in log odds. We use the non-central t-distribution to approximate the power of the test with J-2 degrees of freedom. The lowest power is at probability of success of 0.5, hence we take the conservative assumption that our indicators are starting at 0.5.

Under the assumption that we will include one model health facility per ward in the facility survey, and that in each facility we have one observation of a variable of interest, we calculate the following power levels:

Table 8: Power calculation results for the health facility surveys

State	ϕ_C	ϕ_T	J	N (average)	Power
Nasarawa	0.5	0.6	12	12	0.52
Ondo	0.5	0.6	17	12	0.78
Adamawa	0.5	0.6	20	10	0.72

Nigeria RBF Impact Evaluation – Concept note

Overall	0.5	0.6	49	11	0.97
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The below graphs depict the power of the experiment for various levels of J (number of clusters) and N (wards/model health facilities per cluster). The first graph depicts the power curves for Nasarawa (J=12) and Ondo (J=17), the second graph depicts the power curves for Adamawa (J=20) and the three sites together (J=49). Power is limited especially in the Nasarawa experiment which only has 12 clusters.

For a number of variables such as those that pertain to health workers or patients, we will be able to make multiple observations of each variable in each center, which will contribute to additional power.

Figure 2: Power curves for Nasarawa (J=12) and Ondo (J=17)

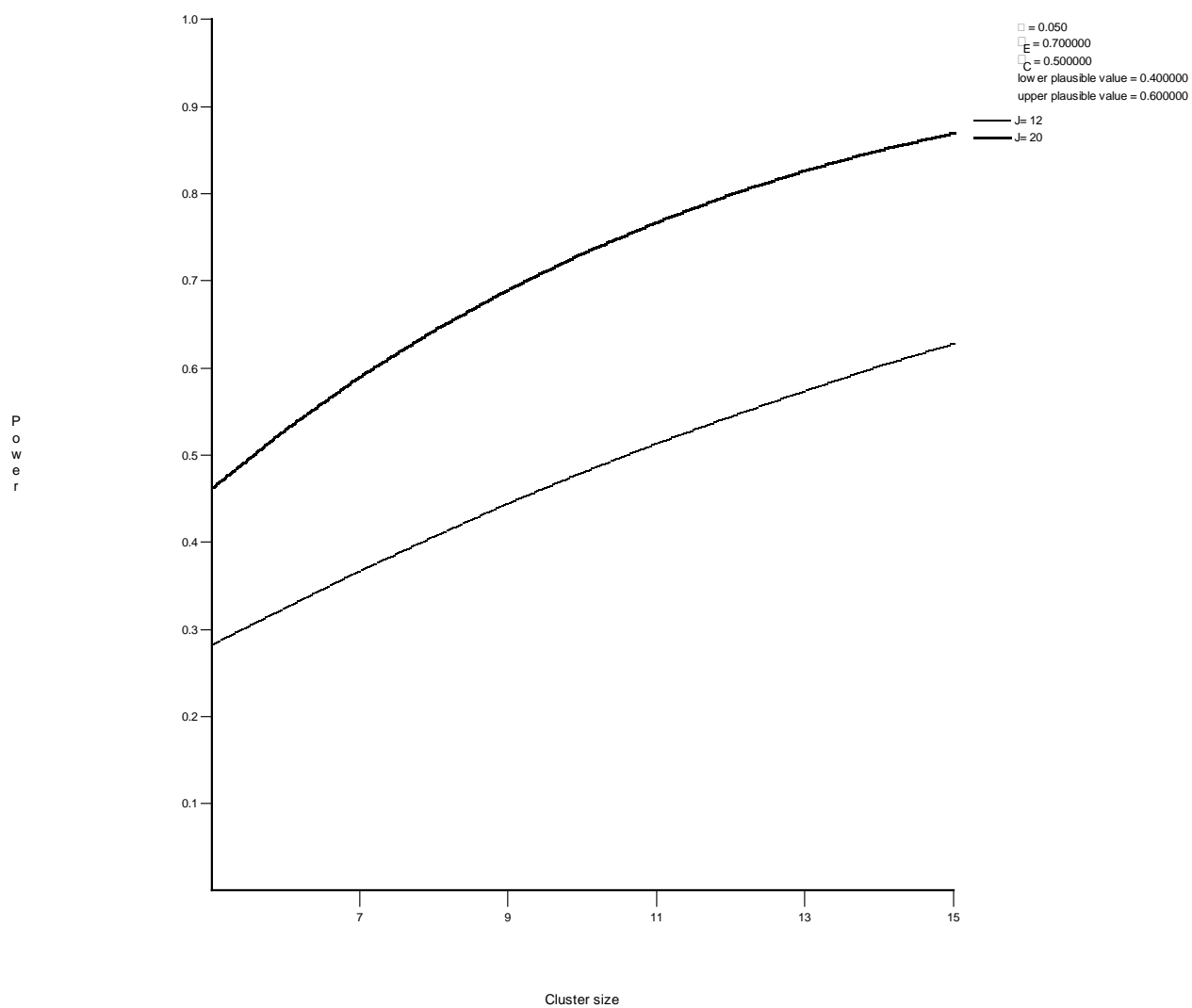
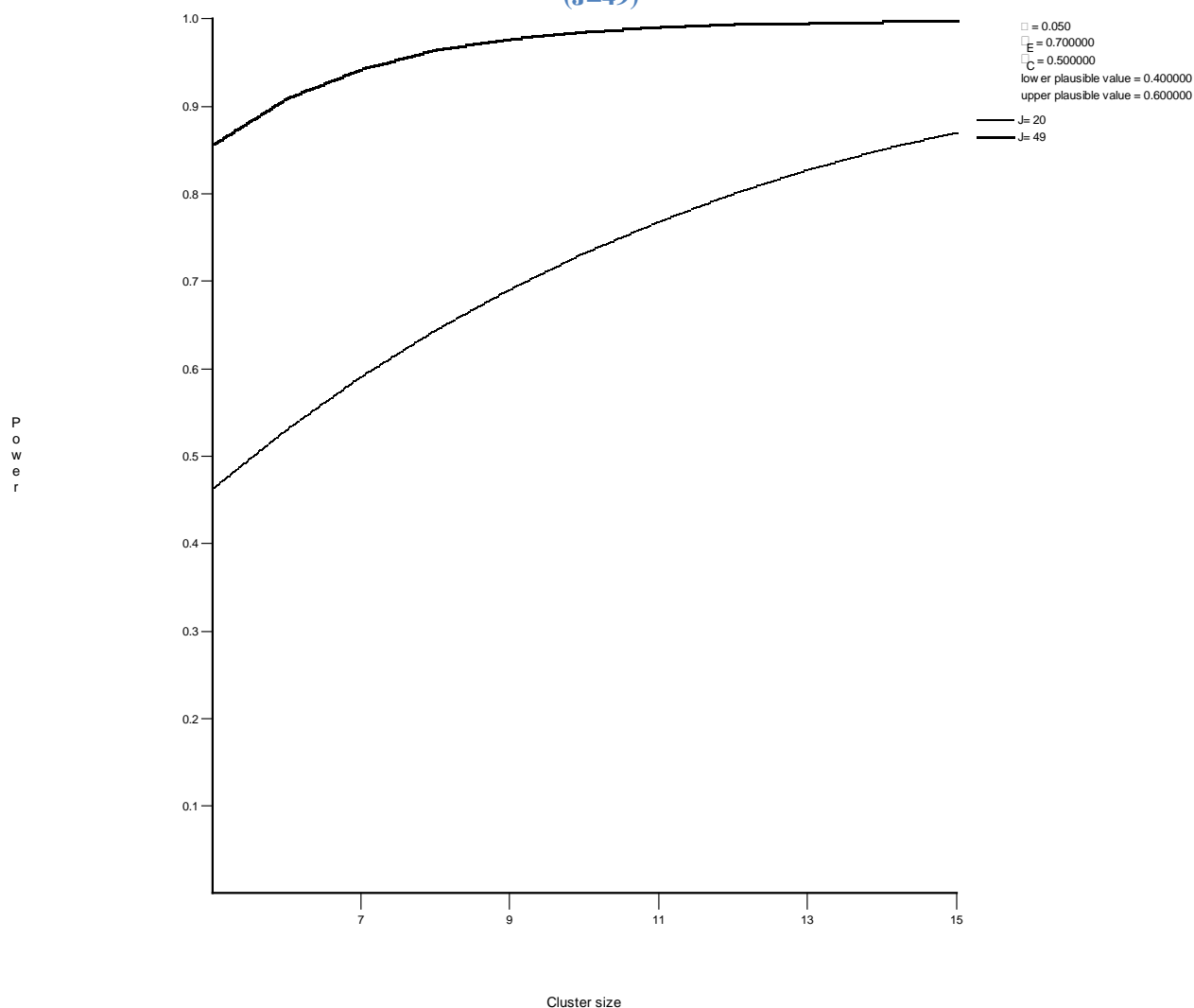


Figure 3: Power curves for Adamawa (J=20) and overall (J=49)



Sampling Technique

Given the constraints on the power of the experiment, the health facility survey would need to include a census of wards, that is, the facility survey would need to include one model health facility in each ward. This means that the health facility survey would be censal for model health facilities. In total, the health facility survey would include approximately 1115 health centers in 6 states.

- 830 model primary health care centers
- 85 general/cottage hospitals
- 200 public health care centers (non-PBF/DFF) but in the same wards as the PBF/DFF health facilities

The number of health workers to be interviewed would be 3 per facility. For each of the health workers, there would also be 3 direct observations and 3 exit interviews.

Timewise, the direct observations and exit interviews need to be done BEFORE the health worker interview in a particular facility.

Hospital surveys

LGAs normally have one hospital that serves as the referral center for the health facilities that are situated in the LGA. Hospitals would receive either a DFF or a PBF scheme depending on whether the corresponding LGA receives the DFF or PBF interventions. Hospitals would be included in the health facility survey using an adapted health facility instrument. The adapted instrument would focus on maternal and child health service delivery and would not include other categories of services. The expected number of hospitals to be surveyed is 12 in Nasarawa, 17 in Ondo and 20 in Adamawa.

Household surveys

Sampling Frame and Sampling Method

The sampling frame would consist of households in the LGAs that are part of the evaluation, which are 12 out of 13 LGAs in Nasarawa, 17 out of 18 in Ondo, and 20 out of 21 in Adamawa. To ensure an efficient sample, the sampling frame will be limited to those households that include at least one woman who has given birth or been pregnant in the last two years. By restricting the sampling frame in such a way, we maximize the proportion of the sample that will have at least one woman who gave birth in the last two years, and the proportion of households that have at least one child under the age of five. While this sampling frame does not give us a fully representative sample of the Nigerian population, it gives a representative sample of the population of interest from this program.

Sampling of households would be done as follows: First, we will list all enumeration areas in the LGAs that belong to the study, and we will randomly draw enumeration areas with probability based on size. Within enumeration areas, the survey firm will list all households within the enumeration area that include at least one woman who has given birth within the last 2 years. Then, 15 households will be randomly drawn from that listing.

Sample size

Sample size calculations are based on a 3-level cluster randomized trial model. We computed the power of the experiment at state level using the following assumptions

- the number of households surveyed per enumeration area is 15
- in each household there is one observation of the variable of interest
- we assume that most variables of interest are binary in nature
- in the 3 level CRT, the number of sites K is the number of LGAs within the state: The number of sites is 12 in Nasarawa, 17 in Ondo, and 20 in Adamawa

Nigeria RBF Impact Evaluation – Concept note

- treatment groups are of equal size
- no stratification between rural and urban areas
- Type I error of 5 percent
- Probability of success in the comparison group is 0.4, in the treatment group it is 0.6
- Plausible ranges of values for the comparison group are 0.2 to 0.8
- The percentage of variance within enumeration area is 60%

We use the Optimal Design software to calculate power dependent on the number of households in each enumeration area. We find that with a sample of approximately 3000 households per state in approximately 200 enumeration areas, we achieve 0.72 power in Nasarawa, 0.85 in Ondo and 0.90 in Adamawa. Options for increasing power in Nasarawa are quite limited, since the number of sites is fixed and increasing the number of units in each cluster, or increasing the number of clusters does not have much impact on power. Sampling and sample sizes would be done in a similar way in the 3 comparison states.

Table 9: Power calculation results for the household surveys

State	Number of sites (fixed)	EAs (clusters) per site	Total EAs	Sample size	Power
Nasarawa	12	17	204	3060	0.72
Ondo	17	12	204	3060	0.85
Adamawa	20	10	200	3000	0.90
Ogun	8	12	96	1440	
Plateau	7	17	119	1785	
Taraba	10	10	100	1500	
TOTAL				13845	

Figure 4: Power curves for Nasarawa and Ondo

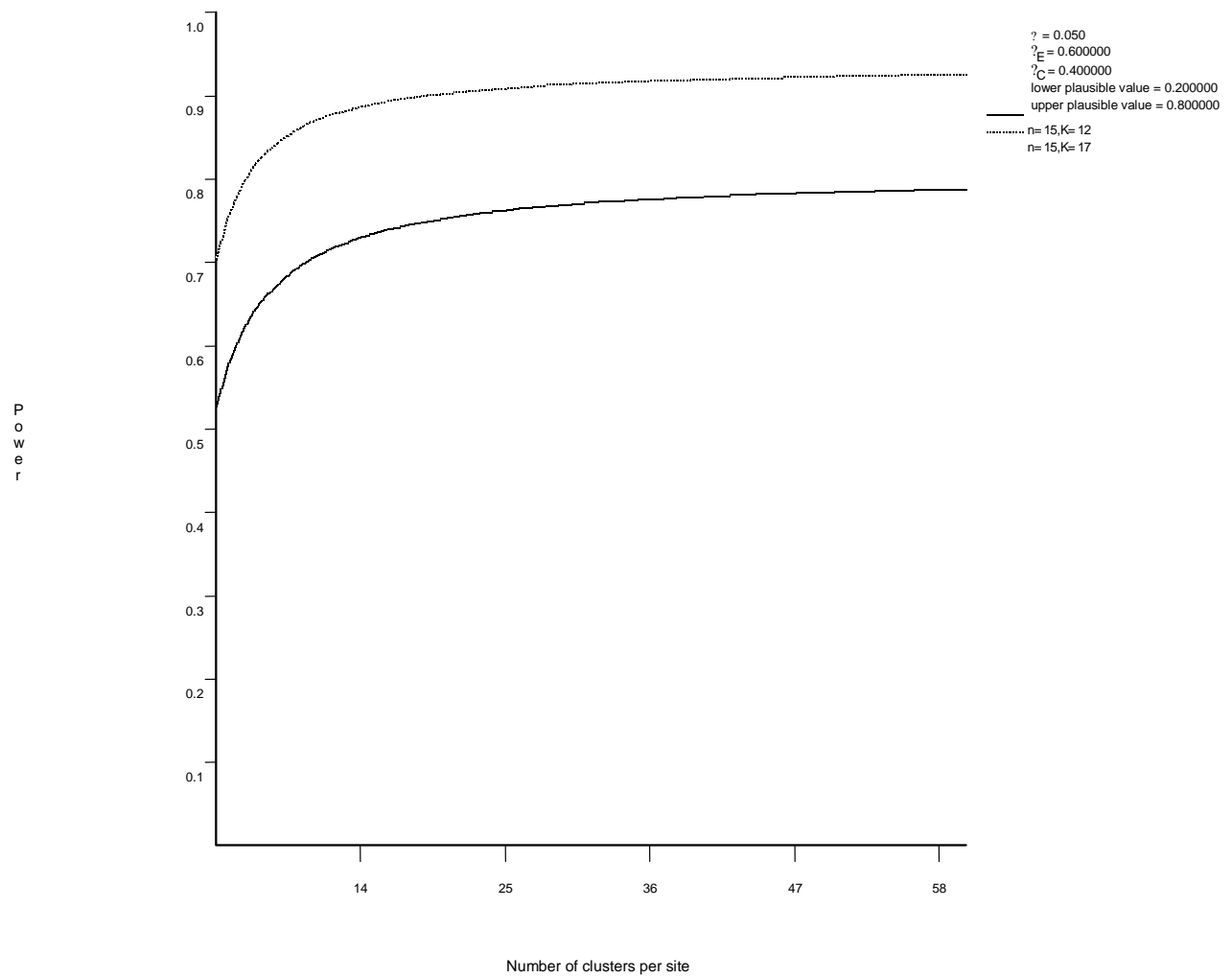
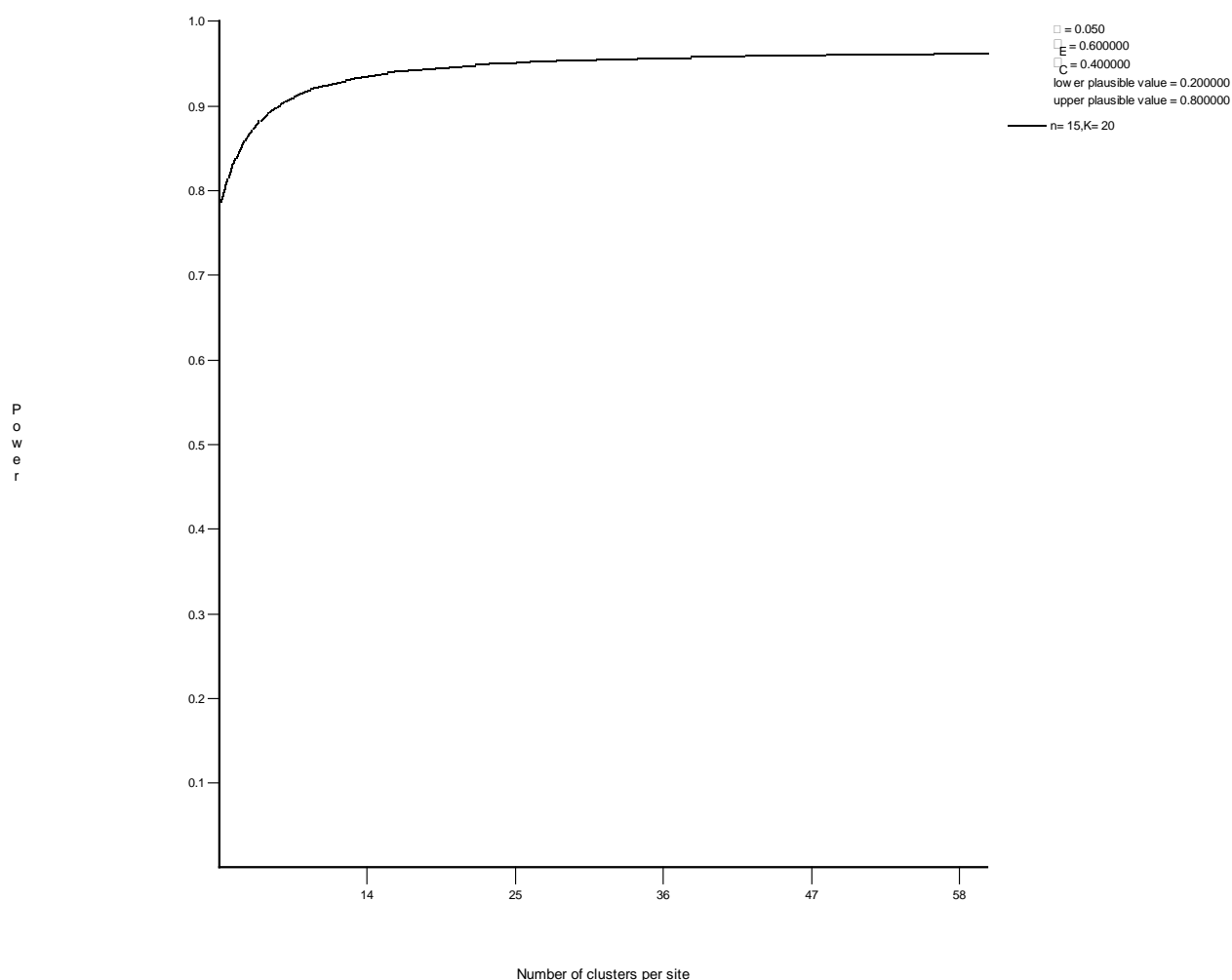


Figure 5: Power curve for Adamawa



Qualitative data

The quantitative data collection will be complemented with qualitative data collection. The goals of this exercise are to (1) provide mid-line updates on how the implementation of the program is progressing, uncover any stumbling blocks, and identify necessary corrective action; and (2) provide a look inside the black box of PBF once it is in place, with an eye on identifying causal pathways and determining which additional indicators should be included in the endline survey to be able to measure those causal pathways.

Ethical review and clearance

Ethical clearance for the impact evaluation is to be obtained from an in-country (i.e., in Nigeria) Institutional Review Board. The IE team has incorporated obtaining the necessary ethical clearances in the terms of reference for the research agency that will be contracted to implement survey data collection. The clearance process will begin as soon as the research agency is contracted.

All researchers working on the evaluation will be required to obtain a certificate of training in Protection of Human Subjects (NIH or similar). To the extent that a suitable registry can be identified, the evaluation will be registered in a registry of randomized controlled trials.

Timeline

Table 12 below presents the timeline for the impact evaluation by fiscal year. The baseline survey will be started in both treatment and comparison states in January 2012 before the project implementation begins (although the pre-pilot will have started in 1 LGA in each of the three project states). We anticipate that states and LGAs in the project states will begin to receive DLI payments in May 2012. 15 months after the pre-pilot has begun, PBF and DFF implementation will begin, with facilities being randomized to one or the other treatment package. Approximately 2.5 years after PBF and DFF implementation has begun, we anticipate that endline data collection will be implemented to assess the impact of the PBF package, the DFF package, and the PBF conditionality treatment conditions respectively.

Value added of the evaluation

The evaluation of the NSHPIC fits into the broader agenda of evaluating results-based financing for health at the World Bank, and is being financed by the HRITF trust. This trust fund currently finances 22 impact evaluations of RBF for health interventions. Compared to the other evaluations, the proposed evaluation is similar to the other ones in the following aspects:

- It evaluates a version of Performance Based Financing, which is a particular type of results-based financing
- It proposes to evaluate PBF against an alternative of non-performance based financing (i.e. the DFF scheme) as well as against an alternative of no additional financing.

The proposed evaluation is different from other evaluations financed by HRITF in that it:

- It evaluates PBF in the context of a decrease in health indicators.
- The evaluation will pilot novel ways of measuring quality of maternal and child care
- The evaluation will attempt to measure the spillover/externality effects between “main” and “satellite” health facilities

Research team

Dinesh Nair, Senior Health Specialist in AFTHE will be the TTL for the impact evaluation and also for the larger NSHPIC project. Christel Vermeersch, Senior Economist in HDNHE will provide oversight and technical assistance on the impact evaluation.

A research firm is to be contracted to provide Technical Assistance to the Federal Government of Nigeria with setting up and implementing the impact evaluation. Suitably qualified staff from this research agency will act as the Principal Investigator and Impact Evaluation coordinator for the impact evaluation.

Individuals who are to fill these key positions will be specified by the firm during the selection process. The research firm is expected to be on board by February 2012.

Budget

The household and facility surveys would be financed by the GoN, while technical assistance would be financed by the HRITF trust fund.

Table 10: Summary budget

Item	Estimated amount
Data collection (shared with GoN)	\$ 320,000
Qualitative data collection	\$130,000
Staff, consultants and technical assistance	\$850,000
Travel	\$120,000
Dissemination	\$20,000
Miscellaneous, incl. IRB	\$10,000
Total	\$1,500,000

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Spybrook, J., et al. (2011). Optimal Design for Longitudinal and Multilevel Research: Documentation for the Optimal Design Software Version 3.0. Available from www.wtgrantfoundation.org or from sitemaker.umich.edu/group-based.

National Population Commission, Federal Republic of Nigeria, Abuja, Nigeria and ICF Macro, Calverton, Maryland, USA (2008), Demographic and Health Survey

Annex 1: Timeline

	FY 2012				FY 2013				FY 2014				FY 2015				FY 2016			
Phase	Q1: Jul- Sep '11	Q2: Oct- Dec '11	Q3: Jan- Mar '12	Q4: Apr- Jun '12	Q1: Jul- Sep '12	Q2: Oct- Dec '12	Q3: Jan- Mar '13	Q4: Apr- Jun '13	Q1: Jul- Sep '13	Q2: Oct- Dec '13	Q3: Jan- Mar '14	Q4: Apr- Jun '14	Q1: Jul- Sep '14	Q2: Oct- Dec '14	Q3: Jan- Mar '15	Q4: Apr- Jun '15	Q1: Jul- Sep '15	Q2: Oct- Dec '15	Q3: Jan- Mar '16	Q4: Apr- Jun '16
Program Design																				
Impact Evaluation Design																				
Evaluation Preparation																				
Randomization lottery																				
PBF pre-pilot																				
DLI implementation																				
DFF implementation																				
PBF implementation																				
Baseline Data Collection																				
Baseline Data Documentation and Storage																				
Baseline Analysis and Report																				
Baseline Dissemination Workshops																				
Midline data collection																				
Midline Data Documentation and Storage																				
Monitoring and Documentation of program																				
Endline Preparation																				
Endline Data Collection																				
Endline Data Documentation and Storage																				
Impact Analysis and Report																				
Endline Dissemination Workshops																				

Annex 2: List of indicators included in facility quality score

	Indicator
1	Proportion of on-duty technical staff present at health facility on the day of survey
2	At least one female clinical staff present on the day of survey
3	Proportion of health facilities with water for hand washing, soap and clean towel in patient examination area
4	Proportion of health facilities with at least one clean and functioning latrine
5	Proportion of health facilities with basic EPI equipment
6	Proportion of health facilities with EPI vaccines in stock on the day of the survey
7	Proportion of health facilities with basic delivery equipment
8	Proportion of health facilities with basic ANC equipment
9	Proportion of health facilities with basic clinical equipment
10	Number of essential drugs available on the day of the survey
11	Average number of contraceptive methods in stock on the day of survey
12	Proportion of health facilities with bednets in stock on the day of the survey
13	Proportion of facilities with an up-to-date EPI register
14	Proportion of facilities with an up-to-date ANC and delivery register
15	Proportion of facilities with completed HMIS monthly report
16	Proportion of facilities that have a working waste disposal system (bin, pit or incinerator) in use and safety box for sharps
17	Proportion of facilities that can perform lab tests for malaria, TB, HIV and full blood count on the day of the survey
18	Proportion of facilities with working means of communication (radio, mobile phone, landline)
19	Proportion of facilities with a working vehicle to transport patients for referral
20	Proportion of health workers who report receiving their full salary on time
21	Average health worker clinical knowledge score***
22	Under-five examination quality score (based on IMCI protocols)
23	ANC examination quality score (based on national ANC protocols)
24	Average client satisfaction score
25	Proportion of health facilities that conduct outreach for key MCH services
2	Proportion of clients who report that facility opening hours are convenient

Annex 3: Public vs private sector in Nasarawa and Ondo

	Public Sector	Private Sector	NGO/CBO /FBO	Percent Private Sector
Nasarawa				
Number of Health Facilities	580	192	29	24%
Mean Number of Functional Beds	4.5	7.4	5.7	
Mean Number of Inpatients in Last yr	181	280	343	
Mean Number of Outpatients in Last yr	817	1813	1188	
Mean Number of Doctors	1.47	0.56	0	
Mean Number of Nurses	1.13	2.56	0	
Total Nurses	658	492	7	43%
Total Doctors	854	107	4	11%
Total Patients	578981	401770	44386	39%
Total Inpatients	105121	53724	9941	32%
Total Out Patients	473860	348046	34445	40%
Total Beds	2602	1418	166	34%
Ondo				
Number of Health Facilities	401	164	7	29%
Mean Number of Functional Beds	7.3	9.8	31.9	
Mean Number of Inpatients in Last yr	149	223	561	
Mean Number of Outpatients in Last yr	1076	952	1635	
Mean Number of Doctors	1.12	1.31	2.00	
Mean Number of Nurses	2.46	3.51	9.29	
Total Nurses	986	576	65	35%
Total Doctors	448	214	14	32%
Total Patients	491337	192660	15373	28%
Total Inpatients	59734	36573	3927	36%
Total Out Patients	431603	156087	11446	26%
Total Beds	2945	1608	223	34%

Annex 4: propensity score matching of LGAs in treatment and comparison states

Models

Propensity score matching: dep variable: dummy for LGA belonging to the comparison state

Explanatory variables:

- Insecticide Treated Bed Nets: The proportion of children under the age of five who slept under either an insecticide treated bed net or a long lasting insecticide treated net the night prior to the survey.
- Antenatal care: The proportion of women aged 15-49 and are pregnant now or were pregnant in the last 12 months who received antenatal care during their last or current pregnancy.
- Birth in Facility: The proportion of children less than two years of age who were born at either a hospital or maternity home.
- Fever prevalence: The proportion of children under the age of five who were reported to have a fever in the two weeks prior to the survey.
- Diarrhea Prevalence: The proportion of children under the age of five who were reported to have diarrhea in the two weeks prior to the survey.
- Modern Contraception Usage: The proportion of women between 15 and 49 who reported using the pill, condoms, injection, IUD, female or male sterilization, norplant, foaming tab, diaphragm, or foam jelly as their main method of contraception.
- Full Immunization: The proportion of children less than two years of age and greater or equal to 1 year old that had reportedly received three boosters of DPT, three polio boosters, BCG, and a measles vaccine.

Model: Logit at the LGA level

ONDO versus OGUN

Logistic regression

Number of obs = 38

LR chi2(7) = 7.61

Prob > chi2 = 0.3684

Log likelihood = -22.482843

Pseudo R2 = 0.1447

statebin	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
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Nigeria RBF Impact Evaluation – Concept note

itn		1.793679	5.421428	0.33	0.741	-8.832124 12.41948
antecare		-.3374548	1.629239	-0.21	0.836	-3.530705 2.855795
modcontra		7.594769	5.588012	1.36	0.174	-3.357534 18.54707
feverprev		-10.86514	8.965967	-1.21	0.226	-28.43811 6.707829
diarrheaprev		-35.30872	23.41886	-1.51	0.132	-81.20884 10.59139
fullimmun		-1.156246	1.407334	-0.82	0.411	-3.914569 1.602077
birthfacil~y		1.549197	2.235965	0.69	0.488	-2.833213 5.931608
_cons		-1.381116	1.808176	-0.76	0.445	-4.925075 2.162844

ADAMAWA versus TARABA

Logistic regression	Number of obs	=	37
	LR chi2(7)	=	23.95
	Prob > chi2	=	0.0012
Log likelihood = -13.33484	Pseudo R2	=	0.4731

statebin		Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
itn		-27.96905	18.15255	-1.54	0.123	-63.5474 7.609287
antecare		-5.427191	3.350522	-1.62	0.105	-11.99409 1.139712
modcontra		24.50955	12.12718	2.02	0.043	.740709 48.27839
feverprev		-25.94662	15.93865	-1.63	0.104	-57.1858 5.292571
diarrheaprev		62.04311	23.15191	2.68	0.007	16.66621 107.42
fullimmun		-14.88476	8.977674	-1.66	0.097	-32.48068 2.711154
birthfacil~y		12.62685	6.117433	2.06	0.039	.6369034 24.6168
_cons		-1.507175	1.529267	-0.99	0.324	-4.504483 1.490133

NASARAWA versus PLATEAU+TARABA

Logistic regression	Number of obs	=	46
	LR chi2(7)	=	12.11
	Prob > chi2	=	0.0971
Log likelihood = -21.334268	Pseudo R2	=	0.2210

Nigeria RBF Impact Evaluation – Concept note

statebin	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
itn	-10.43947	7.084744	-1.47	0.141	-24.32531	3.446374
antecare	-4.074255	2.345467	-1.74	0.082	-8.671285	.5227746
modcontra	8.211067	10.45768	0.79	0.432	-12.28561	28.70774
feverprev	1.714992	11.70999	0.15	0.884	-21.23616	24.66614
diarrheaprev	16.21391	9.98684	1.62	0.104	-3.359935	35.78776
fullimmun	3.870858	2.555211	1.51	0.130	-1.137264	8.87898
birthfacil~y	1.147119	3.705663	0.31	0.757	-6.115847	8.410085
_cons	1.23184	1.252368	0.98	0.325	-1.222757	3.686436