Cost Analysis of Primary Health Care in Kano and Kaduna States

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msh Management Sciences for Health

HEALTH STRATEGY AND DELIVERY FOUNDATION

EXECUTIVE SUMMARY

A strong and responsive primary health care (PHC) system is essential for achieving universal health coverage (UHC). In Nigeria, access to quality PHC services remains limited due to numerous supply- and demand-side bottlenecks, including limited public financing. To improve access to PHC, the Government of Nigeria (GON) has instituted numerous health reforms, including the introduction of Minimum Service Package (MSP) – a contextualized essential service package aimed at guaranteeing a realistic minimum level of services for all state residents.

The objective of this analysis was to calculate the actual cost and resource gap of delivering the MSP for PHC in public sector facilities (health posts, health clinics, health centers, and general hospitals) in Kano and Kaduna states. The findings in this report are based on primary data collected at a sample of 50 facilities (25 in each state) in 20 of 43 local government areas (LGAs) in Kano and 12 of 23 LGAs in Kaduna. The sample for this analysis was composed of 7 health posts, 8 health clinics, 6 health centers, and 4 general hospitals in Kano and 1 health post, 9 health clinics, 10 health centers, and 5 general hospitals in Kaduna. The planning and data collection for this analysis were done in close collaboration with the State Ministry of Health (SMOH) in both states. The results were reviewed by the Kano and Kaduna SMOH and stakeholders during a validation meeting in October 2022.

The cost analysis was conducted from the health sector perspective and is composed of facility-level delivery recurrent costs. The analysis excluded capital costs, above-service delivery costs, and patient out-of-pocket (OOP) costs. The time horizon was from January 1 to December 31, 2019. Both the actual and normative costs of services included in the MSPs were calculated, with the difference of values representing the estimated financial resource gap. Actual costs were based on data collected from the sample of health facilities whereas the normative costs were calculated based on standard treatment protocols (STPs), their associated costs, the population in need of the services, and the required resources (labor, drugs, supplies, operational expenditures). Normative costs reflect the expected cost of providing high-quality services according to clinical standards.

The results show state variation in the average actual cost of PHC service delivery. The average actual PHC cost per capita in Kano was NGN 5620 (USD 17.8) compared to NGN 7,532 (USD 23.8) in Kaduna. The estimated actual costs fall far short of what would be expected to deliver high-quality services according to normative guidelines, indicating that substantial additional resources are needed to successfully implement state MSPs. The normative PHC cost per capita was estimated at NGN 14,030 (USD 44.3) in Kano compared to NGN 14,332 (USD 45.3) in Kaduna. To close the resource gap for PHC, expenditures must increase by 2.5 times in Kano and 1.9 times in Kaduna.

While increased financing is required to close the PHC resource gap, improvements to the efficiency of current healt h expenditures for PHC in Kano and Kaduna would further contribute to reducing the identified gap. Differences in staffing patterns by state suggest that the overall distribution of staff among facilities could be enhanced by more closely enforcing the clinical and non-clinical staffing guidelines for each facility level delineated in the national MSP, accompanied by the necessary financial resources to support a sufficient cadre. A low average number of daily services provided by clinical staff indicate that staff utilization is low and health worker efficiency could be significantly improved. Moreover, the high proportion of outpatient services provided in hospitals suggests there is potential to improve the demand and quality of services at lower-level facilities, where services are provided at a lower cost.

There were some notable limitations of this analysis. The analysis relied on service data reported from the District Health Information Software 2 (DHIS2) which is subject to issues of data quality and completeness. Due to fluctuations in health facility categorization, especially between health post, health clinic, and health center, actual costs for the entire PHC network in each state calculated with 2019 facility categorization may not reflect the current

reality. In Kano state, expenditure data on drugs and other medical supplies were not available at either the health facility or state level and were therefore informed by interviews with state officials and SMOH budgets. Normative clinical costs were based on STPs which are subject to clinician bias while normative non-clinical labor costs were based on sampled facilities which reflect existing inefficiencies.

Despite these limitations, this analysis provides much-needed evidence on the costs and resource requirements for the implementation of the MSPs for PHC in Kano and Kaduna. These results provide insights on facility-level and state cost variations and possible inefficiencies within the current PHC system that should be addressed to further realize the benefits of a robust PHC system. Normative cost estimates provide important benchmarks to guide public financing for ensuring universal access to PHC services at the state level. This evidence can be used by the SMOH in the two states and their partners to better understand the cost of reaching stated PHC coverage targets, identify potential issues related to allocative and technical efficiency of resource allocation for service provision, and facilitate advocacy, planning, and budgeting. Future cost analyses would benefit from the availability of electronic data sources which reliably capture classifications and locations of health facilities, service statistics, and expenditures on drugs, labor, and other recurrent costs to reduce the time required for primary data collection and enable recurrent analyses to guide resource allocation decisions.

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The Government of Kano State is committed to the delivery of universal health coverage (UHC); to ensure that all citizens and residents of the state have access to high quality health services they need without suffering financial hardship.

A strong and sustainable Primary Health Care (PHC) system is essential for achieving Universal Health Coverage (UHC). An important driver of UHC is the prioritization of primary health care to ensure the population is kept healthy and disease conditions are identified and managed.

The Ministry of Health realizes that the successful delivery of PHC services and implementation of enabling policies depends, to a great deal, on the state and their abilities to finance services, which also depends on their ability to estimate the cost of providing the Minimum Health Services Package with good quality of care to all the people in need. As we support the strengthening of Primary Health Services, advocacy and allocation of sufficient financial resources will require understanding the costs of providing Primary Health Care effectively and efficiently by the state.

In this regard, costing of Primary Health Care services was conducted as a collaborative exercise supported by the Federal Ministry of Health, Kano State Primary Health Care Management Board, Health Strategy and Delivery Foundation (HSDF), Management Sciences for Health (MSH), and funded by the Bill & Melinda Gates Foundation (BMGF). This study involved estimating the costs of provision of minimum PHC service packages as provided at primary care facilities and hospitals. The results will support in building an investment case, evidence-based planning, and resource-mobilization for the county-specific plans to scale up PHC services.

We recognize the efforts and leadership of the members of the Technical Working Group including Dr. Tijjani Hussaini, Executive Secretary of the Kano State Primary Health Care Management Board (SPHCMB), and other senior officials who supported this exercise from study approvals, data collection during fieldwork to validation of analytical outputs.

We would like to express our gratitude to the State Ministry of Health, the Hospital Management Board (HMB), the Drugs and Medical Consumables Supply Agency (DMCSA), the Private Health Institution Management Agency (PHIMA), the Kano Health Trust Fund (KHETFUND) for enabling the costing exercise.

31/10/2022

Dr. Aminu Ibrahim Tsanyawa
Honorable Commissioner for Health
Kano State Ministry of Health

FOREWARD KADUNA

The Government of Kaduna State is committed to the delivery of universal health coverage (UHC); ensuring that all citizens and residents of the state have access to high quality health services they need without suffering financial hardship.

A strong and sustainable Primary Health Care (PHC) system is essential for achieving Universal Health Coverage (UHC). An important driver of UHC is the prioritization of primary health care to ensure the population is kept healthy and disease conditions are identified and managed.

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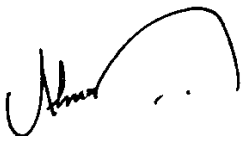
We would like to express our gratitude to Kaduna State Ministry of Health (MOH) and Management of its Secondary Health Facilities, Kaduna State Bureau of Statistics (KSBS), Kaduna State Health and Supplies Management Agency (KADHSMA), and Kaduna State Contributory Health Management Authority (KADCHMA) for enabling the costing exercise.



Adamu Mohammed Mansur
Permanent secretary
Kaduna State Ministry of Health

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Kano State Primary Health Care Management Board

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I would like to express our appreciation of Adamu M. Mansur, the Permanent Secretary, Kaduna State Ministry of Health (SMOH) and officials of the Kaduna State Bureau of Statistics (KSBS), Kaduna State Health Supplies Management Agency (KADHSMA) and Kaduna State Contributory Health Management Authority (KADCHMA). I recognize Dr. Sunday Joseph, (Director, Health Planning Research and Statistics, Kaduna State Ministry of Health), Dr. Dutse Musa, (Director Planning M&E, Kaduna State Primary Health Care Board, SPHCB) and other officials who supported this exercise from study approvals to data collection, up to validation of the analytical output with the core team.

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Dr. Hamza Abubakar
Executive Secretary
Kaduna State Primary Health Care Board

ACRONYMS

BHCPF	Basic Health Care Provision Fund
BMGF	Bill & Melinda Gates Foundation
CHEW	community health extension worker
CHOICE	choosing interventions that are cost-effective
DMCSA	Drug and Medical Consumables Supply Agency
DHIS2	District Health Information Software 2
GBD	Global Burden of Disease
GON	Government of Nigeria
HSDF	Health Strategy and Delivery Foundation
JCHEW	junior community health extension worker
LGA	local government area
MNCH	maternal, neonatal, and child health
MSH	Management Sciences for Health
MSP	minimum service package
NCD	non-communicable disease
NGN	Nigerian naira
NPHCDA	National Primary Health Care Development Agency
OPD	outpatient department
OOP	out-of-pocket
PHC	primary health care
PHCUOR	Primary Health Care Under One Roof
PPMV	patent and proprietary medicine vendors
SCBU	special care baby unit
SMOH	State Ministry of Health
SPHCDA	State Primary Health Care Development Agency
STP	standard treatment protocol
UHC	universal health coverage
USD	United States Dollar
WHO	World Health Organization
WMHCP	Ward Minimum Health Care Package

1. CONTEXT

A strong and responsive primary health care (PHC) system is essential for achieving universal health coverage (UHC), ensuring all people have access to good quality health services without suffering financial hardship. A strong PHC system is also considered fundamental in maintaining access to essential health services in the face of systemic shocks.[1] While PHC services are comparatively low cost, for many individuals, PHC services remain unavailable, inaccessible, or unaffordable in the absence of sufficient resources.[1]

In Nigeria, access to quality PHC services remains limited. It is estimated that only 39% of the population has access to essential health services[2] due to myriad factors including both financial and geographic barriers. Although an estimated 52% of the country's population lives in a rural area,[3] data indicates that Nigeria, relative to other countries, has an abundance of public PHC facilities, high health worker density, and reasonable geographic access to health services.[4] Yet the performance of the country's PHC system remains weak due to fragmented supply chains, poor financial access to services, low health worker performance and absenteeism, and lack of available inputs (i.e., drugs, equipment, vaccines) at facilities, among other challenges.[5] Less than half of public PHC facilities in Nigeria have essential drugs in stock while many lack basic amenities such as electricity or a generator and emergency transportation systems.[6] Meanwhile, the private sector fills a significant gap in service delivery, providing more than 50% of health services,[7] with patent and proprietary medicine vendors (PPMVs) often serving as the first point of care for the majority of the population.[8]

Nigeria's population of more than 200 million people experiences high rates of preventable mortality. Recent assessments estimate neonatal mortality at 39 deaths per 1,000 live births, under-five mortality at 132 per 1,000 live births, and maternal mortality at 512 deaths per 100,000 live births with only 43.3% of births attended by a skilled health worker.[9] These national data mask important variations across states, with some states, including two of Nigeria's most populous states, Kano and Kaduna, reporting indicators well below the national average (Boxes 1 and 2).

[1] WHO and UNICEF. Primary health care measurement framework and indicators: monitoring health systems through a primary health care lens. 2022. Available at: https://apps.who.int/iris/bitstream/handle/10665/352205/9789240044210-eng.pdf?sequence=1&isAllowed=y

[2] WHO and World Bank. Tracking Universal Health Coverage: 2017 Global Monitoring Report. 2017. Available at: http://www.who.int/healthinfo/universal_health_coverage/report/2017/en/

[3] WHO and World Bank. Tracking Universal Health Coverage: 2017 Global Monitoring Report. 2017. Available at: http://www.who.int/healthinfo/universal_health_coverage/report/2017/en/

[4] Daniel H. Kress, Yanfang Su & Hong Wang (2016) Assessment of Primary Health Care System Performance in Nigeria: Using the Primary Health Care Performance Indicator Conceptual Framework, Health Systems & Reform, 2:4, 302-318, DOI: 10.1080/23288604.2016.1234861

[5] Daniel H. Kress, Yanfang Su & Hong Wang (2016) Assessment of Primary Health Care System Performance in Nigeria: Using the Primary Health Care Performance Indicator Conceptual Framework, Health Systems & Reform, 2:4, 302-318, DOI: 10.1080/23288604.2016.1234861

[6] WHO and Alliance for Health Policy and Systems Research. Primary Health Care Systems (PRIMASYS): Case study from Nigeria. 2017. Available at: https://www.who.int/alliance-hpsr/projects/alliancehpsr_nigeriaprimasys.pdf?ua=1

[7] Abubakar I, Dalglish SL, Angell B, Sanuade O, Abimbola S, Adamu AL, et al. The Lancet Nigeria Commission: investing in health and the future of the nation. The Lancet. 2022 Mar;S0140673621024880.

[8] Oyeyemi AS, Oladepo O, Adeyemi AO, Titiloye MA, Burnett SM, Apera I. The potential role of patent and proprietary medicine vendors' associations in improving the quality of services in Nigeria's drug shops. BMC Health Serv Res. 2020 Dec;20(1):567.

[9] National Population Commission (NPC) [Nigeria] and ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF. Available at: https://dhsprogram.com/publications/publication-fr359-dhs-final-reports.cfm

BOX 1. KANO AT A GLANCE

- Population: 13 million (2016)[10]
- Nominal GDP: NGN 2.97 trillion (2017)[11]
- Total revenue: NGN 130.18 billion (2019)[12]
- Total budget: NGN 219.97 billion (2019)[12]
- Total health budget: NGN 33.49 billion (2019)[12]
- Health budget as percent of total budget: 15.22% (2019)[12]
- Health budget per capita: NGN 2,319 (2019)[12]
- Poverty rate: 55.08% (2020)[13]

Kano covers 20,131 square kilometers in the northwest section of the country and is administratively split into 43 local government areas (LGA) and 484 wards. In 2017, Kano had the seventh highest nominal state GDP of the 36 Ethiopian states.[12] Neonatal and under-five mortality rates are estimated at 37 and 164 deaths per 1,000 live births respectively, with only 21.5% of births in the state attended by a skilled health worker.[14]

BOX 2. KADUNA AT A GLANCE

- Population: 8.5 million (2016)[10]
- Nominal GDP: NGN 2.69 trillion (2017)[11]
- Total revenue: NGN 117.75 billion (2019)[12]
- Total budget: NGN 157.44 billion (2019)[12]
- Total health budget: NGN 13.19 billion (2019)[12]
- Health budget as percent of total budget: 8.38% (2019)[12]
- Health budget per capita: NGN 1,461 (2019)[12]
- Poverty rate: 43.48% (2020)[13]

Kaduna covers 46,053 square kilometers in northwest Nigeria, administratively split into 23 LGAs and 255 wards.[15] Kaduna had the tenth highest nominal state GDP in 2017 (NGN 2.69 trillion). Neonatal and under-five mortality rates are estimated at 63 and 187 deaths per 1,000 live births respectively, with 26.5% of births in the state attended by a skilled health worker.[16]

To improve health outcomes and enhance the quality of and equitable access to PHC services, the Government of Nigeria (GON) has instituted several recent health systems reforms. Notably, in 2011, the National Primary Health Care Development Agency (NPHCDA) developed the Ward Minimum Health Care Package (WMHCP) which defined a set of minimum standards for infrastructure, human and financial resources, and provision of essential services, drugs, and commodities for different PHC facility levels in Nigeria. In the same year, the National Council of Health introduced the Primary Health Care Under One Roof (PHCUOR) policy to address the fragmentation and poor accountability in PHC management and service delivery. In each state, the State Primary Health Care Development Agency (SPHCDA) is responsible for the overall governance of PHC in accordance with the mandatory requirements of the National Health Act.

[10] National Bureau of Statistics (NBS). Demographic Statistics Bulletin 2017. 2018.
[11] National Bureau of Statistics (NBS), 2019. *States Nominal Gross Domestic Product (2013-2017)*. Available at: https://www.nigerianstat.gov.ng/pdfuploads/State_Nominal_GDP_2013_-_2017.cdr_(MAY_2019).pdf
[12] BudgIT, 2020. *State of States: The 2020 Revised Edition*. Lagos, Nigeria. Available at: https://yourbudgit.com/wp-content/uploads/2020/11/State-of-States-2020-Revised-Edition.pdf
[13] BudgIT, 2021. *State of States: 2021 Edition*. Lagos, Nigeria. Available at: https://yourbudgit.com/wp-content/uploads/2021/09/State-of-States-report-2021-web.pdf
[14] National Population Commission (NPC) [Nigeria] and ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF. Available at: https://dhsprogram.com/publications/publication-fr359-dhs-final-reports.cfm
[15] Kaduna State Government. "About Kaduna state." Available at: https://kdsg.gov.ng/about-kaduna/
[16] National Population Commission (NPC) [Nigeria] and ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF. Available at: https://dhsprogram.com/publications/publication-fr359-dhs-final-reports.cfm

A key element of the PHCUOR policy is the Minimum Service Package (MSP) – a contextualized essential service package aimed at guaranteeing a realistic minimum level of services for all state residents. The national 2018 MSP focuses on communicable diseases, maternal, neonatal, and child health (MNCH) services as well as nutrition, health education and community mobilization, and non-communicable diseases (NCDs) (Figure 2). The MSP varies by facility level and allows states to classify facilities accordingly while determining the required resources (i.e., human, equipment, drugs and commodities, finances), corresponding budgets, and staffing allocations.[17] State MSPs mirror national standards and only minor differences in MSPs exist across states. States are ultimately responsible for determining and allocating their own resources to drive improvements in PHC coverage and service quality as well as the infrastructure enhancements necessary to achieve state UHC objectives.

Figure 1. Map of states in Nigeria

Figure 2. Overview of Minimum Standards for PHC in Nigeria[18]

COMMUNICABLE DISEASES	MATERNAL AND NEWBORN CARE	NON COMMUNICABLE DISEASES
• HIV prevention and treatment • Malaria prevention and treatment • TB screening and treatment • STI screening and treatment • Measles treatment • Whooping cough treatment • Treatment of respiratory infections • Leprosy treatment and support • NTD screening, diagnosis, and treatment • Other communicable diseases	• Antenatal care • Skilled delivery care • Postnatal care • Neonatal care • Family planning • Reproductive health	• Anemia diagnosis and treatment • Care for minor accidents • Cardiovascular screening • Diabetes screening • Hypertension screening • Arthritis screening • Treatment of eye conditions • Ear, nose, throat care • Oral health • Mental health screening/counseling

[17] Partnership for Reviving Routine Immunization in Northern Nigeria-Maternal Newborn and Child Health Initiative (PRINN-MNCH). Bringing primary health care under one roof. Minimum service package. Available at: https://ngfrepository.org.ng:8443/jspui/bitstream/123456789/3277/4/PHCUOR%20-%20MINIMUM%20SERVICE%20PACKAGE.pdf

[18] National Primary Health Care Development Agency (2016) Minimum Standards for PHC in Nigeria. Available at http://www.nphcda.gov.ng/

NUTRITION	CHILD SURVIVAL	HEALTH EDUCATION AND COMMUNITY MOBILIZATION
• Nutrition screening • Management of malnutrition • Promotion of proper nutrition and food education	• Integrated management of childhood illness • Immunization	• IEC and BCC • Community mobilization • Home visits and community outreach

Despite this growing emphasis on strengthening PHC, low government health spending in Nigeria constrains the expansion of PHC services. Funding for health care – especially from public sources – remains inadequate with a continued reliance on out-of-pocket (OOP) payments. In 2016, government health spending was 0.6% of GDP and government health expenditure as a share of total government expenditure was 6.1% or just USD 11 per capita[19] with variation across states. Because government and pooled health financing are limited, health spending in Nigeria is dominated by OOP expenditures which account for 76.6% of total health expenditures.[20] Meanwhile, a quarter of the population spends more than 10% of their household income on healthcare.[21]

Government health spending for PHC is especially low, with only 39.6% of governmental health funding allocated to PHC services, comprising just 9% of total PHC spending.[22] Local government areas (LGAs) are the main source of governmental financing for PHC services primarily covering facility construction and maintenance, supply of commodities and equipment, as well as staff salaries.[23] However, data from 2016 indicates that on average providers in PHC facilities received salaries with two-to-three-month delays and only a third of facilities received cash grants to meet operational costs. [24] Other financial support for PHC facilities comes from user fees, drug revolving funds, and donors. While the federal government provides in-kind support to PHC facilities for centrally procured commodities,[25] both federal and state health budgets primarily fund staff and capital costs of their respective ministries, department, and agencies as well as teaching, tertiary, and secondary health facilities.[26] Expenditures on PHC services by LGAs are financed largely through local government statutory shares of revenues collected by the federal government from the federation account (including oil revenues) and the value-added tax pool.[27] While LGAs are also supposed to receive statutory allocations from state government revenues, there are no rules or policies for these allocations and the extent to which any forthcoming allocations are used to finance PHC services is unclear.

[19] Hafez, Reem. 2018. Nigeria Health Financing System Assessment. Health, Nutrition and Population Discussion Paper; World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/handle/10986/30174

[20] World Bank. World Bank Open Data. Available at: https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS

[21] WHO and World Bank. Tracking Universal Health Coverage: 2017 Global Monitoring Report. 2017. Available at: http://www.who.int/healthinfo/universal_health_coverage/report/2017/en/

[22] Primary Health Care Performance Initiative website. 2022. Available at: https://improvingphc.org/sub-saharan-africa/nigeria-0.

[23] WHO and Alliance for Health Policy and Systems Research. Primary Health Care Systems (PRIMASYS): Case study from Nigeria. 2017. Available at: https://www.who.int/alliance-hpsr/projects/alliancehpsr_nigeriaprimasys.pdf?ua=1

[24] Hafez, Reem. 2018. Nigeria Health Financing System Assessment. Health, Nutrition and Population Discussion Paper; World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/handle/10986/30174

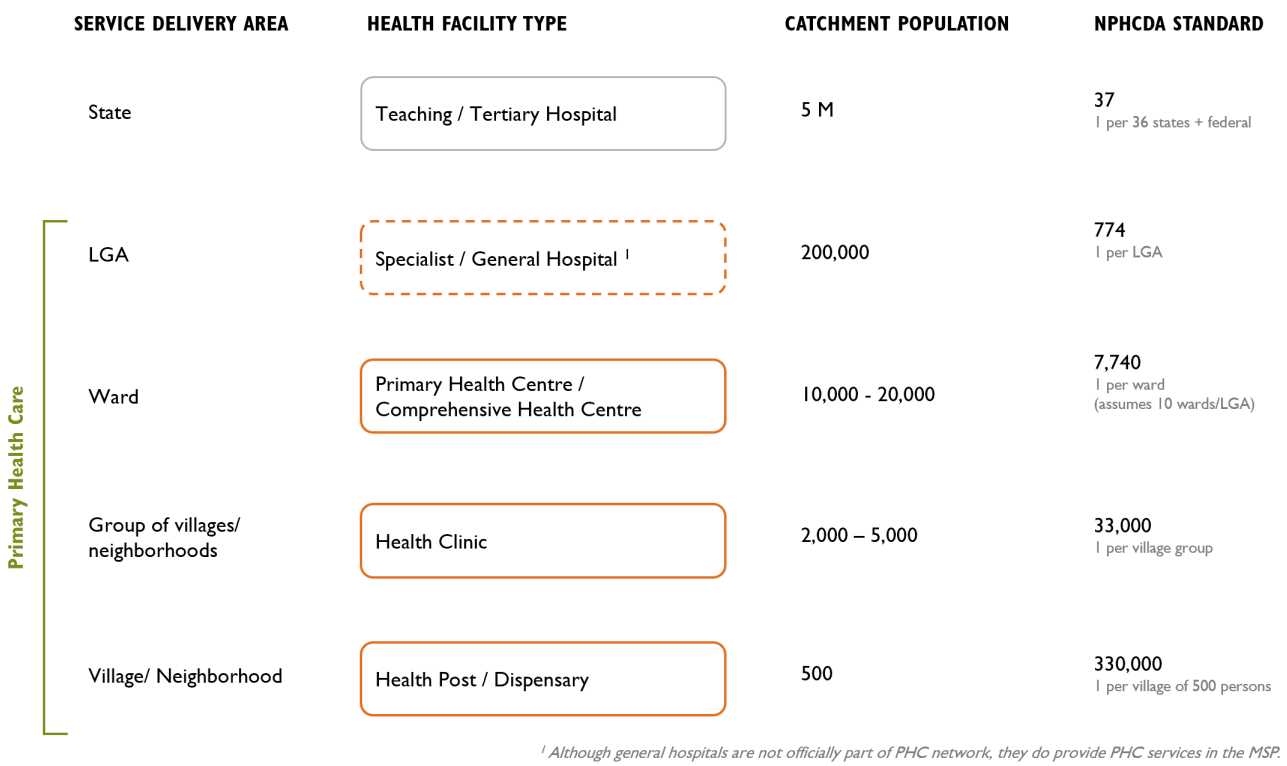
[25] Hafez, Reem. 2018. Nigeria Health Financing System Assessment. Health, Nutrition and Population Discussion Paper; World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/handle/10986/30174

[26] Hafez, Reem. 2018. Nigeria Health Financing System Assessment. Health, Nutrition and Population Discussion Paper; World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/handle/10986/30174

[27] WHO and Alliance for Health Policy and Systems Research. Primary Health Care Systems (PRIMASYS): Case study from Nigeria. 2017. Available at: https://www.who.int/alliance-hpsr/projects/alliancehpsr_nigeriaprimasys.pdf?ua=1

In the face of ongoing resource gaps and service delivery challenges, the GON passed the National Health Act of 2014.[28] The Health Act mandated the establishment of the Basic Health Care Provision Fund (BHCPF) to support the delivery of PHC services. The BHCPF is a federal and state funded initiative that seeks to improve PHC service delivery in at least one primary health center per ward through direct investments in infrastructure, staff, medicines, and commodities and by offering free PHC services to the very poor at these facilities.[29] Figure 3 provides an overview of the public sector health system hierarchy and expected norms for facility structures and catchment populations. Although the aforementioned reforms have sought to specify governance structures and responsibilities, the delineation of responsibilities remains weak and the referral system among the network of public sector providers is considered defective.[30]

Figure 3. Overview of Nigeria public sector health system[31]



[28] Hafez, Reem. 2018. Nigeria Health Financing System Assessment. Health, Nutrition and Population Discussion Paper; World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/handle/10986/30174

[29] Abdullahi, Awwal et al., Preliminary learnings from Nigeria's Basic Health Care Provision Fund https://r4d.org/blog/preliminary-learnings-from-nigerias-basic-health-care-provision-fund/; Implementation of BHCPF: https://options.co.uk/sites/default/files/bhcpf_advocacy_brief.pdf

[30] Abubakar I, Dalglish SL, Angell B, Sanuade O, Abimbola S, Adamu AL, et al. The Lancet Nigeria Commission: investing in health and the future of the nation. The Lancet. 2022 Mar; S0140673621024880.

[31] Adapted from Kress (2016) and the National Primary Health Care Development Agency (2016) Minimum Standards for PHC in Nigeria. Available at http://www.nphcda.gov.ng/

2. OBJECTIVES

Ensuring the availability of and access to quality and affordable PHC services in Nigeria will require the mobilization and equitable allocation of substantial financial resources from local, state, and federal governments. Therefore, there is a need to understand the costs and resource requirements for PHC services. This analysis focused explicitly on generating cost data for PHC services in Kano and Kaduna states.

Through a multiyear award from the Bill & Melinda Gates Foundation (BMGF), Management Sciences for Health (MSH) has developed the Primary Health Care Costing, Analysis, and Planning (PHC-CAP) Tool and is applying an approach to cost PHC services and systems in selected countries. In Nigeria, MSH and the Health Strategy and Delivery Foundation (HSDF) partnered with the governments of Kano and Kaduna states to estimate the actual and normative cost of PHC service provision and the corresponding financing and resource gaps. Both the PHC-CAP Tool and the results of this analysis are intended to generate much-needed evidence to support decision-making on PHC planning, facilitate resource allocation and budgeting, and help to improve PHC system performance. In particular, this analysis and ensuing recommendations are intended to provide information for policy makers in Kano and Kaduna states and their domestic and international partners to mobilize and allocate sufficient resources for PHC. The PHC-CAP Tool will be available as a public good provided to local stakeholders who can then adapt the tool to local needs to calculate costs and generate evidence on the efficiency of PHC service delivery among networks of providers.

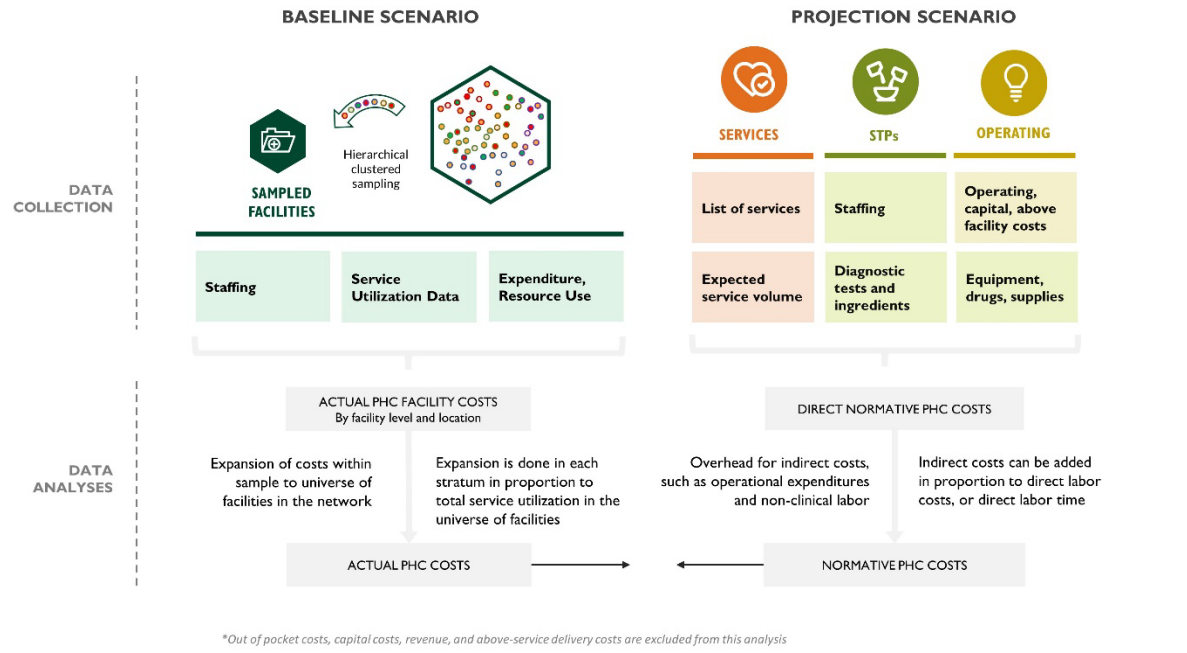
The main objective of this activity was to calculate and compare the actual cost against the MSP established normative cost from the program perspective, thereby determining the financial resource gap of providing PHC services in public sector PHC facilities (health posts, health clinics, health centers, and general hospitals) in Kano and Kaduna states. The key research questions of the activity were:

1. What is the actual cost of delivering the MSPs based on sampled facilities in Kano and Kaduna?
2. What is the normative cost (i.e., what should it cost to deliver the MSPs) of achieving universal coverage of PHC based on standard treatment protocols (STPs)?
3. What is the estimated financial resource gap for delivering PHC services based on the difference between actual and normative costs?

3. METHODS

The following section describes the methods for the cost analysis, as depicted in Figure 4. Both actual and normative costs of the PHC package of services were calculated, with the difference in values representing the estimated financial resource gap. Actual costs were based on data collected from samples of health facilities in Kano and Kaduna states. Normative costs reflect the expected cost of providing high-quality services in Kano and Kaduna states based on STPs, their associated costs, and targeted utilization rates. The cost analysis was conducted from the public sector perspective for January 1 to December 31, 2019. All costs are presented in both Nigerian Naira (NGN) and US Dollar (USD). The currency exchange rate used for the analysis was 316 NGN equal to 1 USD.[32]

Figure 4. Overview of PHC network costing approach



Establishment of State Technical Working Groups

Technical working groups were established in each state and were responsible for facilitating ethical approvals, ensuring access to health facilities and available data (on budgets, drugs, medical supplies, and staff), and validating draft analyses. These groups included representatives from the State Ministry of Health (SMOH), the WMHCP, the State Bureau of Statistics, the Drug Revolving Fund (DRF), the Drug and Medical Consumables Supply Agency (DMCSA) in Kano, the Kaduna State Health Supplies Management Agency, the Kano State Primary Health Care Management Board (SPHCMB), the Kaduna State Contributory Health Management Authority, and facility heads.

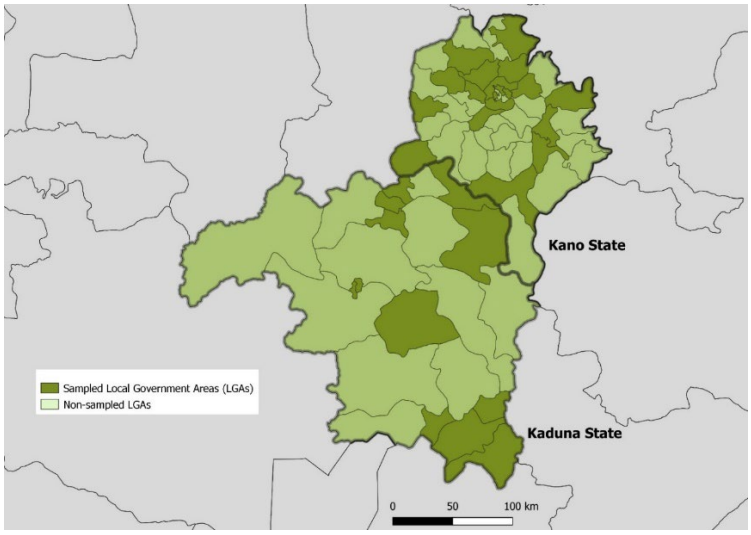
Sampling

Sampling for actual data collection was conducted in consultation with the technical working groups in each state. A map of the sampled LGAs is shown in Figure 5. The sample frames for Kano and Kaduna states are shown in Table 1

[32] Government of Nigeria, reported functional flexible exchange rate, 2019.

and Table 2, respectively. These sample frames were based on Master Health Facility Lists obtained from the two SMOHs and last updated in 2018.

Figure 5. Local Government Areas sampled



Kano sampling procedure

All public primary and secondary health facilities in Kano were included in the sample frame. In a first stage, 20 out of the 43 LGAs in Kano were selected, based on perceived security risk levels, accessibility of facilities by the enumerators, facility types providing PHC services in 2019, facilities reporting health management system data in 2019, and LGA spread. In a second stage, 25 facilities were randomly selected among all public primary and secondary health facilities in the selected LGAs, previously stratified by LGA and facility type to ensure a representative distribution across both domains (Table 1). Twenty-five health facilities were selected (7 health posts, 8 health clinics, 6 health centers, and 4 general hospitals).

Table 1. Sample frame of health facilities in selected LGAs in Kano state

Local Government Area	Health Post (sampled/total)	Health Clinic (sampled/total)	Health Center (sampled/total)	General Hospital (sampled/total)
Ajingi	0/46	1/3 Chula	1/10 Panda	0/0
Bagwai	0/22	1/4 Romo	0/5	0/0
Bichi	1/44 Iyawa	0/3	0/6	1/1 Bichi
Danbata	0/0	0/2	1/41 Laraba Takuya	0/0
Dawaki Tofa	0/32	1/8 Dogon Marke	0/8	0/1
Fagge	0/0	0/7	0/8	1/6 Bokavu Kano
Garko	1/12 Buda	0/3	0/3	0/0
Gezawa	0/17	0/3	1/7 Wangara	0/1
Gwale	0/2	1/15 Aisami	0/10	0/2
Gwarzo	0/14	0/5	1/8 Getso	0/1
Kano	1/3 Datti Wudilawa	0/4	1/11 Emir Palace	0/5
Kumbotso	1/14 Yan Hamar	0/1	1/12 Chiranci	0/0
Madobi	0/15	1/5 Gora	0/2	0/1
Minjibir	0/16	1/8 Gasgainu	0/5	0/1
Nasarawa	0/0	0/9	0/12	1/1 Sir Mohammad Sanusi

Local Government Area	Health Post (sampled/total)	Health Clinic (sampled/total)	Health Center (sampled/total)	General Hospital (sampled/total)
Rogo	1/14 Tsohuwar Rogo	0/4	0/6	0/1
Tofa	1/17 Bugai	0/2	0/4	0/0
Tudun Wada	0/1	2/30 Burum Burum and Dalawa	0/3	0/0
Ungogo	1/21 Dausara	0/7	0/7	0/2
Wudil	0/18	0/1	0/4	1/1 Wudil

Kaduna sampling procedure

All public primary and secondary health facilities in Kaduna were included in the sample frame. As in Kano, in a first stage, 12 out of the 23 LGAs in Kaduna were selected, based on perceived security risk levels, accessibility of facilities by the enumerators, facility types providing PHC services in 2019, facilities reporting health management system data in 2019, and LGA spread. In a second stage, 25 facilities were selected among all public primary and secondary health facilities, previously stratified by LGA and facility type (Table 2). The 25 facilities consisted of 1 health post, 9 health clinics, 10 health centers, and 5 general hospitals).[33] Facilities in Kaduna were also randomly selected as they were in Kano, but many facilities had to be replaced due to logistic and security issues and no record of the replacements was kept.

Table 2. Sample frame of health facilities in selected LGAs in Kaduna state

Local Government Area	Health Post (sampled/total)	Health Clinic (sampled/total)	Health Center (sampled/total)	General Hospital (sampled/total)
Zaria	0/4	0/31	1/13 Danjinjiri[a]	1/1 Gambo Sawaba
Sabon Gari	0/0	2/14 Palladan and Hayin Ojo	1/8 Basawa	1/1 Narict
Kubau	0/0	1/39 Jidda	1/10 Kubau	0/1
Ikara	0/1	1/31 Anguwan Amadu Dogo	0/5	0/0
Kudan	0/0	1/27 Kyadi	0/9	0/1
Jaba	0/2	1/38 Ngarshang-Fada[a]	0/9	1/1 Kwoi
Jema'a	0/0	1/27 Gauta	0/13	0/2
Kaura	0/0	0/22	1/10 Maraban Agban	0/1
Sanga	1/40 Ajangwai-Aboro	0/5	0/5	0/1
Kauru	0/0	2/31 Kadage Kauru[a]	2/11 Dandaura and Kwassam	1/1 Kauru West
Kaduna North	0/0	0/4	2/14 Hayin Banki and Doka (Zakari Isah)[a]	1/2 Kawo
Kaduna South	0/0	0/6	2/15 Kabala West and Zango Road[a]	0/3

[a] Facility type classification included in the Master Health Facility List was inconsistent with categorization encountered in facilities during data collection, see footnote below.

Actual costs and service data

The team used Kobo Toolbox software to issue a questionnaire which captured information on PHC service outputs, the inputs used to produce the services, and their prices. Data were collected on four recurrent input categories: 1) labor (clinical and non-clinical), 2) drugs, 3) medical supplies and laboratory reagents, and 4) operational expenditures (e.g., electricity, water). Data on capital costs were excluded from this analysis. Data collectors and supervisors were

[33] In Kaduna, facility type classification included in the Master Health Facility List was sometimes inconsistent with the categorization encountered in the facilities during data collection. Changes in facility type classifications between the Master Health Facility List and facility reports were encountered for the following facilities: Danjinjiri (health post to health center), Ngarshang (health post to health clinic), Kauru (health center to health clinic), Doka (Zakari Isah) (health clinic to health center), Zango Road (health clinic to health center).

recruited by the HSDF project management team and were trained in research ethics and the use and administration of the survey instrument in health facilities. After the training, the survey instrument was piloted in two facilities in each state (in Wudil and Nasarawa in Kano and in Kaduna North, respectively). Throughout the data collection process, data collection teams were supported by control rooms in each of the two states, responsible for receiving and reviewing data in real time and providing support to data collectors in health facilities. Data were collected in Kano from May 31 to June 5, 2021, and in Kaduna from October 19 to November 8, 2021.

The availability of input and price data in health facilities and at the state level varied. In Kano, data on drug and other medical supplies quantities were not available at either health facility nor state level for 2019 or subsequent years. Data on drug and medical supply prices were also unavailable from state authorities. Estimates of facility drug and other medical supplies expenditures in Kano were constructed based on interviews with state officials and information from SMOH budgets. In Kaduna, some information on drug and other medical supplies quantities and prices were obtained from facility registers and these data were adjusted based on information obtained from the state DRF and interviews with state officials. In both states, information on staff and staff salaries was obtained from facility human resource records, interviews with facility heads, and information from SMOH budgets. Similarly, in both states, data on operational expenditures were estimated using data from facility financial records, interviews with facility heads, interviews with state officials, and information from SMOH budgets.

The total number of inpatient and outpatient services for the universe of health facilities in Kano and Kaduna states from January 1 to December 31, 2019, were collected from the Nigeria District Health Information System 2 (DHIS2). More detailed service data corresponding to MSP service categorizations were collected from facility registers in sampled facilities; however, reported data was difficult to disaggregate and total service outputs appeared subject to double counting. This analysis relies on data reported in the DHIS2 since the DHIS2 includes data for the whole universe of health facilities in each state. However, the DHIS2 is subject to issues of data quality and completeness. Comparisons of service data reported in the DHIS2 with data collected from facility registers in sampled facilities suggest considerable under-reporting in the DHIS2.

Expansion and aggregation

In some cases, the facility type classifications (health post, health clinic, health center, general hospital) in the Master Facility List were inconsistent with the facility classifications reported during data collection (e.g., facilities were promoted or demoted). Given this fluctuating categorization - especially between health post, health clinic, and health center - for the purpose of this analysis, these three categories of facilities were combined into one (i.e., lower-level facilities) to estimate the cost of the entire PHC networks in Kano and Kaduna states. Facilities classified as general hospitals remained unchanged.

The following approach was used to estimate the total cost of PHC in the two states. Actual costs in sampled facilities in each state were expanded to the entire PHC network in the state (i.e., health posts, health clinics, health centers, and general hospitals that reported outpatient services in the DHIS2 in 2019) in proportion to service utilization, assuming that average service cost in sampled facilities was representative of the entire network. The number of outpatient visits and inpatient days in hospitals and other health facilities in the sample were compared to those in the general hospitals and other health facilities of the entire network. Actual costs were allocated to outpatient visits and inpatient days based on weighted service volumes in general hospitals and other health facilities.[34] It should be noted that, unlike in Kano, no lower-level facilities in Kaduna reported inpatient days in the DHIS2 and, therefore, costs for inpatient days in lower-level facilities in Kano were not estimated. The actual total cost for the PHC network in each of the two states was

[34] WHO. WHO-CHOICE estimates of cost for inpatient and outpatient health service delivery. Available at: https://www.who.int/choice/cost-effectiveness/inputs/country_inpatient_outpatient_2010.pdf

obtained by summing expanded costs for general hospitals to those for other health facilities. Actual cost per capita for each state was calculated by dividing the actual total cost for the PHC network in the state by the total state population.

Normative costs and service data

Normative costs were estimated based on the STPs of PHC services documented in the national MSP for each facility level and adapted by state officials, thereby reflecting the cost of PHC service provision according to quality standards. For each service, the following information was determined to calculate the normative cost per service at each level of the PHC network (health posts, health clinics, health centers, and general hospitals):

- Total drug, diagnostic, and laboratory reagent requirements per service episode and the corresponding unit cost for each (sourced from the state MSPs)
- Average number of annual encounters per service episode
- Total human-resource requirements, based on the number of minutes required per service by human resource cadre (physician, nurse, or other) and the corresponding salary cost by state
- Population in need, computed based on the population of each state and disease prevalence rate (i.e., number of expected episodes per target population per year) for each service sourced from either national data or from the 2019 Global Burden of Disease (GBD) Nigeria dataset[35]
- Indirect costs, based on actual data (non-clinical labor) or normative assumptions (operational expenditures

A panel of clinical experts specified the STPs for each facility type and each of the service categories in the MSPs. A list of 109 PHC services were identified in the MSPs. STPs were used to determine resource labor and commodity consumption per service. To account for non-clinical labor delivery costs (e.g., security, janitorial, facility administration) associated with each service encounter, an overhead was calculated which was added to the normative human resource cost.

Overhead rates were estimated for each facility level using staffing and salary data from our sample of facilities. The overhead rate for each facility level was calculated by dividing total non-clinical labor costs by total clinical labor costs in the sampled facilities. To account for other delivery costs (e.g., electricity, office supplies, training costs), an overhead in proportion to normative human resource time requirements was added. The overhead factor (in NGN per staff-minute, regardless of type of staff) was calculated using budget estimates for a model health post, health clinic, and health center (Annex 2).

Sensitivity analysis

One-way sensitivity analyses were conducted to assess uncertainty around the USD estimates of the actual PHC cost per capita in Kano and Kaduna. Given the potential overestimation of drug expenditures in Kano, drug expenditure estimates were reduced by 50% to reflect a more conservative scenario. The currency exchange rate was varied from the 2019 exchange rate of 316 NGN equal to 1 USD to the exchange rate of April 12, 2022, of 416 NGN equal to 1 USD.[36] Given the uncertainty in the population sizes in Kano and Kaduna states (since available population estimates are based on the last census conducted in 2006), we varied the population sizes of both states using mean population

[35] Institute of Health Metrics and Evaluation. Global Burden of Disease (GBD) Results Tool. 2019. Available at: http://ghdx.healthdata.org/gbd-results-tool

[36] Exchange rate obtained from Oanda.com (12 April 2012).

data available from the GRID-3 Nigeria project.[37] Finally, we estimated the PHC cost per capita excluding general hospitals based on national guideline recommendations that PHC services should be provided in health posts, health clinics, and health centers, but not in general hospitals.[38] In addition, general hospitals also provide secondary care services and all general hospital costs were considered in the estimate of PHC service costs since we were unable to disentangle PHC service costs from other service costs.

[37] Geo-Referenced Infrastructure and Demographic Data for Development (GRID3). Population data sets from Kaduna and Kano states. Available from: https://grid3.gov.ng/

[38] National Primary Health Care Development Agency (2016) Minimum Standards for PHC in Nigeria. Available at http://www.nphcda.gov.ng/

4. RESULTS

Health facility and PHC service utilization data

Health facility staffing patterns varied by state and by facility level (Table 3). In Kano, mean clinical staff per facility ranged from 5.2 in lower-level facilities to 27.3 in general hospitals; mean non-clinical staff ranged from 5.2 to 7.7; and mean total staff ranged from 10.4 to 35.0. In Kaduna, mean clinical staff per facility ranged from 15.1 in lower-level facilities to 151.5 in general hospitals; mean non-clinical staff ranged from 3.8 to 40.3; and mean total staff ranged from 19.0 to 191.8.

Table 3. Summary of human resources in sampled facilities in Kano and Kaduna states (2019)

State	Facility level	Clinical staff		Non-clinical staff		Total staff	
		Mean	Median	Mean	Median	Mean	Median
Kano	Health posts/clinics/centers (n=21)	5.2	4.0	5.2	5.0	10.4	8.0
	General hospitals (n=3)[a]	27.3	28.0	7.7	9.0	35.0	37.0
Kaduna	Health posts/clinics/centers (n=21)	15.1	13.0	3.8	3.0	19.0	14.0
	General hospitals (n=4) [b]	151.5	118.5	40.3	24.5	191.8	183.5

[a]One sampled hospital Sir Mohammad Sanusi Specialist Hospital was excluded from the analysis due to its size and complexity.

[b] One sampled hospital Narict Medical Center was reclassified as a health center based on number of staff and volume of services.

Table 4 provides an overview of service utilization for the health facilities sampled in Kano and Kaduna. In Kano, lower-level facilities and hospitals had an average of 3,600 and 42,768 annual outpatient visits, respectively. Whereas no inpatient days were reported for lower-level facilities in the sample, sampled general hospitals had an average of 9,690 annual inpatient days. In Kaduna, lower-level facilities and general hospitals had an average of 2,483 and 13,807 annual outpatient visits and 114 and 8,540 annual inpatient days, respectively.

Table 4. Summary of service utilization in sampled facilities in Kano and Kaduna states (2019)

State	Service volume	Mean	Median	Minimum	Maximum
Kano	**Health posts/clinics/centers (n=21)**				
	Outpatient visits	3,006	1,924	425	13,034
	Inpatient bed days	0	0	0	0
	General hospitals (n=3)[a]				
	Outpatient visits	42,768	20,400	3,469	104,436
	Inpatient bed days	9,690	5,239	596	23,234
Kaduna	**Health posts/clinics/centers (n=21)**				
	Outpatient visits	2,483	2,086	608	7,553
	Inpatient bed days	114	5.0	0	576
	General hospitals (n=4)[b]				
	Outpatient visits	13,807	11,136	3,131	29,824
	Inpatient bed days	8,540	4,877	917	23,488

Service data source: DHIS2

[a] One sampled hospital Sir Mohammad Sanusi Specialist Hospital was excluded from the analysis due to its size and complexity.

[b] One sampled hospital Narict Medical Center was reclassified as a health center based on number of staff and volume of services.

The number of services provided per day by clinical staff varied by state and by facility level (Table 5). In Kaduna clinical staff in lower-level facilities provided an average of 4 services per day while staff in general hospitals provided 9.1. In Kaduna, clinical staff provided an average of 1.4 services in lower-level facilities and 0.5 in general hospitals.

There was also significant variation in the output per clinical staff by facility (Figure 6) with daily output per clinical staff positively correlated with the volume of services delivered in facilities in Kano but not in Kaduna. There could be a myriad of reasons for the differences in service output by clinical staff by facility type and by state. These could include, but are not limited to, issues of reporting (e.g., mis- or under-reporting of services in the DHIS2 and inaccurately reported human resources such as ghost workers) and factors affecting service utilization (e.g., demand for services within the private sector and access to care).

Table 5. Service output per clinical staff per day in sampled facilities in Kano and Kaduna states (2019)

State	Facility level	Average outpatient visits per clinical staff per day[c]	Average weighted service output per clinical staff per day[cd]
Kano	Health posts/clinics/centers (n=21)	4.0	4.0
	General hospitals (n=3)[a]	9.1	16.7
Kaduna	Health posts/clinics/centers (n=21)	1.4	1.6
	General hospitals (n=4)[b]	0.5	1.6

Service data source: DHIS2

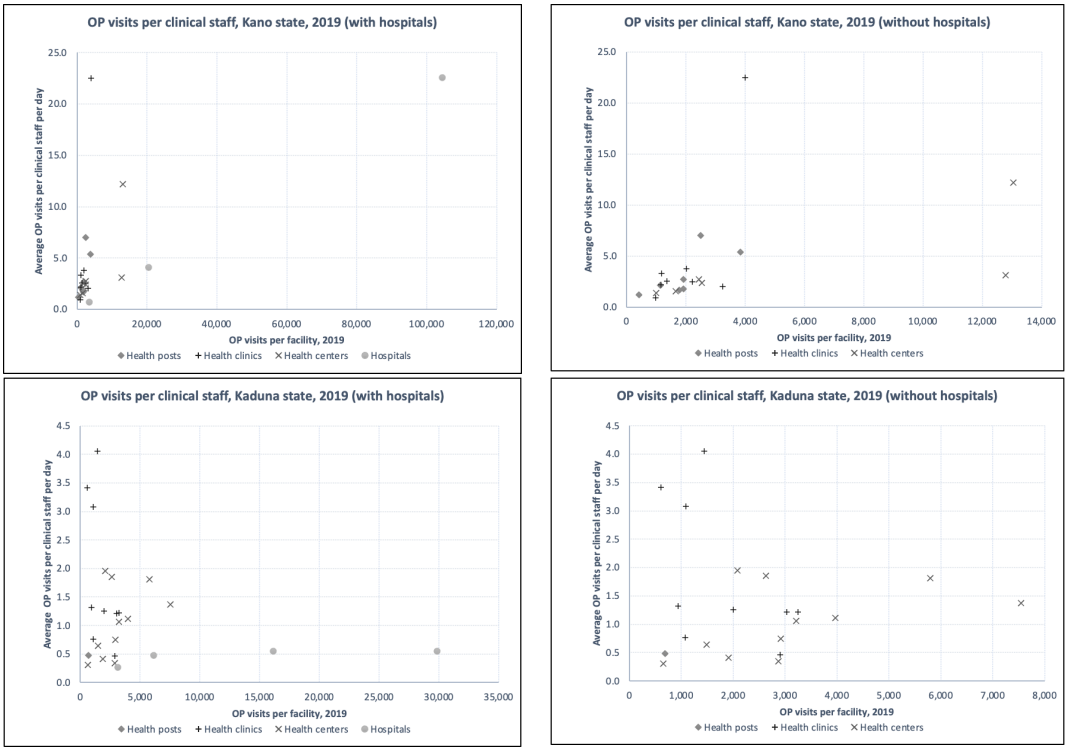
[a] One sampled hospital Sir Mohammad Sanusi Specialist Hospital was excluded from the analysis due to its size and complexity.

[b] One sampled hospital Narict Medical Center was reclassified as a health center based on number of staff and volume of services.

[c]Average outpatient visits per clinical staff per day and average weighted service output per clinical staff per day are defined as the number of outpatient visits/number of weighted service outputs in a facility in 2019 divided by the number of clinical staff in the facility and available working time in days estimated at 178 days as per Okoroafor, S C et al. "Assessing the staffing needs for primary health care centers in Cross River State, Nigeria: a workload indicators of staffing needs study." Human resources for health *vol. 19,Suppl 1 108. 28 Jan. 2022, doi:10.1186/s12960-021-00648-2.*

[d] Weighted service output is calculated as follows. In post/clinics/centers, it is calculated as OP visits + 4.4 x IP days (4.4 is the ratio of the cost per inpatient day in primary hospitals (PPP I$ 21.69) to outpatient visit in health centers with bed (PPP I$ 4.93) from WHO unit cost estimates. In hospitals, it is calculated as OP visits + 3.9 x IP days (3.9 is the ratio of cost per inpatient day in primary hospitals (PPP I$ 21.69) to outpatient visit in primary hospitals (PPP I$ 5.62) from WHO unit cost estimates.

Figure 6. Outpatient visits per clinical staff by facility in Kano and Kaduna states (2019)



Service data source: DHIS2

Average OP visits per clinical staff per day is defined as the number of OP visits in a facility in 2019 divided by the number of clinical staff in the facility and available working time in days estimated at 178 days as per Okoroafor, S C et al. "Assessing the staffing needs for primary health care centers in Cross River State, Nigeria: a workload indicators of staffing needs study." Human resources for health *vol. 19,Suppl 1 108. 28 Jan. 2022, doi:10.1186/s12960-021-00648-2.*

The service utilization statistics reported in the DHIS2 for the universe of health facilities in Kano and Kaduna are shown in Table 6. At the state level, 68% of outpatient visits in Kano were provided by health posts, health clinics, and health centers, and 32% by general hospitals. Most inpatient bed days were in general hospitals (89%) compared with 11% in lower-level facilities. In Kaduna, 82% of outpatient visits were provided by lower-level facilities and 18% by hospitals. Most inpatient bed days were in hospitals (77%) compared with 23% in lower-level facilities.

Table 6. Service statistics in the network of facilities in Kano and Kaduna states (2019)

State	Facility level	Facilities	OP visits	Percent	IP days	Percent
Kano	Health posts/clinics/centers	1,207	2,830,690	68%	55,462	11%
	General hospitals	32	1,310,591	32%	444,568	89%
	Total	1,239	4,141,281	100%	500,030	100%
Kaduna	Health posts/clinics/centers	1,080	1,907,965	82%	61,085	23%
	General hospitals	34	421,013	18%	206,680	77%
	Total	1,114	2,328,978	100%	267,765	100%

Service data source: DHIS2

Actual costs of PHC services

Table 7 summarizes the actual cost results for sampled facilities and for all facilities in Kano and Kaduna. At the state level, the total actual cost for PHC in Kano was estimated to be NGN 80.4 billion (USD 254.2 million) with NGN 72.1 billion (USD 227.7 million) in health posts, health clinics, and health centers, and NGN 8.4 billion (USD 26.5 million) in general hospitals. In Kaduna, the total actual cost for PHC was estimated to be NGN 69.3 billion (USD 219 million) with NGN 54.7 billion (USD 173 million) in lower-level facilities and NGN 14.6 billion (USD 46 million) in general hospitals. The average cost per capita of PHC was NGN 5,620 (USD 17.8) in Kano and NGN 7,532 (USD 23.8) in Kaduna.

Table 7. Actual costs in sample and in network of facilities in Kano and Kaduna states (2019)

		Number of facilities		Percent services captured by sample		Total actual costs (NGN, billions)		Network actual cost per capita	
State	**Facility level**	**Sample**	**Network**	**Out-Patient visit**	**In-Patient day**	**Sample**	**Network**	**NGN**	**USD**
Kano	Health posts/clinics/centers	21	1,207	2.2%	0.0%	1.6	72.1	5,620	17.8
	General hospitals	3[a]	32	9.8%	6.5%	0.7	8.4		
	Total	24	1,239	4.6%	5.8%	2.3	80.4		
Kaduna	Health posts/clinics/centers	21	1,080	2.7%	3.9%	1.6	54.7	7,532	23.8
	General hospitals	4[b]	34	13.1%	16.5%	2.2	14.6		
	Total	25	1,114	4.6%	13.7%	3.8	69.3		

Service data source: DHIS2

[a] *One sampled hospital Sir Mohammad Sanusi Specialist Hospital was excluded from the analysis due to its size and complexity.*

[b] *One sampled hospital Narict Medical Center was reclassified as a health center based on number of staff and volume of services.*

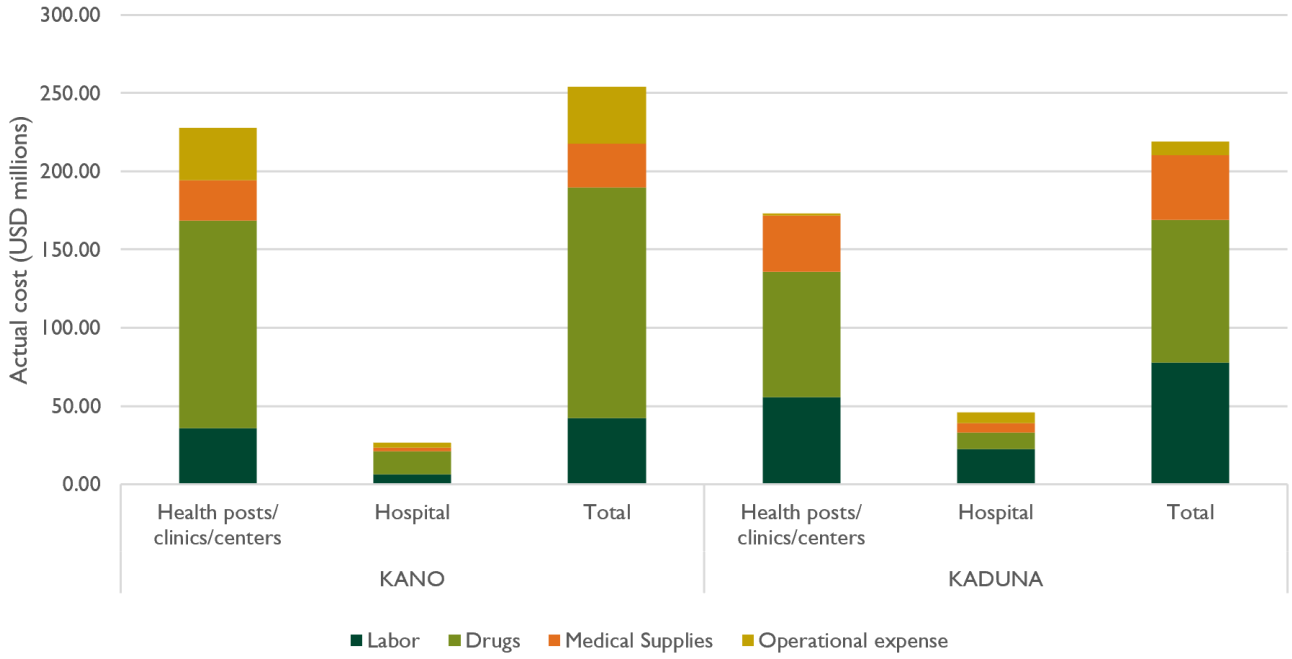
An overview of actual PHC service delivery costs by cost category can be found in Table 8 and Figure 7. In Kano, drugs represented the largest cost driver at all facility levels. Overall, 58% of total costs were for drugs, 17% were for labor, 14% were for operational expenses, and 11% were for medical supplies. In Kaduna, drugs and labor were the dominant cost drivers in health posts, health clinics, and health centers, and labor was the major cost driver in general hospitals. In Kaduna, 42% of total costs were for labor, 36% were for drugs, 19% were for medical supplies, and 4% were for operational expenses. The overall high percentage of drug costs could be overestimated, especially in Kano where, in the absence of expenditure data, drug and other medical supply expenditures were constructed based on interviews with state officials and information from SMOH budgets. Alternatively, these high drug costs could reflect the reality in which health facilities purchase a large volume of commodities as a means of generating income through user fees. The significant differences in the distributions of labor, drugs, medical supplies, and operational expenses between the two states may reflect state funding priorities but they are rather surprising given the similarities in the two states' epidemiological profiles as well as their comparable MSPs.

Table 8. Actual cost by facility level and distribution in network of facilities in Kano and Kaduna states (2019)

State	**Facility level**	**Currency/%**	**Labor**	**Drugs**	**Medical supplies**	**Operational expenses**	**Total**
Kano	Health posts/clinics/centers	NGN (billions)	11.4	42.0	8.2	10.6	72.1
		USD (millions)	35.9	132.7	25.8	33.4	227.7
		Percent	16%	58%	11%	15%	100%
	General hospitals	NGN (billions)	2.0	4.7	0.6	1.0	8.4
		USD (millions)	6.3	14.9	2.0	3.3	26.5

		Percent	24%	56%	8%	12%	100%
	Total	NGN (billions)	13.3	46.7	8.8	11.6	80.4
		USD (millions)	42.2	147.5	27.9	36.6	254.2
		Percent	17%	58%	11%	14%	100%
Kaduna	Health posts/clinics/centers	NGN (billions)	17.6	25.4	11.3	0.5	54.7
		USD (millions)	55.5	80.2	35.6	1.6	173.0
		Percent	32%	46%	21%	1%	100%
	General hospitals	NGN (billions)	7.1	3.4	1.9	2.2	14.6
		USD (millions)	22.3	10.7	5.9	7.1	46.0
		Percent	48%	23%	13%	15%	100%
	Total	NGN (billions)	24.6	28.8	13.1	2.7	69.3
		USD (millions)	77.8	90.9	41.6	8.6	219.0
		Percent	36%	42%	19%	4%	100%

Figure 7. Actual cost by facility level and distribution in network of facilities in Kano and Kaduna states (2019)



Normative costs of PHC services and estimated resource gap

In both Kano and Kaduna, the actual PHC cost per capita was below the normative cost per capita when considering expanded service utilization as per state MSPs (Table 9). In Kano, the actual cost per capita of NGN 5,620 (USD 17.8) was substantially less than the estimated normative cost per capita of NGN 14,030 (USD 44.3) and would require an increased investment of 2.5 times current levels of investment. In Kaduna, the actual cost per capita was NGN 7,532 (USD 23.8) and the normative cost per capita was NGN 14,332 (USD 45.3), requiring current investments to increase by 1.9 times.

Table 9. PHC resource requirements based on actual and normative costs in Kano and Kaduna states (2019)

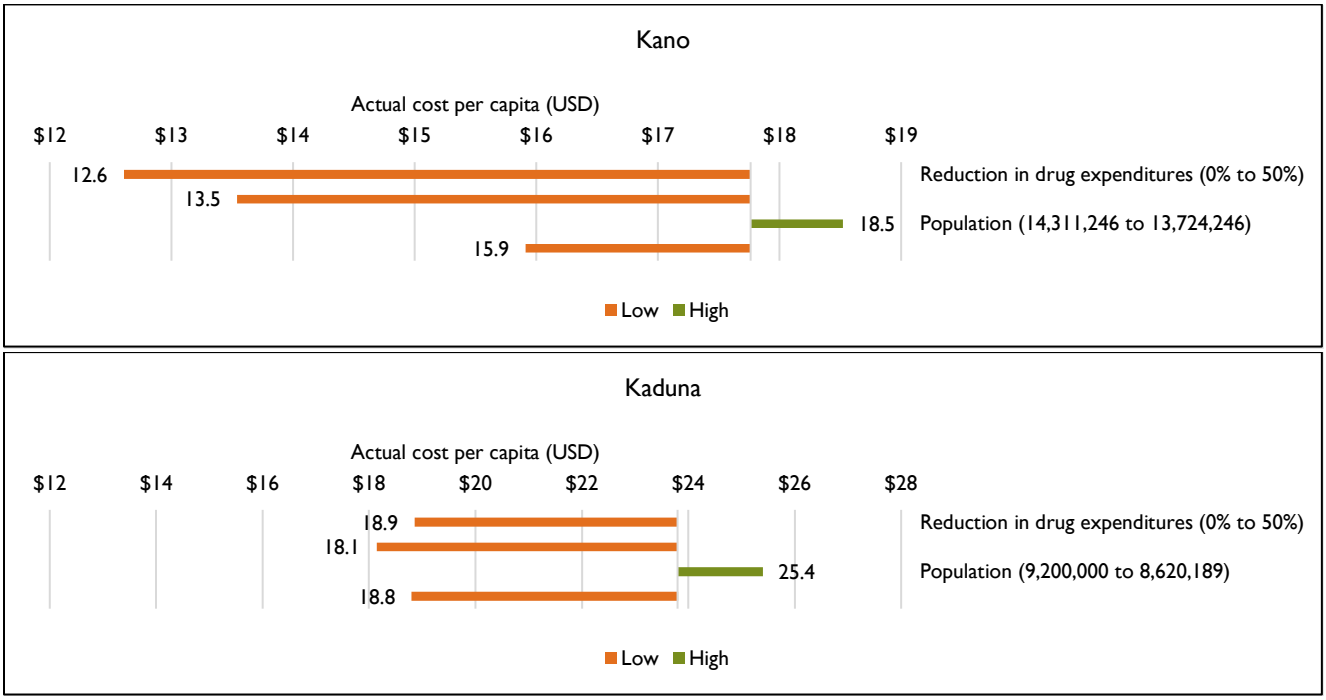
State	Currency	Actual cost per capita	Normative cost per capita	Resource gap	Increase investment needed
Kano	NGN	5,620	14,030	8,410	2.5

	USD	17.8	44.3	26.6		
Kaduna	NGN	7,532	14,332	6,800	1.9	
	USD	23.8	45.3	21.5		

Sensitivity analysis

Figure 8 displays the results of the one-way sensitivity analyses for the actual PHC cost per capita in Kano and Kaduna where we modified variables with some degree of uncertainty: drug expenditures, the exchange rate, state population size, and the inclusion/exclusion of general hospitals in the state PHC networks. The PHC cost per capita in both states was most sensitive to the variations in drug expenditures, exchange rate, and inclusion/exclusion of general hospitals. Reducing drug expenditures by 50% resulted in a PHC cost per capita of USD 12.6 in Kano and USD 18.9 in Kaduna. Increasing the NGN to USD exchange rate from 316 to 415 resulted in the PHC cost per capita of USD 13.5 in Kano and USD 18.1 in Kaduna. Excluding general hospitals in the PHC network resulted in PHC costs per capita of USD 15.9 in Kano and USD 18.8 in Kaduna.

Figure 8. Sensitivity analysis results for Kano and Kaduna states



5. DISCUSSION

The findings from this 2019 analysis show state variation in the average actual cost of PHC service delivery. In Kano, the average actual PHC cost per capita was NGN 5620 (USD 17.8) compared to NGN 7,532 (USD 23.8) in Kaduna. These estimates fall far short of what would be expected to deliver high-quality services (according to normative guidelines) from the public sector perspective. The normative PHC cost per capita was estimated at NGN 14,030 (USD 44.3) in Kano compared to NGN 14,332 (USD 45.3) in Kaduna.

These findings suggest that substantial investments are needed to ensure universal access to PHC services. However, these results should be interpreted carefully with the understanding that the normative expanded service utilization scenario assumes that the entire population of each state would access services at public sector PHC facilities. This is an unlikely scenario given current care-seeking behavior, especially among private providers which play a critical role in service delivery. If we assume that 50% of the population of each state would access services at public sector PHC facilities, the normative PHC cost per capita would be NGN 7,015 (USD 22.2) in Kano and NGN 7,166 (USD 22.6) in Kaduna. Nevertheless, both sets of figures provide important benchmark estimates to guide public financing for ensuring universal access to PHC services at the state level, which to date, have been limited.

When compared to national-level analyses of PHC per capita costs in Nigeria, the actual per capita costs of PHC services in Kano and Kaduna observed in this study are considerably lower. For example, the Institute for Health Metrics and Evaluation (IHME) estimated that PHC expenditure per capita in Nigeria in 2017 was USD 31.[39] According to the World Health Organization (WHO), PHC expenditure per capita in Nigeria in 2019 was USD 49.[40] It is important to note that both of these estimates are national averages which mask any differences that exist across states. Moreover, there are considerable methodological differences in the studies - e.g., the type and ownership of the health facilities considered, how PHC is defined, the PHC elements costed, and the extent to which above service level costs are included. For example, both the IHME and WHO estimates are based on country-reported health expenditure data that include private providers, OOP expenditures, and above service level expenditures which are not included in this study.[41]

The normative total cost of PHC services in Kaduna estimated in this study is significantly higher than the normative cost estimated in a previous study conducted in Kaduna in 2017. While the normative total cost for PHC in Kaduna state in this study is estimated to be NGN 131.9 billion (USD 416.7 million), the 2017 study estimated that the cost of providing PHC in the state was NGN 21.1 billion (USD 66.9 million).[42] The differences in total costs between these two studies are partly due to differences in the health facilities considered. Whereas the current study considers PHC

[39] Schneider, Matthew T et al. "Trends and outcomes in primary health care expenditures in low-income and middle-income countries, 2000-2017." BMJ global health vol. 6,8 (2021): e005798. doi:10.1136/bmjgh-2021-005798.

[40] PHC Expenditure per capita (USD, 2019). WHO Global Health Expenditure Database (2019). Available at: https://apps.who.int/nha/database/ViewData/Indicators/en; N.B.: Data are collected using the System of Health Accounts (SHA2011) standards in which a working definition for PHC expenditure has been developed, which includes (1) all expenditures for PHC service providers; (2) expenditures for PHC preventive services; and (3) a proportion of administrative expenditures (based on ratio of PHC services expenditure and non-PHC service expenditure). WHO methodology excluded capital expenditures and assumed a share of health system administration and governance costs.

[41] Schneider, Matthew T et al. "Trends and outcomes in primary health care expenditures in low-income and middle-income countries, 2000-2017." BMJ global health vol. 6,8 (2021): e005798. doi:10.1136/bmjgh-2021-005798 and Vande Maele, Nathalie et al. "Measuring primary healthcare expenditure in low-income and lower middle-income countries." BMJ global health vol. 4,1 e001497. 21 Feb. 2019, doi:10.1136/bmjgh-2019-001497.

[42] Kaduna State Ministry of Health and Human Services and Health Strategy and Delivery Foundation (2020). Kaduna State PHC Costing 2017.

services provided in health posts, health clinics, health centers, and general hospitals, the 2017 Kaduna PHC costing study did not consider PHC services provided in general hospitals since the national objective is to eventually provide PHC services only in lower-level facilities. This difference is also likely explained by methodological differences between the two studies – e.g., the 2017 study reportedly estimated the average normative cost of providing PHC services per type of facility (utilizing catchment population in need of those services) and then expanded by the total number of facilities in the state. However, at the time of this report, the full report and data set were not available for review.

The normative cost per capita estimates from this study also differ from those reported by the WHO (2019) and Disease Control Priorities 3rd edition (DCP3) (2016) which varied in their methodological approaches. The WHO reported an average per capita cost of USD 65 in low-income countries by 2030 based on 188 different PHC interventions (most at 95% population coverage) in addition to needed health system *investments* (e.g., infrastructure, equipment, information system, and supply chain costs).[43] The DCP3 reported a 2015 per capita cost in low of USD 58 (30 to 100) for an essential UHC (EUHC) package and USD 110 (54 to 190) for the Highest-Priority Package (HPP) at 80% population coverage. The HPP is a subset of EUHC package which includes 218 unique interventions, including 13 interventions at the population level, 59 at the community level, 68 at health centers, 58 at first-level hospitals, and 20 at referral and specialized hospitals.[44] Comparing the packages of services costed across studies is somewhat complicated by the different levels of disaggregation of the interventions included. Overall, however, the packages of interventions included by WHO and DCP3 are broader in scope than the Kano and Kaduna MSPs.

The results from this 2019 analysis show considerable variation in the staffing patterns among health facilities in Kano and Kaduna, contributing to differences in the cost of labor in the two states. Whereas sampled health posts, health clinics, and health centers in Kano had an average of 5.2 clinical staff per facility, lower-level facilities in Kaduna had an average of 15.1 clinical staff per facility. The differences in staffing patterns were even more extreme among general hospitals -- Kano had an average of 27.3 clinical staff while Kaduna had an average of 151.5 clinical staff. These large differences in staffing patterns in the two states persist even when excluding outlier facilities. The differences in staffing patterns observed suggest that health facilities do not adhere to existing staffing guidelines.

This difference in staffing patterns is particularly notable since service volumes per facility in the two states are similar (in lower-level facilities) or somewhat lower in Kaduna (in general hospitals). This difference in staffing patterns partly explains the important variation in the daily caseload of clinical staff in the two states. While clinical staff in Kano provided an average of 4 services per day in lower-level facilities and 9.1 in general hospitals, in Kaduna, they provided an average of 1.4 services in lower-level facilities and 0.5 in general hospitals. These low levels of daily caseload per clinical staff are consistent with previous work in Nigeria which found that when taking into account rates of staff absenteeism (observed to be very high at 31.7% overall), the caseload per clinical staff in Nigeria was 5.2 overall in all facilities, 2.3 in health posts, 5.6 in health centers, and 5.4 in hospitals.[45] This study also found significant variation by state with Kaduna having the highest caseload with clinical staff providing 12 services per day (Kano was not included in the study). Differential issues of misreporting on health services and human resources across the two states in our study cannot be excluded. Nonetheless, the caseloads per clinical staff observed in the two states in this study and in

[43] Stenberg, Karin et al. "Guide posts for investment in primary health care and projected resource needs in 67 low-income and middle-income countries: a modelling study." *The Lancet. Global health* vol. 7,11 (2019): e1500-e1510. doi:10.1016/S2214-109X(19)30416-4

[44] Watkins DA et al. Universal Health Coverage and Essential Packages of Care. In: Jamison DTet al., editors. Disease Control Priorities: Improving Health and Reducing Poverty. 3rd edition. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017 Nov 27. Chapter 3. Available from: https://www.ncbi.nlm.nih.gov/books/NBK525285/ doi: 10.1596/978-1-4648-0527-1_ch3

[45] The World Bank. 2014. Health service delivery in Nigeria: results of the 2014 Service Delivery Indicator Survey. World Bank, Washington, DC. Available at: https://microdata.worldbank.org/index.php/catalog/2559/download/49991

previous work suggest that there is an issue with low staff utilization which may represent an opportunity to improve health worker efficiency.

These study results also suggest that in both states, the PHC referral system may not be functioning as intended and there may be a high prevalence of bypass in which persons seek care at higher-level facilities instead of at lower-level facilities. There is considerable variation in the number of outpatient service encounters among lower-level facilities where numbers of outpatient visits in sampled facilities ranged from 425 to 13,034 in Kano and 608 to 7,553 in Kaduna. According to DHIS2 data, 32% of outpatient visits in Kano were provided in general hospitals while in Kaduna, 18% of outpatient visits were in general hospitals, although most outpatient services can be provided at lower-level health facilities. This pattern of service use can lead to overutilization of higher-level facilities and underutilization of lower-level facilities, the former having higher operational and labor costs. The high proportions of outpatient services provided in hospitals indicates that there is potential to improve the demand and quality of services at health posts, health clinics, and health centers. There is also an opportunity to improve the overall efficiency of care by instituting a referral system (and/or gatekeeping practices) and better informing patients of the referral process.

Although substantial financial investments will be necessary to expand quality PHC service provision in Kano and Kaduna, they may not inevitably address the root causes of PHC underperformance. According to the Primary Health Care Performance Initiative conceptual framework, "the successful combination of systems, inputs, and service delivery contribute to PHC outputs."[46] This study does not assess some of the major PHC inputs required (e.g., the availability of drugs and supplies), nor does it assess some of the key system-level characteristics (e.g., governance and leadership and goals of the PHC system), or service delivery processes (e.g., provider competence, availability, and motivation and quality of care). This analysis does provide insight into some PHC inputs and indicates that the additional resource requirements could be partly offset by improved allocation of existing resources (i.e., through improvements in technical and allocative efficiency). For example, service and staff utilization could be enhanced through service redesign, by instituting better referral practices, and implementing a more appropriate staff mix.

Closing the PHC resource gap will likely require contributions from federal, state, and local governments as well as development partners. For both states, it is envisaged that with the implementation of the National Health Act's BHCPF and the Federal Government/World Bank Program for Results grant, public sector resources for PHC will increase. In addition, the implementation of the PHCUOR policy is intended to streamline funding for PHC through the SPHCDA which could potentially contribute to closing the resource gap at LGA and/or facility level. Mobilizing resources from other sources for the observed resource gap within the state is a function of state and federal government PHC networks via the SPHCDA and related MDAs.

A key but pertinent issue not captured in this study is the OOP expenditures incurred by patients in accessing PHC services in Kano and Kaduna. Although no state-specific data are available for Kano, private financing of health care (mainly through OOP payments) comprised 80% of total health expenditure in Kaduna State.[47] This study excluded what is currently "the main source of financing of basic health care."[48] Such high OOP spending on health is inefficient and inequitable and constitutes an important barrier to care-seeking in Kano and Kaduna where 55% and 43% of the

[46] Bitton A, Ratcliffe HL, Veillard JH, et al. Primary Health Care as a Foundation for Strengthening Health Systems in Low- and Middle-Income Countries. 2017. J Gen Intern Med. 32(5): 566-571.

[47] Azubuike CE, Ogundeji YK, Butawa N, Orji N, Dogo P, Ohiri K. Evidence from the Kaduna State Health Accounts on the pattern of sub-national health spending in Nigeria, 2016. *BMJ Glob Health*. 2020;5(5):e001953.

[48] Abubakar I, Dalglish SL, Angell B, Sanuade O, Abimbola S, Adamu AL, et al. The Lancet Nigeria Commission: investing in health and the future of the nation. The Lancet. 2022 Mar; S0140673621024880.

population respectively lives in poverty.[49] The importance of pooled arrangements that cover PHC enabling all people to receive PHC that is free at the point of service has been emphasized by the recent Lancet Global Health Commission on financing PHC.[50]

[49] National Bureau of Statistics (NBS). 2019 Poverty and inequality in Nigeria: executive summary. 2020. Available at: https://nigerianstat.gov.ng/download/1092

[50] Hanson, Kara et al. "The Lancet Global Health Commission on financing primary health care: putting people at the centre." *The Lancet. Global health* vol. 10,5 (2022): e715-e772. doi:10.1016/S2214-109X(22)00005-5

6. LIMITATIONS

Several limitations of this analysis should be noted:

Perspective and generalizability:

- The analysis focused on calculating the actual cost and resource gap of the MSP as a proxy for PHC service provision. Depending on its definition, PHC may surpass the interventions included in the MSP; however, an explicit service package was necessary for drawing boundaries around the analysis and elaborating normative STPs.
- The cost analysis is conducted from the public sector perspective and does not include patient costs (i.e., time costs and OOP costs). It is expected that OOP costs comprise a substantial proportion of PHC expenditures and represent a major funding source for operational expenses at the facility level.[51]
- The analysis did not measure the quality of PHC service provision which is a critical component of UHC. Having a comprehensive understanding of the quality of care (e.g., adherence to clinical guidelines), would also allow for a more nuanced efficiency analysis of the service output per clinical staff.
- The analysis did not disaggregate costs by source of financing and though some development assistance for health is captured (e.g., expenditures on HIV, TB and malaria), no information was collected on health insurance.
- The analysis focuses only on the recurrent costs (inputs with useful lives of less than one year) of labor, drugs and supplies, utilities, and other expenditure. Capital costs were not included in the analysis.
- The analysis is focused on health facility costs and does not include above service delivery costs such as support services provided by the state and federal administrations which can also be sizable.
- A key assumption underpinning the estimate of PHC service costs in Kano and Kaduna states is that the average service cost for the public facility types in each state sample is representative of the health posts, health clinics, health centers, and general hospitals of the state. A variety of issues in both states, including security issues, determined the LGAs that selected. Though health facilities were randomly selected in Kano, the facility selection process in Kaduna was not random. In Kaduna, in particular, the Master Facility List was not up-to-date and facility type classification included in the Master Health Facility List was sometimes inconsistent with the categorization encountered in the facilities during data collection.
- The analysis is limited to public facilities. Not included are private, public enhanced, faith-based (especially the near pro bono catholic church mission facilities), and charitable facilities. This means that the normative expanded service utilization scenario assumes that the entire population of each state would access services at public sector PHC facilities which is an unlikely scenario. It also means that the gap between actual and normative cost per capita is likely to be somewhat smaller since actual cost results are probably an underestimate of current PHC service costs given the exclusion of non-public facilities.

[51] Daniel H. Kress, Yanfang Su & Hong Wang (2016) Assessment of Primary Health Care System Performance in Nigeria: Using the Primary Health Care Performance Indicator Conceptual Framework, Health Systems & Reform, 2:4, 302-318, DOI: 10.1080/23288604.2016.1234861

Service delivery data:

- This analysis relies on data reported in the DHIS2 since the DHIS2 includes data for the whole universe of health facilities in each state. However, the DHIS2 is subject to issues of data quality and completeness. Comparisons of service data collected from facility registers in sampled facilities with data reported in the DHIS2 suggest considerable under-reporting in the DHIS2. For example, none of the sampled lower-level facilities in Kano reported inpatient services during 2019, even though normative guidance would suggest that these services are provided in health clinics and health centers and other facilities of this type in the state did provide these services. These findings are consistent with recent evidence from the Lancet Nigeria Commission (2022) which found that facility-reported data completeness on the DHIS2 platform varied between 58.3% and 71.7%, based on a data quality audit of DHIS2 in 31 districts across Nigeria (period of January to March 2020).[52]

Actual costs:

- Though the actual costing study was designed to be a largely bottom-up costing study, the availability of input and price data in health facilities and at the state level varied by state with significant data gaps encountered in both states. Data on all the input categories in both states had to be completed with information from SMOH budgets and/or interviews with state officials. The data supplementation methods used are subject to bias but whether they contribute to overestimating or underestimating actual cost is impossible to determine.

- In Kano, data on drug and other medical supplies quantities and prices were not available in health facilities or at the state level for 2019 or for the following years. Estimates of facility drug and other medical supplies expenditures in Kano were constructed based on interviews with state officials and information from SMOH budgets. These estimates were adjusted based on expenditure reports from various sources including the state DRF. In Kaduna, drug and other medical supplies quantities and prices obtained from facility registers were adjusted based on expenditure reports from the state DRF and interviews with state officials. Given the uncertainty around these reported costs, we conducted one-way sensitivity analysis to show the impact on the cost per-capita by considerably reducing drug expenditures by 50%.

- In Kano and Kaduna, information on staff and staff salaries obtained from facility human resource records was supplemented through interviews with facility heads, and information from SMOH budgets. It was not possible to verify the actual number of human resources working at each facility and determine levels of absenteeism and ghost workers. In both states, data on operational expenses from facility financial records were complemented with data from interviews with facility heads, interviews with state officials, and information from SMOH budgets.

- Community health extension workers (CHEWs) and junior CHEWs (JCHEWs) are attached to health facilities (health posts, health clinics, health centers, and general hospitals) and their outputs are included in the analysis. However, the extent to which costs for CHEWs and JCHEWs were included varied by health facility. Even for the health facilities for which data on CHEW and JCHEW are included, it is not possible to disaggregate costs for the community level nor estimate the cost per CHEW/JCHEW-provided service.

- Actual costs in sampled facilities account for all reported health services provided at each health facility. It is probable that some health facilities (particularly general hospitals) also provided secondary care services, which would result in higher actual cost estimates for PHC services. If these non-PHC costs were removed, the actual

[52] Abubakar I, Dalglish SL, Angell B, Sanuade O, Abimbola S, Adamu AL, et al. The Lancet Nigeria Commission: investing in health and the future of the nation. The Lancet. 2022 Mar; S0140673621024880.

cost would be somewhat lower and further from the normative expectations, as demonstrated through the one-way sensitivity analysis excluding hospitals.

- Though inpatient days were reported in the DHIS2 for health posts, health clinics, and health centers in Kano, costs for inpatient days in lower facilities in Kano were not estimated since none of the lower-level facilities sampled reported IP days.
- Because of the fluctuating facility categorization (especially between health post, health clinic, and health center), these three categories of facilities were combined into one (i.e., lower-level facilities) to estimate the actual cost of the entire PHC networks in Kano and Kaduna states. The cost profile for health centers in both states is slightly higher than that of health posts and health clinics. Given that in Kaduna, health centers were over sampled, and health posts were under sampled, expanded actual costs are likely somewhat overestimated.

Normative costs:

- In the absence of available and explicit clinical guidelines, normative costs were based on STPs elaborated by expert panels of clinicians which are subject to bias.
- Several factors likely contribute to an underestimation of normative costs even though the normative assumptions were reviewed and approved by an expert panel. The Kano and Kaduna MSPs excluded certain interventions that are part of the national MSP including oral health services. The number of encounters per service episode for most chronic or long-term conditions report only one visit. The staff time per service was found to be low when compared to staff time per service in other countries where the PHC-CAP tool was applied (e.g., Kenya).
- To estimate normative inpatient costs, the analysis leveraged data from the WHO-CHOICE estimates, using the ratio between cost per outpatient service and cost per inpatient bed days. If the growth of inpatient cost outpaced the outpatient cost since the publication of WHO-CHOICE, normative cost estimates would increase.
- Overhead rates for normative costs were estimated for each facility level using staffing and salary data from our sample of facilities as well as using budget estimates for a model health post, health clinic and health center shown in Annex 2.

7. CONCLUSIONS AND RECOMMENDATIONS

The data presented in this report can support the Governments of Kano and Kaduna and key stakeholders to better understand the cost of reaching PHC coverage targets; identify potential issues related to allocative and technical efficiency of resource allocation for service provision; and facilitate advocacy, resource mobilization, planning, and budgeting. Given the structure of the Nigerian health system, advocacy based on these study results should be aimed at decision makers in local, state, and federal government and in development partner organizations.

Despite a growing emphasis on strengthening public PHC service provision in the two states, the study results indicate that there is a sizable financial gap between the actual resources for PHC services and the estimated normative costs. In Kano, the 2019 actual cost per capita was NGN 5620 (USD 17.8) and NGN 7,532 (USD 23.8) in Kaduna. The estimated resources required to provide PHC services according to normative guidelines are NGN 14,030 (USD 44.3) in Kano and NGN 14,332 (USD 45.3) in Kaduna. Although substantial additional resources will be required to close the PHC resource gap, improving the efficiency of current health expenditures for PHC in Kano and Kaduna would likely also contribute to reducing the identified gap.

The study results point to several opportunities to improve the overall efficiency of PHC services in the two states. For example, differences in staffing patterns by state suggest that the overall distribution of staff among facilities should be better managed with clinical and non-clinical staffing guidelines for each facility level delineated in the national MSP better enforced and accompanied with the necessary financial resources. Moreover, variation in numbers of services provided by clinical staff indicates that staff utilization is low and health worker efficiency could be significantly improved. Also, the high proportions of outpatient services provided in hospitals suggests that there is potential to improve the demand and quality of services at lower-level facilities. There is a need to harmonize, clarify, and enforce the quality of services that should be offered at specific levels of the PHC system. There is also an opportunity to improve the overall efficiency of care by instituting a referral system (and/or gatekeeping practices) and better informing patients of the referral process.

Supplemental data collection and analysis would be helpful to have a more comprehensive understanding of overall PHC expenditures and quality of service provision. For example, to more accurately estimate the total cost of PHC services, it would be necessary to capture health insurance contributions (health insurance fund and private insurance packages) and OOP expenditures in both states. To better understand the complete universe of PHC service providers, it would have been useful to capture private providers and health facilities run by faith-based organizations and non-governmental organizations. More detailed information on human resources including data on absenteeism, idle staff time, and service quality (e.g., captured through clinical vignettes) would also be important.

Future cost analyses would benefit from the availability of reliable electronic data sources which could considerably reduce the time necessary for primary data collection at health facilities and allow for recurrent analyses to guide resource allocation. The issues encountered in the sample selection and the inconsistencies between categorizations of health facilities in the Master Health Facility List and the categorization encountered in the facilities during data collection underscores the need for up-to-date facility lists in both states and nationally. Data collection of service data from facility registers in sampled facilities relied mostly on paper registers which were often missing or incomplete. Comparisons between data collected from facility registers and data in the DHIS2 were largely inconsistent. We endorse the call of the recent Lancet Nigeria Commission (2022) to urgently move away from paper-based.[53]

[53] Abubakar I, Dalglish SL, Angell B, Sanuade O, Abimbola S, Adamu AL, et al. The Lancet Nigeria Commission: investing in health and the future of the nation. The Lancet. 2022 Mar; S0140673621024880.

The inputs and prices of drugs, medical supplies, and labor and facility operational expenditures were similarly difficult to collect from facilities and from states underscoring the need for greater transparency and more systematic tracking of cost and expenditure data. The implementation of and access to routine data capture through the use of Logistics Management Information systems (used for tracking drug consumption at the state level) would allow for more accurate drug expenditure tracking. Moreover, the institutionalization of drug expenditure tracking (based on the System of Health Accounts (SHA) 2011 methodology) combined with use of electronic point-of-sale systems and electronic medical records in all public health facilities would facilitate more accurate drug expenditure tracking. Similarly, the implementation of human resource information systems would facilitate monitoring the distribution of health workers and addressing human resource shortages and excesses and skill mix imbalances.

Finally, we note that this study is based on data that precedes the COVID-19 pandemic and it is important that future PHC planning and resource mobilization consider the impact that COVID-19 has and will continue to have on PHC service provision and costs. National data for Nigeria suggests that COVID-19 led to reductions in outpatient visits, childhood vaccinations, and reproductive and maternal health services.[54] Additional issues that may impact the demand for PHC services in Kano and Kaduna that should be considered closely are food security and nutrition concerns arising from security and climate change issues in both states.

[54] Shapira G, Ahmed T, Drouard SHP, et al. Disruptions in maternal and child health service utilization during COVID-19: analysis from eight sub-Saharan African countries. Health Policy Plan. 2021;36(7):1140-1151.

ANNEXES

Annex 1. Normative costs per service in Kano and Kaduna, NGN

Table 10. Normative PHC costs per service (Kano)

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
101	Antenatal	5,198	3,281,289	22.5%	736,978	3,830,936,114
102	Diagnose/treat malaria	2,784	3,281,289	3.5%	115,173	320,658,296
103	Diagnose/treat severe malaria	6,805	3,281,289	0.7%	21,985	149,610,706
104	Diagnose/treat anemia	1,113	3,281,289	13.7%	450,193	500,864,079
105	PMTCT/HIV-no cost antiretroviral (ARV)	85,787	3,281,289	0.4%	12,469	1,069,665,857
106	Treatment of syphilis	5,358	3,281,289	0.4%	11,813	63,293,769
107	Treat other STIs apart from syphilis	2,265	3,281,289	1.2%	39,375	89,179,086
108	Basic obstetric care (normal delivery)	4,079	3,281,289	16.6%	545,350	2,224,297,182
109	Provide Vit A to post-partum woman	1,038	3,281,289	1.4%	44,954	46,665,017
110	Emergency obstetric care - post-abortion care	4,126	3,281,289	2.5%	81,048	334,436,225
111	Labor complications (Severe pre-eclampsia/Eclampsia) - pre-referral	5,454	3,281,289	0.3%	8,859	48,315,739
112	Labor complications (post-partum hemorrhage - heavy bleeding) - pre-referral	6,390	3,281,289	0.6%	18,375	117,421,910
113	Labor complications (obstructed labor) - pre-referral	976	3,281,289	2.5%	81,704	79,705,505
114	Labor complications (sepsis) - pre-referral	13,160	3,281,289	0.3%	10,172	133,866,238
115	Postnatal care	3,734	3,281,289	16.6%	545,350	2,036,317,154
201	Manage neonatal tetanus (refer to next level SCBU)	476	545,258	1.2%	6,543	3,113,585
202	Initiation of early breastfeeding (within 30mins after birth)	138	545,258	100.0%	545,258	75,283,392
203	Prevent new-born infection (e.g. using chlorhexidine gel)	536	545,258	100.0%	545,258	292,371,651
204	Prevent and manage new-born hypo/hyperthermia	28	545,258	24.2%	131,843	3,640,705
205	Early asphyxia identification and management	148	545,258	3.3%	18,103	2,672,190
206	Prevent and manage ophthalmic neonatorum	349	545,258	1.1%	5,998	2,091,739
207	Identification and management of sick new-born (sepsis)	2,187	545,258	4.3%	23,283	50,930,132
208	Care of preterm and/or low birth weight new-born	268	545,258	27.2%	148,310	39,805,631
301	Identification of eligible pregnant women and children	306	545,258	100.0%	545,258	167,049,602
302	Immunization services TD, BCG, OPV, DPT, YF, MMR etc.	15,359	545,258	100.0%	545,258	8,374,647,303

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
303	Immunization trend follow up	218	545,258	100.0%	545,258	119,055,221
304	Adverse effect following immunization (AEFI)	1,440	545,258	5.0%	27,263	39,249,777
305	Assist in the identification of acute flaccid paralysis (AFP)	67	2,950,241	1.2%	36,583	2,454,668
306	Monitor ORT/ feeding for diarrhea	965	2,950,241	10.0%	295,024	284,785,552
307	Pneumonia treatment	414	2,950,241	10.0%	295,024	122,201,320
308	Treat ARI with antibiotics	301	2,950,241	10.0%	295,024	88,843,150
309	Treat measles	292	2,950,241	2.0%	58,120	16,979,023
310	Treatment of malaria	1,389	2,950,241	69.7%	2,057,203	2,857,857,989
401	Counselling and motivation for FP	358	3,281,289	69.6%	2,283,777	818,383,791
402	Dispensing of male and female condoms	1,268	6,655,075	50.0%	3,327,537	4,220,630,150
403	Dispensing of oral contraceptives	1,819	3,281,289	3.5%	115,830	210,700,102
404	Administering injectables	10,469	3,281,289	7.1%	232,972	2,438,939,325
405	HCT and lab tests	276	3,281,289	31.0%	1,017,200	280,888,094
406	Insert implants	37,355	3,281,289	7.4%	242,159	9,045,922,128
407	Insert IUD	3,477	3,281,289	1.8%	58,079	201,911,708
501	HIV testing Services (HTS)	1,411	6,655,075	22.2%	1,479,423	2,087,601,760
502	Initiate anti-retroviral therapy (ART >10 years)	89,338	9,424,272	1.7%	162,097	14,481,512,617
503	Initiate anti-retroviral therapy (ART<10 years)	38,097	4,493,681	0.1%	5,392	205,432,516
504	Initiate anti-retroviral (ARV) for pregnant women	2,209	3,281,289	0.4%	12,469	27,545,155
505	Syndromic management of STIs	3,684	6,655,075	20.1%	1,335,674	4,920,682,593
601	TB testing	506	14,856,504	30.0%	4,456,951	2,257,144,779
602	Initiate TB treatment in adults (>25kg)	9,430	9,424,272	0.2%	20,733	195,517,690
603	Initiate TB treatment in children (<25kg)	14,559	4,493,681	0.1%	2,696	39,253,461
701	Malaria Prevention- Provide LLINs	231	2,950,241	100.0%	2,950,241	682,311,976
702	Malaria diagnosis	724	11,906,263	25.4%	3,023,000	2,187,736,847
703	Treatment of uncomplicated malaria	1,172	11,906,263	22.6%	2,688,434	3,151,647,646
704	Treatment of severe malaria (pre-referral management)	25,993	11,906,263	2.8%	334,566	8,696,224,636
801	Vaccinate hepatitis B negative individuals	5,159	14,311,246	7.0%	1,001,787	5,168,636,864
802	Screening and diagnosis of hepatitis infection	424	14,311,246	25.0%	3,577,812	1,518,479,920
803	Life course vaccine for adolescents and adult (HBV/HPV)	228	874,333	100.0%	874,333	199,466,316
901	Preventive chemotherapy	462	11,906,263	85.0%	10,120,323	4,673,441,244
902	Screening and diagnosis of NTDs	276	11,906,263	85.0%	10,120,323	2,794,612,000
903	Provide treatments for cases of NTDs	276	11,906,263	85.0%	10,120,323	2,794,612,000
1001	Soil transmitted helminths	0	11,906,263	85.0%	10,120,323	0
1002	Schistosomiasis	0	11,906,263	17.4%	2,070,499	0

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
1101	Screening and diagnosis of EPDs	552	14,856,504	100.0%	14,856,504	8,204,908,585
1102	Provide treatments for cases of EPDs	884	14,856,504	100.0%	14,856,504	13,127,853,736
1201	Identification of cases of minor ailments	201	14,856,504	10.0%	1,485,650	299,055,265
1202	Provide treatments of minor ailments	608	14,856,504	10.0%	1,485,650	902,539,944
1301	Provision of micronutrients, vitamin A supplementation for children	74	2,950,241	100.0%	2,950,241	218,608,789
1302	Management of moderate malnutrition	1,329	2,950,241	57.0%	1,681,637	2,235,245,785
1303	Management of severe malnutrition	28,164	2,950,241	30.0%	885,072	24,927,050,680
1304	Food demonstration	201	2,950,241	57.0%	1,681,637	338,506,643
1305	Deworming for under-5s	197	2,950,241	100.0%	2,950,241	581,488,448
1306	Nutrition screening	285	2,950,241	100.0%	2,950,241	841,620,919
1307	Promotion of exclusive breastfeeding	178	545,258	100.0%	545,258	97,098,364
1308	Promotion of use of iodized salt	125	3,281,289	100.0%	3,281,289	411,011,566
1309	Promotion of dietary diversification	40	3,281,289	100.0%	3,281,289	132,101,982
1310	Complications of worm infestation	1,618	3,281,289	100.0%	3,281,289	5,307,609,128
1401	Informing, educating and communicating necessary behavior change messages	126	14,856,504	20.0%	2,971,301	375,049,537
1403	Community mobilization for health	135	14,856,504	20.0%	2,971,301	401,568,288
1404	Home visits and community outreach	90	14,856,504	20.0%	2,971,301	267,712,192
1501	Screening for risk of adverse cardiovascular event	71	2,538,321	25.0%	634,580	45,295,519
1502	Screening for sore throat, fever, and joint pains to rule out acute rheumatic fever	335	2,538,321	20.9%	531,271	178,237,634
1503	Counselling on lifestyle management based on findings from risk assessment	268	2,538,321	20.9%	531,271	142,590,107
1504	Commence aspirin in individuals with high risk of adverse cardiovascular event	2,509	2,538,321	20.9%	531,271	1,333,015,904
1505	Commence statins in individuals with high cholesterol	238	2,538,321	20.9%	531,271	126,404,695
1506	Referral to secondary/tertiary health facilities for further management	335	2,538,321	20.9%	531,271	178,237,634
1507	Support for self- management	134	2,538,321	20.9%	531,271	71,295,054
1601	Urgent and facilitated referral through an escort if BP >180/>110 mm Hg	3,644	5,293,491	6.1%	322,903	1,176,746,219
1602	Refer if SBP ≥140 or DBP ≥ 90 mmHg in people < 40 yrs	469	5,495,142	17.9%	985,828	462,713,315
1603	Initiate drug treatment if SBP ≥130 or ≥ DBP 90 mmHg with diabetes	1,272	5,293,491	1.0%	53,994	68,696,982
1604	Initiate lifestyle management if SBP ≥120 or DBP ≥ 80 mmHg	497	5,293,491	28.9%	1,529,819	760,395,677
1605	Commence drug treatment if persistent BP ≥140/90 mm Hg	784	5,293,491	28.9%	1,529,819	1,199,818,159

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
1606	Support for self-management and care (e.g. regular blood pressure monitoring)	15,164	5,293,491	28.9%	1,529,819	23,198,871,222
1701	Screening for various types of diabetes	143	6,534,230	25.0%	1,633,558	234,305,190
1702	Pre-referral treatment for hyperglycemic hyperosmolar sickness	7,758	6,534,230	2.9%	190,146	1,475,212,021
1801	Screening and examination	5,383	2,436,034	33.3%	811,930	4,370,912,618
1802	Promotion of self-breast examination	59	2,436,034	33.3%	811,930	48,136,499
1803	Cervical cancer (pap smear)	263	2,436,034	33.3%	811,930	213,357,987
1901	Identification and screening of arthritis	95	1,891,576	25.0%	472,894	44,857,966
1902	Management of arthritis	1,620	1,891,576	20.0%	378,315	612,848,807
2001	Treatment of minor eye infections with topical eye drugs	134	14,856,504	10.0%	1,485,650	199,370,176
2002	Allergic conjunctivitis/foreign body in eyes	1,618	14,856,504	10.0%	1,485,650	2,403,326,227
2003	Infective conjunctivitis/pustule in the eyelid	2,386	14,856,504	10.0%	1,485,650	3,545,018,846
2101	Screening and examination of COPD	147	970,775	4.1%	39,996	5,874,001
2102	Management of COPD	2,565	970,775	4.1%	39,996	102,591,396
2103	Management of asthma	2,200	14,856,504	3.6%	533,348	1,173,366,686
2104	Support for self-management and care of asthma	497	14,856,504	3.6%	533,348	265,100,596
2201	Identification and screening of mental disorders	1,016	14,856,504	9.2%	1,365,313	1,387,066,269
2202	Management of depression	357	14,856,504	2.7%	401,126	143,159,120
2203	Management of epilepsy	402	14,856,504	0.5%	68,340	27,500,563
2204	Management of psychosis	981	14,856,504	0.2%	23,770	23,315,393
2205	Management and treatment of dementia cases	523	970,775	1.8%	17,377	9,095,819

Table 11. Normative PHC costs per service (Kaduna)

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
101	Antenatal	5,843	2,115,798	22.4%	473,727	2,767,824,378
102	Diagnose/treat malaria	2,403	2,115,798	3.5%	74,265	178,461,628
103	Diagnose/treat severe malaria	6,968	2,115,798	0.7%	14,176	98,781,171
104	Diagnose/treat anemia	1,419	2,115,798	13.7%	289,441	410,686,791
105	PMTCT/HIV-no cost antiretroviral (ARV)	85,785	2,115,798	0.4%	8,040	689,717,851
106	Treatment of syphilis	5,417	2,115,798	0.4%	7,617	41,258,347
107	Treat other STIs apart from syphilis	2,095	2,115,798	1.2%	25,390	53,179,047
108	Basic obstetric care (normal delivery)	4,029	2,115,798	16.6%	350,588	1,412,622,356
109	Provide Vit A to post-partum woman	1,076	2,115,798	1.4%	28,986	31,199,605
110	Emergency obstetric care - post-abortion care	4,305	2,115,798	2.5%	52,260	224,992,426

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
111	Labor complications (Severe pre-eclampsia/Eclampsia) - pre-referral	5,441	2,115,798	0.3%	5,713	31,079,816
112	Labor complications (post-partum hemorrhage - heavy bleeding) - pre-referral	7,514	2,115,798	0.6%	11,848	89,024,070
113	Labor complications (obstructed labor) - pre-referral	1,072	2,115,798	2.5%	52,683	56,482,812
114	Labor complications (sepsis) - pre-referral	16,109	2,115,798	0.3%	6,559	105,659,369
115	Postnatal care	3,792	2,115,798	16.6%	350,588	1,329,399,776
201	Manage neonatal tetanus (refer to next level SCBU)	547	350,520	100.0%	350,520	191,824,763
202	Initiation of early breastfeeding (within 30mins after birth)	138	350,520	100.0%	350,520	48,322,402
203	Prevent new-born infection (e.g. using chlorhexidine gel)	536	350,520	100.0%	350,520	187,730,646
204	Prevent and manage new-born hypo/hyperthermia	28	350,520	24.2%	84,756	2,336,871
205	Early asphyxia identification and management	148	350,520	3.3%	11,637	1,717,332
206	Prevent and manage ophthalmic neonatorum	327	350,520	1.1%	3,856	1,259,186
207	Identification and management of sick new-born (sepsis)	2,806	350,520	4.3%	14,967	41,991,074
208	Care of preterm and/or low birth weight new-born	277	350,520	27.2%	95,341	26,453,334
301	Identification of eligible pregnant women and children	405	350,520	100.0%	350,520	142,005,766
302	Immunization services TD, BCG, OPV, DPT, YF, MMR etc.	15,609	350,520	100.0%	350,520	5,471,328,604
303	Immunization trend follow up	253	350,520	100.0%	350,520	88,722,894
304	Adverse effect following immunization (AEFI)	1,713	350,520	5.0%	17,526	30,023,431
305	Assist in the identification of acute flaccid paralysis (AFP)	69	1,879,985	1.2%	23,312	1,617,018
306	Monitor ORT/ feeding for diarrhea	1,192	1,879,985	10.0%	187,999	224,149,525
307	Pneumonia treatment	529	1,879,985	10.0%	187,999	99,461,701
308	Treat ARI with antibiotics	378	1,879,985	10.0%	187,999	71,007,763
309	Treat measles	262	1,879,985	2.0%	37,036	9,713,826
310	Treatment of malaria	1,685	1,879,985	69.7%	1,310,914	2,209,533,836
401	Counselling and motivation for FP	393	2,115,798	69.6%	1,472,595	578,903,678
402	Dispensing of male and female condoms	1,277	4,291,933	50.0%	2,145,966	2,741,383,746
403	Dispensing of oral contraceptives	1,837	2,115,798	3.5%	74,688	137,214,898
404	Administering injectables	10,648	2,115,798	7.1%	150,222	1,599,556,821
405	HCT and lab tests	276	2,115,798	31.0%	655,897	180,842,968
406	Insert implants	37,603	2,115,798	7.4%	156,146	5,871,632,006
407	Insert IUD	3,855	2,115,798	1.8%	37,450	144,364,287

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
501	HIV testing Services (HTS)	1,687	4,291,933	89.0%	3,818,103	6,440,217,533
502	Initiate anti-retroviral therapy (ART >10 years)	88,980	6,077,621	1.7%	104,535	9,301,533,462
503	Initiate anti-retroviral therapy (ART<10 years)	37,738	2,869,956	0.1%	3,444	129,968,657
504	Initiate anti-retroviral (ARV) for pregnant women	1,970	2,115,798	0.4%	8,040	15,840,970
505	Syndromic management of STIs	3,537	4,291,933	20.1%	861,391	3,046,544,944
601	TB testing	631	9,550,520	30.0%	2,865,156	1,806,924,099
602	Initiate TB treatment in adults (>25kg)	9,783	6,077,621	0.2%	13,371	130,810,751
603	Initiate TB treatment in children (<25kg)	11,551	2,869,956	0.1%	1,722	19,889,690
701	Malaria Prevention- Provide LLINs	249	1,879,985	100.0%	1,879,985	467,475,126
702	Malaria diagnosis	741	7,670,535	25.4%	1,947,549	1,444,009,032
703	Treatment of uncomplicated malaria	1,237	7,670,535	22.6%	1,732,007	2,142,535,240
704	Treatment of severe malaria (pre-referral management)	25,663	7,670,535	2.8%	215,542	5,531,368,731
801	Vaccinate hepatitis B negative individuals	5,505	9,200,000	7.0%	644,000	3,545,042,381
802	Screening and diagnosis of hepatitis infection	783	9,200,000	25.0%	2,300,000	1,800,771,648
803	Life course vaccine for adolescents and adult (HBV/HPV)	236	563,078	100.0%	563,078	132,796,252
901	Preventive chemotherapy	429	7,670,535	85.0%	6,519,955	2,793,986,962
902	Screening and diagnosis of NTDs	246	7,670,535	85.0%	6,519,955	1,605,752,306
903	Provide treatments for cases of NTDs	276	7,670,535	85.0%	6,519,955	1,797,671,302
1001	Soil transmitted helminths	0	7,670,535	85.0%	6,519,955	0
1002	Schistosomiasis	0	7,670,535	17.4%	1,333,906	0
1101	Screening and diagnosis of EPDs	551	9,550,520	100.0%	9,550,520	5,266,507,657
1102	Provide treatments for cases of EPDs	882	9,550,520	100.0%	9,550,520	8,426,412,251
1201	Identification of cases of minor ailments	208	9,550,520	10.0%	955,052	198,740,777
1202	Provide treatments of minor ailments	776	9,550,520	10.0%	955,052	741,071,190
1301	Provision of micronutrients, vitamin A supplementation for children	79	1,879,985	100.0%	1,879,985	148,264,515
1302	Management of moderate malnutrition	1,434	1,879,985	48.1%	904,273	1,296,542,558
1303	Management of severe malnutrition	27,867	1,879,985	22.1%	415,477	11,578,278,455
1304	Food demonstration	208	1,879,985	48.1%	904,273	188,173,921
1305	Deworming for under-5s	198	1,879,985	100.0%	1,879,985	371,569,138
1306	Nutrition screening	305	1,879,985	100.0%	1,879,985	573,251,979
1307	Promotion of exclusive breastfeeding	250	350,520	100.0%	350,520	87,500,617
1308	Promotion of use of iodized salt	127	2,115,798	100.0%	2,115,798	267,899,901
1309	Promotion of dietary diversification	42	2,115,798	100.0%	2,115,798	88,057,061
1310	Complications of worm infestation	2,207	2,115,798	100.0%	2,115,798	4,668,953,096
1401	Informing, educating and communicating necessary behavior change messages	172	9,550,520	20.0%	1,910,104	327,740,779

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
1403	Community mobilization for health	175	9,550,520	20.0%	1,910,104	335,150,950
1404	Home visits and community outreach	117	9,550,520	20.0%	1,910,104	223,433,966
1501	Screening for risk of adverse cardiovascular event	105	1,642,126	25.0%	410,532	42,991,552
1502	Screening for sore throat, fever, and joint pains to rule out acute rheumatic fever	347	1,642,126	20.9%	343,697	119,202,264
1503	Counselling on lifestyle management based on findings from the risk assessment	277	1,642,126	20.9%	343,697	95,361,811
1504	Commence aspirin in individuals with high risk of adverse cardiovascular event	2,506	1,642,126	20.9%	343,697	861,217,816
1505	Commence statins in individuals with high cholesterol	274	1,642,126	20.9%	343,697	94,045,423
1506	Referral to secondary/tertiary health facilities for further management	347	1,642,126	20.9%	343,697	119,202,264
1507	Support for self- management	139	1,642,126	20.9%	343,697	47,680,906
1601	Urgent and facilitated referral through an escort if BP >180/>110 mm Hg	1,543	3,408,267	6.1%	207,904	320,811,799
1602	Refer if SBP ≥140 or DBP ≥ 90 mmHg in people < 40 yrs	223	3,538,645	17.9%	634,833	141,649,873
1603	Initiate drug treatment if SBP ≥130 or ≥ DBP 90 mmHg with diabetes	1,466	3,408,267	1.0%	34,764	50,969,255
1604	Initiate lifestyle management if SBP ≥120 or DBP ≥ 80 mmHg	635	3,408,267	28.9%	984,989	625,337,095
1605	Commence drug treatment if persistent BP ≥140/90 mm Hg	630	3,408,267	28.9%	984,989	620,533,438
1606	Support for self-management and care (e.g. regular blood pressure monitoring)	15,170	3,408,267	28.9%	984,989	14,942,628,803
1701	Screening for various types of diabetes	141	4,209,577	25.0%	1,052,394	148,613,528
1702	Pre-referral treatment for hyperglycemic hyperosmolar sickness	8,157	4,209,577	2.9%	122,499	999,268,464
1801	Screening and examination	5,293	1,568,514	33.0%	517,610	2,739,881,905
1802	Promotion of self-breast examination	70	1,568,514	33.0%	517,610	36,073,254
1803	Cervical cancer (pap smear)	258	1,568,514	33.0%	517,610	133,302,537
1901	Identification and screening of arthritis	112	1,222,931	25.0%	305,733	34,091,406
1902	Management of arthritis	1,649	1,222,931	20.0%	244,586	403,341,665
2001	Treatment of minor eye infections with topical eye drugs	139	9,550,520	10.0%	955,052	132,493,851
2002	Allergic conjunctivitis/foreign body in eyes	1,008	9,550,520	10.0%	955,052	962,304,663
2003	Infective conjunctivitis/pustule in the eyelid	1,590	9,550,520	10.0%	955,052	1,518,708,408
2101	Screening and examination of COPD	142	625,657	4.1%	25,777	3,671,412
2102	Management of COPD	2,217	625,657	4.1%	25,777	57,152,445
2103	Management of asthma	1,690	9,550,520	3.6%	342,864	579,353,883

ID	Service	Cost per case ($ NGN)	Target population size	Population in need rate	Population in need	Total cost ($ NGN)
2104	Support for self-management and care of asthma	635	9,550,520	3.6%	342,864	217,672,820
2201	Identification and screening of mental disorders	1,208	9,550,520	9.2%	877,693	1,060,637,532
2202	Management of depression	524	9,550,520	2.7%	257,864	135,019,761
2203	Management of epilepsy	575	9,550,520	0.5%	43,932	25,249,413
2204	Management of psychosis	1,056	9,550,520	0.2%	15,281	16,142,892
2205	Management and treatment of dementia cases	768	625,657	1.8%	11,199	8,600,571

Table 12. List of services with sources for population in need rates for normative costing (Kano and Kaduna)

ID	Services	Kano	Kaduna
101	Antenatal	Kano MSP	Kaduna MSP
102	Diagnose/treat malaria	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
103	Diagnose/treat severe malaria	Kotepui, M., Kotepui, K.U., Milanez, G.D. et al. Global prevalence and mortality of severe Plasmodium malariae infection: a systematic review and meta-analysis. Malar J 19, 274 (2020). https://doi.org/10.1186/s12936-020-03344-z	Kotepui, M., Kotepui, K.U., Milanez, G.D. et al. Global prevalence and mortality of severe Plasmodium malariae infection: a systematic review and meta-analysis. Malar J 19, 274 (2020). https://doi.org/10.1186/s12936-020-03344-z
104	Diagnose/treat anemia	Nigeria DHS. 2018.	Nigeria DHS. 2018.
105	PMTCT/HIV-no cost antiretroviral (ARV)	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
106	Treatment of syphilis	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
107	Treat other STIs apart from syphilis	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
108	Basic obstetric care (normal delivery)	Bankole et al.,The Incidence of Abortion in Nigeria. Int Perspect Sex Reprod Health. 2015 Dec;41(4):170-81. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4970740/	Bankole et al.,The Incidence of Abortion in Nigeria. Int Perspect Sex Reprod Health. 2015 Dec;41(4):170-81. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4970740/
109	Provide Vit A to post-partum woman	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
110	Emergency obstetric care - post-abortion care	Bankole et al.,The Incidence of Abortion in Nigeria. Int Perspect Sex Reprod Health. 2015 Dec;41(4):170-81. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4970740/	Bankole et al.,The Incidence of Abortion in Nigeria. Int Perspect Sex Reprod Health. 2015 Dec;41(4):170-81. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4970740/
111	Labor complications (Severe pre-eclampsia/Eclampsia) - pre-referral	Kirk and Chattopadhyay, A systematic review of the treatment and management of pre- eclampsia and eclampsia in Nigeria. Population Council. 2016.https://knowledgecommons.popcouncil.org/cgi/viewcontent.cgi?article=1657&context=departments_sbsr-rh	Kirk and Chattopadhyay, A systematic review of the treatment and management of pre- eclampsia and eclampsia in Nigeria. Population Council. 2016.https://knowledgecommons.popcouncil.org/cgi/viewcontent.cgi?article=1657&context=departments_sbsr-rh
112	Labor complications (post-partum hemorrhage - heavy bleeding) - pre-referral	Esike, Chidi Ochu Uzoma et al. "Eclampsia in rural Nigeria: The unmitigating catastrophe." Annals of African medicine vol. 16,4 (2017): 175-180. https://www.annalsafrmed.org/article.asp?issn=1596-3519;year=2017;volume=16;issue=4;spage=175;epage=180;aulast=Esike	Esike, Chidi Ochu Uzoma et al. "Eclampsia in rural Nigeria: The unmitigating catastrophe." Annals of African medicine vol. 16,4 (2017): 175-180. https://www.annalsafrmed.org/article.asp?issn=1596-3519;year=2017;volume=16;issue=4;spage=175;epage=180;aulast=Esike
113	Labor complications (obstructed labor) - pre-referral	Hoque, Monjurul. "Incidence of Obstetric and Foetal Complications during Labor and Delivery at a Community Health Centre, Midwives Obstetric Unit of Durban, South Africa." ISRN obstetrics and gynecology vol. 2011 (2011): 259308. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3147131/	Hoque, Monjurul. "Incidence of Obstetric and Foetal Complications during Labor and Delivery at a Community Health Centre, Midwives Obstetric Unit of Durban, South Africa." ISRN obstetrics and gynecology vol. 2011 (2011): 259308. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3147131/

ID	Services	Kano	Kaduna
114	Labor complications (sepsis) - pre-referral	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
115	Postnatal care	Kano MSP	Kaduna MSP
201	Manage neonatal tetanus (refer to next level SCBU)	Adeyemo FO, Abioye TA, Felicia AE, Usunobun A. Incidence of neonatal tetanus in a Nigerian State Hospital, Benin, Nigeria. J Health Res Rev 2016;3:102-6. https://www.jhrr.org/article.asp?issn=2394-2010;year=2016;volume=3;issue=3;spage=102;epage=106;aulast=Adeyemo	Kaduna MSP
202	Initiation of early breastfeeding (within 30mins after birth)	Kano MSP	Kaduna MSP
203	Prevent new-born infection (e.g. using chlorhexidine gel)	Kano MSP	Kaduna MSP
204	Prevent and manage new-born hypo/hyperthermia	Ogunlesi, Tinuade A et al. "Prevalence and risk factors for hypothermia on admission in Nigerian babies <72 h of age." Journal of perinatal medicine vol. 37,2 (2009): 180-4. https://www.researchgate.net/publication/23153057_Prevalence_and_risk_factors_for_hypothermia_on_admission_in_Nigerian_babies_72_h_of_age	Ogunlesi, Tinuade A et al. "Prevalence and risk factors for hypothermia on admission in Nigerian babies <72 h of age." Journal of perinatal medicine vol. 37,2 (2009): 180-4. https://www.researchgate.net/publication/23153057_Prevalence_and_risk_factors_for_hypothermia_on_admission_in_Nigerian_babies_72_h_of_age
205	Early asphyxia identification and management	use data from MSP but not sure where comes from	use data from Kano MSP but not sure where comes from
206	Prevent and manage ophthalmic neonatorum	Ochigbo et al., Prevalence of Ophthalmia Neonatorum in Calabar, South-South Nigeria: A 3-Year Review. https://ijn.mums.ac.ir/article_7646_08d3a84a8562da6931870ed7826abfd1.pdf	Ochigbo et al., Prevalence of Ophthalmia Neonatorum in Calabar, South-South Nigeria: A 3-Year Review. https://ijn.mums.ac.ir/article_7646_08d3a84a8562da6931870ed7826abfd1.pdf
207	Identification and management of sick new-born (sepsis)	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
208	Care of preterm and/or low birth weight new-born	MICS 2017	MICS 2017
301	Identification of eligible pregnant women and children	Kano MSP	Kaduna MSP
302	Immunization services TD, BCG, OPV, DPT, YF, MMR etc.	Kano MSP	Kaduna MSP
303	Immunization trend follow up	Kano MSP	Kaduna MSP
304	Adverse effect following immunization (AEFI)	Kano MSP	Kano MSP
305	Assist in the identification of acute flaccid paralysis (AFP)	Kano MSP	Kano MSP
306	Monitor ORT/ feeding for diarrhea	Kaduna MSP (UNICEF modeling)	Kaduna MSP
307	Pneumonia treatment	Kaduna MSP (UNICEF modeling)	Kaduna MSP
308	Treat ARI with antibiotics	Kaduna MSP (UNICEF modeling)	Kaduna MSP
309	Treat measles	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
310	Treatment of malaria	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.

ID	Services	Kano	Kaduna
401	Counselling and motivation for FP	DHS 2018 # of women 15-49 in union.	DHS 2018 # of women 15-49 in union.
402	Dispensing of male and female condoms	assume .5, no intervention for condoms for HIV prevention	
403	Dispensing of oral contraceptives	FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf	FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf
404	Administering injectables	FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf	FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf
405	HCT and lab tests	test for all women seek FP; FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf	test for all women seek FP; FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf
406	Insert implants	FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf	FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf
407	Insert IUD	FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf	FP 2030 http://www.track20.org/download/pdf/2021%20Country%20Briefs/English/Nigeria%202021%20Summary%20Brief.pdf
501	HIV testing Services (HTS)	assume 25%	Kaduna MSP
502	Initiate anti-retroviral therapy (ART >10 years)	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
503	Initiate anti-retroviral therapy (ART<10 years)	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
504	Initiate anti-retroviral (ARV) for pregnant women	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
505	Syndromic management of STIs	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
601	TB testing	Kaduna MSP (UNICEF modeling)	Kaduna MSP
602	Initiate TB treatment in adults (>25kg)	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
603	Initiate TB treatment in children (<25kg)	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
701	Malaria Prevention- Provide LLINs	Kano MSP	Kano MSP
702	Malaria diagnosis	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
703	Treatment of uncomplicated malaria		
704	Treatment of severe malaria (pre-referral management)	Kotepui, M., Kotepui, K.U., Milanez, G.D. et al. Global prevalence and mortality of severe Plasmodium malariae infection: a systematic review and meta-analysis. Malar J 19, 274 (2020). https://doi.org/10.1186/s12936-020-03344-z	Kotepui, M., Kotepui, K.U., Milanez, G.D. et al. Global prevalence and mortality of severe Plasmodium malariae infection: a systematic review and meta-analysis. Malar J 19, 274 (2020). https://doi.org/10.1186/s12936-020-03344-z

ID	Services	Kano	Kaduna
801	Vaccinate hepatitis B negative individuals	Lu, Peng-jun et al. "Hepatitis B vaccination coverage among high-risk adults 18-49 years, U.S., 2009." Vaccine vol. 29,40 (2011): 7049-57. https://pubmed.ncbi.nlm.nih.gov/21782873/	Lu, Peng-jun et al. "Hepatitis B vaccination coverage among high-risk adults 18-49 years, U.S., 2009." Vaccine vol. 29,40 (2011): 7049-57. https://pubmed.ncbi.nlm.nih.gov/21782873/
802	Screening and diagnosis of hepatitis infection	assume 25%	assume 25%
803	Life course vaccine for adolescents and adult (HBV/HPV)	assume 100%	assume 100%
901	Preventive chemotherapy	assume 85%	assume 85%
902	Screening and diagnosis of NTDs	Kano MSP	Kano MSP
903	Provide treatments for cases of NTDs	assume 85%	assume 85%
1001	Soil transmitted helminths	assume 85%	assume 85%
1002	Schistosomiasis	IHME. GBD, 2019. Nigeria.	IHME. GBD, 2019. Nigeria.
1101	Screening and diagnosis of EPDs	Kaduna MSP (UNICEF modeling)	Kaduna MSP
1102	Provide treatments for cases of EPDs	Kaduna MSP (UNICEF modeling)	Kaduna MSP
1201	Identification of cases of minor ailments	Kaduna MSP (UNICEF modeling)	Kaduna MSP
1202	Provide treatments of minor ailments	Kaduna MSP (UNICEF modeling)	Kaduna MSP
1301	Provision of micronutrients, vitamin A supplementation for children	Kaduna MSP (UNICEF modeling)	Kaduna MSP
1302	Management of moderate malnutrition	DHS 2018	DHS 2018
1303	Management of severe malnutrition	DHS 2018	DHS 2018
1304	Food demonstration	DHS 2018	DHS 2018
1305	Deworming for under-5s	Kaduna MSP (UNICEF modeling)	Kaduna MSP
1306	Nutrition screening	Kaduna MSP (UNICEF modeling)	Kaduna MSP
1307	Promotion of exclusive breastfeeding	Kano MSP	Kaduna MSP
1308	Promotion of use of iodized salt	Kano MSP	Kaduna MSP
1309	Promotion of dietary diversification	Kano MSP	Kaduna MSP
1310	Complications of worm infestation	Kano MSP	Kaduna MSP
1401	Informing, educating and communicating necessary behavior change messages	Kano MSP	Kaduna MSP
1403	Community mobilization for health	Kano MSP	Kaduna MSP
1404	Home visits and community outreach	Kano MSP	Kaduna MSP

ID	Services	Kano	Kaduna
1501	Screening for risk of adverse cardiovascular event	assume 25%	assume 25%
1502	Screening for sore throat, fever, and joint pains to rule out acute rheumatic fever	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.
1503	Counselling on lifestyle management based on findings from the risk assessment	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.
1504	Commence aspirin in individuals with high risk of adverse cardiovascular event	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.
1505	Commence statins in individuals with high cholesterol	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.
1506	Referral to secondary/tertiary health facilities for further management	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.
1507	Support for self- management	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.	assume cardio disease prevalence IHME. GBD, 2019. Nigeria.
1601	Urgent and facilitated referral through an escort if BP >180/>110 mm Hg	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/ & Hendriks ME, Wit FWNM, Roos MTL, Brewster LM, Akande TM, de Beer IH, et al. (2012) Hypertension in Sub-Saharan Africa: Cross-Sectional Surveys in Four Rural and Urban Communities. PLoS ONE 7(3): e32638. https://doi.org/10.1371/journal.pone.0032638	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/ & Hendriks ME, Wit FWNM, Roos MTL, Brewster LM, Akande TM, de Beer IH, et al. (2012) Hypertension in Sub-Saharan Africa: Cross-Sectional Surveys in Four Rural and Urban Communities. PLoS ONE 7(3): e32638. https://doi.org/10.1371/journal.pone.0032638
1602	Refer if SBP ≥140 or DBP ≥ 90 mmHg in people < 40 yrs	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/
1603	Initiate drug treatment if SBP ≥130 or ≥ DBP 90 mmHg with diabetes	IHME. GBD, 2019. Nigeria. & Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/	IHME. GBD, 2019. Nigeria. & Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/
1604	Initiate lifestyle management if SBP ≥120 or DBP ≥ 80 mmHg	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of

ID	Services	Kano	Kaduna
		global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/	global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/
1605	Commence drug treatment if persistent BP ≥140/90 mm Hg	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/
1606	Support for self-management and care (e.g. regular blood pressure monitoring)	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/	Ezejimofor, Martinsixtus et al. "Magnitude and pattern of hypertension in the Niger Delta: a systematic review and meta-analysis of community-based studies." Journal of global health vol. 8,1 (2018): 010420. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997369/
1701	Screening for various types of diabetes	assume 25%	assume 25%
1702	Pre-referral treatment for hyperglycemic hyperosmolar sickness	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
1801	Screening and examination	Kano MSP	Kano MSP
1802	Promotion of self-breast examination	Kano MSP	Kano MSP
1803	Cervical cancer (pap smear)	Kano MSP	Kano MSP
1901	Identification and screening of arthritis	assume 25%	assume 25%
1902	Management of arthritis	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2001	Treatment of minor eye infections with topical eye drugs	Kaduna MSP (UNICEF modeling)	Kaduna MSP
2002	Allergic conjunctivitis/foreign body in eyes	Kaduna MSP (UNICEF modeling)	Kaduna MSP
2003	Infective conjunctivitis/pustule in the eyelid	Kaduna MSP (UNICEF modeling)	Kaduna MSP
2101	Screening and examination of COPD	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2102	Management of COPD	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2103	Management of asthma	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2104	Support for self-management and care of asthma	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2201	Identification and screening of mental disorders	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2202	Management of depression	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2203	Management of epilepsy	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2204	Management of psychosis	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria
2205	Management and treatment of dementia cases	IHME. GBD, 2019. Nigeria	IHME. GBD, 2019. Nigeria

Annex 2. Kano and Kaduna indirect cost estimation

The overhead factors for non-clinical labor were calculated using staffing and salary data from our sample of facilities. Table 13 and Table 14 show total salaries for clinical and non-clinical staff, by facility level and state, and the resulting overhead rate (ratio of non-clinical to clinical labor costs). Since STPs only include direct clinical labor, this overhead is added in proportion to STP labor cost.

Table 13. Estimation of overhead rate for non-clinical labor (Kano)

Indicator	Health post/clinic/center	Hospital
Clinical labor costs	7,202,122,644	1,704,864,956
Non-clinical labor costs	4,154,337,283	288,140,396
Overhead rate (non-clinical labor)[a]	58%	17%

[a] *The overhead rate from the sample may not be representative of the universe of health facilities. Contrary to the results obtained from our sample, standard budgets for non-clinical labour costs for lower-level health facilities and hospitals yield an overhead rate of 22.4% and 60%, respectively. However, when applying these overhead rates, there was an overall marginal difference to the total normative costs.*

Table 14. Estimation of overhead rate for non-clinical labor (Kaduna)

Indicator	Health post/clinic/center	Hospital
Clinical labor costs	14,842,421,415	6,360,831,039
Non-clinical labor costs	2,730,063,267	696,268,391
Overhead rate (non-clinical labor)	18%	11%

The overhead factors for operational expenses were calculated using budget estimates for a model health post, health clinic and health center in the costed MSPs. For health posts, we budgeted 2 clinical staff working for a total of 2,211 hours per year; for health clinics, we estimated 8 clinical staff working 8,844 hours per year; for health centers, we estimated 17 staff working 18,492 hours per year (see Table 15). The resulting operational cost factors (NGN 1.59 in health posts, NGN 1.81 in health clinics and NGN 2.40 in health centers) are expressed per staff-minute. Given the fluctuating categorization (between health post, health clinic, and health center), we applied an average operational cost factor (NGN 1.93) to all lower-level facilities in both states. Normative operational costs are then estimated in proportion to human resource time requirements as per STPs. For hospitals, we used the value for health centers (NGN 2.40 per staff-minute).

Table 15. Estimation of overhead factor for operational expenses and non-clinical labor

Indicator	Health post	Health clinic	Health center
Operational expenses per month	NGN 17,583	NGN 80,083	NGN 221,667
Clinical staff working 1,005 hours per year (1)	1	4	10
Clinical staff working 1,206 hours per year (2)	1	4	7
Total staff-hours per year	2,211	8,844	18,492
Operational cost per staff-minute	NGN 1.59	NGN 1.81	NGN 2.40

(1) CHEW/JCEHW

(2) medical office/nurse/midwife/CHO

Source: Authors, based on costed MSPs, based on availed state budgets of previous fiscal periods

Annex 3. Summary of services provided by sampled facilities in Kano and Kaduna

Table 16. Summary of services provided by sampled facilities in Kano

Facility level	Facility	Outpatient visits	Inpatient bed days	Weighted output
Health post	Buda	3,838	0	3,838
	Bugai	1,920	0	1,920
	Datti Wudilawa	1,924	0	1,924
	Dausara	2,498	0	2,498
	Iyawa	1,134	0	1,134
	Tsohuwar Rogo	425	0	425
	Yanhamar	1,782	0	1,782
Health clinic	Aisami	4,007	0	4,007
	Burum Burum	3,234	0	3,234
	Chula	1,358	0	1,358
	Dalawa	1,157	0	1,157
	Dogon Marke	1,180	0	1,180
	Gasgainu	976	0	976
	Gora	2,020	0	2,020
	Romo	2,229	0	2,229
Health center	Chiranchi	13,034	0	13,034
	Emir Palace	2,532	0	2,532
	Getso	12,786	0	12,786
	Laraba Takuya	994	0	994
	Panda	1,660	0	1,660
	Wangara	2,435	0	2,435
General hospital	Bichi	104,436	5,239	124,656
	Bokavu	3,469	596	5,769
	Wudil	20,400	23,234	110,070

Service data source: DHIS2

One sampled hospital Sir Mohammad Sanusi Specialist Hospital was excluded from the analysis due to its size and complexity.

Table 17. Summary of services provided by sampled facilities in Kaduna

Facility level	Facility	Outpatient visits	Inpatient bed days	Weighted output
Health post	Ajangwai-Aboro	685	47	892
Health clinic	Hayin Ojo	3,028	5	3,050
	Palladan	3,253	1	3,257
	Jidda	608	1	612
	Anguwan Amadu Dogo	1,084	20	1,172
	Kyadi	1,443	0	1,443
	Nagarshang-Fada	1,096	0	1,096
	Gauta	937	13	994
	Kauru	2,903	359	4,482
	Kadage	2,008	401	3,772
Health center	Danjinjiri	2,086	0	2,086
	Basawa	2,920	0	2,920
	Narict	1,909	222	2,886
	Kubau	2,868	212	3,801
	Maraban Agban	659	0	659
	Dandaura	3,212	576	5,746
	Kwassam	2,635	474	4,720
	Doka (Zakari Isah)	7,553	0	7,553
	Hayin Banki	1,487	0	1,487
	Zango Road	5,795	0	5,795
	Kabala West	3,971	67	4,266
General hospital	Gambo Sawaba	29,824	23,488	120,474
	Kwoi	6,133	7,826	36,337
	Kauru West	3,131	917	6,670
	Kawo	16,138	1,927	23,575

Service data source: DHIS2

One sampled hospital Narict Medical Center was reclassified as a health center based on number of staff and volume of services.