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A Decade after the Implementation of Primary Healthcare Under One Roof: Policy Evaluation and Recommendations for Integrated Quality Healthcare Delivery in Nigeria

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Abstract

This study sought to evaluate the progress made over a decade of implementing the Primary Healthcare Under One Roof (PHCUOR) policy in Nigeria. A longitudinal study design using predefined scorecard was used. The scorecards are Scorecard 2 (2014) to Scorecard 6 (2022); Scorecard 1 (2012), corresponding to the programme's inaugural year, was unavailable and therefore excluded. Data on state scores across the thirty-six states and the Federal Capital Territory were extracted and recorded. The primary outcome was the cumulative national progress achieved over the study period, while the secondary outcome assessed performance across each of the nine PHCUOR pillars. A Linear Mixed-Effects Model (LMEM) was used to evaluate overall policy progress. At the same time, the K-nearest neighbour (KNN) machine learning algorithm was applied to cluster states into three performance categories. Analyses were conducted in Python version 3 via Google Colab. The mean progress coefficient for PHCUOR implementation across the nation was 56.4±26.8. Despite a statistically significant overall improvement ($P < 0.05$) from baseline (Scorecard 2) to endline (Scorecard 6), substantial variation was observed across the nine pillars. Progress coefficients, from lowest to highest, were: Legislation (3.999), Office Set-up (5.599), Governance and Ownership (8.199), Minimum Service Package (8.599), Operational Guideline (11.199), System Development (11.699), Repositioning (12.499), Funding Sources (14.599), and Human Resources (16.799). While some states are struggling to meet implementation targets, others are excelling. Underperforming states need to prioritise legislative enactment and office set-up as critical enablers of improved access to quality healthcare and better health outcomes in Nigeria.

Clinical Trial Registration

Not applicable

Introduction

Globally, access to quality healthcare remains a major challenge and according to the World Health Organisation (WHO) [1], at least 50% of the world's population lacks access to essential healthcare services, with over 100 million people pushed into extreme poverty because of health expenditure [1]. Current evidence indicates that approximately 800 million people spend at least 10% of their household budgets on healthcare for themselves, a sick child, or another family member [1]. These expenses are sufficient to push an estimated 100 million of them into extreme poverty, forcing them to survive on $1.90 or less per day [1]. Populations in sub-Saharan Africa experience some of the poorest access to essential health care, and a report from the Legatum Institute [2] revealed that Nigeria ranks 162 out of 167 countries in health performance, placing the nation's health system among the worst-performing globally with limited access to quality healthcare especially in rural communities. A major problem in the Nigerian healthcare system, particularly at the primary healthcare level, which serves most of the population, is fragmentation [3]. Even though 70% of Nigerians rely on primary healthcare centres (PHCs) for their health needs, only 20% of these facilities are fully functional and therefore a great number of the population lack access to essential healthcare [4]. This fragmentation impairs effective management of

the system, undermines accountability, and compromises quality improvement efforts, including health policies aimed at realising Universal Health Coverage (UHC) across the country [5, 6, 7].

The health system in Nigeria comprises both public and private healthcare systems, managed by the government and private individuals, respectively. The system is further categorised into primary, secondary, and tertiary levels, which are managed by the local government area (LGA), state, and federal governments, respectively. The primary level comprises 34,076 PHCs distributed across wards, LGAs, and states, which fall under the purview of the LGA authority and account for more than 85.3% of total hospitals and clinics in the country [8]. Evidence indicates that the LGA level, where PHC implementation occurs, is the weakest tier of governance in Nigeria and is associated with poor accountability, corruption, and inadequate resource management, all of which contribute to underperformance of the health system with resultant limited capacity in the delivery of quality healthcare services [9, 10]. Within PHCs, the proliferation of fragmented and parallel vertical health programmes by implementing partners and government agencies has resulted in poor access to quality, comprehensive, and integrated primary health care services in the country [5]. The immediate consequence of such a service delivery model is poor uptake of PHC services, rendering many facilities moribund and undermining efforts towards Universal Health Coverage (UHC). The longer-term impact of weak primary healthcare systems is reflected in poor maternal and child health indicators, while increased access to functional PHCs has been associated with declines in maternal and newborn deaths [11, 12].

Evidence from the 2018 National Demographic and Health Survey (NDHS) indicates that common preventable conditions such as malnutrition, malaria, and diarrhoea are the major causes of morbidity and mortality among children [13], while preventable obstetric complications, including postpartum haemorrhage, eclampsia, and sepsis, are the leading causes of maternal deaths [14]. These deaths are preventable through a strengthened health system capable of delivering antenatal care, skilled birth attendance, and postnatal care based on global standards of care [13]. Over the past five years, Nigeria's maternal mortality ratio (MMR) has remained among the worst globally. In 2015, the MMR stood at 814 per 100,000 live births, while estimates for 2020 recorded 1047 per 100,000 live births. This represents a 22.3% increase and this makes the country to contribute disproportionately to the high burden of global maternal mortality [15, 16]. Similarly, under-five mortality rates have shown insufficient decline relative to Sustainable Development Goal (SDG) 3.2 targets. In 2015, the under-five mortality rate was 117 per 1,000 live births, declining marginally to 107.2 per 1,000 live births in 2022. At this trajectory, it is evident that Nigeria is far from achieving the SDGs and the objectives of the PHCUOR policy, which is critical to addressing the country's poor health indicators. The WHO has noted that these poor maternal and under-five indicators are a reflection of the country’s weak health system, further compounded by corruption, chronic underinvestment, and mismanagement of resources [6], within the context of a struggling economy that has pushed many into multidimensional poverty that has been recognised internationally [17]. This constrains access to basic health care, which is a fundamental right enshrined in the Alma-Ata Declaration of 1978 to improve health outcomes of populations [18].

Notable challenges identified within PHCs that have contributed to persistently poor services and outcomes include the inability to provide essential health care services due to inadequate human resources for health, lack of equipment, insufficient essential medicines and consumables, and poor infrastructure [19]. Furthermore, the WHO has noted that only a quarter of PHCs possess the minimum required equipment, with only 20% having the capacity to provide basic emergency obstetric care services which is critical for improving maternal and child health outcomes in Nigeria [20].

In addition to financial risk protection, there is an urgent need to ensure that the more than 30,000 PHCs are functional and capable of delivering the Basic Minimum Package of Healthcare necessary for the attainment of Universal Health Coverage (UHC) [9, 21]. Over the years, several policies and initiatives such as Saving One Million Lives, the Basic Healthcare Provision Fund, and the Primary Health Care Under One Roof (PHCUOR) policies have been introduced to promote access to quality integrated healthcare for all Nigerians [22, 23, 24, 25]. PHCUOR is a landmark intervention adopted in 2011 by the National Council of Health to address the fragmentation prevalent at the primary healthcare level, which had hitherto undermined the provision of comprehensive integrated health services consistent with the principles of the Alma-Ata Declaration of 1978 [26, 27]. The policy, which is aligned with the National Health Act, was envisioned as a solution to fragmented service delivery across PHCs in Nigeria and as a mechanism to bring vertical programmes under a single platform [27]. The harmonisation of all primary healthcare structures under one umbrella was intended to ensure an effective and efficient health system capable of delivering quality healthcare to all citizens and therefore transform maternal and child health outcomes [28].

The National Primary Healthcare Development Agency (NPHCDA) noted that the PHCUOR policy is grounded in principles that aligned with the WHO model for integrated district-based service delivery [29]. This includes integration of all PHC service delivery under one authority; a single management body with adequate capacity to control services and resources (including human resources for health and healthcare finances); decentralised authority, responsibility, and accountability; the "three ones" principles of one management, one strategic plan, and one monitoring and evaluation system; an integrated supportive supervision system; and an effective two-way referral system, underpinned by enabling legislation and regulations aimed at improved health outcomes in Nigeria [15]. Since the adoption of this policy, the Government of Nigeria and development partners like the DFID, the Bill & Melinda Gates Foundation, and the United States Agency for International Development (USAID) have made considerable efforts towards its implementation. By 2019, 75% of states had demonstrated commitment to implementing the policy to a notable degree, despite some disparities [28]. To monitor and evaluate progress, a scorecard was developed by NHED based on the nine pillars of PHCUOR [28]. These pillars are: Governance and Ownership, Legislation, Minimum Service Package, Repositioning, System Development, Operational Guideline, Human Resources for Health, Funding Sources and Structures, and Office Set-up [29].

Despite concerted government and partner interventions, the implementation of this policy has been sub-optimal in several states and across certain pillars, as demonstrated by scorecard evaluations and

the country's persistently poor maternal and child health indices, which rank among the worst globally and in sub-Saharan Africa [30, 31]. This raises two critical questions: To what extent has PHCUOR been successfully implemented in Nigeria? And what are the key drivers of progress as measured by the scorecards developed to monitor and evaluate the policy? Addressing these questions is essential to providing an in-depth understanding of the successes and bottlenecks encountered in PHCUOR implementation. This is also key towards generating evidence needed to design policies, guide policy advocacy efforts and strengthen implementation of quality integrated healthcare across the country. According to Babaranti [32], a robust primary healthcare system is fundamental to the attainment of Universal Health Coverage through PHCUOR. Achieving this requires sustained government commitment to adequate healthcare financing of at least 15% of the annual budget, as pledged in the Abuja Declaration of 2001 by African Union member states [33]. Nevertheless, even with sufficient funding, a fragmented system cannot fulfil the goal of PHC, which is the foundation for Universal Health Coverage and attainment of health-related Sustainable Development Goals in Nigeria.

This study was therefore designed to evaluate the progress made in the implementation of the PHCUOR policy in Nigeria over a decade, with the ultimate aim of generating evidence to inform targeted policy advocacy and strategic recommendations for strengthening primary healthcare delivery and advancing Universal Health Coverage in Nigeria.

Materials and Methods

Study Design

A longitudinal study design involving the collection of secondary data from 2012 to 2022 was used to evaluate the progress made in the implementation of the PHCUOR policy in Nigeria. Policy evaluation was conducted using the scorecard developed by the National Primary Health Care Development Agency (NPHCDA), which is based on nine pillars operationalised under the principle of "One Management, One Plan, One Monitoring and Evaluation System" within a government structure administered by the State Primary Health Care Development Agency (SPHCDA) [34].

Study Setting

Nigeria, officially called the Federal Republic of Nigeria, is the most populous country on the African continent, located in West Africa. It is bordered to the south by the Gulf of Guinea (Atlantic Ocean), to the west by the Republic of Benin, to the east by Cameroon, and to the north by Niger and Chad. The country has an estimated landmass of 923,769 square kilometres (356,669 sq mi) and a population of 232,679,478, distributed across thirty-six states and the Federal Capital Territory, with Abuja as the capital city [35, 36]. Nigeria is a multi-ethnic nation divided into six geopolitical zones: South-South, South-East, South-West, North-Central, North-East, and North-West. A former British colony, Nigeria gained independence in 1960 and has since implemented various health policies to address the health

needs of its population. These policies are most often sub-optimal and insufficient to provide Universal Health Coverage to its large population. The over 230 million population is served by more than 30,000 primary healthcare centres, of which only 205 are fully functional [9, 35]. A persistent challenge in the provision of primary healthcare has been the proliferation of vertical programmes by government and partners, alongside weak coordination mechanisms, which affect decision-making and the delivery of quality healthcare services. Despite being the second largest economy in Africa with several minerals such as gold, and crude, an estimated 133 million Nigerians are multidimensionally poor and often unable to afford healthcare, with the majority relying on out-of-pocket payments due to poverty and limited health insurance coverage [36, 37, 38]. The country has one of the worse health systems ranked as the 11th out of the 12 countries with the worst healthcare systems in the world [39]. To address these challenges and improve access to integrated healthcare, the PHCUOR policy was designed and implemented. This study sought to evaluate the progress made over a decade of implementing PHCUOR across the nation.

Data Collection

Data for this study were obtained from the scorecard reports published on the National Primary Healthcare Development Agency (NPHCDA) website, which releases scorecards approximately every two years. Data collection followed a two-stage process: first, scorecards were downloaded, and then relevant data were extracted to a Microsoft Excel spreadsheet over two months spanning January to February 2023. The scorecard is a monitoring and evaluation instrument designed to track progress during the implementation of PHCUOR across all 36 states and the Federal Capital Territory in Nigeria. It is structured around nine expert-designed pillars: Governance and Ownership, Legislation, Minimum Service Package, Repositioning, System Development, Operational Guidelines, Human Resources, Funding Sources and Structure, and Office Set-up, all operationalised under the principle of “One Authority, One Plan, One Monitoring and Evaluation [40, 41]. Data were extracted from Scorecards 2 through 6, corresponding to the years 2014, 2016, 2018, 2020, and 2022, respectively. Scorecard 1 (2012), corresponding to the policy’s inaugural year of full operationalisation, was unavailable and therefore excluded. Accordingly, Scorecards 2 to 6 served as the source of secondary data for evaluating progress at both national and sub-national levels.

Study Outcome

The primary outcome evaluated in this study was the level of progress made in the implementation of PHCUOR in Nigeria from 2012 to 2022, using Scorecards 2 to 6. Secondary outcomes included the performance of individual states, the trajectory of each of the nine pillars over the study period, and the clustering of states into high-, moderate-, and low-performing groups. This classification is important for identifying states requiring targeted advocacy and technical support, as well as for pinpointing the underperforming pillars that need to be addressed at the state and national levels. Through this approach, the primary healthcare system can be positioned to function optimally, provide integrated

quality healthcare to Nigeria's population of over 230 million, and ultimately contribute to improvements in maternal, newborn, and child health outcomes, placing the country on a credible trajectory towards achieving Sustainable Development Goal 3 by 2030.

Data Analysis

Statistical and machine learning methods appropriate for the study objectives were employed in the analysis of the data. Specifically, the Linear Mixed-Effects Model (LMEM) was used to estimate the progress made in the implementation of PHCUOR in Nigeria. The progress coefficient was estimated for each of the nine pillars of PHCUOR over the study period using data from Scorecards 2 to 6, obtained from the official NPHCDA website. A P-value of < 0.05 was considered statistically significant. The K-nearest neighbour (KNN), a machine learning model, was used to cluster states into high-, moderate-, and low-performing groups based on their scores over the study period. This clustering was undertaken to identify states performing well and those that are not, thereby providing a data-driven basis for peer-to-peer learning across states. This approach is also needed for authorities to share experiences as to how they were able to improve Primary Healthcare delivery in their States for the overall improvement of healthcare in Nigeria.

Linear Mixed-Effects Model (LMEM) is a flexible extension of linear models in which fixed and random effects are modelled at the same time. The model is used to estimate the average progress made (fixed effects) and the inter-subject variability (random effects) over time [42]. This model is useful in many disciplines that deals with repeated, longitudinal, or clustered observations, in which random effects are introduced to help capture correlation or/and random variation among observations in the same group of individuals [42]. Mixed effect model is employed when repeated measurement of the same variable are collected from the same target population over time [42]. This makes it suitable for the evaluation of PHCUOR policy that was implemented over various years from 2012 to 2022 for this study.

Mathematically, the general univariate LMEM is represented as:

$Y=X\beta + Zb+\epsilon$,

Where:

Y = the $n \times 1$ random response vector,

X = the $n \times (p + 1)$ design matrix for the fixed effects,

β = $(\beta_0, \beta_1, ..., \beta_p)^T$ is the $(p + 1) \times 1$ coefficient vector of fixed effects,

b = a $q \times 1$ vector of random effects,

Z = the associate matrix design for the random effects, and

$\boldsymbol{\epsilon}$ = the $n \times 1$ vector of random errors.

The model assumes that $\boldsymbol{\epsilon}$ is a random vector with a mean vector of **0** and a variance–covariance matrix **R**, **b** is a random vector with a mean of **0** and variance–covariance matrix **D**, and a null variance–covariance matrix between $\boldsymbol{\epsilon}$ and **b**, Cov($\boldsymbol{\epsilon}$, **b**) = $\mathbf{0}_{n \times q}$ (43).

K-Nearest Neighbours (KNN) is a simple, non-parametric, supervised machine learning model used for classification and regression problems. KNN is often used for classification as a k-NN classifier with an output which is a class membership [44]. An object is classified by a plurality vote of its neighbours, with the object being assigned to the class most common among its k nearest neighbours. k-NN classifier categorise unlabeled observations by assigning them to the class with the most similar examples [44]. A key feature of KNN is the classification of unlabeled data into a number of classes known as the k. This parameter decides how many neighbours will be chosen for Knn algorithm [44]. A large k reduces the impact of variance caused by random error but risks ignoring small but important patterns. The key to choose an appropriate k-value is to strike a balance between overfitting and underfitting [45]. When in doubt, the square root of the number of observations in the training dataset is often recommended [46].

Data Quality and Limitations

The scorecard used to collect data for this study was developed by subject matter experts drawing on the WHO District Health System implementation framework, lending credence to the tool's validity and reliability for assessing PHCUOR implementation progress in Nigeria [47]. Data collection across states was conducted using a standardised instrument comprising nine clearly defined domains and a Delphi-based scoring approach, in which experts observed, collected, and scored performance data at the domain and state levels [48]. To ensure data quality, two authors (FA and DI) undertook data extraction in a stepwise manner: DI was trained in data extraction using Microsoft Excel, while FA reviewed the extracted data to ensure fidelity of the data collected for the study. Despite the application of these measures which include expert-designed scorecard, biennial data collection, and the two-stage extraction process from Scorecards 2 to 6, observer bias during state-level data collection remains a potential limitation that may affect the accuracy of the data used for this study.

Results

The results of this study are presented in Tables 1 to 4 and Figs. 1 and 2 below.

Table 1
Descriptive Statistics of PHCUOR Evaluation in Nigeria

Index	Score	Time
Count	185	185
Mean	56.38919	4
Std	26.78436	1.418051
Min	0	2
25%	39	3
50%	59	4
75%	78	5
Max	100	6

Table 1 presents the descriptive statistics from the evaluation of PHCUOR implementation in Nigeria from 2012 to 2022, based on Scorecards 2 to 6. The mean implementation score across all states and scorecard cycles was 56.4 ± 26.8.

Mean Score Over Time

Table 2
Progress Coefficient across the 9 Pillars of PHCUOR in Nigeria

Pillar	Coefficient_Time	P_Value
Government and Ownership	8.199283189	2.03502E-97
Legislation	3.999725525	7.08001E-36
Minimum Service Package	8.59942044	5.61548E-33
Repositioning	12.49892053	1.0794E-107
System Development	11.69906928	1.3419E-109
Operation Guideline	11.1991983	1.00073E-75
Human Resources	16.79883138	6.2209E-68
Funding Source and Structure	14.59928443	1.7762E-262
Office Set up	5.599523871	4.76076E-58

Table 2 presents the progress coefficients across the nine pillars of PHCUOR in Nigeria. Ranked from lowest to highest, the coefficients are: Legislation (3.999), Office Set-up (5.599), Governance and Ownership (8.199), Minimum Service Package (MSP) (8.599), Operational Guideline (11.199), System

Development (11.699), Repositioning (12.499), Funding Sources (14.599), and Human Resources (16.799).

Heat Map of State Performance

Figure 2 presents the heat map of state-level PHCUOR implementation performance across Scorecards 2 to 6. The map reveals heterogeneous trajectories across states over the study period: some states started with poor performance and improved substantially by Scorecard 6; a small number started well but deteriorated over time; while others sustained strong performance consistently from Scorecard 2 through Scorecard 6.

Table 3
Early Adopters Vs Late Adopters of a Legal Framework in PHCUOR

Score Card	**1**	**2**	**3**	**4**	**5**	**6**
Variable	coef	std err	T	P>|t|	[0.025	0.975]
Intercept	78.0000	23.569	3.309	0.001	31.495	124.505
Is_Early_Adopter	-37.5342	23.730	-1.582	0.115	-84.357	9.288
Post_Treatment	-27.0000	27.215	-0.992	0.322	-80.699	26.699
DiD_Interaction	53.6361	27.448	1.954	0.052	-0.524	107.796

Table 3 presents a comparative analysis of early versus late adopters of a legislative framework in PHCUOR implementation, using a difference-in-differences approach. The interaction term (DiD_Interaction), representing the differential effect of early adoption of legislation, yielded a coefficient of 53.64, with a p-value of 0.052, which approaches but does not reach conventional statistical significance.

Table 4
K-Nearest Neighbour Clustering of 36 States and the FCT during Implementation of PHCUOR from 2012 to 2022

Clusters	Cluster Description	Names of State
0	Struggling	Akwa Ibom
		Cross River
		Kwara
		Kogi
		Ogun
		Taraba
1	Good	Benue
		Borno
		FCT
		Enugu
		Edo
		Oyo
		Imo
		Ebonyi
		Cross River State
		Anambra
		Osun
		Bayelsa
		Plateau
2	Excellent	Ekiti
		Adamawa
		Delta
		Abia
		Bauchi
		Kebbi
		Katsina
		Kano

Clusters	Cluster Description	Names of State
		Kaduna
		Niger
		Nasarawa
		Jigawa
		Gombe
		Ondo
		Lagos
		Rivers State
		Rivers
		Sokoto
		Yobe
		Zamfara

Table 4 presents the KNN-based clustering of the 36 states and FCT according to their PHCUOR implementation performance from 2012 to 2022. Of the 37 entities assessed, 6 states were classified as Struggling (Cluster 0), 13 states as Good performers (Cluster 1), and 20 states as Excellent performers (Cluster 2), indicating that the majority of states demonstrated strong implementation progress over the study period.

Discussion

Even before the Alma-Ata Declaration of 1978, primary healthcare has been recognised as the cornerstone of Universal Health Coverage and improved health outcomes globally but implementation in most low- and middle-income countries like Nigeria has been sub-optimal. This study evaluated the progress made during the implementation of PHCUOR in Nigeria provides insights on the progress made at the national and sub-national levels as well as the progress made in the implementation of each of the nine pillars of PHCUOR. This section presents the findings of the study, beginning with a discussion of the progress made in PHCUOR implementation in Nigeria from 2012 to 2022 and the performance across each of the nine pillars. This is followed by a discussion of state-level performance based on machine learning clustering. A comparative analysis of states that adopted a legislative framework early versus those that delayed or did not adopt it is then discussed. Conclusion was drawn and the implications of findings and recommendations for improved implementation of quality integrated primary healthcare in Nigeria was done thereafter.

Progress in the Implementation of PHCUOR in Nigeria

Findings from this study (Tables 1–2, Figs. 1–2) demonstrate that Nigeria made significant progress in the implementation of PHCUOR between 2012 and 2022. Using the LMEM, the mean national progress coefficient was 56.4, representing more than a 50% improvement from baseline (Scorecard 2) to endline (Scorecard 6). The overall upward trend in the progress coefficient across the study period is encouraging and underscores the need for sustained commitment and efforts aimed at optimum implementation of the policy across the states in Nigeria (Fig. 1). Despite this statistically significant improvement ($P < 0.05$) from baseline to endline, considerable variation was observed across the nine pillars (Table 2). Legislation, Office Set-up, and Governance and Ownership recorded the least progress, whereas Minimum Service Package, Operational Guideline, and System Development demonstrated moderate progress, and Repositioning, Funding Sources, and Human Resources achieved the greatest improvement over the study period. These findings may be partly explained by the reluctance of several states to enact the requisite legislative framework for the policy which is driven, in some instances, by political and personal interests, as reflected in the near-significant DiD interaction p-value of 0.052 (Table 3). The absence of a legislative framework was, in turn, associated with weak government ownership and inadequate leadership in PHCUOR implementation, which also corresponded with the absence of a dedicated Office Set-up as stipulated in the policy framework. This result is in alignment with reports by Olise (2007) who noted that government willingness is a key factor that influence the implementation of primary healthcare services and this starts with the enactment of laws that provides a legal framework for the smooth implementation of PHCUOR in Nigeria [49]. The finding is also in alignment with report by Ogunmodede and colleagues (2024) who noted that a strong policy framework is needed towards effective implementation of PHCUOR in Nigeria [50]. It is also in consonance with report by Odutolu and colleagues (2016) who noted that the establishment of a legal framework – State Primary Healthcare Development Agency is critical towards bringing PHCUOR in Nigeria [51].

State Performance in the Implementation of PHCUOR

Results from this study (Table 2, Fig. 2) indicate that states varied considerably in their PHCUOR implementation trajectories. Some states began with poor performance but achieved substantial improvements by Scorecard 6; a small number started well but subsequently declined; while others maintained strong performance throughout the study period. These divergent trajectories suggest that while certain states were able to build and sustain the institutional systems required for effective PHCUOR implementation, others, despite initial progress, failed to maintain momentum due to weak systems and governance structures inadequate for addressing ongoing implementation challenges. The consequence is that maternal and child health indicators in states with weak healthcare systems remain poor and are unlikely to improve without deliberate, targeted interventions. Our result showed that state performance varied across the implementation states and this could affect the uptake of maternal and child health services. This finding is similar to results by Odutolu and colleaques (2016) who noted a progression in the implementation of PHCUOR across Adamawa, Nasarawa, and Ondo states and observed that the implementation of this program affects access to maternal and child health services [51]. There is therefore an urgent need for underperforming states to intensify implementation efforts, beginning with the legislative pillar and the establishment of a dedicated Office Set-up including the

establishment of the State Primary Healthcare Development Board. This action is a central point of convergence for policy experts, programme managers, and decision-makers to plan, coordinate, and drive improvements in access to quality integrated healthcare and health outcomes in Nigeria.

Implication of Findings and Recommendations towards Quality Integrated Primary Health Care Services in Nigeria

The findings from this study draw on evaluation scores across 185 data units extracted from Scorecards 2 to 6, which were designed to monitor PHCUOR implementation in Nigeria. The results (Tables 1 and 2) reveal moderate overall implementation, with significant operational disparities across the nine pillars. The mean implementation score of 56.4% reflects a sub-optimal national performance that falls short of the threshold required for achieving Universal Health Coverage. The wide standard deviation (26.8%) underscores the substantial inter-state variation in implementation, with some states and PHCs fully adapted to the integrated system, while others have made negligible progress. A critical setback has been the absence of a legal framework in several states, which not only undermines operational autonomy but also constrains dedicated budgetary allocation for running PHCs. While some states adopted the legal framework early and others did so late or not at all, the near-significant association between early legal framework adoption and broader implementation performance ($p = 0.052$) suggests that legislation is an important enabler of systemic change. This finding calls for stronger political will at the federal level to ensure that all state governments treat the enactment of the PHCUOR legal framework as a binding obligation, thereby compelling stakeholders to adopt and operationalise all components of the policy. The persistently poor maternal and child health indicators are among the worst globally and are a direct consequence of this implementation gap. A renewed call is therefore issued to the federal government and sub-national authorities to champion the implementation of PHCUOR and, by extension, Universal Health Coverage in Nigeria, as an indispensable pathway towards achieving Sustainable Development Goal 3.

Conclusions

This study evaluated the progress made in the implementation of the PHCUOR policy in Nigeria over a decade. A cross-sectional design involving secondary data collection from the NPHCDA scorecard series was employed. A Linear Mixed-Effects Model (LMEM) was used to assess overall policy progress, while a K-Nearest neighbour (KNN) algorithm was applied to classify states into three implementation performance clusters. Findings demonstrate that Nigeria achieved more than 50% improvement in PHCUOR implementation over the study period, with progress being statistically significant ($P < 0.05$) from baseline (Scorecard 2) to endline (Scorecard 6). However, substantial variation was observed across the nine pillars: the Legislation pillar recorded the lowest progress coefficient, while Human Resources recorded the highest. Furthermore, while some states are excelling in PHCUOR implementation, others continue to struggle. Evidence from the study indicates that states which adopted a legal framework early outperformed those that adopted it late or did not adopt it at all. There is, therefore, an urgent need for underperforming states to accelerate implementation, beginning with

legislative enactment and office set-up, and progressing to healthcare financing and human resource strengthening, as essential steps towards improved access to quality integrated healthcare and better health outcomes in Nigeria.

Abbreviations

PHCUOR
Primary Healthcare Under One Roof
LMEM
Linear Mixed Effect Models
KNN
K–Nearest Neighbour
UHC
Universal Health Coverage
SDG
Sustainable Development Goal

Declarations

Declarations and Ethic Statements

Ethical Approval

This study employed a systems-level approach involving the collection of publicly available data for the evaluation of PHCUOR implementation in Nigeria. No individual-level data were involved, and therefore informed consent was not required, and this is consistent with the principles of the Declaration of Helsinki governing ethical conduct in research. The authors acknowledge the efforts of NPHCDA in collecting and making this data publicly available for health system research and evaluation purposes.

Data Availability

Data for this study will be made available upon reasonable request.

Clinical Trial Registration

Not applicable

Competing Interest

The authors clearly states that there is no potential conflict of interest related to this study. The overall goal was for research and contribution of knowledge to public health which will guide policy advocacy for improved healthcare and better health outcome.

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Author Contributions

FA, and OA, developed the concept note. ID extracted data from score card to Microsoft Excel while FA reviewed the data before exporting it to Python 3 in Goggle Colab for data analysis. FA prepared the first draft, introduction, method, data analysis and result while OA did the discussion of findings and reviewed the final manuscript.

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Consent to Publish Declaration

This is to state that all the three authors for this study have given the consent to publish this manuscript with BMC Primary Care

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Figures

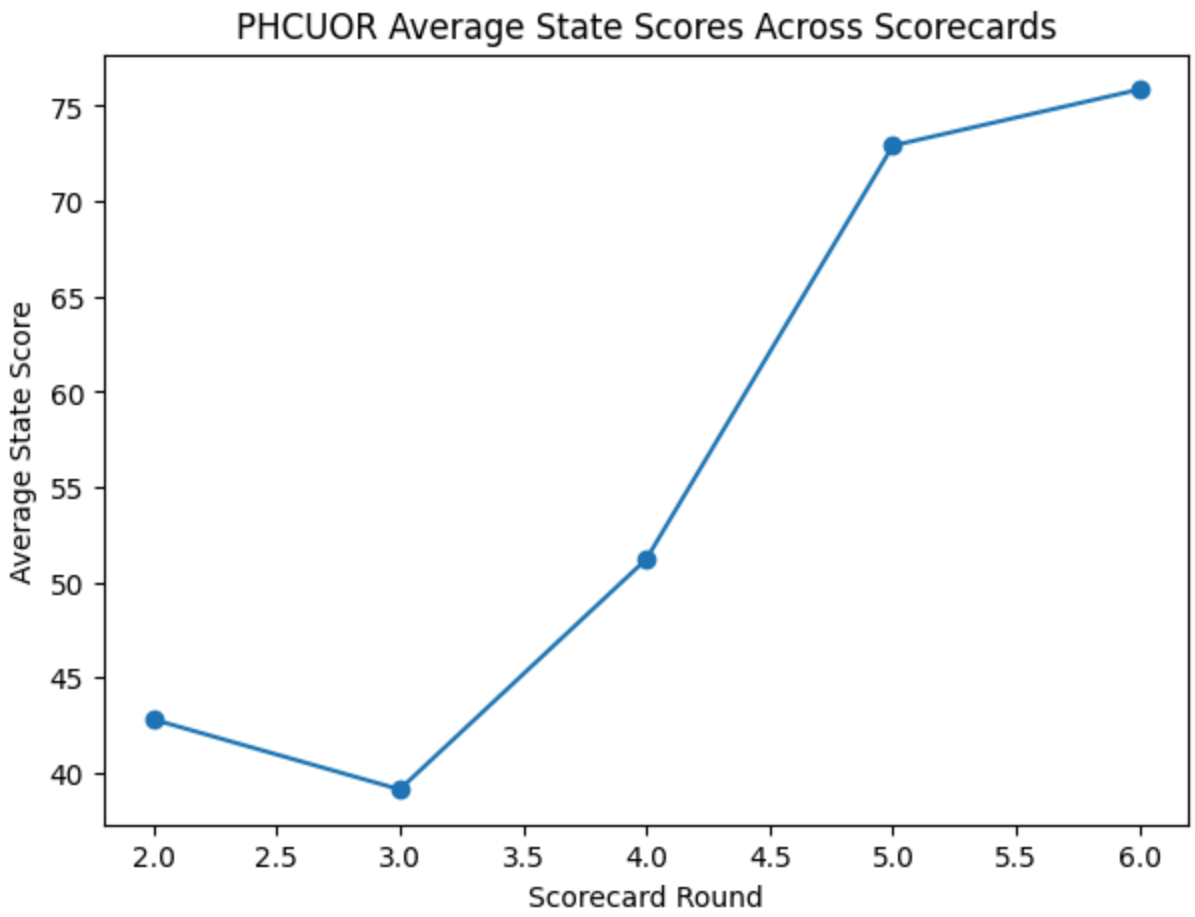


Figure 1

illustrates the mean national score recorded across all states during PHCUOR implementation, by scorecard cycle. The country average scores were: Scorecard 2 = 42.81, Scorecard 3 = 39.14, Scorecard 4 = 51.22, Scorecard 5 = 72.92, and Scorecard 6 = 75.86. A marginal decline was observed from Scorecard 2 to Scorecard 3, after which there was a consistent and progressive increase from Scorecard 3 to Scorecard 6.

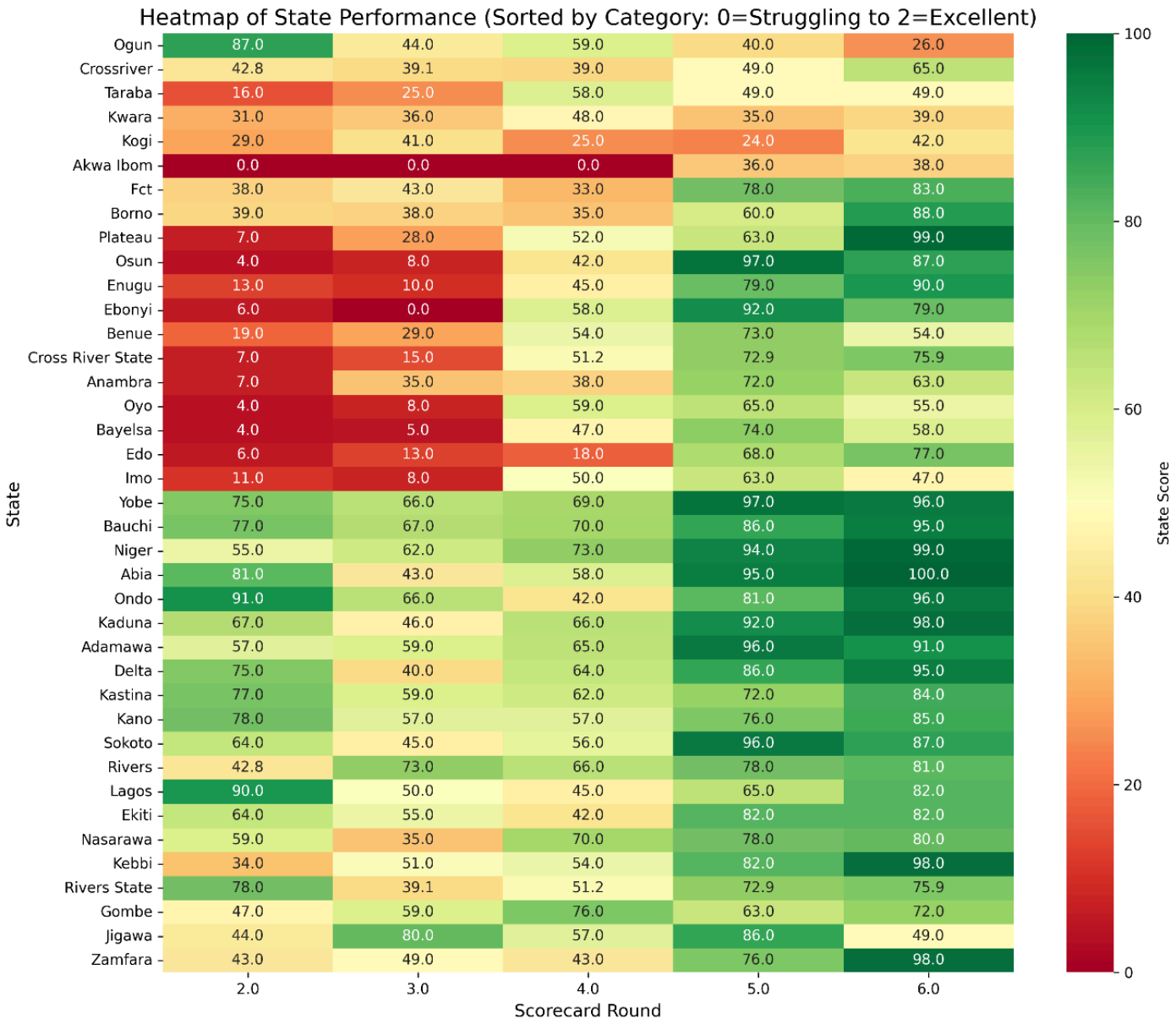


Figure 2

Heat Map of State Performance across Score Card 2 to 6