

Review

Addressing skilled birth attendants' needs of primary healthcare facilities in Nigeria using the human resources for health solutions model

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Abstract

This study addresses the needs of skilled birth attendants (SBAs) of primary healthcare centers (PHCs) in Nigeria using the human resources for health (HRH) solutions model. A model analysis approach was adopted to understand existing frameworks in the global HRH landscape. An initial framework identification and contextualization were conducted to guide the analysis of the models identified in the literature. Relevant frameworks were identified, reviewed, and consolidated using the WHO HRH Action Framework (HAF). A total of 109 articles were included in the study after thorough screening out of which only nine (9) models of improving HRH planning and implementation in global health were reviewed. These were the Task Shifting/Sharing Model, Community Midwifery Model (CMM), Performance-Based Financing Model (PBF), Needs-Based Planning Model, Facilities-Based HRH Planning Model, Utilization-Based HRH Planning Model, Workforce Indicator Staffing Needs Model, USAID—Financing Innovations for Nutrition (FINFI) Model, and Micro-Learning Model. The proposed HRH solution model was adapted based on the gaps identified in all analyzed models. This study showed that there are different HRH models which address specific elements of the HRH value chain. However, these models are not comprehensive, therefore, tackling the challenges of SBA shortage in Nigeria would either require the integration of multiple models or the deployment of models in a phased approach which is what informed the proposed HRH solution model in addressing SBAs' needs of PHCs in Nigeria. We therefore recommend the implementation of the model.

Keywords Solutions model · Human resources for health · Primary healthcare centers · Skilled birth attendants · Maternal and child health · Nigeria · EMBRACE model

1 Background

Human resources for health (HRH) is one of the building blocks of the health system, which provides the human elements needed for driving population health outcomes [1]. Based on these facts, HRH is interconnected with every other aspect of the health system. Therefore without focus on the former, investments in the latter would not yield the intended outcomes [2]. Despite its crucial role in the health systems, there is a global shortage of human resources for health—specifically for skilled birth attendants (SBAs)—which has been estimated to reach about 10 million healthcare

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workers by 2030 [3]. This challenge is more profound in low and middle-income countries (LMICs) where the global burden of disease is high [4, 5].

In Nigeria, the situation is worsened as only 1.95 healthcare workers are available to care for 1000 population [6]. This is further complicated by the country's high population growth rate [7], and increasing trend of emigration [8]. The shortage of healthcare workers in Nigeria is severe at the primary healthcare centers (PHCs). This has affected the delivery of reproductive, maternal, and child health and access to skilled birth delivery, thereby translating to poor health outcomes for the country [9, 10].

To further highlight the problem, according to the National PHC HRH profiling conducted in 2022 by the National Primary Healthcare Development Agency (NPHCDA), Nigeria could only boast of (approximately) 31,131 skilled birth attendants with Nurses/Midwives, CHEWs, and Medical Doctors. By disaggregation, CHEWs are predominantly available at the PHC facilities at 26,602, Nurses/Midwives are about 4040, while Medical Doctors are the least available with only 489 doctors working across all the PHC facilities in the country. Against the Minimum of the Service Package's number of SBAs across the facilities [11], these figures are quite infinitesimal, as a severe SBA gap is predominant across most of the PHC facilities in Nigeria.

Similarly, Nigeria currently has about 449 schools of nursing and medicine, with a total accreditation quota of 38,135 Nurses/Midwives, and 5355 medical doctors. In a situation where all the admitted students graduated from the schools, it implies that the country has a total production capacity of 43,490 nurses/midwives and medical doctors. Again, this falls below acceptable thresholds when compared with other countries that have similar settings.

According to the literature, several frameworks such as the Task shifting/Task sharing model [12, 13], Performance-based financing [14], Community Midwifery Model [15], and the Needs-based Model Planning [16], to name a few, have been adopted at different times to tackle the challenges with specific HRH domains. The aforementioned models focused on strategically redistributing tasks, providing financial incentives based on achievements, deploying trained midwives within communities, and estimating required healthcare workers based on the population's health needs, respectively. However, none of these models has been able to provide a holistic approach to solving the multifaceted HRH challenges in a country such as Nigeria.

Therefore, this study not only seeks to address the shortage of SBAs in Nigeria but also provides a multi-dimensional HRH solution model that could be adopted by countries with similar settings.

2 Methods

2.1 Study design

We used a scoping review approach in this study. This approach include review of frameworks and relevant articles on human resource for health. Thereafter, we conducted synthesis of evidence gathered and develop our solutions model.

2.2 Criteria for considering documents reporting frameworks

The SPIDER approach as propounded by Cooke et al. [17] was used in developing the eligibility criteria for the study [17], as follows:

Sample: We excluded studies that were carried out or only applicable to high-income countries. Priorities were given studies focusing on LMICs.

Phenomena of Interest: human resource for health frameworks addressing skilled birth attendant shortages in primary healthcare facilities.

Design: We considered materials with conceptual study designs and different research types with the exception of opinions, editorials or studies without clear research methods.

Evaluation: frameworks that were used in addressing the human resources for health challenges, especially those focusing on skilled birth attendant gaps in PHCs, drawing out themes, lessons, findings and perceptions.

Research type: we explore studies that used qualitative or quantitative approach, mixed-methods and those that generated evidence in line with our review question. Only studies written in English were considered in our selection.

2.2.1 Search strategy

The search and review of materials was conducted by HE, OO, OS, TOI, TOr, EO, and MO. We conducted the online search in the study by utilizing different combinations of relevant HRH-related search terms relevant to the research to develop search strings using Boolean operators (see Appendix 1). The team searched online databases such as PubMed, Research Gate, SCOPUS, and Google Scholar for population-based studies published between 2004 and 2024, using various combinations of human resources for health terms. HE, OO, TOI, TOr, EO, and MO ran additional searches on Google Scholar using the same search terms and date restrictions. Reference lists of included papers and related systematic reviews on PubMed were further hand-searched for additional studies that were not identified in our main search.

Online and offline search strategies were deployed. The online search retrieved relevant peer-reviewed articles, web-pages, technical reports, policy documents, and project reports on HRH interventions from relevant online databases. Searches were conducted in English and articles published within 2004–2024 on the subject matter were included. The offline search strategy involved retrieving hard copies of policy documents that are not publicly available online from the Ministry of Health, and the National Primary Healthcare Development Agency as well as reaching out to development partners working in the space for relevant policy documents that may be relevant to answer the research questions.

Identified studies were reviewed and screened to identify duplicates and to ensure alignment with defined inclusion and exclusion criteria. The selected studies were then analyzed using the adapted framework in line with the pre-defined research questions.

2.3 Selection criteria

In selecting and screening for articles, the research team screened the titles of the search results to remove duplicates on Endnote, following which screening of abstracts and executive summaries of policies, project reports, and articles to identify studies that meet the inclusion and exclusion criteria were conducted.

2.3.1 Inclusion criteria

- Prioritized policies focused on Nigeria's health system
- The study reviewed interventions, models, and frameworks from comparable settings within sub-Saharan Africa and other LMICs.

2.3.2 Exclusion criteria

- Studies not published in the English language.
- Studies whose research focus was not specific to the human resources for health and/or the health workforce at the PHCs.

2.4 Data extraction and analysis

Arksey and O'Malley's framework was adapted for the scoping review [18]. This framework guided the study's scoping review procedures.

Findings from the literature were categorized into frameworks and models. An initial framework identification and contextualization were conducted to guide the analysis of the models. Relevant frameworks were identified, reviewed, and consolidated using thematic analysis to provide contextualized frameworks that can be used to analyze HRH models. The contextualization was guided by the experience of two subject matter experts in HRH within the research team. Models were analyzed using the contextualized frameworks developed. Following this, a contextualized integrated model was developed based on gaps in existing interventions and models.

2.5 Data synthesis

Themes and concepts were extracted from the reviewed frameworks and were classified to present their interconnections and relationships, as described in each of the frameworks. Emerging themes were observed in accordance with the study reviewed question, the empirical literature and the setting in which the study was conducted.

An overview/scope, strengths and gaps of each framework were presented. Furthermore, an extensive analysis of the scope, domains and impact of the selected human resources for health frameworks or models were conducted using the WHO HRH Action Framework [HAF] (See Table 1).

The team engaged experts in the HRH space for their input and contributions to the proposed model. Finally, the findings from the reviewed studies and stakeholders' consultations were collated and synthesized into the development of the model.

3 Results

We identified 415 articles on human resources for health published between 2000 and 2024, and 332 were screened after the removal of duplicates. Following screening for eligibility, 109 articles reported on SBAs, HRH models, interventions, and policies (Fig. 1).

3.1 Overview of existing HRH/midwifery models

This section presents the findings from assessed literature based on the frameworks, policies, and models earlier mentioned. Based on the gaps identified, the HRH solution model was proposed. Identified models were analyzed using the adapted WHO HRH Action Framework (HAF). The team used the adapted HAF for model analysis to analyze the suitability of different proposed models to comprehensively address challenges in addressing SBAs' needs of PHCs in Nigeria. In this study, nine models of improving HRH planning and implementation in global health were reviewed.

3.1.1 Task shifting/sharing model

The Task Shifting and Sharing model aims to address the challenges of resource constraints in healthcare settings by strategically redistributing tasks among various healthcare workers. Central to this model are two key principles: first, tasks are assigned based on competency rather than traditional professional boundaries, allowing less specialized healthcare workers like nurses and community health workers to handle low-complexity tasks, while higher-complexity tasks remain with specialized personnel such as doctors. This approach optimizes the use of skills and resources. Second, effective communication and collaboration between different cadres of healthcare workers are essential, emphasizing shared responsibility to enhance workflow and patient care. The task-shifting model is recommended by WHO for LMICs and some studies have shown that it is a cost-effective model for improving access to healthcare services [12, 13].

3.1.2 Community midwifery model (CMM)

The CMM model focuses on deploying trained midwives within communities, particularly underserved areas, to provide essential maternal and child healthcare services [15]. The assumptions underlying this approach are that midwives can effectively manage routine pregnancy and childbirth care and that community-based care enhances accessibility and cultural sensitivity. The strengths of this model include increased access to care in remote areas, empowerment and strengthening of local communities, and a reduction in maternal and child mortality rates. However, the model also presents challenges, such as the need for robust training and ongoing support for midwives, potential limitations in managing complex obstetric complications, and possible resistance from existing healthcare structures [19].

3.1.3 Performance-based financing model (PBF)

Performance-Based Financing (PBF) in healthcare involves providing financial incentives to healthcare providers based on their achievement of predetermined performance targets. This model operates on the assumption that providers are motivated by rewards, leading to improved service delivery, and that measurable performance indicators are crucial for objectively evaluating and rewarding effectiveness [14]. PBF has shown strengths in enhancing service delivery, with studies indicating increased utilization of essential services, improved healthcare quality, and better adherence to clinical guidelines [20]. Additionally, it promotes efficiency by encouraging providers to optimize resources, potentially reducing overall healthcare costs. The link between funding and performance also fosters accountability and transparency

Table 1 Model analysis using the Adapted HAF

S/N	Models	Alignment with HRH goals	Adaptability	Comprehensiveness				Information System	Leadership & Governance	Financing
				Production	Size &Pro-duction	In-service Training	Retention, Performance & Exit Management			
1	Task shifting and sharing model	+	+	-	+	+	-	-	-	-
2	Community Midwifery Model	+	+	-	+	-	+	-	+	-
3	Performance-Based Financing Model	+	+	-	-	-	+	-	+	+
4	Needs-Based Planning Model	+	+	+	+	-	+	-	+	-
5	Facilities-Based HRH Planning Model	+	-	-	+	-	-	-	+	-
6	Utilization-Based HRH Planning Model	+	+	-	+	-	-	-	+	-
7	WHO's-WISN	+	+	-	+	-	-	-	+	-
8	USAID-FINFI	+	+	-	-	-	+	-	-	+
9	Micro Learning	+	+	-	-	-	+	-	-	-

+ means that model components align with the element it is reviewed against. For instance, under adaptability, a “+” means that model is found to be adaptable, as it has been deployed in multiple countries. “and – stands for the contrary”

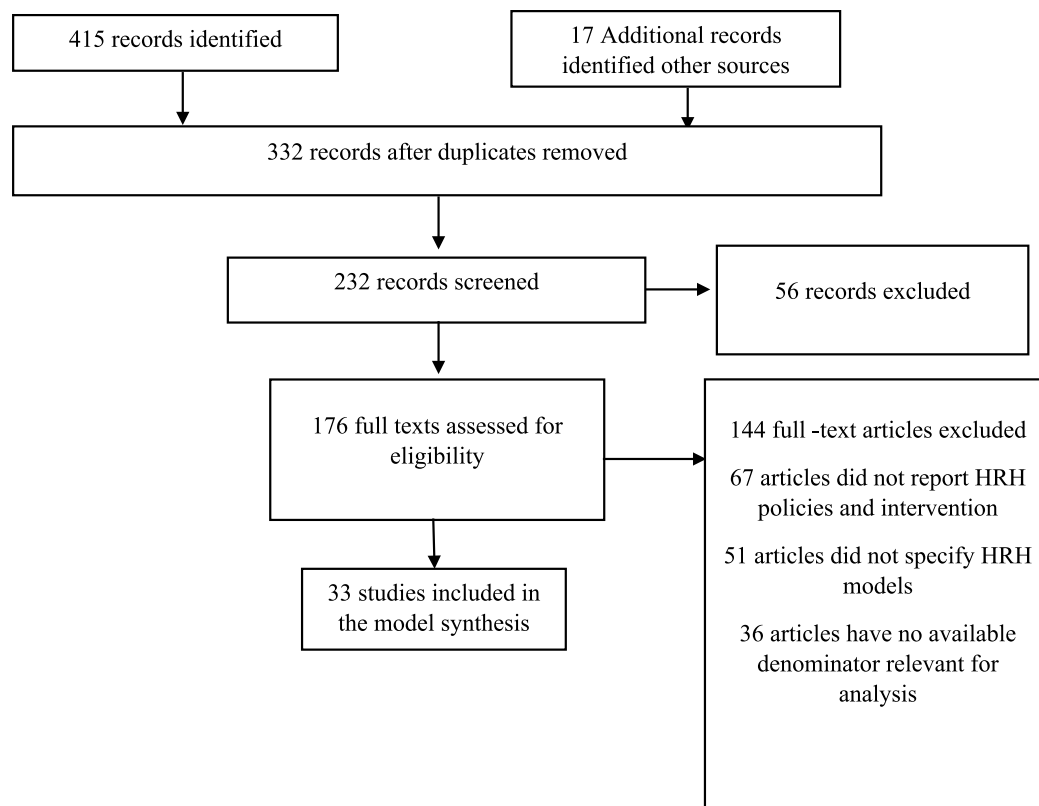


Fig. 1 Flow diagram of search and review results of the study

in healthcare systems. Though not specifically designed for HRH, PBF has been shown to have mixed effects on health worker performance [21, 22].

3.1.4 Needs-based planning model

The Needs-Based Planning Model is centered on estimating the healthcare workforce required by assessing the population's health needs and determining the desired service levels [16]. The assumptions underlying this model include the availability of accurate data on population demographics and health needs, as well as well-defined specifics regarding interventions and their corresponding Human Resources for Health (HRH) requirements. The strengths of this model lie in its ability to target HRH allocation to address specific health priorities, promote the efficient use of resources based on demand, and maintain flexibility and adaptability to changing health needs. However, challenges associated with the model include the potentially challenging and costly nature of data collection and analysis, the difficulty in accurately predicting future needs, and the risk of neglecting existing healthcare facilities and infrastructure in low- and middle-income countries [23].

3.1.5 Facilities-based HRH planning model

The facilities-based HRH Planning model determines Human Resources for Health (HRH) allocation by relying on the existing capacity and services offered by various healthcare facilities [24]. The model operates under the assumption that healthcare facilities provide a stable and predictable setting for workforce planning and that staffing needs are directly proportional to facility capacity [25]. Its strengths lie in the ease of implementation using readily available facility data, ensuring adequate staffing within each facility, and aligning HRH with the established service delivery infrastructure. However, the model has limitations: it may neglect specific population needs, lead to staff surpluses or shortages in certain locations, and its inflexible nature restricts its ability to respond dynamically to changing healthcare requirements [25].

3.1.6 Utilization-based HRH planning model

The Utilization-Based HRH Planning Model relies on estimating Human Resources for Health (HRH) requirements through the analysis of historical healthcare service utilization data [26]. The model operates under the assumption that past utilization patterns accurately reflect future needs, and that service utilization correlates directly with the necessary HRH levels. Its strengths include being a practical and data-driven approach, accounting for actual service demand and workload, and being particularly useful for short-term HRH planning and resource allocation. It is however limited to projecting health workforce needs based on the status quo and may not be sufficient for addressing the inadequacies in the current workforce availability and distribution [24].

3.1.7 Workforce indicator staffing needs model

The Workforce Indicator Staffing Needs (WISN) model developed by the World Health Organization (WHO) is grounded in the assumption that standardized staffing ratios, determined by factors such as population size and disease burden, effectively address health needs [27]. It relies on national health information systems to provide accurate and updated data. The strengths of the WISN model include offering a globally applicable framework for workforce planning, simplifying needs assessment, and facilitating resource allocation comparisons across [28]. It also advocates for establishing a minimum level of essential healthcare personnel, contributing to a standardized approach to workforce planning on a global scale. However, the model has notable weaknesses, such as overlooking unique contextual factors and specific disease challenges that may vary between regions or countries [29]. Additionally, there is a potential for rigidity in the model, which may neglect emerging service needs, and its effectiveness relies on the completeness and quality of data, which may vary, especially in developing settings.

3.1.8 USAID—financing innovations for nutrition (FINFI) model

This model was developed by the USAID local health systems sustainability project in Colombia, it provides a framework for financial and non-financial models that can be deployed to improve the state of comprehensive PHC delivery. The model also provides an analytical framework for the public policy and technical viability of financial and non-financial incentives [30].

3.1.9 Micro-learning model

Micro-Learning is an innovative training model predicated on the effectiveness of short, focused digital modules in enhancing the knowledge and skills of healthcare workers [31]. It is a model of in-service training. The model further posits that healthcare personnel readily engage with mobile learning platforms and consider micro-learning a valuable complement to traditional training methods. This approach offers several distinct advantages:

- *Increased accessibility and flexibility:* Micro-learning provides busy healthcare workers with convenient and adaptable learning opportunities, readily digestible within their dynamic schedules [32].
- *Targeted skill development:* Tailored modules address specific skill gaps and knowledge needs, ensuring focused learning experiences relevant to individual practice.
- *Cost-effective scalability:* Micro-Learning presents a financially efficient and scalable approach to continuous workforce development, readily disseminated across large healthcare systems.
- *Minimal disruption to workflow:* The brief nature of the modules facilitates ongoing learning without significantly impacting daily duties.

3.2 Analysis of the identified HRH/midwifery models

The analysis of the identified models using the adapted HAF revealed that despite the varied array of HRH/Midwifery models reviewed, none emerged as a remedy for the intricate HRH needs of Nigerian PHCs. This is due to the limitations in the scope of most of these models, as they do not take into consideration all or some of the factors across the domains specified in the adapted HRH Action Framework. Implying that none of the reviewed models can be independently deployed to effectively bridge the midwives' gap in PHC facilities in Nigeria. In addition, none of the reviewed models

emphasized the role of contextual differences in the deployment of the HRH/Midwifery models. The analysis of the selected HRH models is shown in Table 1.

3.3 The PHC-HRH solutioning model—EMBRACE model

The EMBRACE (Ensuring Motivated, Balanced, Resourceful Access to Skilled Birth Attendants) solution model (See Fig. 2) was developed as a tailored response, integrating insights from various models and introducing innovative strategies. This model represents an approach poised to fill critical gaps in HRH planning and implementation, particularly in resource-constrained environments like Nigeria for policymakers/development partners.

It illustrates the interconnectivity across all the domains (size and distribution, production and in-service training, retention, motivation, performance, and exit management, the HRH information system, HRH leadership and governance, and HRH leadership and governance) of the HRH/Midwifery landscape in the PHC facilities in Nigeria. It explains that government/development partners must undertake cross-cutting actions by observing contextual factors, and the midwifery value chain, including establishing an active Human Resources for Health Information System (HRHIS) to achieve the overarching goals of having adequate, quality, motivated, and accessible midwives across the PHC facilities in Nigeria.

The contextual factors must be conducive to successfully driving any midwifery interventions, this includes ensuring the availability of updated HRH policy/strategies, and sustainable funding means fuelling effective implementation of HRH/midwifery solutions. Similarly, under the midwife's value chain, efforts must be taken to examine the available number of midwives, the required number of midwives based on the needs (what is required?), and the midwife's gap, this will be crucial for carrying out an evidence-based recruitment exercise of midwives.

Concurrently, the production capacity of the available health training institutes within the scope of application must be assessed to determine their ability to produce midwives in line with the midwifery gap. Additionally, interventions aimed at training midwives, alongside enhancing their intrinsic and extrinsic motivation must be executed to improve the quality of care and retention rate of midwives.

The premises of the EMBRACE Model:

- An established monitoring and evaluation system must be deployed to promote relevant stakeholders' accountability for the effective implementation of the model.
- The working conditions of all PHC facilities must also be considered when the EMBRACE model is used.

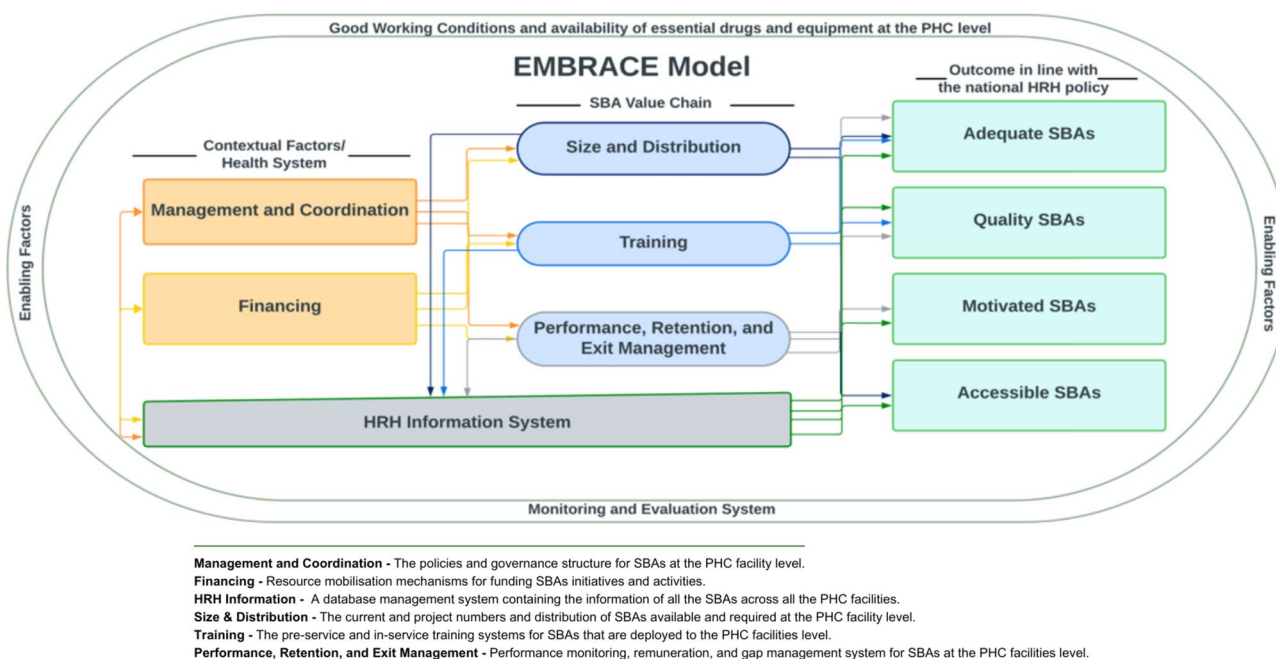


Fig. 2 The EMBRACE model

- Revitalization measures to renovate dilapidated PHC facilities and the provision of drugs and essential equipment must be implemented alongside the execution of the EMBRACE model's recommendation across its domains.

3.4 Potential barriers to implementing the EMBRACE model

From the literature, we have observed that certain factors might stand as barriers to the successful implementation and achievements of any framework, and the same also applies to the EMBRACE model. Therefore, the following factors might hinder the successful implementation of the solution model if they are not addressed and they include:

3.4.1 Funding

Lack of funding could limit the scope of implementing an intervention. It could also hinder its continuity, especially after the life-span of the project that informed it. Hence, there is a need for a clear source of funding and a specific amount to be allocated to HRH activities from the government budget at different levels. Similarly, there is a need for stakeholders such as the government, donors, implementing partners, and others to have alignment on the percentage of funding expected of them during the implementation or continuity of an intervention using the EMBRACE model.

3.4.2 Monitoring and evaluation

In Nigeria, not so many frameworks deployed in the past have recorded evidence of achievements through liable data. In most cases, little or no attention is paid to the collation and collection of data that could be used to measure the milestone performance of the frameworks or models deployed. For the EMBRACE model to work there is a need to consider an active system and structured processes through which set targets and goals are evaluated over time. Also, the same system should ensure timely collation and collection of relevant data. This would require that there is capacity building for officers in charge of these offices for effective delivery and to move away from the paper-based method of keeping records to electronics.

3.4.3 Political will

The support and approval of the policymakers is essential to the successful implementation of the EMBRACE Model. So also, the effectiveness and sustainability of the EMBRACE model in any setting are tied to the acceptance and approval of the government as this plays a major role. Some interventions had failed to yield positive results in the past after the donors or implementing partners who initiated them ended their activities in the state. This means that a lot of interventions or frameworks became redundant because there was no buy-in from the policymakers.

3.4.4 Involvements and alignment among relevant stakeholders

There is a need to involve all relevant stakeholders at different levels. For the EMBRACE model to be successfully implemented and achieve its results, all key players in the HRH space at different levels in that setting must work together as a team. The reason is, that each stakeholder understands their challenges and their early involvement goes a long way in the kind of result that would be recorded using the solution model.

4 Discussion

We have carried out a synthesis of human resources for health frameworks especially those focusing on addressing skilled birth attendants' gaps in PHCs located in under—resource settings. We synthesized 9 frameworks that are used in understanding the human resources for health challenges and interventions in LMICs.

Findings from this study shows that various HRH models have been developed, adopted, and deployed across different countries with several results recorded [14, 15, 20, 23, 24, 26, 27]. Most developed HRH models are targeted towards addressing a specific problem within the domains of HRH, hence, not providing a holistic solution to improving the HRH landscape if independently deployed. Most of the models reviewed targeted the size and distribution, leadership and governance, followed by the retention, performance, and exit management domains.

Our findings also shows that only five of the nine reviewed HRH models have been deployed in Nigeria and all have been adjudged impactful to the HRH sector. A case in point is the piloted WISN in Rivers and Cross River States for validation of the model, which was found to be very relevant in determining the exact staffing need across the PHC facilities where the model was deployed, however, the predominantly weak documentation of health data might jeopardize the efforts to scale the model across all the PHC facilities in Nigeria [28, 29]. Other limitations to the implementation of the model include its cost-intensiveness. This is corroborated by the application of WISN in India and South Africa, which was reported to be financially demanding [32]. However, PERU was able to circumvent this limitation with a contextualized WISN model. Determining the required staffing across the PHC facilities in Nigeria is crucial, however, to be able to scale the WISN nationwide, strengthening the health data reporting system and modifying the WISN to suit the Nigerian context is imperative [32].

The experiences with the WISN model was not surprising, as the need to ascertain the necessary healthcare workers (HCWs) for a population's health requirements is crucial in determining staffing needs. Knowing the size and distribution is also important for ensuring that HCWs are sufficient, retained, and appropriately incentivized. This holds significant importance for decision-makers, forming a sacred aspect of evidence-based and effective planning and resource distribution within the Human Resources for Health (HRH) sector [33].

To further corroborate this finding, the Community Midwifery model is a commendable initiative to address the HCWs shortage in the rural community, as it resulted in improved availability and retention of midwives in the piloted States—Jigawa, Zamfara, Katsina, and Yobe, which was, however, for validation of the proposed model. However, other factors such as deteriorated PHC facilities, stigmatization, lack of accommodation, and poor remuneration of the community midwives negatively limited the overall objectives of the model [19]. Given the success of the model implementation in the northern region of Nigeria, it is recommended that the community midwifery model be deployed in other regions within the country, most especially hard-to-reach areas with the greatest need.

Based on our findings, it is imperative to incorporate various models to comprehensively address all aspects of the HRH domain, while requisite attention is given to addressing other underlying problems such as dilapidated PHC facilities. Moreover, considering the diverse levels of HRH maturity at the subnational level, adopting a uniform model to attain the nationwide objective of ensuring an ample supply of qualified and committed healthcare workers across all PHCs would prove ineffective. Instead, a flexible HRH framework with adaptable models tailored to each state's unique context becomes crucial.

Given the gaps identified in previous frameworks, the EMBRACE model elucidates the interconnectivity among the HRH domains (size and distribution, production and in-service training, retention, motivation, performance, and exit management, the HRH information system, HRH leadership and governance, and HRH leadership and governance) in a country such as Nigeria. The deployment of a comprehensive HRH intervention in Nigeria seeks to be more effective than a singular domain-focused intervention as it highlights interventions across all the HRH domains to improve its landscape in the country.

The Solutions—model accentuates the roles of key stakeholders through the undertaking of complementary actions. Our model is flexible as it considers contextual factors, the midwifery value chain, as well as having a functioning HRHIS to achieve the main goals of having adequate, quality, motivated, and accessible midwives across the PHC facilities in Nigeria.

The EMBRACE model would yield effective results when there are reasonable investments in the health systems. Hence, the success of the Solutions model is dependent on the robustness of the electronic HRH information systems available in the settings where it is been deployed. Just as good governance has the capacity to boost the outward look of human resources for health interventions with digital HRH information system for timely decision making [34]. It becomes difficult to conclude on the success or weaknesses of multi-faceted health system interventions without data as evidence [35]. By simply redressing HRH interventions/models without tackling the underlying issues could worsen the dilapidated state of HRH in most LMICs.

The EMBRACE model is relevant in different settings especially under-resourced communities. Its impact is undeniable when the right policies are in place. Our Solutions model thrive in an environment/settings where there are unhindered access and political will guiding implementation through effective policies. It is important to know that policy is a sufficient condition and it plays a major role in the scaling of the model. Similarly, ensuring factors that could enhance the motivation and welfare of human resource for health professionals is a necessary condition to achieving success in the application of this all rounded solutions model.

We therefore recommend based on the findings of this study the need for further in-depth studies on relevant stakeholders at both national and subnational levels to access non-public HRH data, such as SBA attrition data at the PHC level,

and explore the barriers hindering the effective implementation of HRH models. Similarly, accountability mechanisms should be in place to ensure the implementation of HRH models and guidelines at the national and sub-national levels. This should be a robust monitoring and evaluation system at different levels that will ensure timely measurements of milestones and performance assessments.

HRH models should be integrated to create a robust and holistic HRH solutions model with deeper consideration for the global HRH goal(s) for the primary healthcare sector in Nigeria. Finally, it is essential to contextualize this solution model to the actual level of maturity of each state across the nation before adoption.

5 Limitations of the study

The following were some of the limitations of this study:

The study team experienced challenges in assessing some of the stakeholders while trying to schedule a suitable interview time that works for both parties. This was majorly due to the status and busy schedule of some of the selected study participants.

The team could not access certain offline documents and secondary datasets from some of the government health agencies due to missing documents or data, and the unavailability of persons in -charge.

6 Conclusions

This study shows that there are different HRH models which address specific elements of the HRH value chain. However, these models are not comprehensive, therefore, tackling the challenges of the availability of SBAs in Nigeria would either require the integration of multiple models or the deployment of models in a phased approach which is the proposed HRH solution models to address SBA needs of PHCs in Nigeria.

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Author contributions HE, OO, OS, TOI, TOR, EO, and MO were major contributors in writing the manuscript. OS reviewed and edited the manuscript. CC, LH, and SS supervised the manuscript writing process. All authors reviewed and approved the final manuscript. EO, TOR, and MO prepared the figures and Table.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate Not applicable.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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Appendix 1

We conducted the online search in the study by utilizing different combinations of relevant HRH-related search terms relevant to the research to develop search strings using Boolean operators:

“AND” and “OR”: (Skilled birth attendants OR nurses OR midwives OR human resources for health OR health workforce OR HRH) AND (models OR frameworks OR intervention) AND (“middle-income countries” OR “low-income countries” OR LMICs OR Nigeria OR “sub-Saharan Africa” or SSA”) (Skilled birth attendants OR nurses OR midwives OR human resources for health OR health workforce OR HRH) AND (“motivation” OR deployment OR employment OR salaries OR retention OR “exit management” OR “performance management” AND “workforce shortages”) AND (“middle-income countries” OR “low-income countries” OR LMICs OR Nigeria OR “sub-Saharan Africa” or SSA”).

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