EXPLORING THE FEASIBILITY OF COMMUNITY PHARMACY-BASED IMMUNIZATION PROGRAM AS A STRATEGY FOR TYPHOID CONJUGATE VACCINE(TCV) IN NIGERIA: GLOBAL EXPERT'S PERSPECTIVES

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Abstract

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Background: While Typhoid conjugate vaccines (TCVs) offer significant advantages, they are only available to children up to 2 years of age in Nigeria's routine immunization program. To address immunization gaps among individuals who are missed by this strategy, innovative approaches such as pharmacy-based immunization (PBI) are being explored. This study explored the perspectives of global experts on a PBI strategy for TCV, including the potential barriers and facilitators to its implementation.

Method: From February 2024 to May 2024, we conducted 12 semi-structured interviews with global experts. We purposively sampled the experts to include individuals working within nonprofit and academic research agencies and with experience developing and implementing vaccines or working with pharmacy-based programs. Interviews were conducted via Zoom, audio recorded, and transcribed. We applied in-vivo codes and analyzed the transcripts to capture key thematic barriers and facilitators to the implementation of a PBI strategy

categorized by the domains of the Capability Opportunity Motivation and Behavior (COM-B) model.

Findings: Experts showed great enthusiasm regarding the prospects of PBI in increasing vaccine coverage. They referred to it as an untapped resource that could significantly increase vaccine coverage in Nigeria. However, experts highlighted the need for pharmacists to be trained and certified in vaccine administration and reported that leaving unskilled or untrained persons to carry out pharmacist duties could hinder this strategy. Additionally, experts pointed out that pharmacies may lack space and cold storage and face resistance from some healthcare professionals. Clear policies are needed to address these issues. Experts discussed the need to adopt strategic approaches to incentivize pharmacists, for example, by offering business development opportunities.

Conclusion: While experts see significant potential in using pharmacies to deliver TCV vaccines in Nigeria, addressing key challenges like pharmacist training and certification, pharmacy space constraints, cold chain storage, and potential resistance from healthcare professionals will be important for successful implementation. Further research should explore optimal policy frameworks, effective incentive programs to motivate pharmacist participation, and the resource requirements for pharmacies to deliver TCVs.

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INTRODUCTION

Typhoid fever is an acute generalized infection caused by a highly virulent and invasive enteric bacterium, Salmonella enterica serovar Typhi, generally termed Salmonella Typhi (S. Typhi).[1] .Annually, an estimated 12–27 million cases of typhoid fever are reported worldwide, with a case fatality of 1-4%, primarily in low- and middle-income countries.[2,3] The Global Burden of Disease report highlights the highest incidence rates in South Asia, Southeast Asia, Western Sub-Saharan Africa, and Eastern Sub-Saharan Africa, with respective rates of 550, 220, 152, and 161 per 100,000 people.[2] Typhoid conjugate vaccines (TCV) represent a significant advancement over earlier generations of typhoid vaccines.[3] They offer a longer duration and a high level of protection against typhoid, with just one dose starting at six months of age.[2] In 2018, the WHO prequalified TCV for use in endemic countries and nations with high rates of multi-drug-resistant typhoid.[4,5] It has since been implemented in Pakistan, Liberia, Malawi, Nepal, and Zimbabwe, with other countries, including Kenya, Bangladesh, and Burkina Faso, preparing to apply for TCV from GAVI—the alliance—in 2024.[5,6,7]

Among the West and Central African countries grappling with a high incidence of Typhoid, Nigeria stands out as a significant contributor to the global burden of the disease.[8] The lack of robust epidemiological surveillance systems has led to a scarcity of data on the prevalence and incidence of Typhoid in Nigeria.[1] Based on comparable settings in sub-Saharan Africa and modeled estimates, the predicted typhoid burden in Nigeria ranges from 160,00 to 490,000 cases per year, with an estimated mortality of 6,000 to 18,700 deaths per year.[9] This lack of data underscores the urgent need for improved epidemiological surveillance in Nigeria to better understand and combat the disease. Studies conducted across some states reveal a concerning trend. The prevalence rates vary between 11.3% and 47.1% across febrile patients, with a high prevalence of multidrug resistance.[1,10] These estimates also suggest that the incidence of Typhoid in Nigeria is highest among children under two years old. [9] The country is considering introducing TCV after 2026, with plans to prioritize high-burden areas. This is a crucial step in the fight against typhoid, and the involvement of healthcare professionals, policymakers, and researchers is vital.

Vaccination is one of the safest and most valuable strategies for combatting Typhoid. Acceptance and coverage are essential factors in its effectiveness as a public health strategy. However, the immunization coverage rates for essential vaccines in Nigeria, as reported by WHO and UNICEF in 2022, fall between 50 and 70 percent.[11] This finding is considered inadequate compared to other West African nations like Ghana.[12] The introduction of COVID-19 vaccinations has highlighted access as one of the main obstacles to vaccination coverage in sub-Saharan Africa. [13] According to published research, four out of ten Nigerians who are not vaccinated require assistance locating a vaccination provider [13] and underlining a gap in vaccine access.

The COVID-19 pandemic and vaccines have stimulated novel approaches to vaccine introduction. With a decline in vaccine coverage due to the pandemic, stakeholders like UNICEF have advocated for more community approaches.[14] Approaches that ensure that vaccines are available

and accessible to all, especially missed populations.[14] GAVI's new civil society and community engagement approach emphasizes community engagement to build equity in immunization. It highlights a critical need to accelerate strategic alliances between the community and governments to hasten the distribution of life-saving vaccines to every child and adult who requires them.[15] According to WHO, TCV has a high level of protection against Typhoid, from 6 months to 45 years of age.[5,16] While GAVI provides country support for TCV vaccines from over 6 months to under 15 years,[7] the National Expanded Program on Immunization (EPI) routine is scheduled for children aged 0-2 years.[17]As a result, TCV distribution is limited in communities not covered by the regular schedule. This emphasizes the need for innovative strategies to improve access for marginalized and missed groups. Thus, investigating the roles that community pharmacies can play in delivering TCV is crucial.

Pharmacy-based immunization (PBI) is a vaccination modality where pharmacies found within the community play a significant role in administering vaccines to populations.[18] This is carried out independently or with other public or commercial immunization facilities.[18] This approach uses pharmacies' accessibility to bolster the number of individuals who can obtain immunizations in a welcoming and comfortable setting. PBI began in the United States following the first flu vaccination season in 1999 and has since been replicated in several settings, including the UK, Canada, and Portugal.[18] PBI brings profitable business opportunities for pharmacies, including policy changes that expand pharmacy services.[18] According to systematic reviews, PBI has positively impacted vaccine uptake rates, including patient satisfaction.[19]

Despite the demonstrated benefits of pharmacy-based immunization, its adoption in Nigeria remains limited. Several studies have consistently urged more government assistance and a more comprehensive implementation of the PBI service to improve vaccination coverage in Nigeria.[20,21] According to surveys, Nigerian pharmacists are prepared and willing to participate in PBI, and some actively offer vaccination services.[22,23,24] The preparedness of pharmacists to increase immunization services through pharmacies represents a huge opportunity. With strategic planning and addressing barriers, Nigeria can fully leverage the potential of the PBI strategy.

Since global experts support countries in implementing vaccines and interventions, this study aims to explore their perspectives on the possibility of using community pharmacies as a setting for introducing the Typhoid Conjugate vaccine (TCV) and other vaccines in Nigeria. This study also aims to discover potential barriers and facilitators to adopting pharmacy-based immunizations for TCV in Nigeria. This study contributes to the debate on the use of community pharmacies as an additional setting for the delivery of vaccines.

Conceptual Framework

Public health interventions often rely on changes in people's behavior. The Capability, Opportunity, and Motivation (COM-B) model offers an evidence-based and structured approach to understanding the factors influencing successful behavioral change. This model has been applied to improve the implementation of new professional services for pharmacists.[25] Using this framework in an intervention design clarifies what elements of the behavior system need to be modified to reach the target behavior.[26]

The model focuses on three key components influencing behavior: Capability, Opportunity, and Motivation (COM-B).

Capability is the individual's psychological and physical capacity to engage in the target behavior.[26] Capability is categorized into physical and psychological components.[27] For example, a community pharmacist's physical ability to administer vaccines requires vaccine administration skills. Their psychological capacity in this behavior refers to their knowledge of vaccines, protocol, safety, and regulations. Understanding this component in the research provides a deeper insight into tailoring training programs for pharmacists and other pharmacy providers regarding vaccination. In the COM-B framework, capability influences motivation.

Opportunity refers to all the external elements that enable a behavior.[26,27] The social component of opportunity guides understanding how non-tangible resources can support or hinder this behavior. For instance, collaboration between other health workers and government agencies can positively influence individuals to engage in the target behavior. The physical component of opportunity refers to the availability of tangible resources that could enable the behavior. For instance, this could include cold chain storage or a wash basin. Opportunity also influences the construct of motivation.

Motivation involves the reflective or automatic mechanisms facilitating or inhibiting behavioral change.[26] Reflective motivation considers how much an individual values the target behavior and how much of a priority it is to them. For example, with the right incentives, pharmacists may be more motivated to engage in the target behavior of administering vaccines on their premises. This component provides insight into how a PBI strategy that aligns with community pharmacists' intrinsic and extrinsic motivators can be adopted.

METHODS

Study Design

The study adopted an interpretative phenomenological approach grounded in the belief that theories and concepts emerge from participants' lived experiences and perspectives. It aimed to explore global experts' views on pharmacy-based immunization (PBI) by delving into their opinions and ideas. Recognizing that PBI in Nigeria remains under-investigated using an evidence-based approach, the researcher opted for an exploratory qualitative study utilizing methods associated with grounded theory. This approach leverages experts' insights and experiences to identify and understand the interplay between facilitators and barriers impacting PBI implementation.

Study Settings and Participant

This study used purposive sampling, targeting global experts working within nonprofit and academic research agencies involved in developing and implementing vaccines or pharmacy-based programs. We recruited participants using multiple approaches that leveraged the co-author's research networks, professional platforms like LinkedIn, authors of published literature relevant to the topic, and snowball sampling.

We sent an email or text message to each potential participant acknowledging their expertise and value to the study, including a brief description of the study objectives and approach. We asked potential participants to respond if they were willing to participate. Individuals could participate if they had at least three years of experience in vaccine implementation, research, or pharmacy-based programs.

Of the 20 experts contacted, 13 responded and agreed to participate; however, one declined to participate after being unwilling to provide informed consent. All 12 individuals who received a follow-up email or text to schedule their preferred interview time responded in the affirmative, and no responses were received from the remaining experts.

Data Collection

We developed a semi-structured interview guide informed by COM-B framework [26] and conducted one interview virtually to pilot test the guide. Audio recordings were made during the interviews and later transcribed for a comprehensive recording of the discussion. The transcripts were then reviewed, and the interview guide was revised based on these comments and suggestions. The guide was revised based on the pilot study to enhance participant engagement and include questions on community beliefs and motivation components**.**

The revised interview guide explored the following:

i. Provider capacity, opportunity, and motivation to administer typhoid vaccine in pharmacies.
ii. Perspectives on introducing typhoid vaccines in pharmacies.
iii. Recommendations on the potential barriers
iv. Lessons learned from other pharmacy-based programs were introduced in different settings.

From February 2024 to May 2024, we conducted interviews in English over Zoom video calls. All interviews were audio recorded and transcribed. After each interview, we created a debrief report summarizing the key takeaways discussed during team meetings.

Data analysis

To ensure the accuracy and reliability of the transcripts, the researcher thoroughly reviewed them, comparing the audio data to identify missing information and contextual meanings. Corbin and Strauss's strategy of questioning, theory comparison, and leveraging life experiences was used to guide data analysis.[28]

To guide the analysis, eight questions were developed based on the COM-B framework and the study guide:

i. To what extent do pharmacy providers have the knowledge and skills to provide these services?
ii. How appropriate a setting do you think the pharmacy is for providing these services?
iii. Do pharmacies have the resources to provide such services?

iv. Are incentives necessary when offering such services?
v. What would be the impact of delivering these services to the target population?
vi. What are the advantages of offering these services to the target population?
vii. What are the advantages of offering the PBI service?
viii. To what extent will the service improve child health?

To ensure the answers to each question were grounded in the data, an in-vivo coding approach was adopted. This involved developing codes directly from participants' words and phrases. After this process, the codes were organized into similar categories and themes derived from each category. The analysis aimed to identify barriers and facilitators stratified by the COM-B domains (Capability, Opportunity, and Motivation) and to discover unique themes on PBI in Nigeria. To validate the findings, AM and MM reviewed a subset of the transcripts and discussed the findings with TT during team meetings.

Reflexivity

We held regular meetings to discuss and debate the study's procedures and results to maintain reflexivity. TT, the researcher responsible for interviews and analysis, further ensured reflexivity by creating positionality statements at the outset of the research and revisiting them throughout the study. Leveraging her experience as a pharmacist and native Nigerian with over three years of community pharmacy knowledge, TT ensured proper introductions before interviews, especially for participants she hadn't met beforehand.

Ethical Considerations

The institutional review board at the University of Washington considered the study exempt from formal review. All participants provided verbal consent before participation.

RESULTS

Study Population

From February 2024 to May 2024, we interviewed 12 participants. With 4 participants' age data missing due to late completion of the survey, experts' ages ranged from 36 to 79 years, with an average age of 39. Interviews lasted 30 to 60 minutes, with an average of 40 minutes. Of the experts interviewed, 7 identified as male and 5 as female. Six experts were connected to government agencies, 2 to universities, 2 to research organizations, and 2 to non-profits. Experts indicated a range of 3 to 40 years of experience in vaccine or pharmacy-based programs, with an average of 17 years of experience. Among those interviewed, 10 mentioned they had experience working in low-resource settings.

Expert opinions on the impact of pharmacy-administered typhoid conjugate vaccines

This section explores experts' opinions on the potential impact of the pharmacy-based immunization (PBI) strategy in Nigeria. Eleven experts believed that PBI could improve vaccine accessibility and increase vaccine coverage. They discussed the strategy's potential to reduce the burden of typhoid and other vaccine-preventable diseases. Furthermore, five experts specifically mentioned that PBI services in Nigeria could lead to fewer missed doses and a

decrease in the number of children who have never received vaccinations (zero-dose children). Overall, experts view the PBI strategy as a great opportunity. For example, one expert stated:

"*We've established that we can provide sexual and reproductive health services in a much more packaged and targeted way within pharmacies. In much more developed countries, pharmacies have always been maximized in their potential. And I'm hoping we see much more commitment in Africa because it's a low-hanging fruit to improve population access to services. Partnering with the private sector to increase our reach and coverage of services has been effective*" (Female, research organization, three years of experience).

Experts also highlighted the importance of considering the community's perception of pediatric vaccine safety. They suggested that administering these vaccines in pharmacies might require more tact and supervision. Three experts specifically discussed potential barriers to community understanding of the PBI strategy. They explained that community members may have preconceived notions about pharmacists' roles, and vaccine administration might not be readily seen as part of those duties. One expert shared:

"*Think of it this way; for as long as we have been here, mothers, you know, for under five immunization programs, they take their kids to under five clinics. So why would I, as a mother, take my child to a pharmacy? So, there could be that, but there could be an opportunity to focus on adult vaccines."* (Male, government entity, six years of experience)

Disagreement also arose regarding the potential impact on vaccine access equity between affluent and poorer communities. One expert expressed concern that the strategy might exacerbate inequity, as pharmacies tend to be located primarily in urban areas, potentially increasing accessibility only for the wealthy:

"One big advantage is the ability to attract the elites, so the affluent communities in the urban areas would normally not go to a community health center but would probably find it more comfortable to go to a private pharmacy. But then, where you continue to increase the gap between the rich and the poor regarding health-seeking behavior and health provision, I think it further exacerbates it*."* (Male, Non-profit, twelve years of experience)

"And so, if you sort of provide a service that in a way separates the rich and affluent from the general, from the rest of the community, could have that sort of pervasive outcome" (Male, non-profit, twelve years of experience)

One other expert thought this could bridge the gaps in vaccine equity and described it as an advantage of the PBI strategy:

*"Some of the advantages I can think of are that this could decrease the gaps in access and promote health equity." (*Male, non-profit, ten years of experience)

Capability of pharmacists to administer typhoid conjugate vaccines

This section explores experts' perceptions of whether pharmacists have the skills and expertise to deliver the PBI strategy.

Eight experts shared that pharmacists receive vigorous and intensive pharmacy school training. They were confident that their training made them highly skilled professionals and respected healthcare workforce members in their communities.

"Their courses are quite rigorous, and their understanding of their role within the provision of healthcare services is good; they have the scope within their courses that renders them quite good healthcare workers." (Male, non-profit, ten years of experience).

Most experts felt that while pharmacists are highly skilled professionals, their elementary training does not include the administration of vaccines. Ten experts shared that pharmacists may lack the hands-on experience to administer vaccines, underscoring the need for training and certification to overcome this barrier. One expert shared that although pharmacists may not have been trained in vaccine administration, some have taken an interest in administering injections and have found ways to become adept in these skills.

"*If you are interested in them, you can learn how to do them. You can try to find other ways to become better at things like injections. But that said, it's not part of the curriculum. Nobody will formally teach it to you, and you will never be evaluated against it. This is the first barrier that needs to be addressed." (Male, non-profit, ten years of experience)*

Another expert emphasized the need for training:

"Lack of certification could be a barrier or a challenge because other entities within a given country, whether it's Nigeria or Ghana, would want to see that a pharmacist has completed the necessary course of experience and instruction to be a vaccinator and that kind of certification should come from a recognized body" (Male, university, thirty-five years of experience)

Most experts proposed a comprehensive training approach, balancing theory and practical aspects. Experts mentioned that training should include vaccine administration and motivational interviewing so pharmacists can convince vaccine-hesitant patients to indulge. Nine experts expressed the importance of including components of M&E reporting, monitoring for AEFIs, waste management, and the fundamentals of the disease of concern.

"But I think there's something that's lacking; empathy building, communication skills, and listening skills should all be included in addition to routines like vaccine management and administration safety-related elements. For vaccine-hesitant folks, you know, pharmacists can navigate those conversations and potentially help, using skills like motivational interviewing to make that person decide that they want a vaccine." (Female, non-profit, 5 years of experience)

Experts revealed that sometimes, in similar settings, pharmacists are not always present in the community pharmacies. Two experts specifically discussed that some pharmacies permit family members or personnel not trained to manage these premises. Experts felt that lack of supervision and regulations could lead to the abuse of patients' rights by quacks or untrained personnel. One expert discussed:

"It is assumed that a pharmacist is someone well-trained. But often, you know, in some of these countries, they have nurses or anybody who can sit there and dispense medicine" (Male, government entity, six years of experience)

Opportunity for pharmacists to administer typhoid conjugate vaccines

This section explores expert's perceptions of pharmacists' physical and social environment and how it might influence the ability of pharmacies to administer typhoid conjugate vaccines.

Experts identified a potential lack of space, logistics, and capital within community pharmacies as barriers to implementing PBI services. Specifically, concerns were raised regarding the physical layout of pharmacies in these areas.

Nine experts discussed the need for space, highlighting that those pharmacies would need space to administer vaccines, counsel patients, and monitor for Adverse Events Following Immunization (AEFIs)AEFIs. In addition, four experts revealed that pharmacies in similar settings as Nigeria are usually structured so patients can walk in, purchase medications, receive over-the-counter counseling, and then depart through a one-way exit. Experts considered that there would be a need to restructure the pharmacy setting to create room for administering vaccines, counseling, and monitoring AEFIs. One expert discussed:

"Logistically speaking, a pharmacy is not necessarily designed like some accommodation so that they can easily administer vaccines, you know, because most of the time people come, they get the vaccine, maybe they get some advice, and then they go out through the same way." (Male, non-profit, 10 years of experience)

Another expert shared:

"*So, I have been to a few pharmacies there, and in those countries, pharmacies are not as big as in my country. They are often quite small, compact spaces. So space would be an issue".* (Female, research organization, three years of experience)

Experts also noted that capital and cold chain storage may be an additional barrier. They highlighted that some pharmacies in settings such as Nigeria still struggle with capital to stock their pharmacies with essential medicines. And so, enhancing extra cold chain storage may be challenging. One expert explained this:

"They already have fridges most of the time, but the refrigerator will need additional space, such as cold chain space, to store these vaccines. This will add to the logistical implications for that, but other than that, I don't see any other barrier." (Male, non-profit, ten years of experience)

Another expert discussed that the need for refrigerators may not be a deal breaker as there could be alternatives. They mentioned:

"We have vaccine carriers and ice packs, which are usually supported by the program. So, the idea is to get community pharmacists to get vaccine carriers. And they take the vaccines in the vaccine carrier to their facilities in the morning." (Female, government entity, five years of experience)

Some other resources mentioned by experts were the need for adequate tools and technology for documentation. Two experts discussed the need to provide tools for monitoring vaccination. One of them discussed:

"You have to have something to document the things that you are doing when you receive the vaccine when you administer them, all of that including getting consent" (female, government entity, five years of experience)

Experts generally agreed that pharmacies offer the most accessible healthcare service in communities. All participants referred to them as the initial point of contact for various health concerns. Experts generally felt that the community pharmacy was an appropriate setting for implementing this service. Three experts gave anecdotes of outbreaks and pandemics to reinforce how appropriate the pharmacy settings are for administering vaccines. Many experts referred to them as an untapped resource. For instance, one expert mentioned:

"It's such an untapped resource in the community. Their position in terms of geographical location, the proximity to which people can access them easily, and their location in terms of customer friendliness are ideal." (Male, government entity, six years of experience)

Experts also referred to the community pharmacy as having round-the-clock accessibility and that its informal nature allows patients to feel more comfortable seeking healthcare. Three experts expressed this by citing examples of the Ebola outbreak in Liberia and the COVID-19 pandemic. One expert mentioned:

"*Right during the Ebola epidemic, Ebola outbreak in Liberia, people were not going to the health facilities. People couldn't go for many reasons, including fear, overload, etc. We worked with the Ministry of Health to use pharmacies to dispense all the essential medicine during the outbreak. So, you can see today that you can position them for a lot more."* (Male, government entity, six years of experience)

Another expert discussed:

"It's also been something that has come up a little bit more during, as part of the COVID vaccination drive, where pharmacies have set up provisions where they can administer drugs or vaccines, COVID vaccines and any other vaccines, including yellow fever, vaccines that are required for travel for people to get them at the pharmacies." (Male, non-profit, ten years of experience)

Experts broadly expressed that a lack of policy and support from the government and other health professionals could hinder the PBI strategy. They felt that government policies that support pharmacies administering vaccines are necessary to ensure the quality of pharmacists' training. One expert expressed the need for adequate policies to provide supply chain management and ensure the safety of vaccines distributed to these pharmacies:

"*So, it's important that these pharmacies are also regulated under a policy that ensures the safety of the vaccines that are provided in the pharmacies"* (Male, non-profit, twelve years of experience)

Another expert spoke more on the issue of regulations:

"*So, laws and regulations can be a challenge, and alternatively, they can be very strong enablers, which implies the importance of understanding what can and cannot be done in the context of existing laws and regulations for practice. If the scope of practice is restrictive in a given country, that presents a barrier. If it's silent or expansive in terms of scope, then it becomes an enabler,*

so it's really important to understand in any given country what pharmacists are legally allowed to do and can't do." (Male, university, thirty-five years of experience)

Eight experts emphasized that resistance from other professional bodies could be one possible obstacle to this strategy. According to one expert, this reluctance may result from health workers fearing for their jobs:

"The other issues came in because other healthcare providers, particularly those who keep their vaccines and those who administer the vaccines, thought we were creating a new cadre of healthcare professionals who would take their jobs from them." (Female, government entity, five years of experience)

Experts felt pharmacists' ability to administer vaccines would be enabled with adequate policies and proper engagement. One expert emphasized the necessity of advocacy and communications while noting that overcoming these obstacles might take some time:

"It took a little bit longer to convince them because, in the national guidelines, TB medicine is free and can only be provided in the public sector. So, the idea that they could be part of, you know, increasing access to TB medicine all over the place took a little longer. I think it took longer to convince them; it took longer to rationalize with them." (Male, non-profit, six years of experience)

Motivation of pharmacists to administer typhoid conjugate vaccines

This section explores experts' views on factors influencing pharmacists' motivation to administer typhoid conjugate vaccines.

Experts suggested that a pharmacist's motivation to administer vaccines could come from the feeling of contributing to public health. Five experts suggested that implementers can emphasize the service's humanitarian benefits and potential to improve the health of their community as an incentive and, therefore, increase pharmacist support for the PBI service.

"And part of it is a desire to provide a public good to the community. Some motivation is altruistic in that respect, but I also think it's important to determine how to reimburse pharmacists for their services." (Male, university, thirty-five years of experience)

Four experts, however, stated that private pharmacies' focus on making money is not sustainable.

Six experts discussed that community pharmacies are private entities and, as such, would inherently tilt toward income-generating activities. They believed it is vital to consider incentives that carefully prioritize the pharmacy's business needs. They described incentives in the PBI strategy as a possible increase in footfall, increasing the pharmacy's clientele and demand for other services.

One expert shared on why incentives should be considered:

Six experts discussed that community pharmacies are private entities and, as such, would inherently tilt toward income-generating activities. They believed that it is vital to consider incentives that prioritize the pharmacy's business needs carefully. They described incentives in

the PBI strategy as a possible increase in footfall, increasing the pharmacy's clientele and demand for other services.

One expert shared on why incentives should be considered:

*"If they're done correctly with so much private sector engagement, you can do anything with them. I mean, they're so creative. There's much potential there. If incentives are well aligned, they will do your public health function in a way that benefits the community." (*Male, non-profit, six years of experience)

Another expert shared:

"You know, if you are a pharmacist, probably you have a private practice, you have taxes to pay, you know, you're thinking that although you may be interested in doing public health, you tend to think like a businessman because you have some liabilities, some commitment, etc." (Male, non-profit, ten years of experience)

One participant revealed how the private sector typically mistrusts the government, its laws, and its involvement in their business.

"Don't think they will be sitting there jumping and want to do it. People are very skeptical of government intervention in the private sector. I saw it in some countries." (Male, non-profit, six years of experience)

They also elucidated the concept of incentives in general with suggestions:

"They struggle because there's no consolidation around those markets to serve them. So, we understood a little about those market dynamics, the markups, the supply chain, and all. We started addressing those. Number one, we'll provide them with a loan. You know, there were several criteria. We had a powerful component of business management. So, they'll sit down with them, and they'll look at their income, cash flow, customer base, and what they're doing" (Male, non-profit, six years of experience)

DISCUSSION

This study explored expert opinions on the potential for pharmacists to improve typhoid conjugate vaccine coverage in Nigeria and builds on existing research that demonstrates the success of PBI programs in other settings.[19,29] Experts were generally supportive and enthusiastic about PBI because they believe pharmacies are a convenient first point of contact for many people. This aligns with stakeholders' views in a similar program focused on family planning, where pharmacies were seen as a way to improve access to healthcare.[30] In this study, experts believe PBI could help reach people who haven't been vaccinated before, including higher-income earners who might prefer pharmacies because they avoid long wait times often associated with traditional healthcare settings. However, experts also expressed concerns that not all pharmacists have the necessary training and skills to administer vaccines and that some tasks might be delegated to unskilled personnel, which could be a safety risk. Overall, experts saw pharmacies as a good fit for typhoid vaccine administration, although they acknowledge challenges like supply chain issues, limited space, lack of clear policies, and the need to motivate pharmacists to participate.

Like many professionals starting a new service, experts believe pharmacists need training and certification to administer typhoid vaccines. Some experts indicated that current training programs might not include vaccine administration, raising concerns about pharmacists' practical experience. This concern aligns with previous research, where pharmacists reported feeling unprepared for vaccination due to their education.[23] Interestingly, some pharmacists in Nigeria are already involved in vaccine administration, according to surveys and other studies.[31,32,21] This suggests that some pharmacists are taking the initiative to get trained, supporting the view that some are already skilled in vaccination. Training and certification still remain critical; however, assessing pharmacists' existing skills before training and potentially offering targeted programs might be an efficient approach. Further research is needed to understand the type of vaccination skills and the extent to which pharmacists possess these skills in Nigeria.

In this study, experts raised concerns that some pharmacies might be run by inexperienced individuals who lack proper qualifications. This situation can be detrimental because it creates a risk of unqualified people administering vaccines, potentially compromising safety and effectiveness.[33,34] Unqualified individuals in healthcare roles are not unique to Nigeria and are a concern in other parts of the world.[33,34]To address this challenge and ensure qualified professionals administer typhoid vaccines, it will be essential to establish a supervisory body responsible for training and certifying pharmacists in vaccine administration. Displaying certifications in pharmacies as visible proof of qualification can also help alleviate public concerns and build trust in the PBI program.

To our knowledge, there is limited information on the physical resources pharmacies in Nigeria have for vaccine administration. Even though experts expressed confidence in pharmacies being a good fit for typhoid vaccine administration, they highlighted the need to address critical resource limitations, including physical space, cold chain storage, and documentation systems. These limitations are similar to those observed in other resource-limited settings implementing services in pharmacies ordinarily provided in traditional health facilities. [35,36,37] However, our study findings

suggest that vaccine carriers could be a practical solution when refrigerators are unavailable. Vaccine carriers are insulated containers designed to transport vaccines at recommended temperatures to ensure they remain potent and effective until they are administered[38]. Further research is needed to understand the existing infrastructure of pharmacies in Nigeria and their suitability for typhoid vaccine administration.

Previous findings from a state survey in Nigeria indicated that many pharmacists want to be compensated for providing vaccines.[23] Studies have also suggested that lacking capital and space is associated with lacking financial resources or incentives. [23,37] When pharmacists are not incentivized to prioritize immunization, there is little motivation to allocate limited resources toward improving or expanding these facilities. This study's new insight is that experts suggest engaging the private sector with targeted incentives by approaching them with business growth and development ideas. Examples of suggested incentives include micro-loans, refrigerators, and free training. According to published literature, pharmacists in Nigeria who received training as vaccinators often bear the program's costs.[21] This highlights an area for intervention: offering free training to enhance the community's trust and professionalism in their local pharmacists. This study also suggests that increased visits to pharmacies for vaccinations could lead to greater patronage of these pharmacies' services. PBI has a history of boosting pharmacy revenue in various ways.[18] For instance, the demand for travel vaccines, usually not free, could create a profitable opportunity for community pharmacies through PBI services

STRENGTHS AND LIMITATIONS

This study has several strengths. Utilizing the COM-B framework identifies specific areas for intervention and reveals a comprehensive analysis of the potential barriers and facilitators to PBI adoption in Nigeria. This evidence-based strategy is meticulously designed to maximize the PBI strategy's full potential by identifying barriers that implementers can consider for interventions. The study's design also allowed for exploring stakeholders' unique perspectives, drawing on lessons learned from similar programs. Ultimately, this study offers actionable recommendations informed by the expertise of those involved in vaccine implementation and pharmacy-based programs.

While there is so much to learn from experts, we recognize that this study has certain limitations. First is the tendency to lean overly on experts' perspectives, neglecting other stakeholders' views, like the pharmacists and community members. Another limitation is that most experts lack lived experience in these settings and may have provided perspectives based on their contextual understanding. Thus, we suggest additional studies utilizing the COM-B framework with other essential stakeholders, such as pharmacists and community members. This would allow the potential of the PBI approach to be fully explored.

CONCLUSION

In this study, experts saw significant potential in using pharmacies to deliver TCV vaccines in Nigeria. However, addressing key challenges like pharmacist training and certification, pharmacy space constraints, cold chain storage, and potential resistance from healthcare professionals will be necessary for successful implementation. Further research should explore optimal policy frameworks, effective incentive programs to motivate pharmacist participation, and the resource requirements for pharmacies to deliver TCVs.

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