

Assessing the Development, Design, and Implementation of Gender-Responsive mHealth Solutions for Nigerian Women

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KEYWORDS Cultural Competence. Digital Health. Gender Equity. Healthcare Access. Mobile Technology. User-Centred Design

ABSTRACT This study investigates the development, design, and implementation of gender-responsive mHealth apps for Nigerian women, aiming to evaluate their potential impact, develop recommendations, and assess existing mHealth apps' effectiveness. Through interviews with five mHealth app decision-makers, developers, and owners, the study explores perspectives on addressing the unique needs of Nigerian women. The results showed different motivations behind gender-responsive mHealth solutions, primarily focused on improving healthcare accessibility and addressing specific health challenges. The study highlights the importance of user-centred, culturally sensitive design approaches considering Nigerian women's health needs and challenges. The results emphasise the need for tailored features, cultural competence, and strategies to overcome awareness, language, and infrastructural barriers. This research contributes valuable insights for creating effective, accessible, and culturally relevant mHealth solutions that can significantly improve healthcare access and outcomes for Nigerian women, promoting gender equity in health.

INTRODUCTION

The potential of mobile health applications (mHealth apps) to address traditional barriers to health access, such as resource limitations, geographic inaccessibility, and inadequate healthcare infrastructure, makes it significant (Agarwal et al. 2021). In Nigeria, mHealth applications have also facilitated the real-time collection of health data, monitoring of health indicators, and tracking of medical supplies at the health facility level (Osei et al. 2021).

In Nigeria, the impact of mHealth solutions on women's health is very significant. Designing mHealth solutions with a gender-responsive approach is crucial to addressing the particular health demands and barriers that Nigerian women experience. This involves considering socio-cultural features, socio-economic variables, and demographics and making sure the technology is accessible and easy to use for the intended audience (Kabongo et al. 2021; Kayode-Adediji et al. 2023).

mHealth apps can improve healthcare outcomes by facilitating prompt access to health in-

formation, remote consultations, and prescription reminders. However, it is essential to note that a thorough grasp of the needs, preferences, and sociocultural contexts of the target population is necessary for the successful implementation and adoption of mHealth applications (Ameyaw et al. 2024; Cao et al. 2022; George et al. 2021; Giebel et al. 2024). Gender-responsive mHealth design and implementation is crucial in Nigeria since gender differences in healthcare service consumption and access are still present. Women frequently encounter particular barriers, such as restricted access to resources, low decision-making autonomy, and societal norms that shape their health-seeking behaviours (Udenigwe et al. 2023).

In Nigeria, there are significant barriers to attaining equitable healthcare outcomes due to gender differences in the availability, design, and application of mHealth apps. Apart from the advantages of mobile health solutions, gender differences in the availability, design, and application of these technologies in Nigeria are obvious (Luo and Muo 2022). The authors also opine that men

and women are influenced differently by perceived disease risk, response efficacy, self-efficacy, and response cost. These inequalities are visible in the persistence of mHealth app usage.

Women's effective engagement with mHealth apps is restricted by several societal barriers, such as restricted access to mobile devices and low levels of digital literacy. Failure to address these gender-specific challenges can exacerbate existing healthcare inequalities and undermine the potential impact of mHealth solutions.

Gender-responsive techniques must be included in designing and implementing mHealth apps to guarantee that Nigerian women have fair access to and use mHealth solutions. Without these customised techniques, mHealth solutions risk escalating already-existing disparities and falling short of reaching the groups most in need of better access to healthcare (Peter et al. 2023; Udenigwe et al. 2022).

Objectives of the Study

This study aims to investigate and promote the development, design, and implementation of gender-responsive mHealth solutions that effectively address the unique healthcare needs of Nigerian women. The specific objectives of this study are:

1. To evaluate the potential impact of gender-responsive mHealth apps on healthcare delivery among Nigerian women.
2. To develop recommendations for designing and implementing gender-responsive mHealth apps that enhance healthcare access and outcomes for Nigerian women.
3. To assess the effectiveness of existing mHealth apps in addressing Nigerian women's healthcare needs and challenges.

METHODOLOGY

This study aims to evaluate the potential impact of gender-responsive mHealth solutions on healthcare delivery among Nigerian women. This study used the interview method as the primary data collection method. The interview method is needed to explore complex things, gain in-depth insights, and gather diverse participant perspectives (Osborne and Grant-Smith 2021). This study's interviews allow for a deep understanding

of the experiences, challenges, and viewpoints of decision-makers, developers, and owners concerning designing and implementing gender-responsive mHealth apps.

Eppich et al. (2019) opines that the interview method is needed for several reasons. For this study, it makes it easier to analyse personal experiences, beliefs, and attitudes necessary for understanding the factors that influence the development and adoption of gender-responsive mHealth apps. Through open-ended questions, interviews enable participants to share their unique perspectives, ideas, and stories, providing rich and contextualised data that may not be easily captured through other methods (Eppich et al. 2019).

The interview method also allows for flexibility and adaptability, which helps the researcher to tailor the questions and trends that arise or additional information (O'Quinn et al. 2024). This flexibility is valuable when examining the complex nature of gender, sociocultural factors, and technology, as it allows for a deeper understanding of the nuances and intersectionality that shape the design and implementation of mHealth apps. Furthermore, interviews foster a rapport between the researcher and participants, creating a safe and comfortable environment for open dialogue (Eppich et al. 2019). This is particularly important in the Nigerian context, where cultural norms and gender dynamics may influence participants' willingness to share their experiences. By establishing trust and rapport, interviews can facilitate authentic responses, providing valuable insights into Nigerian women's unique challenges and barriers in accessing and utilising mHealth apps.

In the context of this study, interviews with mHealth app decision-makers, developers, and owners gave a deeper insight into their perspectives, experiences, and challenges in addressing the needs and barriers unique to Nigerian women (Walton et al. 2022). By gaining insights into their decision-making processes, design considerations, and implementation strategies, this study can help develop valid recommendations for gender-responsive mHealth apps that effectively meet the unique needs of Nigerian women.

Data

Five respondents were purposively selected because they are mobile health developers, own-

ers, or integral decision-makers. These respondents were also chosen because they are Nigerians, and the mHealth apps are developed primarily for Nigerian audiences. The five respondents who were selected and participated in this study are:

- i. The Chief Operating Officer (COO) of DRO Health
- ii. The Head of Socials of Akoma Health
- iii. The Product Growth Manager of Motherboard
- iv. An anonymous staff from Reliance Health HMO
- v. An anonymous staff from Famasi Africa

The use of purposive sampling follows the principles of qualitative research, which emphasises the importance of collecting different points of view to thoroughly understand the subject matter being studied (Gentles and Vilches 2017).

In the data collection process for this study, semi-structured interviews were used to relate with Nigerian mHealth app decision-makers, developers, and owners. The interview sessions were conducted through Google Meet. This web-based meeting platform enables video and audio communication regardless of the participants geographical locations in Nigeria. The use of Google Meet as a platform for conducting interviews offers many advantages in the context of this study. Firstly, it allows respondents to participate and navigate physical limitations (Sari et al. 2020). The use of Google Meet is also much needed, given the different geographical locations of mHealth stakeholders within Nigeria and the logistical challenges associated with in-person interviews.

Secondly, Google Meet provides a convenient platform for respondents to share their perspectives and opinions concerning the development, design and implementation of gender-responsive mHealth solutions for Nigerian women. The online format allowed the respondents to engage with the interview questions at their convenience, potentially encouraging more thoughtful and deliberate responses (Sari et al. 2020). Also, using a web-based platform, the interview questions were presented and delivered consistently, reducing the possibility of biases arising from in-person interviews.

The interview questions were created to allow for open-ended responses via Google Meet, allowing the detailed collection of the respondents' opinions. This method made it easier to gather

tailored data, allowing for a better understanding of the nuances and difficulties related to developing and implementing gender-responsive mHealth solutions in Nigeria. After recording the responses via Google Meet, the responses were transcribed for easier understanding and then subjected to qualitative data analysis methods like content analysis and thematic analysis to find recurring themes, patterns, and insights significant and applicable to the objectives and theories of this study (Saunders et al. 2023). It is important to note that while using Google Meet made response collection more accessible, the respondents' rights and privacy were protected throughout the research process by adhering to ethical issues like informed consent, data privacy, and confidentiality.

RESULTS

A thematic analysis was conducted across several questions to explore respondents' different opinions and perspectives on designing gender-responsive mHealth apps for Nigerian women. The respondents were asked to share their opinions on whether the mHealth app they developed or work for is usable by the general Nigerian population or women alone, how the app addresses the health needs and challenges of the average Nigerian woman, the sources of health information they reference to understand the cultural context, beliefs, behaviours and needs of target female users in Nigeria, etc. The thematic analysis of the responses revealed several key themes related to designing gender-responsive mHealth apps for Nigerian women. These themes highlight Nigerian women's needs and preferences, providing valuable insights for developing and designing mHealth apps that serve as the primary focus.

Theme 1: Motivations for Developing, Designing and Working with Gender-Responsive mHealth Apps

One of the prominent themes that emerged from the data was a need to know the motivation for building and designing these mHealth apps. The answers from the respondents showed different motivations behind the development of gender-responsive mHealth apps. While some respondents were not directly involved in conceiving the initial idea, others provided insightful perspectives on

the motivations behind their respective mHealth products. Table 1 presents relevant quotes that illustrate this theme.

Respondent 4's response highlights a common motivation for developing mHealth apps, that is, enhancing accessibility to healthcare services and resources. By providing a convenient platform for members to access services, schedule appointments, and receive personalised health guidance, Reliance HMO aims to address the challenges Nigerian women often encounter in accessing healthcare. This aligns with assessing the influence of gender-responsive mobile health apps on healthcare provision to women in Nigeria.

Respondent 5's response emphasises how necessary it is to address medication distribution and access concerns. Famasi Africa's solution addresses problems, including drug shortages and long waiting times, using digital technology to connect Nigerians with authorised pharmacies. This motivation is beneficial for Nigerian women, who frequently encounter more obstacles getting access to necessary drugs because of socioeconomic and cultural issues.

To create gender-responsive solutions for Nigerian women, mHealth apps must bridge healthcare access and service delivery gaps, as these responses highlight. By addressing the challenges faced by this demographic, mobile health apps have the potential to enhance healthcare results and enable women to assume responsibility for their health.

Theme 2: Understanding the Health Needs and Challenges of the Nigerian Woman as a Target Audience for mHealth Apps

Another recurring theme was the need to understand the average Nigerian woman as a target audience for mHealth apps. The responses show the importance of understanding Nigerian women's healthcare needs and challenges when designing mHealth apps. Some respondents highlighted the need to address issues such as maternal health, family planning, cancer screening, and mental health support, which are essential concerns for Nigerian women's overall well-being. Table 2 presents relevant quotes highlighting this theme.

Table 1: Quotes highlighting the motivations for developing, designing and working with gender-responsive mHealth apps

<i>Direct quotes</i>	<i>Respondents</i>
"I did not come up with the idea, but it is brilliant."	Respondent 1
"It was to create a platform where people could buy therapy and gift their loved ones."	Respondent 2
"I did not come up with it."	Respondent 3
"Reliance HMO was developed to provide our customers with a convenient way to access healthcare services in Nigeria, access diagnostic tests and receive personalised health tips and reminders."	Respondent 4
"Famasi Africa was built for Nigerians to provide convenient access to authentic medications for Nigerians by connecting them directly to licensed pharmacies online and through a mobile app. This helps address challenges like drug stock-outs and long travel distances to physical pharmacies."	Respondent 5

Table 2: Quotes highlighting the understanding of the health needs and challenges of the Nigerian woman as a target audience for mHealth apps

<i>Direct quotes</i>	<i>Respondents</i>
"Women who use our app have remote access to healthcare practitioners."	Respondent 1
"We provide mental health support for women across all facets of their lives. As women's mental health has been neglected a lot."	Respondent 2
N/A	Respondent 3
"The app includes a dedicated section for women's health, covering bookings such as maternal health, diagnostic tests, spas and cancer screening."	Respondent 4
"While not exclusively for women, our platform helps address common health needs by providing easy access to a wide range of authentic medications from reputable pharmacies. This includes medications for women's health issues like fertility, maternal care contraceptives, etc. The convenience helps overcome challenges like mobility issues."	Respondent 5,

Respondents 1, 4, and 5 offer helpful suggestions through their mHealth apps in understanding the health needs and challenges that Nigerian women face trying to obtain healthcare services, such as geographical barriers. These apps aim to close the gap and increase Nigerian women's access to healthcare by providing features including quick access to verified pharmacies, instructional materials, and remote access to medical professionals. Respondent 2 highlighted the importance of offering thorough mental health support via their mHealth app and addressed the frequently overlooked issue of mental health among Nigerian women. Recognising Nigerian women's holistic healthcare needs shows that the target audience is understood, as there is a need to address several aspects of their well-being.

The responses under this theme highlight the importance of tailoring mHealth apps to Nigerian women's unique needs and challenges. By incorporating features and content tailored to address issues like maternal health, reproductive health, mental well-being, and access to healthcare services, these Nigerian mHealth apps show an interest in understanding and serving the target audience effectively.

Theme 3: Designing Nigerian mHealth Apps for Relevance and Resonance

The respondents mention the need to prioritise mHealth app features and topics that address Nigerian women's health challenges and needs. Some respondents mention chronic disease management, maternal and child health, and preventive care as areas of relevance and resonance for Nigerian women. By giving attention to these relevant health areas,

mHealth apps can significantly improve healthcare access, improve disease management, and promote preventive behaviours among Nigerian women. Table 3 presents relevant quotes highlighting this theme.

Respondent 1 emphasises the importance of ease of use, accessibility and pricing, which involves considering cultural factors influencing user experience and adoption. Respondent 3 notes the relevance of health insurance purchases, which cultural beliefs and financial constraints may influence. By understanding Nigerian women's cultural context, beliefs, and behaviours, mHealth app stakeholders (developers and decision-makers) can ensure that the content, messaging, and overall user experience resonate with the target audience, enhancing engagement and increasing the likelihood of continued use.

To effectively design Nigerian mHealth apps for relevance and resonance, decision-makers and developers must balance addressing Nigerian women's health challenges and ensuring that the solutions are culturally appropriate and resonate with the target audience's values, beliefs, and lived experiences. This can be done through user research, involving end-users in the design and development process.

Theme 4: Sources of Health Information for Cultural Context, Behaviours and Needs of Women in Nigeria

The responses under this theme mention the different sources of health information that mHealth apps leverage to understand the cultural context, behaviours, and needs of users in Nigeria when designing mHealth apps. This is essential in de-

Table 3: Quotes showing the designing of Nigerian mHealth apps for relevance and resonance

Direct quotes	Respondents
"We are a mental health brand, so we prioritise ease of use, accessibility and pricing."	Respondent 1
"Chronic illness is a priority as it affects daily living and is a leading cause of death. We focus on cardiovascular health and mental health."	Respondent 2
"We do not discuss health topics specifically. We might discuss topics that relate to health insurance purchases, but only in ways that affect employers (who make the purchases for employees) rather than the end users (employees who use the health insurance)."	Respondent 3
"We prioritise chronic disease management, maternal and child health, and preventive care. These areas represent significant health challenges in Nigeria, and our app aims to empower our customers to manage their conditions better and adopt healthier lifestyles."	Respondent 4
"Some key health topics we focus on are chronic disease management (e.g. diabetes, hypertension), maternal and child health, sexual and reproductive health, and general wellness/immunity boosting products. Based on data, these align with Nigeria's major health challenges and needs."	Respondent 5

veloping gender-responsive mHealth apps that align with the target audience and address their healthcare needs and challenges. Table 4 presents relevant quotes highlighting this theme.

Some respondents highlight the need to consult local stakeholders, healthcare professionals, and end-users through case studies, user research, and customer feedback. This direct engagement with the stakeholders allows mHealth app developers and decision-makers to gain first-hand insights into Nigerian women's cultural differences, health beliefs, and lived experiences, ensuring that these mHealth apps are culturally appropriate and relevant.

Respondents 4 and 5 reference credible sources such as published works, reports from international health agencies like UNICEF and the World Health Organisation (WHO), and partnerships with local healthcare facilities. By combining these various sources of information, mHealth app developers can have a solid understanding of the target audience, which is an integral part of designing and developing effective gender-responsive mHealth apps. This process makes apps more culturally relevant and acceptable and increases the potential for

adoption by Nigerian women, ultimately improving healthcare access and outcomes.

Theme 5: Assessing the Features or Functionalities and Impact of Gender-Responsive mHealth Apps for Nigerian Women

Another theme from the data gathered was the features, functionalities and impact of gender-responsive mHealth apps for Nigerian women. The responses highlighted by the respondents in this theme highlight the features, functionalities, and impact prioritised in building gender-responsive mHealth apps for Nigerian women. These features play a vital role in increasing the impact of mHealth apps in addressing the healthcare needs and challenges of Nigerian women. Table 5 presents relevant quotes highlighting this theme.

A recurring response under this theme is the emphasis on accessibility and a user-friendly app. Respondents 1, 3, and 4 highlight the importance of verifying that their mHealth apps are accessible to the intended users. This includes taking note of easy navigation, user-friendly interfaces, and accessibility even for users with limited digital litera-

Table 4: Quotes highlighting the sources of health information for cultural context, behaviours and needs of women in Nigeria

Direct quotes	Respondents
"We do case studies and compile findings."	Respondent 1
"Most research is found in papers and online, but we build health products with doctors who interact with the patients."	Respondent 2
N/A	Respondent 3
"We collaborate with local healthcare establishments, conduct user research, and consult with relevant stakeholders to understand Nigerian women's cultural nuances and health beliefs. We also review published literature and guidelines from reputable health organisations."	Respondent 4
"We reference reports and data from reputable health organisations like WHO, UNICEF, etc. We also gather insights directly from customer feedback."	Respondent 5

Table 5: Quotes assessing the features or functionalities and impact of gender-responsive mHealth apps for Nigerian women

Direct quotes	Respondents
"We prioritise accessibility and privacy since it is a mental health brand. We also understood the need for reminders so people do not get overwhelmed and miss their sessions."	Respondent 1
"Our features go through quality assurance tests to ensure they work. As we build, we prioritise user experience and utilise user feedback via focus groups."	Respondent 2
"Ease of use and access for all parties involved."	Respondent 3
"Key features include virtual appointment scheduling, telemedicine consultations, and diagnostic tests. We prioritise user-friendly design, intuitive navigation, and accessibility for users."	Respondent 4
"Key features include ordering medications and delivery tracking, e-prescriptions, medication reminders, and sometimes tailored health content."	Respondent 5

cy. By prioritising accessibility, mHealth app developers can remove barriers and facilitate the widespread adoption and continued engagement with mHealth apps among Nigerian women.

Also, respondents 1 and 5 highlight features such as reminders and tailored health content in building gender-responsive mHealth apps. These features can promote self-care, encourage adherence to treatment plans, and provide culturally appropriate health information. Targeted health content can help Nigerian women address their needs and challenges, improving their health outcomes and empowering them to make informed decisions.

Respondent 2 emphasises the need for quality assurance testing and including user feedback throughout the mHealth app development process. This user-centric approach ensures that the features and functionalities are applicable and reliable and align with the preferences and needs of the target users. Developers can create mHealth apps that resonate with their experiences and cultural contexts by involving Nigerian women in focus groups and gathering feedback.

The responses highlighted in this theme show the wide range of features and functionalities that gender-responsive mHealth apps can include to address the healthcare needs and challenges of Nigerian women effectively. By prioritising accessibility, user-friendly designs, streamlined healthcare delivery, tailored health content, and iterative user feedback, these apps have the potential to bridge gaps in healthcare access, promote preventive care, and empower Nigerian women to take control of their health and well-being.

Theme 6: Challenges Faced by mHealth Decision-Makers, Developers and Owners in Reaching and Engaging with Nigerian Women

The responses under this theme highlight the challenges mHealth decision-makers, developers, and owners face in connecting and interacting with Nigerian women. These challenges can be divided into three main categories of awareness and education, cultural and language barriers, and logistical and infrastructural constraints. Table 6 presents relevant quotes highlighting this theme.

The responses show a need to raise awareness and educate Nigerian women about the advantages and use of mHealth apps. Respondent 1 mentions the problems of informing the public about mental health issues without spreading misinformation or fear. This emphasises the importance of using empathy and kindness in UX writing for mHealth apps to build trust and encourage more use. Respondent 4 also mentions addressing cultural misconceptions about healthcare through educational campaigns and community partnerships.

In addition, communicating with Nigerian women can be difficult due to language and cultural barriers. Language barriers and a lack of digital literacy are cited by respondent 4. Overcoming these barriers requires a thorough grasp of the target audience's different cultures, beliefs, and communication styles. Effective mHealth app engagement needs data and user experience tailored to Nigerian women. In addition, using mHealth apps to reach Nigerian women is limited by logistics and infrastructural constraints. Respondent 5 high-

Table 6: Quotes highlighting the challenges faced by mHealth decision-makers, developers and owners in reaching and engaging with Nigerian women

Direct quotes	Respondents
"Most challenges we face is educating the public on mental health issues without scaring the public; we have adopted empathy and compassion to reduce fear-based messaging."	Respondent 1
"We have no challenges reaching our target users. They are available on most social media platforms."	Respondent 2
"Embedding with our target users (HR managers, Operation Leads, and Founders at startups and enterprises) and increasing activation. Created a niche Substack newsletter for people operators and joined multiple niche startups and HR communities to help."	Respondent 3
"Some challenges include limited digital literacy and cultural misconceptions about healthcare. We address these through health campaigns and partnerships with community organisations to build trust and awareness."	Respondent 4
"Key challenges include low awareness levels, limited online payment adoption, and logistics/delivery issues in certain places."	Respondent 5

lights challenges like limited online payment adoption and delivery issues in some areas where Famasi Africa operates. These logistics and infrastructure limitations make it more difficult for mHealth apps to become widely used, especially in rural or underdeveloped locations.

Different methods are needed to address these challenges. Collaboration with community-based groups, local healthcare providers, practitioners, and culture experts can help bridge awareness and trust gaps. Leveraging various communication channels, including traditional and digital media, can increase reach and engagement. Additionally, prioritising user-centred designs and integrating local languages and cultural references can enhance the resonance and usability of mHealth apps.

The thematic analysis revealed various perspectives among the respondents concerning designing gender-responsive mHealth apps for Nigerian women. By carefully considering and addressing these themes, mHealth decision-makers, owners and developers can build apps that meet the needs of Nigerian women, fostering better health outcomes.

DISCUSSION

The results reveal helpful perspectives on designing and developing gender-responsive mHealth solutions.

The Potential Impact of Gender-responsive mHealth Apps on Healthcare Delivery Among Nigerian Women

The response to the first theme was the need to understand the underlying motivations for building, designing and developing these mHealth apps. The responses from the participants indicated different motivations underpinning their respective mHealth products. Respondent 4 highlighted a common motivation for developing their mHealth app, that is, enhancing access to healthcare services and resources for Nigerian women. By providing a platform for members to access services, schedule appointments, and receive personalised health guidance, Reliance HMO aims to address Nigerian women's challenges in gaining access to healthcare. This motivation aligns with the evaluation of the influence of gender-responsive mobile health apps on healthcare provision to women in Nigeria.

Similarly, Respondent 5's response highlighted the need to address issues related to medication distribution and access to local pharmacies. Famasi Africa's solution addresses drug scarcity and long waiting times by leveraging digital technology to connect Nigerians with urgent medications. This motivation is pertinent for Nigerian women, who often face barriers in accessing their needed medications due to socioeconomic, geographical barriers and cultural factors. These responses stress the significance of developing gender-responsive mHealth solutions that close Nigerian women's healthcare access and service delivery gaps. By addressing the challenges, mobile health apps can potentially improve healthcare outcomes and empower women to take charge of their health (Udenigwe et al. 2022). The responses align with past research highlighting the importance of designing mHealth apps to address women's specific needs and challenges in low- and middle-income countries (LMICs) (Srinivasan et al. 2024). Gender-responsive mHealth solutions can help to mitigate barriers to healthcare access, such as distance, transportation, and socio-cultural factors, which limit women in LMICs.

The second theme from the results emphasises the need to understand the diverse healthcare needs and challenges Nigerian women face, which should inform the development of gender-responsive mHealth solutions. Some respondents emphasised the importance of addressing critical health concerns for Nigerian women, such as maternal health, family planning, cancer screening, and mental health support. These issues are essential for the overall well-being of Nigerian women and must be addressed through tailored mHealth apps. Respondents 1, 4, and 5 mentioned how their mHealth apps aim to close the gap and increase Nigerian women's access to healthcare services by providing features like quick access to verified local pharmacies, informational materials, and remote consultations with doctors.

In particular, Respondent 2 highlighted the issue of mental health among Nigerian women and the importance of providing comprehensive mental health support through their mHealth app. This awareness of Nigerian women's holistic healthcare needs shows an understanding of the target audience and the need to address facets of their well-being.

The responses under this theme stress the importance of tailoring mHealth apps to Nigerian women's unique needs and challenges. By integrating features and content tailored to address issues such as maternal health, reproductive health, mental well-being, and access to healthcare services, these Nigerian mHealth apps demonstrate a genuine interest in understanding and effectively serving the target audience (Jidong et al. 2021; Mafiana et al. 2022; Otu et al. 2021).

This results in the second theme aligns with the existing literature on developing gender-responsive mHealth apps. Research has emphasised the importance of adopting a user-centred design approach considering the target population's sociocultural, economic, and environmental factors (Crawford et al. 2024; Udenigwe et al. 2023). By understanding Nigerian women's challenges, mHealth app developers can tailor their solutions to address these factors and improve the adoption, usability, and effectiveness of mHealth apps. Also, the recognition of the various health needs of Nigerian women, including mental health, aligns with the World Health Organisation's (WHO) call for a holistic approach to women's health (WHO 2023). The WHO emphasises the need to address the physical, mental, and social determinants of health that disproportionately affect women, particularly in low- and middle-income countries like Nigeria.

To Develop Recommendations for Designing and Implementing Gender-responsive mHealth Apps that Enhance Healthcare Access and Outcomes for Nigerian Women

The third theme emphasises the importance of designing mHealth solutions that resonate with their target audience and can influence healthcare access, disease management, and preventive behaviours. Several respondents noted areas of health relevance for Nigerian women, such as chronic diseases, maternal and child health, and preventive care. Respondent 1 stated the importance of considering factors influencing user experience and adoption, such as ease of use, availability, and pricing. These factors are often shaped by culture and beliefs, which should be considered to ensure that mHealth apps are of value to Nigerian women. Similarly, Respondent 3 mentioned educating people about health insurance purchases, especially employers.

Research has shown the importance of customising mHealth solutions to the target population's cultural contexts, beliefs, and practices (Armaou et al. 2019; Rice and Laimputtong 2023). By incorporating culturally appropriate information and design elements, mHealth apps can better connect with users, promoting trust, acceptability, and long-term engagement (Cao et al. 2022). Furthermore, emphasising health topics such as chronic disease management, maternal and child health, and preventive care reflects global health themes and the growing numbers of non-communicable diseases in low- and middle-income countries, including Nigeria (Simkovich et al. 2023). mHealth solutions that focus on these areas have the potential to address health challenges and contribute to the achievement of the Sustainable Development Goals related to maternal and child health and non-communicable diseases (Akselrod et al. 2023; Firoz et al. 2022; Simkovich et al. 2023).

To effectively design and develop Nigerian mHealth apps for value and resonance, decision-makers and developers must strike a balance between addressing the health challenges faced by Nigerian women and ensuring that the solutions are culturally appropriate and align with the target audience's values, beliefs, and lived experiences (Hilty et al. 2021; Osei et al. 2021; Ogunlana et al. 2023). This can be achieved through user research, involving end-users in the design and development process, and collaborating with healthcare professionals, community leaders, and cultural experts.

The fourth theme emphasises the importance of a holistic approach to collecting information to develop gender-responsive mHealth solutions that align and effectively address Nigerian women's healthcare needs and challenges. Several respondents emphasised the need for direct engagement with local stakeholders, healthcare professionals, and end-users through case studies, user research, and customer feedback. By involving stakeholders directly in the development process, mHealth app developers and decision-makers can gain invaluable insights into the cultural nuances, health beliefs, and lived experiences of Nigerian women, ensuring that the resulting apps are culturally appropriate and relevant (El-Sherif and Abouzid 2022; Hilty et al. 2021).

Respondents 4 and 5 also emphasised the importance of utilising data from reliable sources, including published literature, reports from inter-

national health agencies such as UNICEF and the World Health Organisation (WHO), and partnerships with local hospitals. This method of obtaining data aligns with practices in evidence-based mHealth design, which emphasises the integration of scientific evidence, expert knowledge, and local context (Götzl et al. 2022; Haggag et al. 2022; Luo and Muo 2022). The combination of diverse information sources enables mHealth app developers to fully understand the target audience, which is needed for designing and developing gender-responsive mHealth apps. This approach increases the potential for adoption and prolonged use of mHealth apps but contributes to the general goals of improving gender equity in health.

To Assess the Effectiveness of Existing mHealth Apps in Addressing Nigerian Women's Healthcare Needs and Challenges

The fifth theme from the data emphasises the importance of prioritising specific features and functions to improve the efficiency of mHealth solutions in addressing the healthcare needs and challenges faced by Nigerian women. Some respondents emphasised the importance of accessibility and user-friendliness in mHealth app design. Respondents 1, 3, and 4 mentioned the importance of ensuring that their mHealth apps are accessible and usable for their users, considering factors such as easy navigation, user-friendly interfaces, and accessibility for users with low levels of digital literacy. This focus on usability aligns with the principles of universal design and digital inclusion, which are crucial for bridging the digital divide and ensuring equitable access to health information and services (Wang et al. 2022).

Also, Respondents 1 and 5 emphasised the importance of including features such as reminders and tailored health content in developing gender-responsive mHealth apps. These features are essential in promoting self-care, encouraging compliance with medical treatment plans, and providing culturally appropriate health information. Integrating targeted health content can contribute to addressing Nigerian women's specific needs and challenges, ultimately improving their health outcomes and empowering them to make informed decisions about their health. The emphasis on reminders and personalised health information aligns with behavioural change theories and strategies

successfully applied in mHealth solutions to promote health-seeking behaviours and self-management of chronic conditions (Jiang et al. 2024; Salwen-Deremer et al. 2019).

The responses from the sixth theme show significant barriers faced by mHealth decision-makers, developers, and owners in reaching, interacting and engaging with Nigerian women. These barriers can be divided into three main areas of awareness and education, cultural and language barriers, and logistical and infrastructural barriers. A key challenge is that Nigerian women need to be better informed about the benefits of using mHealth apps and how to use them appropriately. Respondent 1 notes how difficult it is to educate the public about mental health concerns without spreading fear or false information. This statement emphasises the importance of using compassionate and sympathetic user experience (UX) in mHealth apps to foster adoption and trust. This is consistent with the study by Kaveladze et al. (2022) that highlights the importance of health literacy and digital health literacy in effectively executing mHealth interventions.

In addition, Respondent 4's suggestion to use community partnerships and educational campaigns to eliminate cultural misconceptions about healthcare aligns with conventional strategies for enhancing health communication and encouraging health-seeking behaviours across cultural contexts (Ameyaw et al. 2024). Logistical and infrastructural barriers raise significant challenges in targeting Nigerian women through mHealth apps. Respondent 5 highlights issues such as limited online payment acceptance and delivery challenges in certain regions where Famasi Africa operates. These responses correspond with the challenges of digital health implementation in low- and middle-income countries like Nigeria, where infrastructure limitations can make it difficult to widely adopt and utilise mHealth solutions, particularly in remote or underserved areas (Armaou et al. 2019).

By acknowledging and addressing these barriers, mHealth developers and decision-makers can create more effective, accessible, and culturally relevant solutions to improve Nigerian women's health outcomes and healthcare access. Future research should concentrate on developing and evaluating strategies to overcome these barriers, particularly in gender-responsive mHealth interventions in low- and middle-income countries like Nigeria.

CONCLUSION

The results indicate different motivations behind designing and developing gender-responsive mHealth solutions, primarily focused on improving healthcare accessibility and addressing specific health challenges Nigerian women face. These motivations align with global initiatives to improve women's health outcomes and promote gender equity in healthcare access.

Understanding the target audience is an essential factor in designing effective mHealth solutions. The study highlights the importance of tackling different health concerns, including maternal health, reproductive health, mental well-being, and access to healthcare services explicitly tailored to the needs of Nigerian women. Prioritising relevant features and health topics in mHealth apps is essential for their effectiveness. The emphasis on chronic disease management, maternal and child health, and preventive care reflects the pressing health challenges faced by Nigerian women and aligns with global health objectives.

In order to guarantee that mHealth solutions are relevant and culturally acceptable, the study emphasises the importance of leveraging different health information sources, such as local stakeholders, healthcare professionals, and reliable foreign sources. This multifaceted approach increases the potential for app adoption and continuous use among Nigerian women. Gender-responsive mHealth apps need essential features and functionality like reminders, personalised content, accessibility, and user-friendliness. These features are necessary for encouraging adherence to treatment, self-care, and informed decision-making in Nigerian women. However, significant challenges persist in reaching and engaging Nigerian women through mHealth apps. These include issues related to awareness and education, cultural and language barriers, and logistics and infrastructural barriers. Addressing these barriers requires a strategy that combines targeted awareness campaigns, culturally sensitive design, and innovative solutions to overcome infrastructural limitations.

In conclusion, this research offers relevant information about designing, developing, and using gender-responsive mHealth apps for Nigerian women. It highlights the need for a user-centred, cul-

turally sensitive design approach that considers Nigerian women's particular health requirements and difficulties.

RECOMMENDATIONS

Based on the findings of this study, it is recommended that developers and decision-makers of mHealth solutions for Nigerian women, men included, adopt a user-centred approach in their design processes. This approach should prioritise cultural sensitivity, accessibility, and relevance to the specific health needs of Nigerian women and general users. The decision-makers and developers should engage directly with local stakeholders, healthcare professionals, and end-users throughout the development process to gain insights into the cultural context, health beliefs, and actual lived experiences of Nigerian women. Also, mHealth apps should include features that address critical health priorities such as reproductive health, maternal health, chronic disease management, and preventive care while ensuring user-friendly interfaces, personalised content, and reminders to promote long-term use and improved health outcomes.

Finally, to address the challenges identified in reaching and engaging Nigerian women, it is recommended that stakeholders invest in awareness and education campaigns to promote the benefits and proper use of mHealth apps. In addition to limiting language barriers, multilingual interfaces and culturally relevant content should be used. To tackle infrastructural constraints, developers should explore innovative solutions like offline functionality and partnerships with local organisations to improve access in marginalised areas. Finally, it is essential to establish continuous monitoring and evaluation processes to assess the effectiveness of these mHealth solutions and to inform iterative improvements. By implementing these recommendations, stakeholders can enhance the potential of mHealth apps to improve healthcare access and outcomes for Nigerian women significantly.

ACKNOWLEDGEMENTS

The researchers appreciate the Covenant University Centre for Research, Innovation and Discovery (CUCRID) for the financial support for this publication.

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Paper received for publication in August, 2024
Paper accepted for publication in July, 2025