Enablers and barriers to the acceptability of mHealth for maternal healthcare in rural Edo, Nigeria

Ogochukwu Udenigwe [a,*], Friday E. Okonofua [b,c], Lorretta F.C. Ntoimo [d], Sanni Yaya [a,e]

[a] *School of International Development and Global Studies, Faculty of Social Sciences, University of Ottawa, Ottawa, Canada*
[b] *Women's Health and Action Research Centre, KM 11 Lagos-Benin Expressway, Igue-Iyeha, Benin City, Edo State, Nigeria*
[c] *Centre of Excellence in Reproductive Health Innovation, University of Benin, Benin City, Nigeria*
[d] *Federal University Oye-Ekiti, P. M. B. 373, Km 3 Oye-Are Road, Oye-Ekiti, Ekiti State, Nigeria*
[e] *The George Institute for Global Health, Imperial College London, London, United Kingdom*

ABSTRACT

Objective: Acceptability has become a key consideration in designing, implementing and evaluating digital health interventions. Current evidence points to acceptability as a crucial factor in sustaining mobile health programs for maternal health across sub-Saharan Africa particularly in Nigeria where the burden of maternal mortality is high. This paper describes the enablers and barriers to the acceptance of Text4Life, a mobile phone-based health intervention that extends maternal healthcare services to rural areas of Edo State Nigeria.
Method: This is a cross-sectional qualitative study of women who used Text4Life, their spouses who were all men and Ward Development Committee chairpersons who oversaw the implementation of Text4Life. This study was set in Etsako East and Esan Central Local Government Areas of Edo State, Nigeria. Between September 2021 and January 2022, eight focus groups were conducted with 64 participants: 39 women and 25 men. Two in-depth interviews were conducted with Ward Development Committee chairpersons. Data collection was conducted in English and Pidgin English. Discussions and interviews were digitally recorded and translated to English from Pidgin English where necessary. Data analysis followed a mainly deductive approach to thematic analysis, however, emergent information from the data was also considered and reported.
Results: The results show that participants' positive attitudes towards the intervention, the involvement of the community, participants' understanding of the intervention, and perceived effectiveness of the Text4Life program were enablers to women's acceptance of Text4Life and enablers to Ward Development Committee chairpersons' assistance with the program. On the other hand, limited resources and a clash with the community's value system presented barriers to the acceptability of the Text4Life program.
Conclusion: Our findings demonstrate the importance of alleviating the burdens associated with participating in mobile health interventions while noting that the risk of obstructing the gains from mobile health interventions is high if plans for sustaining it are not incorporated early enough in the design phase.

1. Background

Acceptability has become a key consideration in designing, implementing, and evaluating digital health interventions. Digital health, specifically mobile health, is the use of mobile devices for medical and public health practices [1]. The concept of acceptability takes root in the classic Technology Acceptance Model which centres users' experiences and perceptions of technology rather than the technology itself [2]. The model posits that the acceptance of technology such as digital health technology is determined by users' perception of its usefulness and their perceived ease of use [2,3]. Failure to understand and address users' acceptability of digital health technology raises the risk of

overrating the benefits of digital health technologies and invariably adopting ineffectual programs. This has implications for scaling and sustaining mobile health programs, particularly programs that hold strong promises for improving maternal healthcare in underserved populations across sub-Saharan Africa.

The World Health Organization acknowledges that across Africa, priority is often given to implementing digital health programs; however, most of these programs remain at the pilot or informal stage [4]. Few of them go on to have well-established programs that are sustainable and scalable. Reiterating this view were global health professionals at a virtual round table discussion on accelerating the implementation of digital innovations for maternal health in low-income countries [5]. They strongly emphasized

the need to consider scale-up and sustainability early enough in the design and implementation process of digital health solutions for maternal health.

Current evidence points to acceptability as a crucial factor in sustaining mobile health (mHealth) programs for maternal health across sub-Saharan Africa particularly in Nigeria where the burden of maternal mortality is high [6,7]. With a maternal mortality rate of approximately 512 pregnancy-related deaths per 100,000 live births, Nigeria has one of the highest maternal mortality rates in the world [7]. One study in Nigeria attributed the effectiveness of a mHealth intervention for maternal healthcare to high acceptance by users [8]. Another study in Nigeria indicated that low acceptance of a mHealth program for maternal health meant limited use of the intervention by two important users; health workers and pregnant women [9]. It is important to note that primary users of mHealth programs such as pregnant women, do not exist in isolation. Their extended social network including family and community at large are important actors and contributors to their perception of the usefulness of a program [10–12]. Of equal importance are individuals delivering the intervention such as healthcare workers or researchers whose perspectives are also key in determining the success of the program. Users of mHealth programs for maternal health are more likely to adhere to them if they perceive that their content and context are acceptable. Similarly, individuals who are often tasked with delivering interventions to users may not do so effectively if they are not considered acceptable, thereby impacting the overall effectiveness of an intervention [10–12]. Determining acceptability can help highlight progresses made by the intervention and challenges that need to be addressed for the program to realize its full potential.

The usefulness of the concept of acceptability lies in delineating outcomes and factors that determine acceptance of interventions such as mHealth programs. While there is no consensus on a definition of acceptability, studies across sub-Saharan Africa have applied various definitions of acceptability of healthcare interventions including mobile health technologies. A study in Tanzania introduced the term "social acceptability" of interventions [10]. In contrast to the technology-assisted model where bounded rationality of users is assumed, this definition considers shared perception of health interventions such as digital health interventions. Here, social acceptability is defined as a user's perceptions influenced by social representations and interactions [10]. This approach is useful due to the possibility of its transcultural application in understanding the acceptance of biomedical approaches. However, it fails to recognize the possibility of a change in perception over the lifespan of the intervention. It is also ambiguous about users' adherence to interventions even when socially acceptable. Another study in Uganda acknowledges the importance of an acceptable mHealth intervention to users, healthcare workers and communities as a whole and defines acceptability as adherence to using and delivering an intervention both by users and those delivering the intervention [13]. While adherence is an important indicator for the longevity of a mHealth intervention, it is not sufficient to define acceptability.

Following a review of previous studies on acceptability, Sekhon et al. [11] synthesized the aforementioned definitions and others and proposed a theoretical framework of acceptability where acceptability is defined as "a multi-faceted construct that reflects the extent to which people delivering or receiving a healthcare intervention consider it to be appropriate, based on anticipated or experienced cognitive and emotional responses to the intervention" (p.4). This definition is suitable for the purposes of this paper because it considers participants' cognitive and emotional responses to the intervention and how it influences sustained engagement with the intervention. Therefore, this paper operationalizes the theoretical framework of acceptability as a tool to describe the enablers and barriers to the acceptance of a mobile phone-based health intervention that extends maternal healthcare services to rural areas of Edo State Nigeria.

2. The theoretical framework of acceptability

Theorizing the concept of acceptability is an important step in understanding how it relates to engaging with and adhering to an intervention and this provides the foundations for developing the right tools for

measurement. The theoretical framework for acceptability posits that the acceptability of interventions is best assessed using seven constructs, namely: *affective attitude, burden, ethicality, intervention coherence, opportunity cost, perceived effectiveness, and self-efficacy* [9]. This definition considers the perspectives of intervention users and implementers. Not to be confounded with the concept of satisfaction from an intervention, which can only be assessed retrospectively, this framework is unique in its applicability to assess acceptability prospectively or retrospectively. Specifically, the assessment of the acceptability of an intervention can occur prior to the intervention delivery, while there has been some exposure to the intervention and further exposure is planned, or after the intervention delivery period with no plans of further exposure to the intervention. Our study assessed acceptability from a retrospective perspective after exposure to the intervention. Furthermore, the framework can be applied qualitatively or quantitatively to assess acceptability in different stages of an intervention cycle. See Fig. 1 for definitions of the various constructs of the framework.

3. Method

3.1. Study design

This is a cross-sectional qualitative study of women who used Text4Life, a mHealth intervention that extends maternal healthcare services to rural areas of Edo State, Nigeria. Backed by literature and previous studies on our study site, we assumed a collectivist expression of cultural values and therefore designed the study with the assumption that women's experiences during pregnancy would be a communal experience and thus influenced by socio-cultural aspects of their community [14,15]. In keeping with the importance of women's extended social network, this study also sought the perspectives of women's spouses who were all men, and community leaders also known as ward development committee (WDC) chairpersons who oversaw the implementation of the mHealth project in our study sites. WDC chairpersons were both men.

Our study assesses the acceptability of the Text4Life intervention which was implemented in Okpekpe and Ewatto communities in Edo State from June 2019–December 2020 by the Women's Health and Action Research Centre (WHARC). WHARC is a Nigeria-based non-governmental organization that advances women's health in Africa through research and policy [16]. The Text4Life program was part of a larger intervention project funded by the International Development Research Centre (IDRC), Global Affairs Canada (GAC) and the Canadian Institute for Health Research (CIHR) under the Innovating for Maternal and Child Health in Africa project. The larger project aimed to increase women's access to maternal and child health care in primary health centres in rural Edo State, Nigeria. Text4Life was introduced to address the identified barriers to transportation and access to providers. Text4Life is a short message service (SMS) system-based technology that enables dual communication between pregnant women and their primary healthcare providers. Through Text4Life, pregnant women can request swift transportation to primary healthcare centres during labour or in pregnancy-related emergencies by sending a keyword to a dedicated phone number. This message is relayed as a dual SMS to the midwife on duty at the primary healthcare facilities and the WDC chairperson who dispatches community taxi drivers to the women in distress.

Women's names and phone numbers are displayed along with the SMS for ease of identification. Through Text4Life, group messages are also sent out to pregnant women regularly to provide essential information relevant to caregiving. To use this mHealth service, women need to have access to a mobile phone, pay a registration fee of 2000 Naira (equivalent to $6.00) into a community health fund (CHF), and provide their contact information including name, residential address, telephone number, and telephone numbers of the next of kin. Registration for the CHF gives women access to free pregnancy care at their primary health facility, which encompassed antenatal care visits, childbirth, and postpartum care. They also have free use of the mHealth program through which they received health-related messages. Furthermore, WHARC disbursed phones to indigent women for
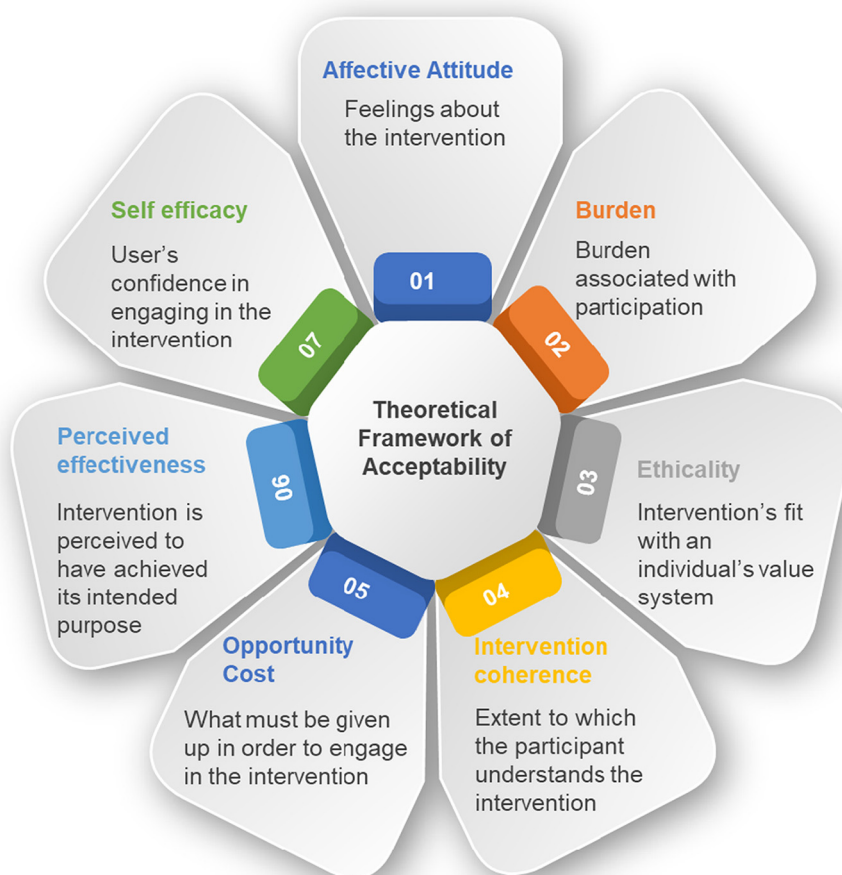
Fig. 1. The Theoretical framework of acceptability: Constructs and definitions.

the duration of their pregnancy. Women received training on Text4Life from WDC chairpersons at the point of registration and additional training from healthcare workers at healthcare facilities during antenatal care. Details about the intervention are described in the program's Logic Model (See Fig. 2).

3.2. Study setting

This study was set in Etsako East and Esan Southeast local government areas of Edo state. Specifically, in Okpekpe community in Etsako East Local Government Area and Ewatto community in Esan Central Local Government Southeast local government area. Edo state is one of Nigeria's 36 states and home to four million residents [17]. The study sites are located in the Northern part of Edo and are predominantly rural. The healthcare system in Edo and Nigeria as a whole is structured across three levels, i.e., primary, secondary, and tertiary. The majority of basic maternal healthcare occurs at primary healthcare facilities (PHCs), and this serves as the main source of healthcare in these communities. Both communities comprise 31 villages and hamlets but the larger intervention and consequently this study was carried out in 20 out of the 31 communities. There are two primary healthcare centres in each community for a total of four facilities covering the 31 villages. These communities were chosen as study sites because of their rural locations, weak health infrastructure and high rates of maternal mortality.

3.3. Participant recruitment

Participants were chosen using a purposeful criterion sampling technique [18]. The criteria for selection were that women were between

15 and 45 years old and were registered for the Text4Life program. Men participants were selected if their spouses registered for the Text4Life program. Finally, the ward development committee's (WDC) chairpersons were chosen based on their role in implementing the mHealth program in their communities. A WDC chairperson serves as a bridge between health facilities and their communities. They monitor the quality of service delivery to their community and enhance community involvement in health by harnessing community resources to sustain quality healthcare delivery [19].

Participants were recruited from the Text4Life database containing their names and phone numbers, which were collected upon registration. At the point of registration, participants provided consent to have their contact information collected and stored on the Text4Life database by WHARC for research purposes. The database is not publicly available, and the authors received authorization from the community and WHARC to access the database for research purposes only. Authors FEO and LFCN oversaw participant recruitment and data collection. Two research assistants invited women to participate in this study through telephone calls. Men were invited to participate first through word of mouth by their spouses and through a follow-up phone call from research assistants. WDC chairpersons were contacted through telephone calls. All women who were approached agreed to participate in the study, but some men declined to participate. Okepekpe and Ewatto communities each had one WDC chairperson, all two WDC chairpersons agreed to participate.

3.4. Data collection

Between September 2021 and January 2022, eight focus group discussions (FGDs) were conducted with 64 participants: 39 women and 25
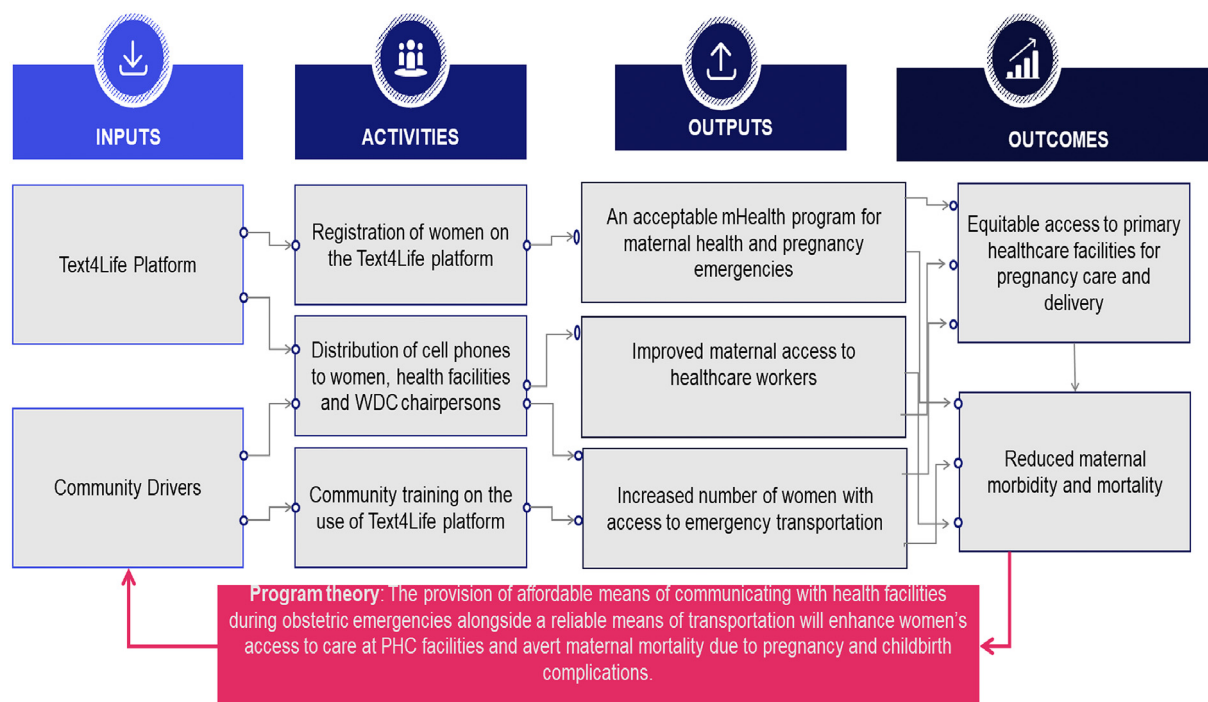
INPUTS | **ACTIVITIES** | **OUTPUTS** | **OUTCOMES**

Text4Life Platform

Community Drivers

Registration of women on the Text4Life platform

Distribution of cell phones to women, health facilities and WDC chairpersons

Community training on the use of Text4Life platform

An acceptable mHealth program for maternal health and pregnancy emergencies

Improved maternal access to healthcare workers

Increased number of women with access to emergency transportation

Equitable access to primary healthcare facilities for pregnancy care and delivery

Reduced maternal morbidity and mortality

Program theory: The provision of affordable means of communicating with health facilities during obstetric emergencies alongside a reliable means of transportation will enhance women's access to care at PHC facilities and avert maternal mortality due to pregnancy and childbirth complications.

Fig. 2. Logic model showing Text4Life program theory.

men. Two in-depth interviews (IDI) were conducted with the WDC chairpersons of Okpekpe and Ewatto communities. Focus groups were desegregated by gender and age [20]. Gender-desegregated focus groups were done to encourage open discussions of private experiences and minimize undesirable consequences such as spousal confrontation or abuse that may threaten the participants' or their family's stability. Furthermore, women and men participants were segmented by age to minimize the effects of age hierarchy as dictated by cultural norms which may hinder freedom of expression from younger participants [20]. Participants in each focus group ranged from 6 to 10 and discussions lasted approximately 45–60 min, this followed recommendations by Fush and Ness who argue in favour of the richness and depth of the data [21]. This study sought to obtain thick and rich data that is detailed, nuanced and intricate as a way to stress the uniqueness of experiences across communities.

Focus group discussions occurred in community squares and interviews occurred at community centres. Each participant received 3000 Naira ($10) to cover transportation costs and refreshments. Participants and research assistants adhered to COVID-19 protective measures including wearing masks, social distancing and using sanitizers. Two local research assistants facilitated focus group discussions and interviews with a guide developed by author OU. The research assistants, one man and one woman each possessing a bachelor's degree or higher level of education, are experienced in qualitative method data collection. Questions were designed with reference to the theoretical framework of acceptability [11] and focused on topics such as participants' perceptions of the Text4Life program, motivations for use, barriers, and facilitators to using the intervention, and quality of the intervention. Questions were carefully crafted to include neutral, non-biased, and non-leading questions to avoid influencing participants' responses. See supplementary material for sample FGD and interview guides with relevant questions. The framework also served as an interpretive tool for analyzing the data.

Data collection occurred in English and Pidgin English and was digitally recorded. Under the supervision of FEO and LFCN, research assistants transcribed the data in English or Pidgin English languages. OU, who is proficient in both languages translated from Pidgin English to English where necessary. Literal translation (word-by-word) was used to preserve participants' responses and provide readers with an understanding of the

mentality of the participants [31]. All authors re-examined the transcripts, screened them for errors and reviewed them to ensure a shared concept of key terms. Any identifying information for participants was altered to protect their privacy, they are referred to simply as a man or woman participant.

3.5. Data analysis

Transcripts from the focus group discussions and interviews were exported to NVivo 1.6 and data analysis followed a conventional approach to thematic analysis. Our approach to the use of theory uses an objectivist deductive research approach to thematic analysis [22,23]. In this approach, the authors identified the theoretical framework of acceptability, which served as a guide for the study. The theory's constructs and assumptions informed the study design, data collection and analysis. While the theory shaped data analysis, data analysis was also done inductively and emergent information from the data was also considered and reported.

Analysis followed the following process: the coder, OU, was immersed in the data and generated initial codes. Codes captured data relevant to participants' acceptability of the Text4Life intervention. In an iterative process, the coder defined codes that appeared meaningful. Upon identifying and defining codes, representative quotations from the transcript were assigned to different codes. Codes were reviewed and overlapping codes were further organized into categories. Themes were subsequently generated from categories that reflected relevance to the constructs of acceptability including participants' feelings about the intervention, their perceived burden or effort required to participate in the Text4Life study, their perception of how it fits with their value system, their understanding of the intervention, sacrifices made in order to participate in the mHealth program, their confidence to participate in the program appropriately and their perception on the effectiveness of the Text4Life intervention. These were further categorized as barriers or enablers to the acceptability of the Text4Life program.

3.6. Ethics approval

A certificate of ethical approval was obtained from the University of Ottawa's Research Ethics Board- file number S-02-21-6573, and from

Nigeria's National Health Research Ethics Committee (NHREC) -file number NHREC/01/01/2007–18/04/2017.

4. Results

4.1. Participant characteristics

The median age for women participants was 26 years old and men were on average 45 years old. The predominant level of education in these rural communities is primary education and the conventional occupation is farming. In this section, we highlight participants' reports of enablers and barriers associated with their participation in the Text4Life program. See Fig. 3 for a summary of the findings.

4.2. Enablers to accepting Text4Life

4.2.1. Positive attitudes towards the intervention

Participants were receptive to the intervention and spoke highly of it. Many women felt happy about participating in the intervention and considered the transportation part of the program to be the most important. Second to the ease of transportation through this program, women praised the program's ability to enable communication between them and their healthcare providers. Women's spouses and WDC chairpersons also indicated positive attitudes towards the intervention and recognized the program's benefits.

"I feel very happy having someone assist with such things as transportation to the health center for free…Yes, we will use it again" (FGD Woman participant, Okpekpe)

"I can say on behalf of the community we all appreciated it because it has opened our women's eyes. During that period, we never recorded missing a baby at birth as they followed the directive of the doctors and nurses. Women didn't have a problem at all they were always fine, and their children were delivered safely." (IDI, WDC chairperson, Okpekpe)

Especially for this program (Text4Life), it is very sweet and very good. This time around the program can stay. (FDG, Man participant, Ewatto)

4.2.2. Community involvement

Women acknowledged the pivotal role of the ward development chairpersons in championing the mHealth intervention and spoke of their altruistic acts. WDC chairpersons served in a volunteer capacity but were described as going above and beyond to make the intervention a success. They would voluntarily take pregnant women in distress to health facilities in the absence of community drivers. WDC chairpersons expressed pride in their work as overseers of the mHealth project.

"The WDC chairman was so active, he helped us even at night when he was not around, we would call him, and he will send someone to us, and that person would take us in a vehicle to the hospital to make sure we are ok. That really helped us; I will appreciate it if it continues." (FGD, Woman participant, Ewatto)

"Well, the Ewatto community is my home. I was born and brought up in Ewatto so any responsibility given to me, I do it to the fullest of my mind. I participated fully in this mobile health program because health is wealth. If you are healthy, you are a multi-millionaire in this country. Health is wealth. The program is for the health benefit of my people, taking care of women and those yet to be born. I am very happy. I put in all effort I could, and I pray that God will assist me to do it." (IDI, WDC chairperson, Ewatto)

4.2.3. Understanding the intervention

Participants displayed a good understanding of the Text4Life program. They understood how it worked and adhered to guidelines on how best to use the program. For women, a good understanding of the program meant a heightened awareness of the program's benefits, which improved their acceptance of it. Women understood that to request transportation services during an emergency, they needed to send a code as a text message. Women understood that the program enabled two-way communication with their healthcare providers through the phone, an opportunity that improved the range and quality of services they received from the health facilities.

"Before the program, we will just go to the healthcare center they would just give us treatment we will pay and go, but through the [Text4Life] program,
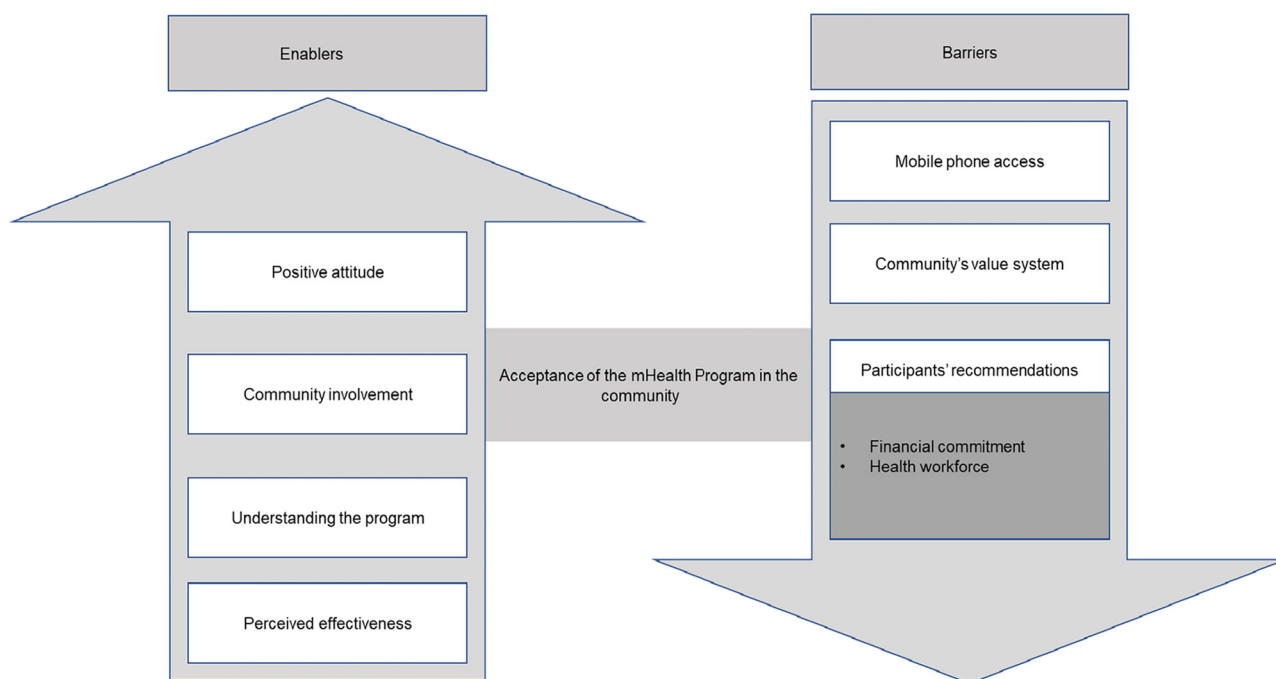

Fig. 3. Enablers and barriers to Text4Life acceptance.

*they will tell us what to eat, things to do to enable us to deliver safely and it always turns out well." (*FGD, Woman participant, Ewatto)

*"When I was feeling pains, I sent a text message, in five minutes the driver came to carry me, and the delivery was successful, and I liked it." (*FGD, Woman participant, Ewatto)

*"Anytime a pregnant woman wants to deliver, she sends a text message to the maternity center." (*FGD, Woman participant, Okpekpe)

4.2.4. Perceived effectiveness

Participants reflected on the effectiveness of the Text4Life intervention. They deemed it successful in meeting its goal, which was to prevent maternal deaths. Furthermore, participants indicated that women's use of healthcare facilities increased since the program was implemented. The evidence of the effectiveness of Text4Life influenced women's intention to continue using the intervention.

*"We used to lose pregnant women and their newborns but now it has reduced." (*FGD, Woman participant, Okpekpe)

*"Unlike before, when you come to the health center you would not meet the nurse or doctor but with the Text4Life we easily have access to them." (*FGD, Woman participant, Okpekpe)

"I think it was something worth it, and it has to continue even till now. I think the community and the women have come to understand the effectiveness of using phones. It (Text4Life) was very helpful to them that they go home telling every other woman. That alone encouraged women to [use the Text4Life]." (IDI, WDC chairperson, Okpekpe)

Participants linked the program's effectiveness to the subsidized cost of participating in the intervention and the distribution of free phones to women for the duration of their pregnancy. Program beneficiaries indicated that without these they could not have participated in the program. Women received phones on loan for the duration of their pregnancy with the expectation to return the phones after childbirth.

*"Because of this Text4Life, many women are interested in this program. When initially this program came up, they paid N2,000 and WHARC took all the responsibilities. Even this Text4Llife there is no additional cost. I don't know if you understand me. There is no additional cost. Because of this, women and some parents, young ones who don't want to reproduce again decided to enter because they know that if their wife is pregnant, they are able to pay N2,000, and people are there to carry other responsibilities. That's a very big achievement." (*IDI, WDC Chairperson, Ewatto)

*"Yes, if we were not given phones, we would not be able to access the Text4Life package." (*FGD, Woman participant, Okpekpe)

4.3. Barriers to accepting Text4Life

4.3.1. Limited resources

Responses from participants were indicative of the effort or burden associated with participating in the mHealth program. The majority of participants suggest it was burdensome to participate and also reported opportunity costs associated with participating in the Text4Life program. The provision of phones notwithstanding, there were insufficient phones to reach all women. Okpekpe community received three phones and Ewatto received 10 phones. Women indicated that participation in the program was hampered by their lack of mobile phones. For some women, participating in the program meant taking on extra paid labour to avoid relying on their spouses' or other relatives' phones. Some men reported having to buy extra mobile phones in the house to enable their spouses to participate in the program. The need for extra phones arose due to inadequate network coverage and inconsistent electricity that made it difficult to charge phones.

*"The changes we made to participate? Well, my wife has a cellphone and I have one too, but I had to buy an extra one and an extra battery too in case of emergency." (*FGD, Man participant, Ewatto*)*

*"The only cost for me to participate was that during that period I had to work hard in other to get myself a phone so I can be part of it, else I will need to ask my husband for assistance." (*FGD, Woman participant, Okpekpe*)*

*"For me, the only difficulty is network issues sometimes." (*FGD, Woman participant, Ewatto)

WDC chairpersons bore the burden of using their own resources to facilitate the mHealth program. They reported using their own vehicles to transport women during emergencies and also using their own phones to assist women.

*"For me, I was using my own phone before they distributed about ten phones to them although it was not enough." (*IDI, WDC chairperson, Ewatto)

*"I as the WC chairman I was very much attentive, many times I didn't wait for the driver sometimes I call the driver and he is not responding; I use my car to make sure the woman get to the health center." (*IDI, WDC chairperson, Okpekpe)

4.3.2. Community's value system

While participants generally indicated that the intervention fit with their value system including religious and cultural values, women identified covert taboos related to conducting oneself during pregnancy that seemed to clash with the requirements of the mHealth program. It was inappropriate for pregnant women to be seen interacting publicly with men (taxi drivers or WDC chairpersons) who were not their spouses, especially at nighttime. Women also expressed concerns over the scrutiny they received when drivers were seen coming in and out of their houses. WDC chairpersons were also cautious of interacting with pregnant women and drawing the wrath of their spouses. This concern notwithstanding, women did not disapprove of the program but took it upon themselves to raise awareness of the Text4Life program to mitigate unwarranted scrutiny.

*"Everybody in the community knows him as a driver man and they know that ordinarily, he can't come to the area because he lives far away from the woman in question. That will prevent them from wondering what made the man come out to that area at that time, then we can tell them that it is with the help of Text4Life that we were able to reach the driver who came and conveyed her to the health center." (*FGD, Woman participant, Ewatto*)*

4.4. Suggestions for the continuity of Text4Life

4.4.1. Financial commitment

Participants revealed that the program was already stalled in their communities due to the lack of funds to sustain it. Much of the program's success was attributed to its subsidized healthcare approach. This meant that regardless of women's economic status, they could afford quality care at their healthcare facilities. WDC chairpersons further revealed that promises and pledges were made by local government officials to sustain the program but have not been honoured. Participants feared that the program will discontinue and urged for more support from the government. Participants contended the provision of phones for beneficiaries was crucial to ensuring the sustainability of the program because women's participation in the study was already hampered by the lack of phones.

"It is not working anymore because there is no money to sustain it, I even thought of the possibility of being able to sustain the program when WHARC finally is done with the project but there is no money. Our local people here are not trying to contribute to it, nobody. Even those that pledged to, even the chairman of this local government those are the people that should

have supported the program they have failed to which is why we stopped registering other women." (IDI, WDC chairperson, Okpekpe)

4.4.2. Healthcare workers in healthcare facilities

Another major deterrent to the continuity of the program was the shortage of healthcare workers. Although this was beyond the purview of the mHealth intervention, participants highlighted the need for more healthcare workers in the facilities.

"We need more nurses and doctors [in primary health facilities]." (FGD, Woman participant, Okpekpe)

"During the Text4Life program, we got a National Youth Service Corps (NYSC) doctor for us that actually came to promote the health center here because there was 24-hour service. To continue the Text4Life program, the provision of a station doctor, more nurses and also a senior health officer is needed." (IDI, WDC chairperson, Okpekpe)

I will say that the Text4ife program is a very good program, I will now suggest that they should provide more phones, provide vehicles (motorcycle) for the easy movement of these people, equipment to the health centres like delivery kits, sufficient beds, and foams at the health centres." (IDI, WDC Chairperson, Ewatto)

5. Discussion

Findings from the study showed that participants' attitudes towards the intervention, the involvement of the community, participants' understanding of the intervention, and perceived effectiveness of the Text4Life program were enablers to women's acceptance of Text4Life and enablers to WDC chairpersons' assistance with the program. On the other hand, limited resources and a clash with the community's value system presented barriers to the acceptability of the Text4Life program.

Affective attitudes, which refer to users' feelings towards the mHealth intervention, were unanimously positive among participants. Women, men and WDC chairpersons conveyed positive feelings about the Text4Life program and described it as "an accomplishment", "sweet" and "very good". They expressed their gratitude for the intervention and were happy to have participated in it. Women's positive attitudes towards the intervention were commonly followed by the intention to continue using the Text4Life program in subsequent pregnancies. This link between users' attitude and continuance of use of mHealth programs is in line with Birkmeyer et al.'s [24] study that highlights attitude as a core determinant of mHealth acceptance and success of a mHealth program across various countries [24]. Attitude towards a mHealth program was shown to influence user satisfaction and consequently influence users' intention to continue using the intervention. Interestingly, the paper also pointed to health consciousness as an exogenous factor in determining users' feelings towards mHealth and their acceptance of it [24]. This could be relevant to our study findings because our study sites were sites for the larger Innovating for Maternal and Child Health in Africa project [25]. It is not unreasonable to expect high levels of health awareness in these communities. Similarly, Adebara et al. [26] reported that in Nigeria, doctors' positive attitude towards mHealth was an indication of their willingness to continue to use mHealth intervention.

The Text4Life intervention anchored on community participation was an enabler to the use of mHealth and provided an important lens through which acceptance of an intervention can be understood. WDC chairpersons, who are integral to the community, spearheaded the mHealth intervention. They were evidently influential in facilitating the mHealth project and gaining the trust of their community in participating in the mHealth program. Women's responses confirmed the vital role of WDC chairpersons in inducing positive attitudes towards mHealth. They ensured women's safe transportation to healthcare facilities as part of Text4Life and planned for contingencies with transportation. Confirming our findings is an analysis of digital health practices across African countries that showed that failure

to engage communities in digital health innovations inadvertently leads to the outright rejection of innovations [27]. Similarly, Arnaert et al. [28] indicated that the engagement of community health workers in Burkina Faso in a mHealth program to support antenatal care enhanced spousal acceptance of the intervention and hence its continuity. Furthermore, in our study, complexities and specificities of the local context were implied in the clash between mHealth and social norms in the community. The embodied knowledge of community members is necessary to navigate the unforeseen consequences of participating in the mHealth program and aid the community as a whole in accepting the intervention. This point is discussed further under barriers.

A study in Kenya confirmed that users' familiarity and knowledge of digital health technology improves users' trust in the technology which in turn informs users' adherence to the digital health technology [29]. As evidenced in our study, women's and WDC chairpersons' understanding of the Text4Life program meant they were using the program as intended and increased their positive perception of the program. Similarly, a systematic review of success factors of mHealth in sub-Saharan Africa revealed that users' literacy and competency in using mHealth increases its acceptance [30]. It is noteworthy that women, men and WDC chairpersons received training on how to use the Text4Life program. That could explain their knowledge and competence in using the program appropriately.

While definitions and evidence of the effectiveness of mHealth are contentious in the literature [31,32], this study relies on the definition given in the theoretical framework model where effectiveness is defined as the indication that the study is likely to achieve its intended purpose [11]. Users of the Text4Life program, their spouses and WDC chairpersons believed that Text4Life is achieving its goal of improving pregnant women's use of skilled healthcare facilities and reducing maternal mortality in their communities. The program's effectiveness was further linked to the subsidized nature of the program and the provision of free phones. Similar to our findings, users' perceived effectiveness of mHealth interventions, which in some studies has also been linked to trust in the program, shapes mHealth acceptance and use in South African and Nigerian contexts [29,33]. Reasons for perceived effectiveness by participants in our study were evidenced in their recollection of instances where women's lives were saved due to emergency transportation and in women's personal stories of safety in access to care.

Our study also points to constructs of acceptability through which to explain barriers to accepting the Text4Life program. The burden of participating in the Text4Life program was high for some of the women and the WDC chairpersons. The burden associated with the intervention refers to participants' perceived effort to participate in the intervention [11]. Participation in Text4Life requires access to a phone; however, women generally reported limited mobile phone ownership. Disbursed phones were insufficient for all participants meaning that some women were left without phones. WDC chairpersons indicated using their own resources to assist women. Women were faced with the double burden of work (domestic unpaid work, their paid work and extra paid work) to afford a phone. Various studies have related gender inequality to women's diminished access to and use of mHealth programs for maternal healthcare. The digital gender divide in Nigeria results in 25% more men than women having ownership of a mobile phone thereby presenting a significant challenge to women's ability to benefit from mHealth interventions [7]. Similar studies assert that women's full participation in health interventions such as digital health programs is hindered when they lack access to resources, have limited decision-making power, and face unfair division of labour and unfavourable social norms [14,34,35].

Mobile health programs operate within a sociocultural context, which influences the acceptability of a program. The theoretical framework of acceptability examines the extent to which an intervention is a good fit with an individual's values [11]. Our study extends this definition to include shared values and the strong influence of users' sociocultural context in shaping perceptions of mHealth programs. Women's sphere of interaction was expanded with the Text4Life program which necessitated their interactions with drivers and WDC chairpersons sometimes late at night. However,

their interaction drew suspicion since it was not socially acceptable to be seen interacting publicly with men who were not their spouses, especially at nighttime. Confirming our findings is a study that links the properness of a mHealth program to its acceptance [36]. Properness was based on a group's values and perceptions. Much like our study, this study indicates the importance of acknowledging various pregnancy-related taboos in a community to ensure the properness of a mHealth program.

Beyond the acceptability of the mHealth program, participants proffered solutions for sustaining Text4Life in their communities. WDC chairpersons stated that despite the verbal commitment from community members and local governments to sustain the Text4Life program, there was a lack of financial investments to sustain the program. They point to an underfunded health system as a barrier to sustaining the mHealth program. Nigeria's digital health landscape shows promise through its National Health ICT Strategy aimed at sustaining applications of digital health solutions in the country [37]. However, recent reports analyzing investments in Nigeria's digital health sector indicate that with only 4.1% of Nigeria's budget going to the health sector (compared to the recommended 13% by the World Health Organization), there has been limited budgetary provisions made to the digital health sector and indeed the health sector as a whole across the various levels of healthcare [9,38]. The issue of funding also ties in with an inadequate health workforce. Evidence to support assertions of an inadequate health workforce abounds in a Nigerian context with significant rural-urban differences in worker distribution [39–42]. In response to this, Nigeria's ICT strategic framework identified the need to strengthen the capacity of the healthcare workforce to design, develop, maintain, govern and use digital health services. An important first step to achieving this would be to adopt strategies to recruit and retain an adequate health workforce, especially in rural areas.

5.1. Study implications and future research areas

Our findings demonstrate the importance of alleviating the burden of participating in mHealth interventions to enhance their acceptance and contribute to their sustainability. Being cognizant of barriers associated with participating in mHealth programs is of utmost importance. Developers of mHealth programs could liaise with internet companies or mobile operators to address the gender divide in mobile phone ownership. The Global System for Mobile Communication Association (GSMA) recommends the provision of low-cost or subsidized phones to address issues of unaffordability in underserved communities [43]. Furthermore, the subsidized nature of the mHealth intervention in our study aided in its acceptance among women and their families, especially those from disadvantaged socioeconomic groups. Digital health implementers must note that limiting the cost of participating in mHealth interventions improves the likelihood of use and acceptance. Understanding a community's value system is important in ensuring acceptance of a mHealth program. mHealth programs geared towards women and their communities must be developed in collaboration with them to ensure culturally sensitive programs and content.

Furthermore, our study highlights the importance of designing an appropriate plan for how best to sustain the project early enough in the design and implementation phase. Ebenso et al. [44] recommend delineating parties responsible for project takeover upon project completion. Unfulfilled financial commitments by the government highlight the inadequacy of the government alone to sustain the benefits of the mHealth program. There is the potential to leverage public-private partnerships for sustaining mHealth programs in a Nigerian context. This is important considering that 50% of health services in Nigeria are provided by the private sector [45]. However, the government-private partnership must be done with adequate regulatory measures that ensure appropriate coverage, quality, and distribution of mHealth programs.

Future research could take an intersectional approach to understand the acceptance of mHealth technologies at various intersections of users and

delivers' identities and interrogate how resulting experiences of privileged or oppression influences their acceptance of mHealth. The authors are already exploring gendered dimensions of engaging with mHealth in these communities and believe such an approach will yield richer understandings of acceptability.

5.2. Strengths and limitations

This study is strengthened by the user-centred operationalization of the concept of acceptability of digital health interventions. Our adoption of the theoretical framework for the acceptability of health intervention covered important factors that centre participants' cognitive and emotional responses to the intervention and how it influences sustained engagement with the intervention. Furthermore, the multiple sources of information helped to triangulate and validate information regarding the mHealth program since it evidently influenced not only pregnant women who used the intervention but also their spouses and community.

This study is not without limitations. While the theoretical framework for acceptability is considered a strength of this study, we have not applied it in its entirety due to the absence of data to accurately operationalize specific constructs. However, the elements of the framework reflected in the study instantiate the acceptability of the Text4Life intervention from the perspectives of the end users. We adopted a qualitative cross-sectional approach to understanding users' experience with the intervention. Deeper insights may have been possible from an approach that incorporated a mixed method design to understanding the complexities of accepting the mHealth program and a longitudinal approach that examined users' perception of the intervention from first use to subsequent uses.

6. Conclusion

This qualitative study applied the theoretical framework of acceptability as a tool to describe the enablers and barriers to the acceptance of a mobile phone-based health intervention that extends maternal healthcare services to rural areas of Edo State Nigeria. Findings highlight participants' attitudes towards the intervention, the involvement of the community, participants' understanding of the intervention, and the perceived effectiveness of the mHealth program as enablers to women's acceptance of the intervention. Implementers must alleviate the burden of participating in mHealth interventions, which in this case presented as limited resources and a clash with the community's value system. Furthermore, the risk of obstructing the gains from mHealth interventions is high if plans for sustaining it are not incorporated early enough in the design phase. This study provides evidence of participants' cognitive and emotional responses to the Text4Life intervention and how that influences engagement with and acceptance of the intervention.

Data availability statement

The datasets generated and/or analyzed during the current study are not publicly available due to analysis being underway for subsequent publications. Further inquiries can be directed to the corresponding author.

Ethics statement

This study was conducted as part of a thesis project. A certificate of ethical approval was obtained from the University of Ottawa's Research Ethics Board- file number S-02-21-6573, and from the National Health Research Ethics Committee (NHREC) -file number NHREC/01/01/2007–18/04/2017. Handwritten informed consent was obtained from all participants prior to participation.

Author contributions

OU conceptualized the study, coded and analyzed the data, and prepared the manuscript with input from SY, FEO, and LFCN. FEO and LFCN coordinated and directed data collection. All authors read and approved the final manuscript.

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Disclaimer

All views expressed in this paper are of the authors only.

Declaration of Competing Interest

FO is the founder of the Women's Health Action Research Centre (WHARC), the organization that implemented the Text4Life program. However, the other authors declare that the study was carried out in the absence of any commercial or financial interest that could be construed as a potential conflict of interest.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Dr. Friday Okonofua reports a relationship with Women's Health and Action Research Centre, Nigeria that includes: equity or stocks.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dialog.2022.100067.

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