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The Role of Gender in Barriers and Facilitators to TENA Use in Ethiopia

HEALTH [e] FOUNDATION

Colophon

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Summary

The COVID-19 pandemic has resulted in disruptions to everyday life across the world. These disruptions have been devastating for all, but for some groups the effects have been disproportionately felt, such as for women. In response to these issues, particularly regarding health issues resulting from the overwhelmed and largely inaccessible healthcare system, mobile health (mHealth) rose to the forefront of modern health service delivery. One example of such an mHealth project is TENA (meaning 'health' in Amharic), an interactive voice response (IVR) service created by Health[e]Foundation, the Ethiopian Midwives Association (EMwA), and Viamo. Aided by distribution through midwifery students and practitioners, TENA aimed to provide pregnant women, mothers of newborns, and more broadly, community members, with health information in the context of COVID-19. This information covered the prevention and treatment of COVID-19, and maternal health (MH), sexual and reproductive health and rights (SRHR), and domestic- and gender-based violence (DGBV) during COVID-19.

The combination of the woman-oriented dissemination method of this project, the female-focused information provided, and the well-documented mobile gap, whereby women are significantly less likely to own mobile phones, prompted the interest and focus on gender considering initial findings demonstrating an almost 50/50 gender division in users. The following research question thus arose: *How do gender-related factors impact TENA use and the barriers and facilitators experienced to TENA use in Ethiopia?* Sub-questions addressed barriers and facilitators, knowledge gain, and usage behaviour, in combination with a gender lens.

In order to answer these questions, a mixed methods approach was adopted. Quantitative analysis of user data provided the basis for the explanatory sequential design. This analysis consisted of statistical comparisons of baseline demographic data, baseline and endline knowledge questions, and endline evaluation questions. Furthermore, analysis of listening times for individual calls was performed to identify more and less 'popular' topics.

Following the quantitative analysis, 10 semi-structured interviews were conducted with a representative sample of the study population. Interviews focused on identifying the barriers and facilitators to TENA usage, and the gendered experiences within TENA use and actions following TENA use. Interviews were conducted via Zoom in the user-preferred language and transcribed by the researcher. Analysis was conducted with a grounded theory

approach using the Atlas.ti program. Findings were grouped into themes identified through the research questions and clarified through the analysis. Quantitative and qualitative data were triangulated in order to support the identification of these themes, the classification of data into these themes, and to have both qualitative data and statistical outputs to support the conclusions drawn.

The research demonstrated that the main barriers to TENA use were infrastructural and mobile-related issues, such as lack of electricity and poor network connectivity. Additionally, the timing of the calls for TENA posed an issue for 6 (60%) of interviewees. Four key facilitators to TENA were identified: 1) the accessibility of TENA, 2) fear and/or lack of knowledge about COVID-19 and other health issues, 3) experiencing personal and community benefits of TENA, and 4) perceiving the importance of TENA and the information shared by TENA for users of the opposite gender. Aside from this point, gender did not pose a significant barrier or facilitator to TENA use, but usage and information sharing behaviours did differ between men and women. Quantitative analysis of knowledge gain showed that men had significant knowledge change in three of the four topics (COVID, MH, DGBV), compared to women having significant change in two topics (COVID and MH). Additionally, women shared information through putting their phones on speaker, and appeared to feel a sense of responsibility for sharing this health knowledge. In comparison, men tended to exhibit more one-on-one knowledge sharing behaviours.

This study identifies several recommendations for Health[e]Foundation and partners as well as national-level bodies, should they deliver a similar service in the future. Firstly, there is a need to improve infrastructure surrounding mHealth services. Moreover, there is a dire need for TENA and other similar services. The popularity of this project and the qualitative research has shown the desire of users to fill their health knowledge gaps, with TENA as a highly accessible and affordable manner to do so. Finally, the main recommendation is a call to continue TENA in Ethiopia and expand it to other communities and countries so others can experience the benefits related to changes in health-seeking behaviour, health knowledge gain, and information sharing that this group has already felt. Further research should focus on identifying barriers to TENA among those who TENA did not reach, sustainability of the behaviour changes initiated by TENA, and trial gender-specific messages regarding the topics of maternal health and domestic- and gender-based violence.

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List of Abbreviations

ANC	Antenatal care
AUB	Actual usage behaviour
BI	Behavioural intention
CHW	Community health worker
COVID-19	Coronavirus disease 2019
DGBV	Domestic and gender-based violence
EE	Effort expectancy
eHealth	Electronic health
EMwA	Ethiopian Midwives association
EUTAUT	Extended Unified Theory of Acceptance and Use of Technology
FC	Facilitating Conditions
FGM	Female genital mutilation
HCP	Healthcare professional
HIC	High-income country
IVR	Interactive voice response
LMIC	Low- and middle-income country
MH	Maternal health
mHealth	Mobile health
NCD	Non-communicable disease
NGO	Non-governmental organisation
PE	Performance expectancy
PNC	Postnatal care
PR	Perceived reliability
SI	Social influence
SMS	Short message service
SRHR	Sexual and reproductive health and rights
SQ	Sub-question
TMT+	Tailor-Made Training Plus
UTAUT	Unified Theory of Acceptance and Use of Technology
WHO	World Health Organisation

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1: Introduction

The COVID-19 pandemic has led to a significant disruption in normal societal functioning globally, and within this, unequal impacts have been seen on several groups, notably women[1]. These disproportionate impacts include higher unemployment rates due to closing of sectors which employ mostly women, higher care burdens for women, who are most often unpaid carers, and increased stressors on family life[1]. These impacts, while almost universal, have also been exacerbated by the pre-existing contextual conditions of low- and middle-income countries (LMICs). It is in this turbulent global context that mobile phones and mobile health, or mHealth, have been reinforced as a crucial part of the future of health service delivery.

The World Health Organization (WHO) already initiated a call for mHealth to become part of the new normal for healthcare service delivery in 2010, with particular focus on scaling-up practical and affordable health technologies in low-resource settings[2]. The COVID-19 pandemic has resulted in a significant increase in mobile technology solutions in response to issues the pandemic has brought to the surface[3]. Mobile technologies have played three main roles thus far. One is the traditional role consisting of connecting people to health systems, the second is the supporting of teaching and work-related activities, and the third is mHealth solutions which aim to control and monitor the spread of COVID-19[3]. There are many definitions of mHealth, but can be more broadly conceptualised as "a new model of remote health delivery via a mobile phone"[4], which may take a number of different forms and have a variety of goals.

One example of such an mHealth project that grew out of the pandemic is TENA, meaning "health" in Amharic. TENA is an interactive voice response (IVR) service that provides short, informative messages to those registered in Ethiopia. Messages provide information about the prevention and treatment of COVID-19, maternal health (MH) and sexual and reproductive health and rights (SRHR), and how to respond to issues of domestic or gender-based violence (DGBV) brought on by the pandemic[5]. TENA was developed in response not only to the direct consequences of the COVID-19 pandemic, but also to support and raise awareness for the aspects of health and health care which had become a lower priority, particularly in the area of women's health and wellbeing in countries where this was already occurring, such as Ethiopia.

In Ethiopia, women are significantly underrepresented in mobile phone ownership, with a gender gap of 25% representing one of the largest gaps globally[6]. In response to this, research indicates that women borrow their spouses' phone on a weekly basis, or, less commonly, borrow from a friend or relative in order to gain access to the information shared there[7]. Ownership of a mobile phone has been demonstrated to have significant positive impacts particularly for women, acting as equalisers through enabling access to the same information as men[8]. Moreover, regarding maternal health and SRHR, Lefevre et al. (2020) demonstrated that mobile phone ownership among women was associated with improved care, including early antenatal care (ANC), greater than 4 ANC visits, skilled birth attendant presence during birth, and postnatal care (PNC) attendance[6]. Similar improvements have been seen in newborn PNC, including PNC attendance, vitamin A supplements, and immunisations[6]. However, these improvements are dependent on having access to and understanding of the information shared among mobile technology devices, which is highly intertwined with gender roles and relations. Aside from the disparity in mobile phone ownership, women may be further inhibited in their access and use of mHealth tools due to the tasks assigned to them as women, such as childcare and water and food collection and preparation[9]. These tasks limit not only time available to learn about and use mHealth tools, but also prevent access to factors which lay the groundwork for empowerment and thus mobile phone ownership, such as education, healthcare, and financial independence[10].

Thus, this research aims to identify and understand the role of gender-related factors in TENA usage and in contributing to barriers and facilitators experienced in the use of the TENA IVR service in Ethiopia.

2: Conceptual and Contextual Background

2.1: mHealth

mHealth is a component of the broader phenomenon of electronic health (eHealth). The WHO defined mHealth in a 2011 report on the state of mHealth as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices"[11]. The concept of mHealth has also been conceived more specifically as a new model to deliver health which uses a mobile phone[4], drawing attention to the capacity of mHealth to directly influence health at an individual and population level.

Recognition of the importance and future possibilities for mHealth has grown in recent decades, as evidenced by the WHO's release of a global strategy on digital health, including mHealth, for the years 2020 to 2025[12]. This strategy is crucial considering the ubiquity of the mobile phone, with over 70% of the planet's 5 billion wireless subscribers living in LMICs, who are sometimes more likely to have access to mobile phone signals than to electricity[11,13].

Mobile health is a highly diverse category, encompassing services such as health call centres, toll-free emergency phone services, disaster and emergency management, and mobile telemedicine[11]. These services, and the many others that exist, are typically offered using one (or more) of three main technological modes: automated calls (or interactive voice response), text messaging or SMS, and smartphones and online tools[14]. mHealth technologies have become more well-known and been adapted as the COVID-19 pandemic has had destructive consequences on healthcare systems globally, necessitating a move to contactless and more efficient health service delivery and functioning[2]. Prior to the onset of COVID-19 many mHealth initiatives were in pilot or research phases. mHealth is now often executed in a far more efficient and routine manner[3]. The benefits of mHealth during the pandemic have been felt by many, but this does not mean that the benefits have been shared equally, nor that there have not been issues exacerbated by the pandemic and the mobile phone dependence which followed.

The COVID-19 pandemic has contributed to the digital divide, as dependence on mobile technologies has grown not only in the health sector. The concept of the digital divide refers to the gap between demographic and regional groups that have access to modern communications and information technology, and those who do not[12]. This divide is rooted in

several issues, including limited access to the data network, whether due to resource availability or political instability, cultural factors, such as the uneven capabilities of different groups to adapt to mobile technology use, and social factors, including gender, such as economic barriers to technology access[3].

2.1.1: Interactive Voice Response

Interactive voice response (IVR) services can be defined in numerous ways. A broad definition of IVR proposed by Tsoli et al. (2018) describe IVR as "an automated, computer-based system, delivering the intervention content through a telephone call that facilitates interactive or non-interactive voice messages"[15]. In a practical sense, the delivered voice messages act as a two-way interaction between a real person and a pre-recorded voice[16]. The user responds to questions in the pre-recorded voice message and tailors the information given to their individual needs via a touch-tone keypad[14,15]. Further developments in IVR technology include the use of voice recognition instead of keypad use, as well as the use of algorithms to provide responses based on information inputted by the user[14,16]. These interactive messages can be used to assess symptoms and give relevant treatment information, facilitate contact with health centre staff, and provide clinicians with updates on their patients[14,16]. The non-interactive voice messages, or automated calls, may have a more educational function, rather than tailored information[14].

Interactive voice response services have been used in a variety of manners to tackle diverse health issues, including smoking, medication adherence, improving diet, and increasing physical activity[15]. Information shared via IVR services can have the goal of changing behaviour or improving access to healthcare, among others[15,16]. The diversity of applications of IVR can be attributed to the numerous advantages it has as an mHealth service. The main advantages are the convenience, simplicity, and confidentiality of IVR, as well as the capacity for cost-saving[15]. Moreover, IVR is particularly relevant for rural or remote areas, where barriers such as literacy or problems with disclosing sensitive or personal information may hinder an intervention[15]. These characteristics make IVR, and mHealth as a whole, of high relevance in LMICs.

2.1.2: mHealth and IVR in LMICs

mHealth has been vastly expanding in LMICs, corresponding with the huge increase in mobile- and smartphone ownership and the necessary services, such as a (3G) network signals[13]. The advantage of mHealth in LMICs is thus the ability to reach groups who, though far from healthcare services, have access to mobile phones. This being said, the majority of mHealth interventions in LMICs have taken the form of SMS services, whether one- or two-way, but in a hugely heterogenous manner, such that conclusions regarding the effectiveness of such interventions are challenging to draw[13]. This focus on SMS, and gradual move to applications which require internet connection, means that those who have limited digital and general literacy are hindered in the amount of benefit they can receive from such interventions[13].

As outlined previously, IVR has been used to share knowledge on a wide variety of topics in high income countries (HICs) – a trend which is also seen in LMICs. These topics include improving access to healthcare, promoting contraceptive use and medication adherence for HIV, and provide information and awareness on non-communicable diseases (NCDs)[4,16–19].

Interactive voice response services are one option that overcome issues associated with limited (digital) literacy. Poor literacy limits the ability to send and comprehend information shared via SMS, while digital literacy further inhibits this. While (digital) literacy still poses a barrier to voice calls, as the user may not be able to read the name of the caller, understand how to pick up the phone call, or engage with the interactive elements of an IVR, studies have demonstrated the ways that these barriers may be overcome. Women, who are particularly limited in LMICs in their (digital) literacy skills due to external factors including limited economic empowerment and educational opportunities, may reach out to friends or family members, such as husbands, who own phones to dial or accept a phone call or help them develop digital literacy skills[8,20]. Moreover, women may be hindered in their access to mHealth interventions due to the aforementioned lack of ownership of mobile phones globally and in Ethiopia. This gap and the documented behaviours to overcome it indicate a need to understand the differences that gender can incur on mHealth access and usage[6].

2.2: Ethiopia Background

2.2.1: Overview of Health Systems and Outcomes

Ethiopia, located in the horn of Africa, is one of the oldest states on the continent and was never fully colonised during the 19th and 20th centuries[21]. The country is a democracy that operates a federal system made up of 9 regions and 2 administrative councils, which are further divided into zones and districts[21]. Prior to 1993, there was limited government focus on health and the health system. However, in 1993, the first health policy was published, which aimed to reorganise the health service delivery system in order to benefit the socio-economic development of the entire country through fiscal and political decentralisation, primary healthcare expansion, and encouraging non-governmental actor participation[21]. Since 1993, further programs and plans have been developed and implemented to improve health outcomes, including further involvement of non-governmental organisations (NGOs)[21].

This renewed interest and focus was, and remains, necessary, as Ethiopia has some of the poorest health outcomes in sub-Saharan Africa. In spite of an increase in life expectancy from approximately 45 years in 1990 to 64.8 years in 2016, it is estimated that 80% of diseases can be attributed to preventable conditions linked to infectious diseases, personal and environmental hygiene, and malnutrition[22]. Moreover, the areas of women's, neonatal, and child health are of high concern, although significant reductions have been seen, including a decrease in maternal mortality ratio from 1400 per 100,000 live births in 1990 to 420 in 2013[22]. Causes of maternal mortality in recent years are similar to those seen in HICs, indicating an improved quality of care in Ethiopia, and supporting the effectiveness of improvements made to tackle issues corresponding with the three delays model of health service utilisation[23].

2.2.2: Midwifery in Ethiopia

Midwifery is defined by the WHO as "skilled, knowledgeable and compassionate care for childbearing women, newborn infants and families across the continuum from pre-pregnancy, pregnancy, birth, postpartum, and the early weeks of life"[24]. In Ethiopia, formal education and training of midwives began in 1954 and was led by European midwives living in the country[25]. However, due to limited enrolment in the early programs, they were shut

down, instead moving midwifery and birth attendant responsibilities and practices onto community nurses[26].

In the last decade, however, there has been a surge of activity and renewed emphasis on the importance and consequent training of midwives in Ethiopia. In 2000, the University of Gondar was the first institute to offer a Bachelor of Science in midwifery, followed by a Master's programme[26]. More institutions followed suit, such that in 2014 there were 46 midwifery training institutions, of which 18 offer this at a degree level and the remaining provide trainings or diplomas[26,27]. An unusual characteristic of midwifery in Ethiopia is the prevalence of males in the profession. Of the 7767 registered midwifery students in 2012, 2279 were male, representing almost a third of students[27]. In some regions, this ratio is flipped, such as in Benishangul-Gumuze, where the ratio of male to female midwifery students is 2.25:1[27]. Consistent with this increase in educational institutions and appeal of the profession to males and females, the number of trained midwives has increased from 1275 in 2008 to 6925 in 2013[26]. This increase is promising, although the setbacks caused by the closure of universities due to the COVID-19 pandemic are not yet clear, particularly considering the low levels of digital integration among many higher education institutions[28].

2.2.3: COVID-19 in Ethiopia

The COVID-19 pandemic has resulted in global halts to normal activities in all areas of life. The first case of COVID-19 was detected in Ethiopia on March 13th, 2020, and since then there have been approximately 469,000 cases and over 7000 deaths as of March 15th 2022 [29,30]. Initial government responses mirrored those seen around the world, including limiting the size of public gatherings, closing schools and borders, and working-from-home directives[28]. Further consequences of the pandemic included reduced access to healthcare services, including many aspects of maternal and neonatal care, such as reduced utilisation of antenatal care, fewer births in health facilities, and decreased numbers of newborn immunisations[31].

In response to the pandemic and the reduced ability to rely on traditional face-to-face interactions in the health system, telemedicine has emerged globally, including in Ethiopia, as a possible solution[32]. Telemedicine is the delivery of healthcare services using telecommunication technologies for healthcare delivery from diagnosis to treatment, and includes modalities such as mHealth and real-time technology[32]. Several interventions and

programs have arisen globally and in Ethiopia to support institution and individual-level responses to the pandemic in a variety of manners.

2.3: Gender Roles

2.3.1: Gender Roles in Ethiopia

Gender has been defined as a continuously changing "set of characteristics, roles, and behaviour patterns that differentiate women from men socially and culturally and relations of power between them"[10]. Unlike sex, which is a biological concept, gender is socially constructed[33]. Identification of the roles of men and women is made up of three main components: action, locus, and visualisation and power[10]. Action refers to the sex-based division of labour and is further divided into three types of action: productive, reproductive, and community[10]. Locus confers the environment that men and women function in, while visualisation is being seen or acknowledge and rewarded for performing certain activities, including being rewarded with privilege, converging with the power aspect of this component[10]. The term gender role is thus defined as "the roles that men and women are expected to occupy based on their sex", and gender roles are thus created based on interactions between individuals and their environment[33].

In Ethiopia, which is largely a male-dominated society, men are most often the head of the household, and exercise authority over their households and the women who live in them[9]. Women's work consists largely of the critical, but overlooked or even deprecated, work of processing crops, carrying water, collecting fuel, and preparing food, in addition to having key roles in trade and agriculture such that there is often a blurring in the gender roles in agricultural work, in particular[9]. In some areas of Ethiopia, research has shown that some women view their own role as mainly a reproductive one[34]. This has been supported by research into reasons why men do not engage in women's pregnancy, which cited sociocultural barriers such as the stereotyping and feminisation of maternal health issues, as well as financial barriers for accessing antenatal care, and the unavailability of men due to their role as providers for the family[35]. Regarding SRHR, a study investigating the relationship between belief in typical gender roles and attitude towards continuing female genital mutilation (FGM) practices found that 90% of the study population who had more egalitarian perspectives to gender roles had a negative attitude to continuing FGM practice[36].

Gender roles are more broadly understood to be critical to women's empowerment, in that they hinder access to many factors that contribute to empowerment, such as education, financial means, and healthcare[10].

2.3.2: Gender Roles in mHealth and IVR

Another area where gender roles have an impact is access to and use of mobile phones, and thus the capacity of women to participate in mHealth initiatives[37]. Research has shown that mHealth can support women's empowerment, however, women need to have access to the tools for mHealth in order for this change to occur[37]. It is therefore essential to critically examine dynamics of gender roles, as women are globally 21% less likely to own a mobile phone in comparison to men[38]. A special report by GSMA mWomen Programme in 2012 focusing on so-called women at the "base of the pyramid", stated that in the majority of families in LMICs, it is husbands who are the main owners and users of mobile phones, with 72% of women stating that their husbands did not allow them to have a mobile phone[39]. A study in Bangladesh investigating the role of husbands in restricting or supporting women's access to mobile phones suggested that gender differentials in mobile phone ownership may be due to inherent suspicion of women having the ability to communicate freely[38].

Conversely, mHealth has been shown to contribute to and combat, or have a transformative or non-transformative effect on, gender roles[37]. Jennings et al. (2013) show how mobile phone ownership can exacerbate existing problematic gender relations, such as fuelling conflict between spouses in negotiating use of the phone, or increase reliance on husbands, for example due to literacy limitations[37]. Transformative effects, on the other hand, include increasing women's ability to directly access healthcare facilities without spousal permission, facilitating the shifting of household resources, and empowering women through creating channels for men and women to discuss taboo issues such as contraception[37]. TENA is an example of an mHealth intervention which addresses women's health issues in a broad and accessible format in Ethiopia in the context of the COVID-19 pandemic.

2.4: TENA

2.4.1: Project Description

Health[e]Foundation, the Ethiopian Midwives Association (EMwA), and Viamo Canada are a consortium of partners that have collaborated on the Tailor-Made Training Plus (TMT+) subsidy program through Nuffic, which is funded by the Dutch Ministry of Foreign Affairs as part of its development cooperation policy. The project was implemented in Ethiopia in 2021 in response to the COVID-19 pandemic, and as of February 2022 has been completed. The project consisted of the Pandemic[e]Response blended-learning program for pre- and in-service midwives complemented by the TENA IVR service for the community. These two elements supplemented each other through focusing on both the care providers (midwives) and their clients (pregnant women and new mothers). The Pandemic[e]Response course aimed to strengthen midwives' capacity such that they could continue working safely and effectively during the COVID-19 pandemic and entailed a combination of face-to-face (or online) workshops with a self-study e-learning program of 3 to 4 months at 4 higher education institutions: Addis Abeba University, Debre Birhan University, Jimma University, and Wolkite University. Subsequently, these trained midwives functioned as ambassadors for TENA outreach towards their clients. The TENA IVR service reinforced the messages midwives shared with their clients and provide pregnant women, new mothers, and other community members with health information relevant to the pandemic.

2.4.2: TENA Content

The content of the TENA IVR service is partially catered towards the target group of (pregnant) women and is available in 3 languages: Amharic, Oromiffa, and English. The content is structured into four main sections, each made up of 6 messages developed by health professionals providing information about that topic. These four topics are:

1. Prevention and treatment of COVID-19 infection,
2. Antenatal and postnatal care during the pandemic,
3. Sexual and reproductive health and rights during the pandemic,
4. Domestic and gender-based violence and mental health during the pandemic.

Each call has a duration of approximately two minutes, and calls are spaced 4 days apart. The whole package of messages is thus listened to over a period of approximately 3 months. Two examples of messages from the COVID-19 and antenatal and postnatal care modules can be seen below (Table 2.1).

Additionally, some basic demographics data and preferences are inputted through the baseline call, which allows for language selection between English, Amharic, and Oromiffa, and collects the users gender, age range, rural/urban location, and whether registration was via a healthcare provider or someone else. Moreover, baseline questions to assess the pre-TENA level of knowledge in each of the four focus areas is asked, which are then repeated in the endline survey (Appendix 9.1).

Table 2.1: Examples of TENA Messages

Module	Message Text
COVID-19 Prevention & Treatment Message 3	Hello. This is sister Lucy. I'm reaching out to you again to inform you about the risks of the coronavirus. You may know someone who has been affected in one way or another by this pandemic. COVID-19 can affect anyone but some people are at higher risk than others. People over 60 years are more at risk than younger people. However, young people are not excluded from getting infected. Other high risk groups are smokers, overweight, people with chronic diseases like diabetes, heart diseases or cancer. Also, people with low immunity are at greater risk, if not taking prevention measures. Take care of yourself and your loved ones. If you have recently been in contact with someone who tested positive for COVID-19, you should avoid human contact as much as possible for 14 days, even if you feel healthy. Even if you have mild symptoms like headache, low grade fever (above 37.3 degrees Celsius) and slight runny nose, stay home until you recover. If you have any doubt about how to lower your risk of getting infected, seek advice from your health provider. Avoid acting upon information that is not from a reliable source. For more accurate information about the risks of COVID-19 in your community, refer to your local health authorities.
Antenatal and Postnatal Care During the Pandemic Message 1	Hello. This is sister Lucy from the Ethiopian Midwives Association and Health[e]Foundation with important health information for you on mother and child health. The next calls will be about having a healthy pregnancy and baby. Pregnancy is not an illness, but medical care is important for a healthy pregnancy. Attend check-ups at your clinic regularly for a healthy pregnancy even when this is more difficult because of the COVID-19 pandemic. Visit your healthcare provider when you know you are pregnant. You will need to have at least 4 clinic contacts and preferably 8 contacts for a healthy pregnancy and to solve any problem early if they occur. Your healthcare provider will tell you when to return for your next visit. Be sure to stick to the schedule that your healthcare provider suggests. Don't forget to tell your healthcare provider if you have any pre-existing health problems and ask any questions you have so they can give you the right treatment. Once your baby is born, take him or her to the clinic for check-up within the first week after birth. Attending regular postnatal care is important in monitoring you and your baby's health and treating complications. All women and newborns need three postnatal check-ups in the first 6 weeks after birth, ask your healthcare provider when to return to the clinic. Breastfeed immediately after birth and after every two hours, because the more you breastfeed, the more milk you will have. You'll know that you're doing all you can to have a healthy baby.

2.5: Barriers and Facilitators to mHealth Adoption and Use in LMICs

2.5.1: Barriers and Facilitators

Despite the growth of mHealth interventions in recent years, there are limited studies on the barriers and facilitators to acceptance and use in LMICs among individuals and communities, rather than at an organizational or health system-level. A selection of those articles that do address this focus are presented below (Table 2.2).

Table 2.2: Barriers and Facilitators to mHealth Adoption and Use in LMICs

Barriers	**Facilitators**
• Poor linguistic competency[40] • Request for demographic data infringing on anonymity[40] • Poor digital literacy[40,41] • Insufficient network coverage and quality[40–42] • Financial costs of the service[40,42] • Sociocultural beliefs and expectations[40] • Individual personality and beliefs[40] • Mobile phone access[41,42] • Access to electricity[41] • Illiteracy[41] • Language barrier/poor translation[41,42] • Confidentiality and security fears[41,42] • Care groups/community involvement[43] • Engaging community members with authority[43] • Lack of funding[42] • Poor advertising/awareness[40,42] • Incompatibility with health system[42] • Insufficient government role[42]	• Perceived confidentiality and privacy[40,44] • Perceived ease and quickness[40,42] • Conveniency[40,44] • Stakeholders and government collaboration[41,42] • Training/orientation provision to users[41] • Willingness to pay for service[41] • Effective two-way communication[42] • Cost efficient and cost effective[42,44] • Can be built to be scaled up immediately[42] • Adaptable with different forms of technology (i.e., SMS and WhatsApp)[42] • Aligns with content shared elsewhere (i.e., counsellors)[44]

Several conceptualisations of the barriers and facilitators experienced to mHealth tool usage have been created, but many do not include the broad impacts social determinants can have or are limited in their how accepted or applicable they are to external contexts. However, the Unified Theory of Acceptance and Use of Technology (UTAUT) model has been widely used and adapted while remaining relevant to a variety of mHealth tools and contexts.

3: Conceptual Model

3.1: Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a model created based on eight existing models which each aimed to explain user acceptance of new technologies[45]. The model was created based on empirical and conceptual similarities between these eight models, and factors were selected for inclusion based on the conclusions of validation studies and comparisons between studies (Figure 1)[45]. The UTAUT model is one of the most commonly cited research models in the field of technology acceptance and use[46]. However, there is also criticism on the UTAUT, including the view that this model has a narrow perspective on how technologies are diffused and used as it is based on a causal social psychology background[46]. In order to overcome this, and other limitations, adjustments, and extensions of UTAUT have been developed, including the addition of factors such as personal innovation specific to IT[47], perceived enjoyment[48], and trust[49,50]. Other adjustments have included adapting the model to increase its relevance in LMIC settings, such as that of Alam et al. (2018)[51].

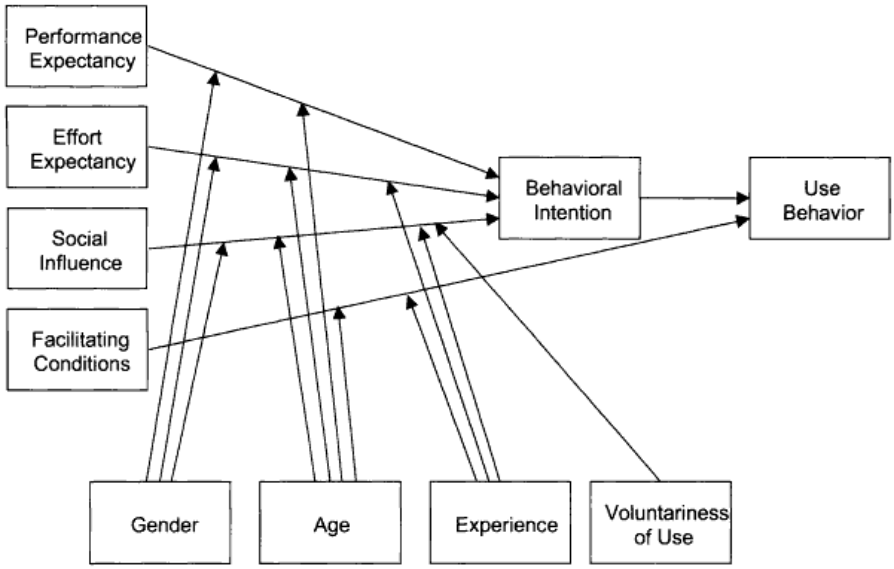

Figure 3.1: Unified Theory of Acceptance and Use of Technology Framework[36]

3.2: Extended UTAUT Model

The Extended UTAUT (EUTAUT) by Alam et al. (2018, Figure 2), was created in order to fill the gap of mobile technology use in a healthcare context in LMIC contexts, as research on this has been limited[51]. Two additional constructs were added: a resource-based construct: price value, and a trust-based construct: perceived reliability. These constructs are valid additions. However, they resulted in restructuring of the model, removing some interactions, namely the direct impact of Facilitating Conditions (FC) on Actual Usage Behaviour (AUB), and the influencing role of gender on Performance Expectancy (PE), Effort Expectancy (EE), and Social Influence (SI).

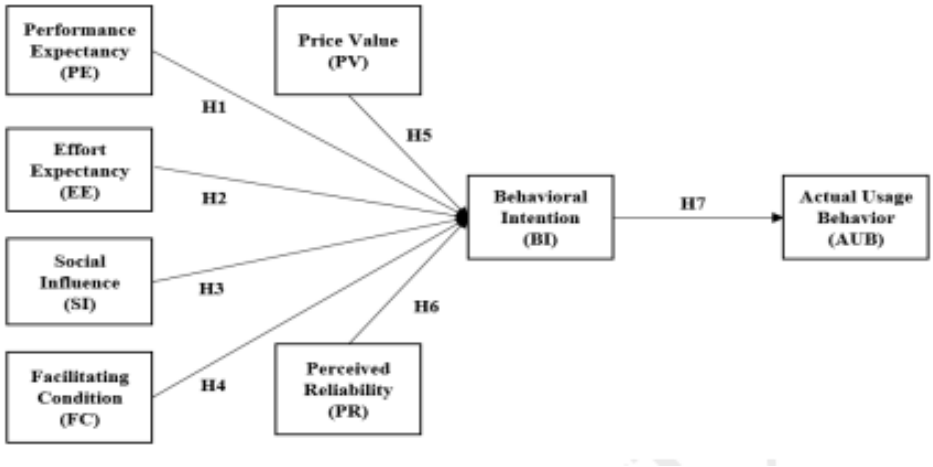

Figure 3.2: Extended Unified Theory of Acceptance and Use of Technology Framework[42]

3.2.1: Social Influence

Social influence (SI) is defined by Venkatesh et al. (2003) as "the degree to which an individual perceives that important others believe he or she should use the new system". This concept is rooted in three constructs: 1) subjective norms, referring to the user's perception of the opinions of the people close to him regarding use of the mHealth tool; 2) social factors, encompassing the way the user internalises the group or community's culture; and 3) image, meaning the extent to which using the tool is perceived to enhance the user's image or social status[45]. The authors suggest that women tend to be more strongly influenced by others' opinions, and thus argue that SI may be a more salient factor in determining their adoption of mHealth tools[45].

3.2.2: Perceived Reliability

Reliability is crucial in healthcare services due to the severe risks associated with unreliable care[51]. Alam et al. (2018) define reliability as "perfect technical functioning to deliver the service accurately"[51]. Reliability is also seen as an element of trust and has also been implicated in perceptions of ease of use, such that a system being seen as easy to use is also seen as reliable and trustworthy[51]. Perceived reliability is of particular importance in LMICs due to the typically low quality healthcare available, meaning that there is a loss of trust in the healthcare system as a whole[51]. The authors hypothesise that PR is positively correlated with intention to use mHealth services, and indeed PR was found to have an influence in predicting intention to use mHealth[51].

3.2.3: Facilitating Conditions

Facilitating Conditions (FC) is a broad term encompassing the extent to which an individual believes that the necessary infrastructure exists to support the usage of the new technology[45]. The base constructs for the FC concept are threefold. The first is perceived behavioural control, which refers to perceptions of constraints, both internal and external, on behaviour, and also includes self-efficacy, and resources available. The second base is facilitating conditions, outlined by other authors, and is described as the "objective factors in the environment that observers agree make an act easy to do"[45]. Finally, compatibility is cited as the third construct, reflect the degree to which a technology aligns with perceived needs, values, and experiences of potential users[45].

3.2.4: Behavioural Intention

Behavioural intention (BI) refers to "the degree to which a person has formulated conscious plans regarding whether to perform a specific future behaviour"[45]. This concept adds an important phase between considering the ease and usefulness of a technology and acting on it. This is particularly relevant in the case of mHealth interventions, as these tend to entail a longer-term commitment, which requires a stronger intention to include the technology in new routines.

3.2.5: Actual Usage Behaviour

This inclusion of technology in the routines of users is conceptualised as the actual usage behaviour, or AUB[45]. This is affected by a user's behavioural intention, which in turn is impacted by the aforementioned factors.

3.3: Modifications and Role of the Framework

The UTAUT and EUTAUT frameworks present valuable conceptualisations of mHealth adoption and use. However, considering the context of Ethiopia and the nature of TENA, some modifications are necessary. The concepts of Performance Expectancy, Effort Expectancy, and Price Value have been removed. Regarding PE and EE, these concepts are less relevant to a service with as little interactivity and complexity as TENA, while PV has limited relevance as TENA is a free service. Instead, focus will be laid upon the social aspects of the framework: Social Influence, Facilitating Conditions, and Perceived Reliability. This decision was made due to the importance of social and personal factors in determining mHealth adoption[45,52], and due to the key role of verbal communication and building trusting relationships in spreading health information in Ethiopia[53]. Thus, the adapted framework can be found below (Figure 3.3).

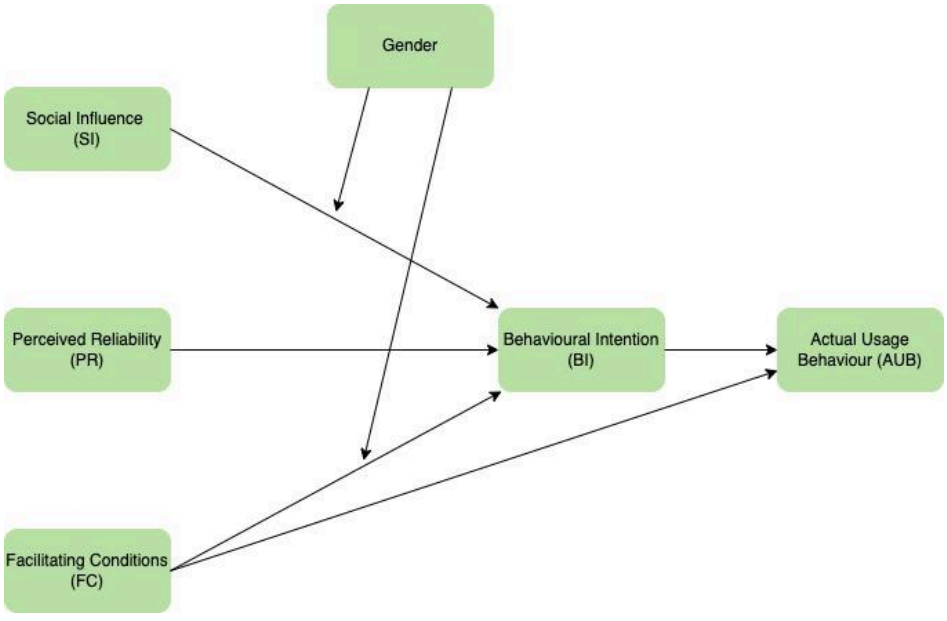

Figure 3.3: Adapted UTAUT Model[11,42]

As the aim of the UTAUT framework and its adaptations is to predict the acceptability and use of technologies, including mHealth, the factors included in the model could be viewed as barriers and/or facilitators to acceptance and use, with BI as the mediator. Use, in the context of TENA, refers to listening to and comprehending the messages, and acting upon the information in the messages, including sharing the information. The framework will thus provide structure to identify the different barriers and facilitators experienced in TENA use and understand the relationships they have, as shown through the main research question below:

How do gender-related factors impact TENA use and the barriers and facilitators experienced to TENA use in Ethiopia?

4: Research Questions

Based on the literature search and conceptual model, which introduced the main research question, the following sub-questions (SQ) were developed and will be used to further guide and develop the research.

1. What were barriers and facilitators experienced to TENA use?
2. To what extent did gender act as a barrier or facilitator or contribute to barriers and facilitators experienced?
3. To what extent is use of and knowledge gain from TENA different between men and women?
4. How did men and women perceive the information and content shared through TENA?
5. How did TENA users act on the information shared and did gender play a role in this?

5: Methods

5.1: Research Design

Understanding technology acceptance and use is a highly complex issue, with additional focus on gender roles and engaging with intervention context notwithstanding[46]. Therefore, a mixed methods approach was taken, as either qualitative or quantitative is often insufficient to truly understand the context of the research[54]. Moreover, due to the completed nature of the IVR component of this project, an evaluation approach was used, in order to identify strengths and areas for improvement in the case of possible scale-ups in the future. It has been argued that when conducting an evaluation, there is a moral imperative to adopt a mixed methods approach due to the complex nature of the contexts in which evaluations take place[55].

This research adopted an explanatory sequential mixed methods design, with the quantitative research based on TENA user data taking place first and the results thereof informing the second, qualitative, component with a selected sample of users. Two different kinds of data collection were used for this project, all contributing to answering the sub-questions introduced in Section 4 (see Table 5.1).

Table 5.1: Data produced and role in answering sub-questions.

Method	Purpose of Collection	Data Tool	Research Sub-Questions
Quantitative	To identify knowledge gain levels between different TENA topics and gender groups	Baseline and endline knowledge question results	SQ 3
	To understand TENA users' perceptions of the content shared	Endline evaluation questions (& interviews)	SQ 4
Qualitative	To identify barriers and facilitators to TENA use and understand if and how gender played a role in this	Semi-structured interviews (& listening times)	SQ 1 & SQ 2
	To understand how users acted upon the information shared by TENA	Semi-structured interviews	SQ 5

5.2: Quantitative Data

5.2.1: Study Population and Data Collection

The population from which the quantitative data was drawn are those who were enrolled to TENA at any point during the project, from the earliest possible registration date of 30-07-2021 until the latest possible registration date of 22-11-2021. The goal population to be registered to TENA was clients and community members of the midwives enrolled in the Pandemic[e]Response program.

Quantitative data has been collected throughout the project by technical partner, Viamo. Registration for TENA was done by calling a phone number and being immediately hung up on, whereby a toll-free number would call back, therefore introducing no selection bias as no phone credit or costs were needed for users to register. Upon registration, a baseline survey was conducted in which users could communicate basic information about themselves through clicking the number corresponding to one of the possible answers to the closed questions asked (Table 5.2). Four knowledge questions were also asked to ascertain the level of knowledge prior to TENA usage (Appendix 9.1). An endline survey was also conducted with the same knowledge questions and additional evaluation questions regarding user perceptions of the service (Appendix 9.6). Additionally, provided data included what percentage of each individual message was listened to, or approximately at what point during a message the listener hung up or did not listen to the message at all.

A distinction was made in analysis between the demographic questions and the knowledge questions in the baseline survey. Only those who answered the knowledge questions at endline, and baseline were included in the knowledge gain analyses. Analyses on the demographic section of the baseline include all those who responded to the questions.

Table 5.2: TENA Demographic Baseline Survey Questions and Responses.

Question	Possible Responses
Are you male or female?	1 – Male 2 – Female
How old are you?	1 – Below 18 years 2 – Between 18 and 30 years 3 – Between 31 and 45 years 4 – Above 45 years
Where do you live?	1 – In a city 2 – Outside of the city 3 – Not sure
How did you hear about TENA?	1 – From your healthcare provider 2 – From someone else

5.2.2: Data Analysis

The data was shared by Viamo as a CSV file whereafter it was transferred to IBM SPSS Statistics version 25 for analysis. From here, descriptive statistics of the study population and message listening were extracted and presented, in line with sub-questions 3 and 4. Crosstabs were conducted to identify associations between baseline characteristics. Comparisons using Mann-Whitney U tests were conducted to ascertain whether differences in average listening times between modules are significant, which aided in guiding the qualitative component of the research. Sign tests were used to examine changes in answers to base- and endline questions, addressing sub-question 3.

5.3: Qualitative Data

5.3.1: Participants and Procedure

A sample of 10 TENA users were selected for semi-structured interviews to address the topics of sub-questions 1, 2, 4, and 5. Interviewees were contacted by EMwA employees who volunteer to help the researcher. They were called and following a brief explanation of the project and their role in it, they were asked if they would like to participate, and if so, when they would be available. Selection was based on the following criteria (Table 5.3) and endeavoured to be representative of the study population while remaining unbiased and adapting to those who were unavailable or did not agree to participate. Interviews were conducted online. TENA users who selected to listen to the messages in English were

interviewed via Zoom by the researcher. Interviews conducted with Amharic or Oromiffa-speaking users were conducted by EMwA staff and midwifery students in Ethiopia who volunteered to collaborate with the researcher on this study. The researcher listened in via Zoom in such situations.

A guide for the semi-structured interviews including informed consent was written in English and translated into Amharic and Oromiffa (Appendix 9.2). The researcher engaged in discussions with the interviewers regarding the interview guide, interview protocol, and aim of the research to guarantee understanding for all parties involved and to ensure consistency between interviewees and interviewers (see Appendix 9.3). Live translation was used in order to allow the researcher to have a steering position in the interview. The questions were asked in the Amharic or Oromiffa language, the interviewee responded, and the interviewer translated word-for-word to the researcher, who could then ask follow-up questions to be translated. During the interviews, additional information to the demographic baseline survey was gathered, including whether the participant had a stable income, and their occupation.

Table 5.3: Selection Criteria for Interviews.

Characteristic	**Criteria**
Age	>18
Gender	4-5 male and 4-5 female
Language	5-6 Amharic, 2-3 Oromiffa, 1-2 English

5.3.2: Data Analysis

The interviews were recorded, transcribed by the researcher, and coded in Atlas.ti. Coding was based on grounded theory using the guiding principles of iteration and theoretical sampling[56]. Open coding was conducted on the first interview, then applied to the second and third for any additional codes to be added. Consequently, the codes were reorganised and categorised for coherence before being applied to the remaining 7 interviews. The coding was an iterative process, and minor changes to the coding organisation were made throughout (see Appendix 9.4 for an example of a code tree).

5.4: Data Integration

Consistent with the mixed methods sequential explanatory design of the study, the results garnered from the quantitative data informed the direction of the qualitative research. Differences in TENA use and knowledge gain were used to guide interviews based on the gender of the interviewee. Moreover, follow-up questions from the endline survey regarding the clarity, understanding, and usefulness of the calls were asked. A final additional aspect of the qualitative component addressed knowledge use and sharing, which was loosely informed by relative success of different modules as identified through average listening times, but also aimed to understand broadly how the knowledge was interpreted and used. In general, the mixed methods approach aimed to provide statistical outputs to support conclusions identified in the qualitative section of the research.

5.5: Ethical Considerations

Following a discussion between Health[e]Foundation and EMwA with the researcher present, it was decided not to pursue ethical approach for this research, as all user data held by Viamo have been anonymised compliant with GDPR regulations and shared with the researcher in this format.

Informed consent was obtained from all participants in the qualitative section of this research. The informed consent for interviews provided a description of the research objective, methods of data collection, ethical considerations, and emphasised the voluntary nature of participation in the research. Verbal consent was gained from the interviewees in the language of the interviewee regarding the recording, transcription, and translation of the interviews, and assurance was provided with respect to the anonymity and confidentiality of their data. Thereafter, the recording was started. Further explanation can be found in the Data Management Plan (Appendix 9.9).

6: Results

The results of this research are structured according to the sub-questions stated in section 4. Following the introduction to the quantitative and qualitative study populations, key findings of the barriers and facilitators to TENA will be presented. Thereafter, the influence of gender on barriers and facilitators will be highlighted, followed by the (gendered) knowledge gain and use of TENA. Perceptions of TENA will be outlined before concluding with the information sharing behaviours of TENA users. Throughout the presentation of the results, links to the conceptual framework will be emphasised.

6.1: Study Population

6.1.1: Quantitative Study Sample

Of the 2033 people who registered as TENA users, 1885 (92.7%) completed the baseline survey and 994 (48.9%) completed the endline survey. The number of listeners differed per message group (Table 6.1) but was at its lowest 1707 listeners (83.9%). The dropout rate from COVID to MH messages was thus 5.3%, from MH to SRHR it was 4.5%, and from SRHR to DGBV there was a dropout rate of 2.5%. The overall dropout rate from COVID to DGBV was 11.8%. Of the listeners who completed the baseline and endline surveys and listened to 100% of all 26 messages broadcasted by TENA (n=947), an initial selection of 15 users was made and a sample of 10 was created to be interviewed following the guidelines outlined in Table 5.3.

Table 6.1. Number of Listeners per message topic

Topic	**Total Number of Listeners**
COVID Messages	1936
MH Messages	1833
SRHR Messages	1751
DGBV Messages	1707

The study population for the quantitative section of the research was 50.5% female, the majority in the age group 18-30 years old (78.3%) and lived in a self-reported urban (74.6%), rather than rural, area. TENA users were largely Amharic speakers (78.4%), followed by Oromiffa-speakers (20.2%, Table 6.2). The majority of TENA users heard about TENA from a healthcare provider (73.5%, Figure 6.1). Crosstabs were performed to identify any associations between variables. It was found that gender was significantly associated with age: X^2 (3, N = 1969) = 18.279, p<0.001, area: X^2 (2, N = 1960) = 29.458, p<0.001, and language: X^2 (2, N = 1978) = 45.351, p<0.001. Women were slightly more represented than men in the age group 18-30 (52.7% to 47.3%), lived more in the urban (53.9% to 46.1%), and were more likely to be Amharic-speakers (54.2% to 45.8%). In contrast, men were more prevalent in the 31-45 and under 18 age groups, rural areas, and Oromiffa-speaking users (see Appendix 9.5).

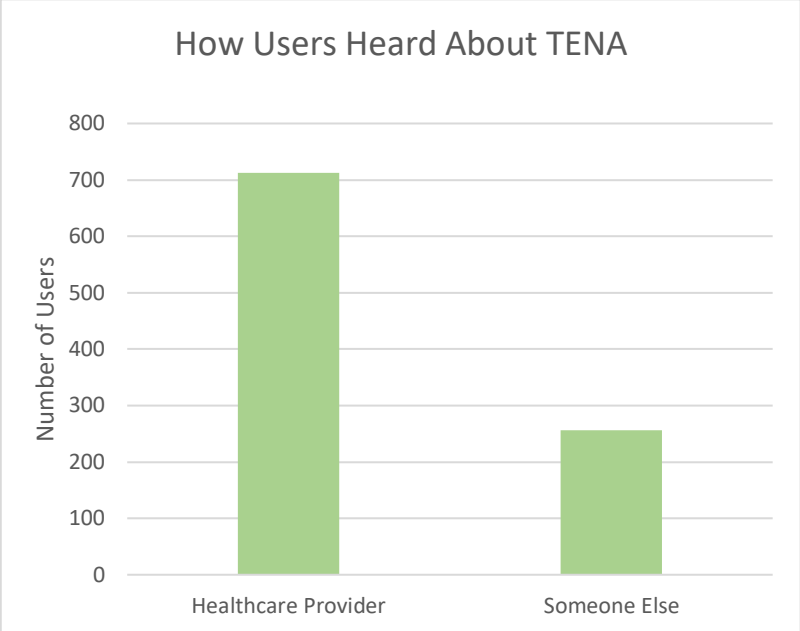

Figure 6.1. Bar graph of where users heard about TENA from

Table 6.2. Quantitative research sample demographics

Variable	**Categories**	**N *(%)***
Gender	Male	980 *(49.5)*
	Female	998 (*50.5)*
Location	Urban	1463 *(74.6)*
	Rural	477 *(24.3)*
	Unsure	20 *(1.1)*
Age	Under 18	185 *(9.4)*
	18-30	1541 *(78.3)*
	31-45	192 *(9.8)*
	Over 45	51 *(2.5)*
Language	Amharic	1593 *(78.4)*
	Oromiffa	410 *(20.2)*
	English	30 *(1.4)*

6.1.2: Qualitative Research Sample

Table 6.3 presents the characteristics of the interview sample. Ten interviews were conducted in total. One was not completed due to failure of the internet connection midway through, and the participant's consequent decision not to continue with the interview.

Table 6.3. Interview Sample Characteristics

Characteristic	**Interview Sample**
Gender	4 female, 6 male
Location	5 urban, 5 rural
Age	8 age 18-30, 2 age 31-45
Language	6 Amharic, 2 Oromiffa, 2 English
How Users Heard About TENA	5 from a friend/student healthcare professional (HCP), 5 from EMwA during a kick-off, 1 from an in-service midwife, 1 from non-HCP friend
Stable source of income	5 no stable source, 5 stable source
Occupation	5 students, 2 in-service midwives, 3 other

6.2: Barriers to TENA

Barriers to users accessing and experiencing TENA fell into two main categories: barriers imposed by broader technological issues and barriers posed by characteristics of TENA.

6.2.1: External Technologies

Issues with mobile phones and the infrastructure related to them were the most commonly reported barriers faced by interviewees. These issues impacted both urban and rural TENA users, although were reported to be a more significant issue in rural areas.

"*You mean did I have, yeah, I had some problems (…) Since I come from rural, battery on the phone, and there may be some network problem*" – Participant 2, M

As demonstrated by the quote above, network issues and electricity issues posed barriers on users being able to listen to messages. One participant also mentioned they had

issues with their mobile phone, such that it was not always functional, while another reported they did not always have their phone on them and as such missed some calls. This relates to the available resources aspect of the facilitating conditions concept. Insufficient or poor-quality resources of electricity and mobile phone network act as barriers to TENA use. However, despite the reality of this lack of resources, participants persisted in their use of TENA.

6.2.2: TENA Characteristics

Some characteristics of the TENA service itself also acted as barriers to TENA use. This can be quantitively demonstrated by the average listening rates, which were between 77.70% and 82.94%, depending on the topic of the messages (Table 6.4). This is likely a combination of the aforementioned technical issues, TENA characteristics, and alternative issues not identified in the study sample.

Table 6.4. Average Listening Percentages per Topic

Topic	Mean Listening %
COVID Messages	82.94
MH Messages	78.41
SRHR Messages	77.70
DGBV Messages	78.05

The evaluation questions built into TENA's endline survey addressed the timing of the messages. Half of the respondents answered that they would prefer to have messages on specific days of the week instead of every 4 days (Figure 6.2). The remaining evaluation questions, addressing understanding, clarity, and usefulness of the messages, had majority positive responses (Appendix 9.1).

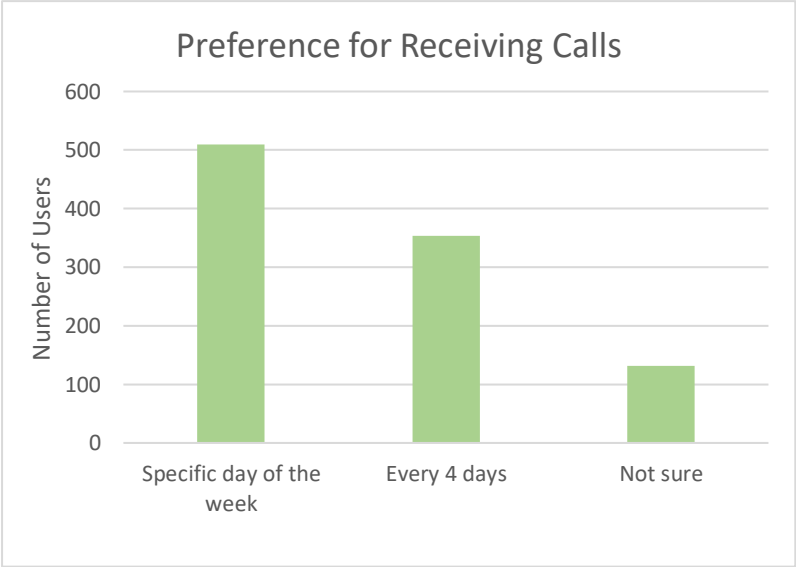

Figure 6.2. Bar graph of distribution of wishes for message timings

Among the interview sample, inconvenient timing of the messages was the most mentioned barrier to TENA usage (n=6). Interviewees mentioned they were sometimes in their workplace or in another situation where they were unable to pick up and listen to the message.

*"…but she gives emphasis: timing. The TENA mobile service call, the participant may be in the marketplace, public transportation, or meeting, so that may affect the accessibility. Yeah, so, she recommend the chance, if [*sic*] there is a chance to repeat the message*."

– Participant 7, F

Here, again, a link to FC is relevant, as the timing of the message posed an external constraint to people's use of the TENA service.

6.3: Facilitators to TENA

Facilitators to the access and use of TENA was rooted in three main factors: 1) characteristics of TENA itself; 2) global and/or local experiences and events; and 3) the perceived and felt benefits of TENA in the short- and long-term. These factors can be connected to the Facilitating Conditions, as outlined in the previous section regarding TENA characteristics, and to the Social Influence concept.

6.3.1: TENA Characteristics

As stated above and shown in Appendix 9.6, the evaluation segment of the endline survey demonstrated the positive experiences users had with TENA, with overall satisfaction rates being high and 92.4% of users responding they would recommend TENA to others.

Follow-up questions during interviews addressed particular characteristics of TENA which users found to be supportive to their (continued) use. Multiple participants mentioned their appreciation for, and the importance of the information shared by TENA, as well as how accessible TENA was (Table 6.5). The accessibility of TENA relates to the concept of Perceived Reliability. PR has been implicated in perceived ease of use, in that a system that is easy to use is also reliable. Reliability also links to the trust-based aspect of TENA, relating to its connection to EMwA and dissemination by midwives.

Table 6.5. Summary of TENA Characteristics as Facilitators

TENA Characteristic	Explanation	Mentions (N of People)
Trust in the source	Knowing TENA was linked to midwives	4
Importance of the information	COVID, MH, DGBV were most commonly mentioned for their importance	7
Language	The accessible, non-medical language and the options for languages offered	7
Accessibility of TENA	Accessible language, no financial barriers, no smartphone needed, no literacy needed	2
Message length	Short messages	1
Structure of messages	Grouped by topic	1
Novelty	Excitement about receiving health information in this format (mHealth)	1

The availability of TENA in multiple languages was mentioned by one Amharic-speaker and was appreciated by both Oromiffa-speaking interviewees:

"*He likes the language because he receive the service in his language, Affan Oromo*" – Participant 4, M

Participants generally recognised many facilitating factors built into TENA and the benefits that they offered for both themselves and the people around them. This can be categorised as an objective factor that makes use of the service easy, in line with one component of the FC concept.

6.3.2: Global and/or Local Events and Experiences

Current occurrences at both local and global levels had facilitating effects on TENA users. Participants brought up fears and concerns about COVID-19 as reasons for (continued) listening or registration with TENA. Additionally, some participants identified a lack of health education in their communities or in themselves and were thus motivated to use TENA in an attempt to provide this information for their community. This demonstrates another aspect of the FC concept, namely the compatibility of a technology with the context. In this

situation, TENA aligned with the need for health information in the face of a global pandemic, thus encouraging use.

"*Before receiving this TENA mobile health message, he has worry about COVID-19. So, after receiving the message, he has, or, he have, he have a full information about the prevention of COVID-19, because he was a student, COVID-19 especially for the first 6 months and so on, there was a worry about the transmission, so he received information about this COVID-19 from the TENA mobile service and he responds as he has benefited from the information*" – Participant 1, M

6.3.3: Benefits of TENA

The knowledge questions and semi-structured interviews revealed the benefits that TENA had on its users, with both shorter- and longer-term benefits identified. The categorisation of benefits as a facilitator links again to the compatibility facet of FC as explained above, as well as the social factors aspect of SI. A user's internalisation of the benefits of TENA for their community facilitates their further use and actions on TENA, both in the short- and long-term.

6.3.3.1: Shorter-Term Benefits

Shorter-term benefits, namely those during the duration of the TENA messaging service, were identified during the semi-structured interviews. Short-term benefits were, in addition to causing personal health benefits, strongly related to the user's ability to share information with and benefit their immediate community, including pupils, clients, friends, neighbours, and family.

"*He aware especially husband should go with her [*sic*] wife when she go to the clinic for antenatal care, for delivery, or postnatal care. So, he receive this new information for the first time from TENA. So, he appreciate very nicely about this. He didn't know previously to go with his wife when she go to the health facility for seeking healthcare*." – Participant 6, M

6.3.3.2: Longer-Term Benefits

In addition to the shorter-term benefits, some TENA users identified longer-term benefits that would endure after the duration of the project.

"*I develop a behaviour of sharing information for other person [*sic*]. Previously, I didn't have any experience or friend, to share, even if I have received training, I didn't share this, the information. But, from the TENA mobile I tried to share all information for all my friends and other individuals.*" – Participant 7, F

*"I develop a confidence. She develop [*sic*] confidence and she feel freedom of- for, for female. Freedom of, of opinion"* – Participant 7, F

"*I receive information especially for substance abuse and so, so I benefited from that to prevent for to save us, to save, to save me from this substance abuse and so. And so, I received some benefits, and so I will continue with changing my behaviour to use this information*." – Participant 1, M

Individual benefits resulting in changes in behaviour and opinions such as those above demonstrate the impact of TENA on its users, which in turn led Participant 7 to act as a facilitator for TENA access through sharing this information.

6.4: Gender and TENA Barriers and Facilitators

Limited gender-specific barriers and facilitators were identified by interview participants, although differences in usage, knowledge gain, and information sharing behaviours were identified (see sections 6.5 and 6.7). However, an emphasised relevance of particular topics for men and women was identified as a facilitator.

6.4.1: Information Relevance

One facilitator discussed was that participants believed some information shared by TENA was more relevant for one gender, and thus this would be an extra motivation to listen to these messages. This was identified for both men and women, sometimes regarding the same topics:

"*I think they will think it's important, because SRHR are more related to women, like even though like they are married, women usually go to health facilities alone. The male will not have information about SRHR, like, services or any information related to SRH. So, having these messages on their mobile phones is, I think, it's, it gives some insights and information about SRHR, so I think, it's a very good thing for the men to, I don't think it's going to be not interesting, I don't think it will be a boring thing for them*." – Participant 8, F

"*Yeah, but, for female, the information for TENA, just like family planning, antenatal care, delivery and so on, so females listen more I think, because of the information, female individuals may listen more*." – Participant 1, M

Participants also expressed similar ideas regarding the topic of DGBV and maternal health as being of extra importance for both men and for women. These findings can be conceptualised by the subjective norms aspect of SI, as users shared how they perceived the other gender to understand TENA and the information shared by it.

6.4.2: Barriers

Limited barriers were discussed in the context of the interviewee's gender. Only two gender-specific barriers were brought up, and these were related to perceived characteristics of the opposite gender. One participant suggested that lack of patience may be an issue for male users, while a male participant suggested that shyness and feeling embarrassed about the messages may pose a barrier for female users. The remaining participants emphasised that any challenges experienced were the same for men and women.

6.5: Gendered Knowledge Gain and Use

Significant knowledge gain was seen for the whole population in the topics of COVID-19 and MH. Women shared this distribution, while men also had significant knowledge change in the DGBV topic. TENA use was also different for men and women, with women listening to messages for longer on average and reporting different behaviours in the interviews.

6.5.1: Knowledge Gain

Sign tests were performed to analyse the knowledge gain among TENA users. A significant change between baseline and endline questions was found in the median answers for the COVID and MH questions ($p>0.001$, Table 6.6). The COVID question addressed the use of face masks against COVID-19, while the MH question was regarding the number of antenatal check-ups a pregnant woman should have. The sign test demonstrated that 401 people had a negative difference, indicating they moved towards recognising the importance of face masks (i.e., from no to not sure, or not sure to yes). The MH question demonstrated 323 positive differences, indicating they saw the need for more antenatal care visits after listening to TENA (Table 6.6). The direction of the differences was dependent on the recoding of the variables in SPSS. Knowledge gain was additionally reported or evident among all participants interviewed, although not statistically significant for the whole group for SRHR and DGBV.

Additionally, some differences in knowledge gain were found between men and women. Men reported significant changes in knowledge for the topics COVID ($p < 0.001$), MH ($p = 0.002$), and DGBV ($p = 0.043$), while for women this was the case for COVID ($p < 0.001$) and MH ($p < 0.001$) only. The knowledge change in the DGBV topic for men indicates an overall change in knowledge opposite to the goal (141 negative differences compared to 108 positive), with Appendix 9.8 showing that more men answered they would not intervene at endline compared to baseline, and fewer men saying they would intervene at endline compared to baseline.

Table 6.6. Sign Test Results Knowledge Gain Questions

Question	Type of Change	Total Population (N)	Men (N)	Women (N)
COVID Question	Negative Differences	401	179	222
	Positive Differences	199	92	107
	Ties	346	157	189
	Total	946	428	518
COVID Q: Z (p-value)	-	*-8.206 (<0.001)*	*-5.224 (<.001)*	*-6.285 (<.001)*
MH Question	Negative Differences	216	99	117
	Positive Differences	323	148	175
	Ties	416	187	229
	Total	955	434	521
MH Q: Z (p-value)	-	*-4.566 (<0.001)*	*-3.054 (0.002)*	*-3.336 (<.001)*
SRHR Question	Negative Differences	93	54	39
	Positive Differences	93	41	52
	Ties	769	338	431
	Total	955	433	522
SRHR Q: Z (p-value)	-	*0.000 (1.000)*	*-1.231 (0.218)*	*-1.258 (0.208)*
DGBV Question	Negative Differences	289	141	148
	Positive Differences	251	108	143
	Ties	410	182	228
	Total	950	431	519
DGBV Q: Z (p-value)	-	*-1.592 (0.111)*	*-2.028 (0.043)*	*-0.234 (0.815)*

6.5.2: Differences in TENA Use

Average listening times between men and women were significantly different ($p < 0.001$), as tested by the Mann-Whitney U test. Women consistently listened to messages for longer than men when analysed per topic (Figure 6.3), and the same is true for all individual messages except the first three (Appendix 9.7).

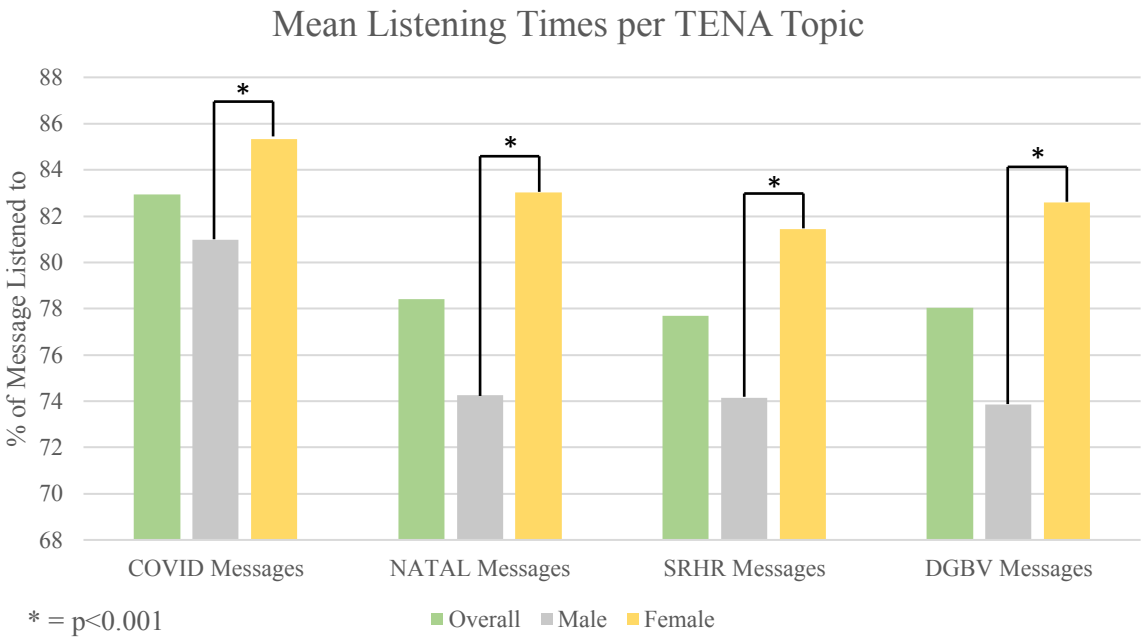

Figure 6.3. Mean Listening Times of Males and Females per Topic

The interviews revealed further differences in how men and women used TENA. One interviewee experienced that men wanted to enrol for TENA when he told them about it, while women only wanted to receive the information without enrolment. Another interviewee identified a difference in how men and women act on the information they receive in TENA:

"*Uh, most of the time males are hesitate when they, even if they have information or they listen the information, they are hesitant to practice that information. But in the case of women, when receive the information or when get experience, they try to apply to their children and for their family*" – Participant 7, F

6.6: Perceptions of TENA

Quantitative evidence demonstrated users' perceived importance of TENA through the evaluation survey, particularly users' assessment of the usefulness of the information in TENA. The chi-squared test showed that people perceiving the calls as useful was significantly different from the null hypothesis distribution ($X^2(2) = 1493.789$, $p < 0.001$), suggesting TENA aligned well with the community's needs and values.

Perceived importance of TENA was a common theme among many participants during the interviews. Participants expressed their perception of TENA's importance in terms

of men, women, and the community as a whole. For men and women, participants recognised that TENA provided information that was important for the health of these groups, particularly to support healthy pregnancies for women and educate men about DGBV. This relates again to the compatibility aspect of the FC element of the UTAUT.

6.7: Information Sharing Behaviours

Users' perceptions of TENA were highly connected to their information sharing behaviours, and where they saw a lack of knowledge, they used TENA to try and spread awareness.

"*As she said, most of the pregnant women came to this clinical area on term, on term. So, as she said, they prepared a mini conference, a mini conference to educate womens [*sic*] or females about ANC follow-up*" – Participant 10, F

Information sharing was a common behaviour among users, as all interviewed participants shared or expressed an intention to share TENA. This sharing took different forms with different motivations and reflects the BI and AUB of TENA users.

6.7.1: Person-Specific Sharing

It was more common for people to report sharing TENA with specific people (N = 7), rather than specific information being the determining factor for sharing (N = 5). Interviewees reported sharing information from TENA with pregnant women, family members, and neighbours, co-workers, and pupils.

"*He give information mostly for pregnant women, yeah, he shared the information for pregnant women*." – Participant 1, M

6.7.2: Topic-Specific Sharing

Five TENA users reported sharing information based on the topic, rather than the person. Several topics were more commonly reported as being shared by TENA users, namely information regarding pregnancy and other maternal health topics, SRHR topics, including family planning, and COVID-19.

"*I have passed the information to my neighbours, but for the male only. (…) I have passed the information about birth spacing, but only for near neighbours, I pass the information. I didn't pass for far peoples. (…) What he is saying, for few womens [sic]*" – Participant 5, M

6.7.3: Gendered Information Sharing

Information sharing behaviours were also reported to be different among men and women, namely in the mode of sharing. Women reported sharing information by putting their phones on speaker when they received the TENA calls. Men reported sharing information in more one-on-one settings.

"*When she was in health facility in working hour, when the TENA mobile call, she try to make loud. (…) Because, yeah, for example if she is in postnatal room, uhm, while she provide this postnatal care or antenatal care, when the condition is willing, she make it loud. At that time, the client can listen the information."* – Participant 7, F

"*So, he have transmitted the message for his brother, for his mother and father. (…) He answer that only, he, pass only the message about COVID because he, this is a great problem of our country*." – Participant 5, M

This difference in behaviour could be attributed to the image facet of SI, with men and women wanting to portray different images and acting according to different societal expectations based on their gender identity and the prominent gender roles.

7: Discussion and Conclusion

The TENA IVR service was developed in response to rising poor health outcomes developing as a consequence of the COVID-19 pandemic. A simple, accessible, and low-cost solution was necessary to prevent the growth of pre-existing disparities among the Ethiopian population, including between men and women. The present research has demonstrated the success of this service in reaching a large and gender-balanced audience. Few barriers were identified by users, and those identified were largely linked to broader technical and infrastructural issues, supporting the promising views on TENA as a beneficial mHealth tool. Moreover, the service provided male and female users with information which they perceived to be very clear and useful, and which they used and shared with their family, community members, and co-workers or clients.

7.1: Key Results in Context

In order to fully understand the presented results, it is necessary to place them in the context of previous research. This section does so through the structure of the sub-questions stated in section 4.

7.1.1: Barriers and Facilitators to TENA Use

The semi-structured interviews provided insights into the factors which were helpful or hindered participants' use of TENA. The main barriers experienced were infrastructure-based, including poor electricity and network connectivity. Additionally, users reported the timing of TENA's calls being inconvenient, as they were engaged in other activities such as work, and thus could not pick up. The infrastructural issues reported are in line with literature investigating mHealth barriers and facilitators. Feroz et al. (2021) report two studies which included network coverage and infrastructural quality as barriers to mHealth usage in Ghana and Nigeria[40]. The simplicity of TENA prevented the occurrence of barriers such as concerns about the cost, health problems being too complex to communicate[16], and illiteracy[41].

Many facilitating factors to TENA use stemmed from users' social surroundings and the influences thereof. TENA use was encouraged by users' perceptions of lack of health knowledge generally and regarding COVID-19 in themselves and their communities, and the

benefits they saw in themselves and their communities after receiving information from TENA. Moreover, the built-in accessibility features, such as language offerings and the link to EMwA, were appreciated by users. Indeed, Brinkel et al. (2017) reported as recommendations to give users a choice of different local languages for the IVR and to include community members to introduce the IVR service to the community[16]. TENA thus made use of documented facilitating factors while avoiding possible barriers that other mHealth tools have faced.

7.1.2: Gender as a (Contributor to) Barriers and Facilitators

The quantitative analysis revealed that TENA was accessed equally by both men and women, suggesting limited impact of gender. This was largely supported by the interviews, where limited gender-specific barriers were mentioned by participants. These results are contrary to much of the literature regarding gender and mHealth use in LMICs, which report significant gaps in mobile phone ownership, thus preventing women from accessing such services[38]. This gap may have been overcome via the TENA dissemination method of midwives, who are in high contact with women particularly. This finding is supported by the results of a study on the impact of women's health volunteers and midwives on maternal and child health outcomes in Myanmar. This study showed improved health outcomes in villages with volunteers and midwives compared to those without, indicating barriers to health information access were overcome[57]. However, in the context of TENA, it is worth noting that while some rural areas were reached by in-service midwives, this was limited due to COVID-19 and the Tigray War in Ethiopia, and so the women most impacted by this mobile phone ownership gap may not have been reached by midwives.

A facilitator mentioned by both men and women was the content of the service itself. Particularly the information shared in the maternal health and domestic- and gender-based violence messages were mentioned as facilitators for people to use TENA due to an existing lack of knowledge and thus extra relevance and need for this information. Both men and women believed that TENA sharing this information regarding maternal health and domestic- and gender-based violence acted as a facilitator for the opposite gender. A study by Harrington et al. (2019) on engaging men in family planning in Kenya demonstrated the eagerness men had to be involved in their partner's contraceptive use, which stemmed from a recognition that men lacked knowledge about family planning in general[58]. Self-awareness of

the limitations of one's health knowledge and concerns and interest in the health of significant family members are thus important factors in facilitating mHealth usage among men and women.

7.1.3: Knowledge Gain and TENA Use in Men and Women

Knowledge gain was different between men and women, with men having statistically significant knowledge change in the areas of COVID, MH, and DGBV, while women had statistically significant changes in COVID and MH, only. Qualitatively, participants emphasised they had learnt a lot and felt many benefits. This is in contrast to the findings of a study by Kinshella et al. (2022), who investigated the impacts of a pre-eclampsia app for community health workers in Mozambique. Kinshella et al. (2022) found that a larger proportion of female community health workers (CHWs) reported that their knowledge had increased compared to male CHWs[59]. The reason for increased knowledge gain in men compared to women could be related to the base level of knowledge people had. Interviews suggested that men were less knowledgeable in comparison to women due to women's increased accessibility to health information through ANC visits. A review by Beia et al. (2021) supported this message, as they identified a lack of consideration for men's health issues in Sub-Saharan health systems and reported studies describing the lower levels of health-related knowledge men had[60].

The lack of significant change in knowledge in the SRHR segment of TENA can be attributed to the high base level of knowledge of male and female users. The SRHR question addressed opinions of the effect of FGM on women's health, for which the vast majority of users agreed that it was harmful at baseline (Appendix 9.8). A UNICEF report on the state of FGM in Ethiopia supports this finding as they share that 79% and 87% of Ethiopian women and men, respectively, have heard of FGM and think it should stop[61]. Moreover, UNICEF highlights rural residence and less education as factors increasing likelihood of undergoing FGM[61]. Conversely, the study population was largely urban, while the qualitative sample revealed on average a higher level of education based on the occupations represented. Thus, this lack of change could reflect the changing state of FGM perceptions in Ethiopia.

Another aspect of the knowledge gain which was of interest was the disparity in significant change in domestic- and gender-based violence information between men and women. Notably, the statistically significant change in knowledge in the opposite direction to

the aim of the intervention among men is of interest. It is worth noting, however, that this change was borderline significant ($p = 0.043$). Nonetheless, a study by Sammut et al. (2021) identified several aspects of educational practices which are beneficial to knowledge gain about GBV among healthcare workers. These factors were an interactive approach, a practical rather than theoretical approach, and a longer duration of education. In contrast, TENA messages had a largely didactic approach and the DGBV messages had a total duration of approximately 3 weeks of 2 minute messages. Moreover, gender disparities were identified, with women consistently performing better than males in knowledge and attitude to GBV[62]. Although these factors cannot account for the negative knowledge change among males, these factors may contribute.

TENA use in terms of listening to messages was significantly higher among women than men. This could be linked to the different behaviours men and women had in another aspect of their TENA usage, namely information sharing. By putting the message on speakerphone, women may be more likely to listen to the whole message due to the people surrounding her, while men shared information in more one-on-one settings, for which they may feel they have enough knowledge for without listening to the whole message. Knowledge gain and use thus varied widely between both topics and genders, demonstrating the variety of age, location, and general backgrounds of the study population.

7.1.4: Perceptions of TENA in Men and Women

Perceptions shared through the qualitative and quantitative research indicated that men and women had very positive experiences with the information shared in TENA. In spite of the women's health-focus of a significant portion of the messages, male interviewees did not indicate that they felt the information was irrelevant to them, nor did women believe that men would think this. However, it is notable that SRHR was minimally brought up in the interviews, possibly suggesting that this topic was perceived less positively or had some issues in reaching the target group. Contributing factors to this could be the taboos regarding discussions about (safer) sex and lack of knowledge surrounding SRHR issues in Ethiopia[63].

Also of note was the enthusiasm men showed to receiving information about women's health issues, particularly maternal health. This was in line with the opinions women shared of how they thought men would perceive this information. This finding is shared by several other studies that reported on interventions aiming to increase male's

involvement in maternal health, where significant percentages of the men were committed to attending group health talks and educational sessions on this topic[64].

7.1.5: Acting on TENA and the Role of Gender

Modes of information sharing differed between men and women, as men shared information in a more one-on-one setting, while women put their phones on speaker to share the message with the people surrounding her at that moment. In the interviews, women appeared to express a feeling of responsibility to share the information in TENA and were highly driven to share this information with as many people as possible. This aligns with the status of half of the interview sample being healthcare professionals, and thus being more likely to have a drive to share health information. Additionally, a meta-analysis on motivators for knowledge sharing identified self-efficacy as a stronger motivator for knowledge sharing behaviours among women compared to men[65]. Self-efficacy can be defined as "an individual's belief in his or her capacity to execute behaviours necessary to produce specific performance attainments"[66]. This aligns with anecdotal examples shared by women users of TENA, who reported increases in confidence and personal improvements as a result of TENA usage, thus suggesting an increased ability to reach goals set. Accordingly, Kinshella et al. (2022) reported self-efficacy to be more prevalent among female than male CHWs[59].

Additionally, factors may have contributed to the male mode of information sharing. Sub-Saharan African men and their health-related behaviours have been conceptualised in terms of their masculinity and how they portray and perform this. This manifests in terms health as having unhealthy behaviours in order to align with masculine cultural norms, and includes having limited health knowledge[60]. These norms may thus influence men such that they share information in a one-on-one manner where they can more easily adapt their demeanour to better conform to the gender roles, which can be deeply rooted in Ethiopian societies[67]. These findings highlight not only the different ways that knowledge sharing is motivated between men and women, but also how the use of an mHealth service can have different effects based on gender.

7.2: Strengths and Limitations

This research had several strengths which contributed to the quality of the results and conclusions drawn. The first strength is the mixed methods nature of the study. Mixed methods research allows for more complex interactions and conclusions to be drawn, reflecting the complex nature of the issues being investigated, namely mHealth tools and gender[46]. Additionally, the utilisation of the data collected by technical partner Viamo is a strength, as this data has high validity due to the sample size and came directly from the source, whereby the strong partnership existing between Health[e]Foundation, Viamo, and EMwA could be leveraged to gain additional insights. Finally, the strength of this study lies in its novelty. Limited research has been conducted to evaluate IVR tools of this nature, particularly in the East African context.

In spite of these strengths, there were limitations which may impact the validity and reliability of the conclusions drawn. The COVID-19 pandemic and the ongoing conflict in Ethiopia resulted in travel during the research period being impossible, and as such the interviews were conducted online. This led to a number of limitations, including the decrease in the length of the interviews, due to the costs and general uncomfortable nature of extended phone calls. As such, the number of follow-up and clarifying questions that could be asked were kept to a minimum. However, the interview guide was subject to feedback multiple times by both Dutch and Ethiopian collaborators in order to maximise the information that could be gained in the short time. Moreover, the use of live translation, while allowing the researcher to be present and have a steering capacity over the interviews, also created a barrier and could have led to misinterpretations or loss of meanings, particularly when combined with the time constraints. In addition, the interview sample presents a selection bias, as only those with adequate phone and electricity connectivity could be interviewed, and those who faced the most barriers and could thus not enrol in TENA were not reached to be included in the research at all. Selection bias also limits the generalisability of the quantitative data, as only those with the means to own and charge a phone and meet with someone who could share TENA with them defined the possible study population. Finally, a limitation in the quantitative analysis was that the baseline and endline questions were not created by the researcher, and thus were not always clear in their aim, leading analysis to be a challenge due to multiple possible interpretations.

7.2.1: Consequences for Validity and Reliability

The dataset used in the quantitative analysis was large enough to be able to identify statistically significant differences and results. However, the sample size for the qualitative section of the research was limited, thus reducing the external validity.

Internal validity of the interviews was strengthened through the extensive feedback moments and opportunity to change the interview guide following the first two interviews. Moreover, 'trial' interviews were conducted by the researcher with Health[e]Foundation employees taking different characteristics to aid the researcher in understanding how questions could be perceived and answered in different ways. In addition, a preparatory meeting was conducted between the interviewer and the researcher in order to ensure that the goals of the interview were clear and to allow the interviewers to ask any clarifying questions. This measure increased the reliability of the research.

7.3: Recommendations

Through this research, several problems have been clarified that are implicated in the TENA IVR service and recommendations have been identified for TENA or other, similar IVR services in the future.

This research has further contributed to literature stating that technological issues pose significant barriers to mHealth and IVR services in LMIC contexts. It is thus recommended that, at a broader level, it is necessary to improve infrastructure related to mobile phones and technologies in order to increase the effectiveness and reach of tools such as TENA, particularly for those who are hardest to reach. In addition, this study's findings have exposed the issue of the limited health information available to many individuals. The popularity of TENA and the anecdotal evidence provided through the interviews supports the crucial and desired nature of the information shared by TENA. The recommendation thus follows that TENA should be continued and scaled up to provide health information to more people nationally and globally. Relating to the negative knowledge change seen among men in the DGBV topic, it is recommended to re-assess the manner in which these messages are approached and shared in order to improve knowledge capture by users.

Further recommendations brought up during the interviews include the following:

First of all, interviewees suggested changing the timing of the calls to be more compatible with their working hours to ensure that fewer messages were missed. Secondly, participants called for additional information to be added to possible future iterations of TENA, including information about responsible handling of money, malaria, HIV/AIDS, and mental health stigma. Finally, participants emphasised that TENA should be brought back and continued, as they had felt the benefits and recognised the need for it in their communities.

7.3.1: Implications of the Study

The implications of this study are threefold. Firstly, this study has demonstrated the significant benefits that can be achieved with a simple, low-cost intervention in a relatively short timeframe. Additionally, this research provides scientific support for possible scale-ups and spreads of TENA or similar IVR services in other LMICs. Lastly, with additional knowledge about the AUB of TENA users it is possible to adapt TENA to maximise its benefits, such as through using the knowledge that many users put their phones on loudspeaker during the calls.

7.3.2: Further Research

While this study has explored the barriers, facilitators, and use of TENA adopting a gender lens, there are still opportunities for further research. As stated in the limitations, those who faced so many barriers to TENA that they were not able to register and thus were not reached through this study make up a population for whom additional research on barriers is highly relevant. Further research could conduct a comparison between TENA users and those who did or could not enrol in TENA. Considering the gendered aspect of this research and in light of the responses identifying MH and DGBV information as of particular importance for users of all genders, research into gender-specific messages in these areas to identify possible extra effectiveness may be of worth. Relatedly, the findings of the knowledge gain aspect of this research on the DGBV topic among men points to a need to investigate possible causes for this result. Additionally, research into the sustainability of the changes made by TENA users in response to the information they received would be of interest in order to examine whether such an IVR service can be used during non-health emergency situations.

7.4: Conclusion

This study aimed to answer the following research question: how do gender-related factors impact TENA use and the barriers and facilitators experienced to TENA use in Ethiopia? The results of this research provide insights into the barriers, facilitators, and experiences of users of a simple IVR service in a health emergency context. Among the study sample, gender was not found to contribute significantly to barriers and facilitators experienced by TENA users. However, differences in usage were identified between men and women, particularly regarding information sharing behaviours. Overall, TENA users reported high satisfaction rates and felt many personal and community benefits due to their engagement with the service. The findings of this research can be used to tailor further iterations of TENA and expand its reach and benefits to larger and more vulnerable populations in Ethiopia and globally.

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9: Appendices

9.1: Baseline and Endline Questions

Table 9.1.1: Baseline Questions

Type of Question	Question
Demographic: Q1 (Gender)	Are you male or female?
Demographic: Q2 (Age)	How old are you?
Demographic: Q3 (Neighbourhood)	Where do you live?
Enrolment	How did you hear about TENA?
Baseline Q1	Do you think the use of a face mask provides full protection against COVID?
Baseline Q2	How often do you think a pregnant woman should visit her healthcare provider?
Baseline Q3	Do you think that female circumcision is harmful for women and girls?
Baseline Q4	What do you think you can do when someone in your community is experiencing violence?

Table 9.1.2: Endline Questions

Type of Question	Question
Evaluation Q1	Did you understand the messages in the calls you received?
Evaluation Q2	Did you find the content of the calls clear?
Evaluation Q3	Did you find the calls useful?
Evaluation Q4	Would you recommend the TENA service to others?
Evaluation Q5	Would you prefer to receive messages every 4 days or on a specific day of the week?
Endline Q1	Do you think the use of a face mask provides full protection against COVID?
Endline Q2	How often do you think a pregnant woman should visit her healthcare provider?
Endline Q3	Do you think that female circumcision is harmful for women and girls?
Endline Q4	What do you think you can do when someone in your community is experiencing violence?

9.2: Interview Guide

Introduction

Hello, my name is ___, and I am conducting this interview on behalf of Georgie Bouwknecht, a master student at the VU University in Amsterdam, the Netherlands, who is doing an internship at Health[e]Foundation. Georgie is listening in on the interview through a video call with me. She may ask questions or clarify things via the interviewer's live translations. Georgie's research is on the TENA service. She is investigating things that helped people to use TENA and any problems that TENA users faced.

This interview will last around 30 to 40 minutes. I would like to remind you that you don't have to answer any questions that you don't feel comfortable with, and that you can stop the interview at any time without needing to explain anything. The questions you will be asked are about your experiences and use of the TENA service in general and in relation to your gender. There are no wrong or right answers, and there is no judgement in your responses, so please feel free to be as open as you can. All the information you give will be helpful! You are always welcome to ask me questions during the interview. Do you have any questions now about the research or the interview?

Before we start, I would like to ask permission to record this interview. This recording will allow Georgie to have transcripts of the interview so she can identify common themes between TENA users and create strong conclusions for her research. The recording will be accessed by the interviewer and Georgie and will be deleted as soon as a transcript has been made. Your identity will not be linked in any way to the recording or transcript. All or part of your anonymised interview may be used in an academic thesis, recommendations, or in media produced by Health[e]Foundation, and the Ethiopian partners EMwA and Viamo. Do I have your permission to record the interview?

Then, I would like to ask you to confirm that you are participating in this research voluntarily, and that you agree to this interview being recorded. Additionally, I would like to confirm that you understand that your personal details will not be linked to your answers in any way and that the anonymised information you have shared may be used in my university report and by Health[e]Foundation, EMwA, or Viamo for communication materials. You can ask questions at any time during the interview, and you can stop the interview at any point without giving a reason for it. Do you agree to continue with this interview?

Thank you! For the interview, Georgie has prepared some questions. We will start with some general questions about you, and then move to more specific questions about how

you experienced using TENA. You can see this as a conversation, and you are always welcome to ask questions and give open and honest answers.

1. First of all, I would like to ask you about yourself. Where are you from? Tell me about your background.
    a. Rural or urban?
    b. Who do you live with?
    c. Do you have a stable source of income?

2. How did you hear about TENA?
    a. In what setting?
    b. Whose phone did you use?
    c. What or who helped to convince you to enrol?

In this section, I would like to ask you some questions about your experience using TENA.

3. What did you like about TENA?
    a. Why?
    b. What did you like about the messages?
        i. i.e., the information, language, clarity, trust

4. Do the people close to you know about TENA?
    a. If yes: what do they think? Did they help you listen to the messages? Why?
    b. If no: did you share it with them? Why? Why not?

5. What would you like to change for future projects like TENA?
    a. Why?
    b. Is there something you would like to see added or changed about the messages?

6. Did you have any problems when listening to the messages in TENA?
    a. What problems?
    b. Did some messages feel less useful or relevant to you? Why?

7. Did you make changes to your behaviour due to the messages?
    a. What changes? Why? Do you think you will keep following these new changes? Why?
    b. Why did you not make changes in other topics TENA gave information about?

8. Did you share the information you got with the people in your community?
    a. Why or why not?
    b. Who did you share the information with (male/female)? Why them?

In this section, I would like to ask you about your experience using TENA as a [man/woman].

9. Tell me about your experience using TENA as a [their sex].
    a. Use examples they mentioned previously that could be linked to their sex if there is confusion.

10. How do you think a [other sex] would experience using TENA?
    a. Use examples of family members/people they have mentioned of the other sex

11. Do you think that [other sex] had different difficulties with using TENA?
    a. Why? Why not?
    b. What do you think those challenges are?

12. Do you think that [other sex] had different support and reasons for listening to TENA messages?
    a. Why? Why not?
    b. What do you think these reasons are?

13. Do you think there is a difference in men and women accessing TENA?
    a. Why?

You've answered all the questions prepared, thank you so much for participating! Do you have any final questions for me, or anything you would like to add that you think is relevant for Georgie's research?
Would you like to receive a summary of the results of the research once it is complete? If so, I will write down your email address or phone number separately from the interview notes and in June, I will send you a summary!

Thank you again and have a good day/afternoon!

9.3: Interview Protocol

Prior to the Interview

- Reached out to the interviewees via telephone to ask them if they would like to be involved
- Explain the basics of the research and the consent form
- Plan a date and time for the interview once they have confirmed they would like to participate

Beginning the Interview

- Thank the participant for agreeing to be interviewed
- Greetings, helping them to feel comfortable
- Ask for consent for audio recording
- Start the audio recording
- Obtain verbal informed consent
- Go through introduction as outlined in interview guide

During the Interview

- Start with some get to know you questions to create a comfortable atmosphere
- Go through the questions and ask for clarification if anything isn't clear or if you think they misunderstood the question
- Provide clarification or rephrase the question if the interviewee asks or appears to misunderstand the question
- If it is obvious that a question will prompt the same answers as a previous question, it can be skipped
- Throughout the interview provide positive affirmations and indicate that you are listening
- At the end of an answer, summarise what the participant said to make sure you understood it correctly. This summary can be related to the content of their answer or the emotions they expressed.

Technical Issues

- If Georgie cuts out, the interview can go on using the guide. The recordings will continue.
- If the interview is cut short due to problems with network between the interviewer in Ethiopia and the interviewee, contact will be sought again, and informed consent received again before starting the recording.
- If it is not possible to call back, the information gained up to that point will be used.

Possible Issues

- In the case of inconsistent answers, the interviewer can bring up the inconsistency in a respectful way and ask for clarification and elaboration.
- If the interview is interrupted, ask the interviewee if they would like to continue another time, which will then be planned.
- When a question is sensitive or is interpreted to be sensitive, reassure the interviewee that the interview will be anonymous, but they should of course only share what they feel comfortable with

Concluding the Interview

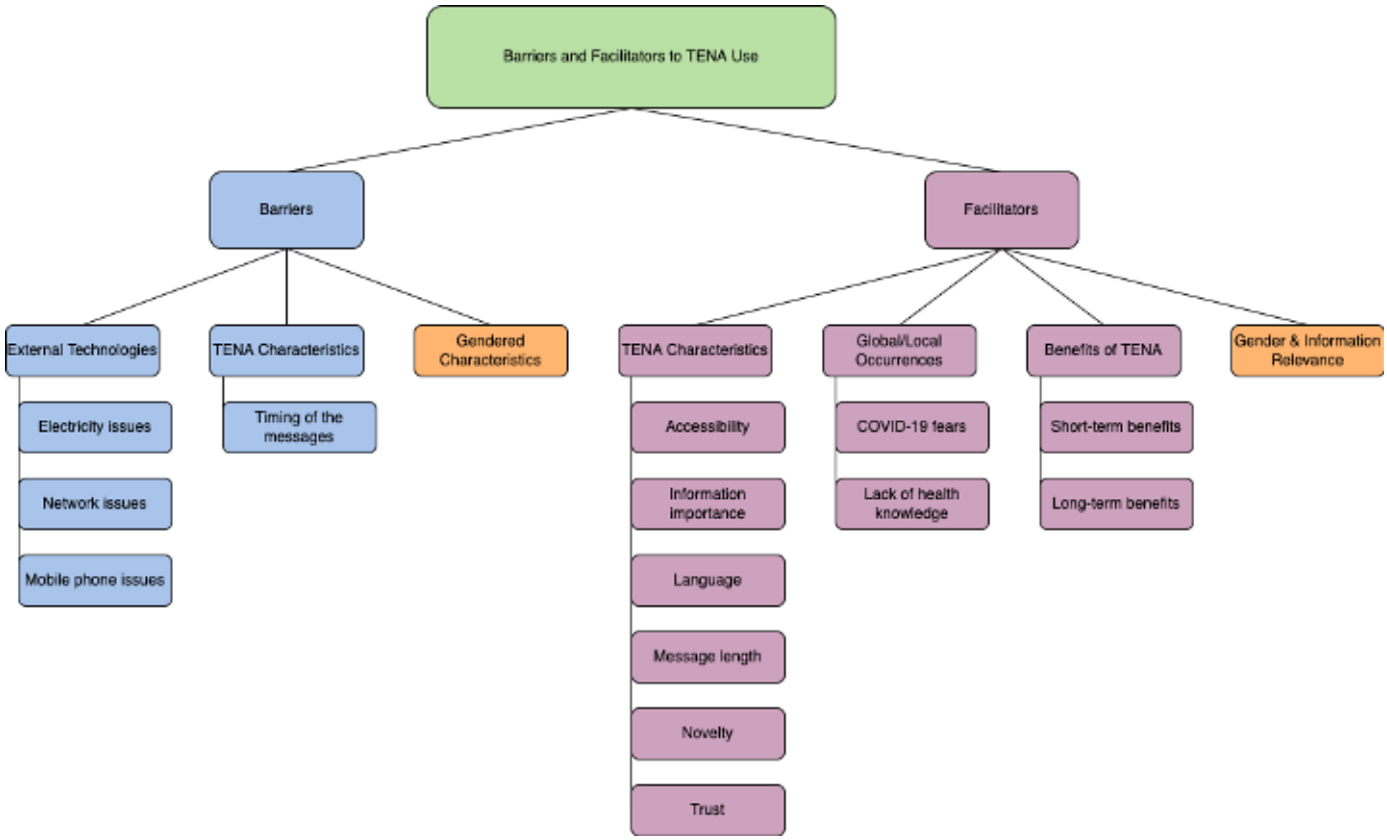
- Thank the interviewee for their time and responses
- Ask if they have any final questions or things they would like to tell me that they think are relevant
- Ask them if they would like to know some of the results of the research once it is complete, in which case their phone number/email address will be collected separately from their interview notes

After the Interview

- Write up the transcript and then immediately delete the audio file once this is complete

9.4: Code Tree

Figure 9.4.1: Code Tree for Sub-Questions 1 and 2



9.5: Crosstabs

Figure 9.5.1: Gender and Age

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Age	1969	96.9%	64	3.1%	2033	100.0%

Gender * Age Crosstabulation

Count

		Age				
		18-30 Yrs	31-45 Yrs	Over 45 Yrs	Under 18 Yrs	Total
Gender	Female	812	89	22	69	992
	Male	729	103	29	116	977
Total		1541	192	51	185	1969

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.279[a]	3	<.001
Likelihood Ratio	18.416	3	<.001
N of Valid Cases	1969		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 25.31.

Figure 9.5.2: Gender and Area

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Area	1960	96.4%	73	3.6%	2033	100.0%

Gender * Area Crosstabulation

Count

		Area			
		City	Not sure	Outside the city	Total
Gender	Female	789	10	189	988
	Male	674	10	288	972
Total		1463	20	477	1960

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	29.458[a]	2	<.001
Likelihood Ratio	29.616	2	<.001
N of Valid Cases	1960		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.92.

Figure 9.5.3: Gender and Contact Language

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Contact Language	1978	97.3%	55	2.7%	2033	100.0%

Gender * Contact Language Crosstabulation

Count

		Contact Language			
		Amharic	English	Oromifa	Total
Gender	Female	842	15	141	998
	Male	713	10	257	980
Total		1555	25	398	1978

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	45.351[a]	2	<.001
Likelihood Ratio	45.862	2	<.001
N of Valid Cases	1978		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.39.

Figure 9.5.4: Age and Area

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age * Area	1960	96.4%	73	3.6%	2033	100.0%

Age * Area Crosstabulation

Count

		Area			
		City	Not sure	Outside the city	Total
Age	18-30 Yrs	1180	12	344	1536
	31-45 Yrs	139	3	49	191
	Over 45 Yrs	41	2	7	50
	Under 18 Yrs	103	3	77	183
Total		1463	20	477	1960

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	44.531[a]	6	<.001
Likelihood Ratio	39.497	6	<.001
N of Valid Cases	1960		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is .51.

Figure 9.5.5: Language and Area

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Contact Language * Area	1960	96.4%	73	3.6%	2033	100.0%

Contact Language * Area Crosstabulation

Count

		Area			
		City	Not sure	Outside the city	Total
Contact Language	Amharic	1215	14	315	1544
	English	14	0	7	21
	Oromifa	234	6	155	395
Total		1463	20	477	1960

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	64.071[a]	4	<.001
Likelihood Ratio	59.885	4	<.001
N of Valid Cases	1960		

a. 2 cells (22.2%) have expected count less than 5. The minimum expected count is .21.

Figure 9.5.6: Language and Age

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Contact Language * Age	1969	96.9%	64	3.1%	2033	100.0%

Contact Language * Age Crosstabulation

Count

		Age				
		18-30 Yrs	31-45 Yrs	Over 45 Yrs	Under 18 Yrs	Total
Contact Language	Amharic	1224	164	48	114	1550
	English	16	3	1	3	23
	Oromifa	301	25	2	68	396
Total		1541	192	51	185	1969

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	47.866[a]	6	<.001
Likelihood Ratio	47.166	6	<.001
N of Valid Cases	1969		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is .60.

9.6: Evaluation Questions

Table 9.6.1: Evaluation Question Responses Total Population

Question	Responses	Count (%)
Evaluation Q1	No	68 (*6.8%*)
	Not sure	80 (*8.0%*)
	Yes	847 (*85.1%*)
Evaluation Q2	Most was unclear	27 (*3.2%*)
	Some was clear and unclear	0 (*0.0%*)
	Most was unclear	818 (*96.8%*)
Evaluation Q3	No	45 (*4.5%*)
	Not sure	44 (*4.4%*)
	Yes	907 (*91.1%*)
Evaluation Q4	No	51 (*5.1%*)
	Not sure	25 (*2.5%*)
	Yes	920 (*92.4%*)
Evaluation Q5	Not sure	132 (*13.3%*)
	Specific day of the week	510 (*51.2%*)
	Every 4 days	354 (*35.5%*)

9.7: Mean Listening Times Per Message

Table 9.7.1: Mean Listening Times per Message

	Message	Mean Listening %	Male Mean Listening %	Female Mean Listening %	Difference in distribution (p-value)	Total N
COVID Messages	COVIDM1	89.22	88.08 (821)	90.92 (852)	0.072	1673
	COVIDM2	85.15	84.02 (810)	86.58 (841)	0.084	1651
	COVIDM3	83.80	82.37 (815)	85.48 (814)	0.060	1629
	COVIDM4	81.26	78.81 (793)	84.31 (809)	<0.001	1602
	COVIDM5	82.33	79.19 (791)	85.61 (810)	<0.001	1601
	COVIDM6	81.09	77.85 (772)	84.83 (810)	<0.001	1582
NATAL Messages	NATALM1	80.80	77.63 (764)	84.37 (795)	<0.001	1559
	NATALM2	79.98	75.86 (722)	84.55 (769)	<0.001	1518
	NATALM3	78.91	73.35 (737)	84.50 (784)	<0.001	1521
	NATALM4	80.64	77.58 (726)	83.95 (797)	<0.001	1523
	NATALM5	80.49	76.47 (726)	84.85 (785)	<0.001	1511
	NATALM6	78.74	73.20 (708)	84.52 (781)	<0.001	1489
SRHR Messages	SRHRM1	80.08	77.35 (708)	83.06 (766)	<0.001	1474
	SRHRM2	78.43	75.13 (699)	81.88 (773)	<0.001	1472
	SRHRM3	79.26	74.89 (691)	83.57 (763)	<0.001	1454
	SRHRM4	77.61	73.54 (697)	81.76 (761)	<0.001	1458
	SRHRM5	79.27	75.17 (687)	82.97 (757)	<0.001	1444
	SRHRM6	80.22	75.46 (662)	84.79 (764)	<0.001	1426
DGBV Messages	DGBVM1	79.19	74.58 (680)	84.35 (747)	<0.001	1427
	DGBVM2	80.89	76.36 (676)	85.24 (758)	<0.001	1434
	DGBVM3	79.46	76.19 (691)	82.61 (754)	<0.001	1445
	DGBVM4	79.46	74.79 (670)	83.96 (745)	<0.001	1415
	DGBVM5	78.37	72.96 (683)	83.52 (746)	<0.001	1429
	DGBVM6	79.08	75.31 (665)	82.95 (740)	<0.001	1405

9.8: Results Knowledge Questions Baseline and Endline

Table 9.8.1: Knowledge Questions Responses at Base- and Endline

Question	**Responses**	**Baseline**			**Endline**		
		Men (%)	Women (%)	Total (%)	Men (%)	Women (%)	Total (%)
COVID-19	Yes	168	190	358	183	217	407
	Not sure	9	5	14	0	0	0
	No	264	328	592	253	307	570
MH	0-3 times	105	100	205	116	117	236
	4-8 times	280	348	628	217	278	502
	More than 8 times	31	49	80	73	69	146
	Not sure	19	25	44	42	64	110
SRHR	Yes	381	462	843	383	473	872
	Not sure	11	8	19	19	23	42
	No	41	52	93	47	33	82
DGBV	Do not get involved	67	60	127	93	71	166
	Not sure	20	30	50	22	29	53
	Talk to the victim	161	267	428	165	281	458
	Intervene	183	162	345	169	148	319

9.9: Data Management Plan

9.9.1: Project Description

This research project aims to answer the following question: How do gender-related factors impact TENA use and the barriers and facilitators experienced to TENA use in Ethiopia? Through this research question, the TENA service will be evaluated with the aim of providing a thorough understanding of the service in order to improve future iterations and similar services.

9.9.1.1: Data Collection

In order to answer this question, a sequential explanatory study design will be used. First, quantitative analysis of data collected by the technical partner of the project, Viamo, will be analysed. This data entails basic demographics, paired baseline and endline survey results, and listening times for each TENA message, which will guide the directions of the qualitative research towards aspects of TENA which were notably of higher or lower success. Thereafter, qualitative research will be undertaken through conducting interviews with a sample of TENA users to ascertain what barriers and facilitators they experienced to using TENA, how these were linked to gender, and how they acted upon the information shared through the service.

9.9.2: Planning

Several different forms of data will be used to answer the research question. These are:

- Raw data: usage and demographic data for TENA users, interview audio files, and notes made by the researchers during interviews
- Processed data: translated interview transcripts, cleaned and processed TENA user data
- Analysed data: graphs, tables, and descriptive statistics based on TENA user data, interviews in Atlas.ti

9.9.3: Data Assets

Consistent with the dual stages of the research, there are different types of data assets used.

Table 9.9.1: Data Assets

Research Type	**Data Assets**
Quantitative	CSV files on TENA users
	Data visualisation
Qualitative	Audio files & researcher notes
	Interview transcripts
	Atlas.ti files

9.9.4: Data (Risk) Classification

Evaluation and permission from an ethical committee was not required due to the following reasons:

- The project as a whole (TMT+) did not require ethical approval
- The study population does not fall under the VU definition of vulnerable groups
    - Participants are over the age of 18
- All data will be anonymised
    - Quantitative data has already been anonymised by Viamo
    - Qualitative data will be anonymised following recording, and audio files will be deleted immediately following transcription
- Informed consent will be ascertained prior to starting the recording of any interview and can be withdrawn at any point without explanation
- The research poses no risk to those involved

9.9.5: Methods

A number of different methods will be used in the collection and analysis phases of both components of the research.

Table 9.9.2: Methods for Collection and Analysis

Research Type	**Methods for Collection and/or Analysis**	
Quantitative	Collection	Data anonymisation
	Analysis	Descriptive statistics
		Comparison of (paired) means
Qualitative	Collection	Interview guide
		Informed consent
		Recording and researcher note-writing
		Transcription & translation
	Analysis	Inductive coding
		Deductive coding

9.9.6: Storage

9.9.6.1: Storage Location

Data will be stored in the Health[e]Foundation OneDrive, a secure online location which only employees of Health[e]Foundation, including the on-site supervisor, and the researcher have access to. Audio recordings of interviews will be deleted following transcription by the researcher. Additional recordings made by Ethiopian collaborators will be deleted immediately following sharing with the researcher.

9.9.6.2: Draft and Final Versions

Draft versions of data files and results of data analysis will be kept encrypted following transfer from the researcher's personal computer on the H[e]F OneDrive, with the file name in the following style: ProjectName_ParticipantNumber_DateOfLastEdit. Final versions will also be saved on the OneDrive and shared with supervisors outside of Health[e]Foundation via the researcher's Health[e]Foundation-operated email account.

9.9.6.3: Archiving

Data will be saved for 5 years. Only anonymised data will be saved, as all interview audio recordings will have been deleted, and quantitative research and surveys will be conducted anonymously.

9.10: Timeline

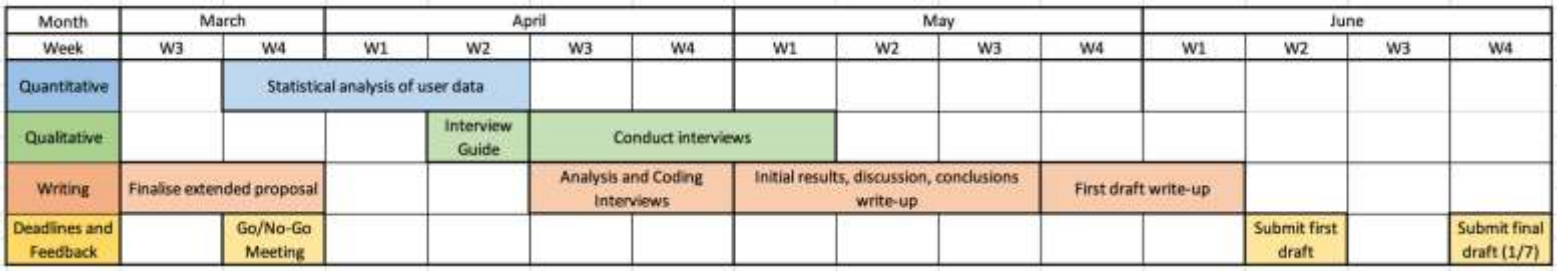


Figure 9.10.1: Proposed Research Timeline