Original Paper

Designing a mHealth Intervention to Enhance Health, Nutrition, and Child Development for Urban Refugees and Host Communities in a Low-Resource Setting: Formative Qualitative Study

Joyce Marangu[1,2], MA; Amina Abubakar[1], MEd, PhD; Nathaniel Jensen[3], MSc, PhD; Simbarashe Sibanda[4], MSc, PhD; Mark Tomlinson[5], MA, PhD

[1]Institute for Human Development, Aga Khan University Kenya, Nairobi, Kenya
[2]Stellenbosch University, Cape Town, Western Cape, South Africa
[3]Division of Global Agriculture and Food Systems (GAAFS), University of Edinburgh, Edinburgh, Scotland, United Kingdom
[4]Food, Agriculture and Natural Resources Policy Analysis Network, Pretoria, Gauteng, South Africa
[5]Institute for Life Course Health Research, Stellenbosch University, Cape Town, Western Cape, South Africa

Corresponding Author:

Joyce Marangu, MA
Institute for Human Development, Aga Khan University Kenya
3rd Parklands Avenue
Nairobi 00100
Kenya
Phone: 254 720173906
Email: joyce.marangu@aku.edu

Abstract

Background: Despite advances in addressing child health and undernutrition, low- and middle-income countries in Africa have experienced a persistently high number of children with suboptimal outcomes over the last decade. Caregivers of young children in low-resource settings have limited access to health and nutrition information to enhance child development. Digital interventions are a possible solution, although the factors for their success among urban, low-income refugee, and host communities are unclear.

Objective: This study explored the perceptions of health care workers and caregivers of health, nutrition, and early child development practices; identified barriers and facilitators for suitable digital interventions; and applied findings to a mobile health intervention design process.

Methods: We conducted a formative study to inform an intervention design using a qualitative approach. This involved key informant interviews (n=12) and 2 focus group discussions (n=17) with caregivers of children younger than 2 years. The key informants included health, nutrition, and child development officials from the Ministry of Health and representatives from community-based organizations. Data were analyzed using framework analysis.

Results: While there were some perceived positive practices among refugee and host communities, they were described by officials as being insufficient, especially regarding breastfeeding, dietary diversity, antenatal and postnatal care, and responsive caregiving. The availability of digital interventions was reported to be limited. Barriers such as limited access to smartphones and low digital literacy were seen as likely to hinder the uptake of digital interventions. However, use of existing resources such as community health promoters was seen as a facilitator of intervention uptake. The findings were mapped to intervention decision-making using the World Bank's Quality Framework for Parenting Programs, and content was informed by the Nurturing Care Framework.

Conclusions: The findings from this study contribute to our understanding of perceptions on health, nutrition, and child development within the context and are useful in informing important considerations for the design of a digital intervention to be tested in subsequent research.

JMIR Form Res 2026;10:e99450; doi: 10.2196/99450

Keywords: maternal and child health; child development; mobile health; mHealth; mobile apps; digital interventions; refugees; urban population; nutrition

Introduction

Globally, maternal mortality rates have plateaued following a rapid drop between 2000 and 2015, declining from 227 to 223 per 100,000 live births. Low- and middle-income countries (LMICs) in Africa accounted for more than 90% of global births [1] and 70% of maternal deaths in 2020 [2]. The high maternal mortality rates are attributed not just to obstetric causes but also to social determinants such as challenges in seeking and receiving care, high poverty rates, low education levels among women, and conflict resulting in displacement.

Child mortality rates in LMICs remain high at 41 deaths per 1000 live births, in contrast to 5 deaths per 1000 live births in high-income countries [3]. Moreover, the reduction in child undernutrition rates has been slow [4,5]. Undernutrition is the result of inadequate intake of nutrients and recurrent infections, manifested as wasting (low weight for height), stunting (low height for age), underweight (low weight for age), or micronutrient deficiencies. This indicates a need for intensified efforts in maternal and child health and nutrition programs to meet the Sustainable Development Goals [6]. Maternal and child health refers to the set of health services, policies, and programs aimed at reducing preventable maternal, newborn, and child mortality and morbidity.

By 2050, it is estimated that more than 60% of the global population will be urban [7]. A quarter of the global urban population currently lives in informal settlements, with the highest numbers in Africa and Asia [8]. Informal settlements often have poor housing; inadequate infrastructure; and limited access to basic services, including health care, water, and sanitation. Informality also increases vulnerability to climate disasters such as flooding and heat stress, affecting maternal and child well-being [9].

The number of refugees and displaced persons is at an all-time high due to conflict, violence, disasters, and the effects of climate change. The sub-Saharan Africa region remains both the largest source and destination for refugees [10]. With greater economic prospects in cities compared with those in refugee camps, Nairobi has experienced a steady inflow of migrants and refugees from neighboring countries in the Horn of Africa and Great Lakes region [11]. The host community [12] provides support, resources, and, to some degree, integration opportunities, but refugees living in urban informal settlements still experience multiple challenges that contribute to poor maternal and child health outcomes [13-16].

Some effort has gone into addressing these challenges through interventions such as universal health coverage [17], Linda Mama free maternity program [18], baby-friendly initiative [19], affordable housing [20], and social cash transfers [21], with varying levels of success. Mobile health (mHealth) interventions present a possible alternative for enhancing maternal and child health. For instance, health promotion messaging and postnatal appointment alerts were found to have a positive effect on the use of antenatal care (ANC) services and the reduction of maternal deaths [22]. mHealth interventions were also linked to increased health-seeking behavior and vaccination rates [23], increased rates of kangaroo care, exclusive breastfeeding (EBF), and appropriate complementary feeding [24], and enhanced health worker supervision [25,26].

Many mHealth interventions are developed following formative research incorporating community perspectives [27-31]. However, the process through which formative findings are translated into intervention components and design decisions is not always sufficiently described. Specifically, the pathway from identified community needs, barriers, and facilitators to the selection of intervention content and delivery strategies is not always documented. The role of conceptual frameworks in this translation process is also inconsistently reported. This limits understanding of how the findings contribute to intervention development, particularly within low-resource settings with vulnerable groups such as refugees.

The study objective was to explore the perceptions of health care workers and caregivers of young children of health, nutrition, and early child development and use these formative findings to inform the design of a contextually appropriate mHealth intervention for refugee and host community caregivers.

Methods

Study Design

This study was formative research intended to inform the design of an mHealth intervention seeking to enhance the quality of maternal and child data and outcomes through a mobile phone app. It used a qualitative approach, comprising focus group discussions (FGDs) and key informant interviews (KIIs), to explore the perspectives of health care workers and caregivers of young children. Behavioral change outcomes were not measured in this formative phase and will form the next step of the research in a pilot randomized controlled trial.

Setting

The study was conducted in urban informal settlements in Eastleigh, Kamukunji Sub-County, Nairobi. With more than 268,276 inhabitants, Kamukunji Sub-County is characterized by a high population density of more than 25,000 people per square kilometer [32]. In addition to the Kenyan locals, this population also comprises embedded refugees from neighboring countries, among them Somalia, South Sudan, Ethiopia, and Uganda. The settlement of refugees in Eastleigh is attributed to political instability in the Horn of Africa from as early as the 1980s [33]. Eastleigh has experienced a strain on critical services, including water and sewage, health, education, and security due to underinvestment in these sectors [33]. In common with other informal settlements

in Nairobi [34], the population is characterized by high rates of child undernutrition [35], which are associated with an increased risk of developmental delays [36].

Participants

Participants were recruited from September 10 to 17, 2022. Participants for both the FGDs and KIIs were selected through purposive sampling. The sample size (n=29) was determined by the study protocol and available resources. While field notes recorded during data collection showed recurring issues, saturation was not systematically assessed. Contacts for the key informants (n=12) were obtained through the Kamukunji Sub-County Ministry of Health, upon approval from the Nairobi County Directorate of Health. The sample comprised health care professionals and representatives of relevant community-based organizations (CBOs) within the Kamukunji Sub-County.

FGD participants (n=17) were caregivers recruited from the community. "Caregiver" in this study refers to the primary provider of care to a child. It includes the parent, immediate family member, or other consistent adult responsible for the daily care and upbringing of a young child. Caregivers were eligible to participate if they had a child younger than 2 years, understood English or Kiswahili, and lived in Eastleigh. To select them, the research team obtained the contacts of 4 community health promoters (CHPs) who worked in Eastleigh through the Ministry, based on their knowledge of the community. The research team provided the CHPs with the eligibility criteria and asked them to identify caregivers who met these criteria from households within the community health units in which they served. Nine refugee caregivers were approached, of whom 6 participated. The number of host community caregivers approached and those who declined was not recorded during recruitment. There was a total of 2 focus groups, the first with 8 (3 refugee and 5 host) and the second with 9 (3 refugee and 6 host) participants [37].

Procedures

Semistructured interview and FGD guides containing a set of exploratory questions and a vignette of the potential digital intervention were developed after a review of existing literature in line with the research objectives and dialogue within the research team (Multimedia Appendix 1). The guides were then pretested with a small sample of participants to enhance the clarity of the questions and prompts. Field notes were used for early identification of themes and guided further refinement of the guides.

Two research assistants were trained by JM, a female researcher and doctoral student at the time, over a period of 5 days to use a semistructured interview guide, FGD guide, note-taking templates, consent forms, and ethical procedures, including obtaining informed consent from participants. The trained research assistants collected participants' sociodemographic information and conducted KIIs with relevant stakeholders, including health and nonhealth professionals (representatives of CBOs) working with young children. JM facilitated the FGDs with caregivers of young children. The interviews were conducted in English, Kiswahili, or a mix of both languages, based on participants' preference and levels of understanding. The interviews were held in community venues, such as school and church halls within Eastleigh, ensuring privacy throughout. The average duration of the interviews was an hour, while that of the focus groups was 2 hours.

Data Management and Analysis

Participants' sociodemographic data were summarized descriptively to show frequencies and percentages. Although ethnicity information was collected as part of the sociodemographic data, it was not included in the sociodemographic table to minimize the risk of unintended stigmatization. Refugee and host community status was based on participants' reported migration status and was corroborated by CHPs.

Interviews and group discussions were audio recorded, transcribed verbatim in the language in which they were conducted, and imported into NVivo (version 20; Lumivero) software for data management and analysis. Data were analyzed in the language of the interview. Only quotes selected for inclusion in the manuscript were translated into English by JM and, as applicable, reviewed by AA to ensure accuracy. Both researchers are proficient in English and Kiswahili.

Framework analysis was used to analyze and interpret the data, following the 5 stages outlined by Ritchie and Spencer [38]: familiarization, developing a coding framework, coding, charting, and interpretation. First, the researchers (JM, AA, and MT) familiarized themselves with the interview data. JM then coded the data against a coding framework that was developed a priori from the literature and study objectives and identified additional codes from participants' responses. JM then refined the coding framework following discussions within the research team to enhance clarity. During the refining process, overlapping codes were merged, and categories were further reorganized to reflect relationships among themes (refer to Multimedia Appendix 2 for the coding framework). The coding process excluded intercoder reliability assessment. However, rigor was maintained through iterative cross-checking of codes against the dataset, and feedback sessions with JM, MT, and AA. Adjustments were then made to enhance accuracy, and a record of the changes was maintained. Output reports were generated through NVivo, and JM used these to identify themes through an iterative process, while the rest of the team provided feedback on the interpretation.

The research team had no prior professional relationship with the study participants. The researchers' professional backgrounds included public health, early childhood development, psychology, parenting programming, and development economics, which informed their assumptions. This consideration was made in interpreting the findings by ensuring members of the research team iteratively provided feedback on the codes and interpretation.

In translating the qualitative findings into intervention design, the research team considered the main themes and translated these into intervention design decisions. The decisions were then mapped against the World Bank's Quality Framework for Parenting Programs [39] around the domains of intervention content, delivery modality, workforce and resources, and context. The intervention content was framed around the Nurturing Care Framework components of good health, adequate nutrition, and responsive caregiving [40]. This study is reported in line with the COREQ (Consolidated Criteria for Reporting Qualitative Research; Checklist 1).

Ethical Considerations

Ethics approval was granted by the International Livestock Research Institute (ILRI-IREC2019-15/2), the Kenya National Commission on Science, Technology and Innovation (NACOSTI/P/21/13533), and Nairobi County and Kamukunji Sub-County Health Management Team (EOP/NMS/HS/156). Written informed consent was obtained from all participants in either English or Kiswahili based on the participants' preferences, and participants retained a copy. During consenting, participants were informed of the purpose of the research and that their participation was voluntary. FGD participants were asked to respect everyone's privacy and not identify anyone in the group or repeat what was said to persons outside the group, although a caveat was given for their awareness that some participants may accidentally repeat what was said during the discussion. Once they had consented, a research assistant recorded their details, such as age, sex, highest education level, and refugee status confidentially and retained this information separately from the data. The research assistant then issued them with number tags which they used to identify themselves to the rest of the participants, and the FGD facilitator (JM) used these numbers to address participants during the discussion. The audio recording and transcriptions captured participants' assigned numbers rather than names or other identifiers, thereby ensuring anonymity. None of the questions in the FGD required participants to disclose their legal status or other identifiers. All participants were compensated at a rate of Kenyan shillings 500 (KES 1=US $0.0077 as of October 27, 2026) per participant for their time.

Results

Participant Characteristics

Most of the key informants were female (9/12, 75%), with a mean age of 42.6 (SD 9.29) years. They were all Kenyan, had tertiary-level training, and were mainly from the health and nutrition sector, with a few from water and sanitation and CBOs. Their roles included advocacy, capacity building, mobilization, coordination, oversight, referral, monitoring and evaluation, and health care provision. The FGD participants (n=17) were all female, with a mean age of 27.7 (SD 5.16) years, with mostly primary school education (n=6, 35.3%). In total, 35.3% (6/17) of refugee caregivers participated in the group discussions compared with 64.7% (n=11) from the host community. Table 1 shows the characteristics of the study participants.

Table 1. Characteristics of study participants.

Characteristic	Key informant interviews (n=12)	Focus group discussions (n=17)	Total (n=29)
Sex, n (%)			
Female	9 (75)	17 (100)	26 (89.7)
Male	3 (25)	0 (0)	3 (10.3)
Age (years), mean (SD)	42.6 (9.29)	27.7 (5.16)	33.2 (9.99)
Highest education level, n (%)			
Tertiary	12 (100)	1 (5.9)	13 (44.8)
Secondary	0 (0)	5 (29.4)	5 (17.2)
Primary	0 (0)	6 (35.3)	6 (20.7)
None	0 (0)	5 (29.4)	5 (17.2)
Status, n (%)			
Host community	12 (100)	11 (64.7)	23 (79.3)
Refugees	0 (0)	6 (35.3)	6 (20.7)

The next section provides an analysis of the perceptions of both the key informants and caregivers on current practices in 3 key areas: health, nutrition, and child development. It also highlights barriers and enablers for the integration of digital technology within mHealth interventions and maps the findings to the intervention design. While this study did not specifically set out to make a comparison between refugees and the host communities, in the few instances where differences between the groups emerged, we highlight them.

Perceptions on Current Practices

Maternal and Child Health

Participants stated that ANC and postnatal care (PNC) services were widely available through public and private facilities and accessible to caregivers in Eastleigh and its surroundings. Public health facilities were seen to be preferred by caregivers since their services were free or low cost. Health officials reported that while uptake for the first ANC visit was high, only a few completed the recommended

8 ANC visits. For PNC, many mothers reportedly missed the first follow-up visit after hospital discharge, typically scheduled 2 weeks after delivery. Key informants reported that there was low uptake among the refugees, which they attributed to lack of awareness about the existence of the services, inflexible vaccination schedules, fear of arrest for lack of legal documentation, and high mobility:

> *The uptake of first ANC is considerably high. But when it comes to the uptake of the fourth ANC, it's very low. You'll find that these...expectant mothers, sometimes, they start...the first ANC late or even don't complete the four visits.* [KI, CBO representative]

> *Like the refugees, maybe they are always on the move and most of them come out at night to seek these services when the facilities, especially the public facilities, are closed to avoid being caught.* [KI, physician]

Participants reported that CHPs, who were essential for outreach efforts, often faced remuneration issues, which led to a lack of motivation and high turnover rates. They also indicated that an inadequate number of CHPs resulted in fewer community health units, which are the basic units for delivering primary health care at the community level, and thus fewer community members being reached. They added that a shortage of translators created communication barriers for non–English- and non–Swahili-speaking patients who were often refugees. Furthermore, they reported that poor health care worker attitudes and scheduling issues contributed to low levels of health-seeking and uptake of referrals:

> *...this is now a challenge within our system, when they [refugees] come to the facility, we don't have translators, language is an issue. And when this mother doesn't come with somebody who is able to understand Swahili or English, it becomes so difficult.* [KI, community health assistant]

> *Yes, except as a human being, you get sometimes the attitude of the healthcare providers becomes a barrier. Yes, maybe the mother is coming in the afternoon, and she is told no, no, no. If you want to attend antenatal [clinic] you come in the morning hours.* [KI, nutritionist]

Maternal and Child Nutrition

Breastfeeding initiation at birth was described as high, although adherence to EBF for the first 6 months was low. The reasons included perceptions of child hunger, mothers needing to resume work, mothers' inability to produce milk, and lack of interest. Among those not practicing EBF, complementary feeding and the use of infant formula or other breast milk substitutes were reported to begin typically around the second month. Health officials reported that continued breastfeeding for up to 2 years was practiced by only a few caregivers and that community sensitization campaigns and the existence of a milk bank in the area had helped increase EBF rates:

> *Some follow [guidelines from] the clinic, but there are others who say that the children are not satisfied, [and] they give them milk. So, they say they can't [exclusively] breastfeed until 6 months [and] must give canned milk.* [KI, CBO representative]

Refugee communities were perceived by health officials to have lower rates of EBF than the host communities. They attributed this to refugees seldom being reached by sensitization campaigns and the tendency to avoid the formal health care system because of lack of legal documents:

> *...there was a time we were dealing with children who are under 6 [months], and we realized several mothers had already started giving other foods. But these specifically were [refugees' nationalities redacted]...For the locals, most of them were breastfeeding...exclusively...because of the encouragement they were getting from the facility.* [KI, nutritionist]

> *We have...routine sensitization, so nowadays they're doing it. For 6 months, they're breastfeeding, unless the mother is either sick or something, but...there's a [human] milk bank in Pumwani Maternity...* [KI, community health promoter]

In both communities, participants reported a preference for foods that were considered to boost milk production, such as nourishing soups and porridge. Some perceived dietary differences were reported between refugees and the host community. For instance, participants noted that the most commonly consumed foods among the refugee mothers, especially those from Somalia, were milk and meat, with limited vegetables and fruits, because of their nomadic pastoralist background. Within the host community, legumes and traditional green vegetables were reported as being predominant:

> *Lactating mothers, [take] a lot of milk. I think camel milk or something, and then we also have the meat… I don't see them [consuming vegetables much], but they are so much into pasta, milk and meat...They have also traditional herbs they usually take...periodically, depending on the duration after giving birth.* [KI, maternal and child health official]

Child Development

Participants identified positive caregiving behaviors in the community. These included playing with children with or without toys, talking and singing to the children, taking children outdoors from time to time, good hygiene practices to prevent illnesses, and clinic visits for routine growth monitoring and early detection of developmental delays:

For example, you can give the child something to hold. There are other things, like, you can say to the child "zingi zingi," give things, and play with the child. The child will get used to it. [Caregiver, refugee, FGD1]

However, participants identified some harmful practices, such as shouting at the child, unregulated screen time, and low caregiver involvement in play. Additionally, participation in economic activities was perceived to affect the extent to which caregivers spent time with children:

If you look at how mothers respond to their children, mothers are not playing with them, mothers are not smiling. They just put their children there in the baby walkers and they're left to watch TV. There are those who are given phones to play with. [KI, community health assistant]

Just as she's said, you know when you leave work when you are tired, he is asleep. [Caregiver, host community, FGD2]

For a child who doesn't speak, if you don't understand them, you should shout at them, they get shocked, so that you can see if they'll cry. [Caregiver, host community, FGD1]

Well, you find them now just buying toys..., the other problem is that they don't play with the children, so they expect these children to know how to play with these toys...they don't buy toys according to the age of the child... [KI, nutritionist]

Having explored some of the gaps in health, nutrition, and child development encompassing responsive caregiving, play, and communication, we explored the barriers and facilitators for digital interventions to further inform the intervention design.

Barriers and Facilitators for Digital Interventions

The use of digital technology was discussed, first, in the context of access and use of smartphones in households within the community, and second, in the context of the integration of smartphones within mHealth interventions. Access to smartphones was seen as limited due to affordability and high insecurity rates within the informal settlements. Participants considered the cost of internet data to be a challenge due to low-income levels. However, caregivers reported having devised strategies for accessing data at low cost, in small chunks, through daily or hourly flash sales from the internet service providers and taking advantage of free Wi-Fi whenever they could. Use was often reported to be limited by the relatively high illiteracy rates in informal settlements, the language barrier, and low technological know-how:

These caregivers do not have smart phones. I see most or some of the caregivers using [feature phones]. [KI, CBO representative]

You can't be online for many hours. Perhaps after you've worked till like 3:00 pm, you buy a 1-hour bundle and go online. Once that 1-hour is over, you go offline till the next day. [Caregiver, host community, FGD2]

...how do I put it, not really ignorance but language barrier, yeah, so if we can bridge that then I don't think they will have any issue using their phone [for you] to be able to relay the messages. [KI, maternal and child health]

The use of smartphones in health, nutrition, and parenting interventions was perceived to be limited in the Eastleigh context. Even among the interventions that used phones, their use was limited to short text messages through feature phones. Most caregivers indicated that they had never used their phones for any health, nutrition, or parenting-related activities:

There is not any other service that is delivered through smartphones. [KI, maternal and child health]

At the facility or the community level, we don't have cases where we are using phones or smart phones. [KI, community health strategy]

Health workers and caregivers strongly recommended the integration of technology into interventions, which was considered beneficial, especially to refugee communities who were often left out of service delivery. Other considerations included supporting smartphone ownership and being cognizant of intra- or interfamily sharing, translating content into languages spoken by refugees, and addressing caregiver illiteracy by providing an audio option. There was a keen interest in interventions that encouraged health-seeking behavior, for instance, through CHPs or technology, such as sending out reminders for ANC and PNC visits:

The moment those you are targeting are taught even for one day, or they use that app [the digital intervention]..., it will encourage them. They will learn a lot. [Caregiver, host community, FGD1]

And my recommendation...having the information through your mobile phone is very important because you can easily access it with a lot of ease... [KI, CBO representative]

You also need to see which group you are targeting, whether they have the phones, or they share within one household. [KI, water sanitation and hygiene]

Application of Findings to Intervention Design

The findings were useful in informing the intervention design, including aligning the content with community needs, identifying the delivery mode, and identifying the workforce. This process followed the Nurturing Care Framework as a guide on intervention content, especially on health, nutrition, and responsive caregiving, as well as the World Bank's Quality Framework for Parenting Programs [39,41] to identify key components for consideration. Table 2 shows the areas in which the intervention design was informed by the findings based on the framework.

Table 2. Mapping findings to intervention design decisions.

Component and findings	Application in intervention design
Intervention content	
ANC[a] and PNC[b] services are not optimally used	• Provide evidence-based ANC and PNC information (eg, reminders on immunization dates, health-seeking behavior, caregiver-child interaction, play, and communication)
Poor dietary diversity	• Provide evidence-based information to support adequate nutrition (eg, exclusive and continued breastfeeding, maternal nutrition, and responsive feeding of young children)
Some caregivers showed inappropriate caregiving practices, such as shouting at children	• Provide information to encourage positive childcare practices or responsive caregiving
Hardly any interventions targeting health and caregiving behavior change	• Focus intervention content on health and caregiver behavior change • Apply behavior change strategies that have been shown to work (eg, prompting, self-monitoring, and personalized feedback) [41,42]
Delivery modality	
Limited knowledge of and access to smartphones	• Provide smartphones • Train caregivers and CHPs[c] on the intervention application and smartphone use
Preference for interactive communication	• Adopt an interactive, 2-way communication model to be adopted • Deliver intervention through a mobile app with a component for messaging the caregivers on the identified topics, tracking progress based on caregiver-input data, and providing personalized feedback
Low literacy	• Provide an audio option in the local language as an alternative to written messages as well as contextual images (eg, images of locally available foods, African mothers, and children) • Use symbols instead of numbers for caregivers to record frequencies • Additionally, pretest the app with caregivers and make adjustments, where relevant, to enhance clarity of messages and appropriateness of images
Cost of data bundles hinders internet access and could limit application use	• Provide internet data bundles to caregivers and CHPs or subsidize the cost • Use anonymized study numbers for login instead of identifiable email addresses
Workforce and resources	
Existing resources include private and public health care providers and CHPs	• Use existing resources such as CHPs
CHPs poorly compensated and facilitated to carry out their work	• Compensate CHPs for their time and expenses in implementing the intervention
Poor awareness among some community members, including refugees, about existing health care services	• Identify health facilities and services offered, including maternity services, health centers, and milk banks, for referral of caregivers
Context	
Refugee caregivers and their children are often left out of health interventions	• Target primary caregivers of children younger than 2 years from the refugee community
Both refugees and host communities often face similar challenges linked to their low socioeconomic status	• Include both the refugees and host communities to avoid stigma and build goodwill within the community

[a]ANC: antenatal care.
[b]PNC: postnatal care.
[c]CHP: community health promoter.

Discussion

Principal Findings

This study explored community perceptions on current health, nutrition, caregiving, and child development practices among urban refugees and host communities in a challenging context. We identified barriers and facilitators to the adoption of digital parenting interventions and mapped the findings against different intervention decision points. While there were some perceived positive practices among refugee and host communities, they were described as insufficient, especially regarding breastfeeding, dietary diversity, ANC and PNC, and positive parenting. Additionally, technological interventions were still underused despite an increase in access to smartphones.

Caregiver knowledge and skills are critical because of their influence on child development outcomes [43]. Research has linked caregiver knowledge of early child development to caregiving competence and shown that knowledge of child development moderates the impact of self-efficacy on parenting competence [44] and has positive effects on the health and nutrition of family members, including young children [45,46]. Our study found that refugees were perceived by some of the health care workers to have lower levels of caregiving knowledge. However, it is important to note that this was simply a perception among participants and likely to have as much to do with prejudice as reality. There is weak evidence that refugees have lower levels of caregiving or parenting knowledge compared with the host community [43].

The perceived high level of awareness about maternal and child health and nutrition within the host community was possibly due to community health outreach programs [18]. Both community-based and facility-based health care services were seen to have limited reach among refugees, due to factors such as language barriers and lack of legal documentation, further marginalizing them. Other studies found similar barriers to health care access by refugees, including insufficient knowledge on how to access health care services in the host country and financial constraints [47], pointing to a need for interventions to address such gaps.

Caregiver involvement in play and communication is crucial for caregivers' bonding with the child [48]. However, economic participation, likely in informal jobs [49], may hinder caregiver involvement. These jobs, along with the number of children, reduced the time caregivers could devote to caregiving. Our finding supports previous research which indicates that mothers working in the informal sector often lacked the time to engage in play-based learning with their children [50,51]. Sensitization on the importance of play and communication in the development of the child, with particular emphasis on the use of low- or no-cost locally available play materials, would be crucial in enhancing child development in the community. The sensitization could be coupled with economic empowerment programs to address livelihood challenges and help safeguard at-risk communities.

There was a rise in adult smartphone ownership in Kenya from 54% to 61% between June 2022 and June 2023 [52]. Despite this, we found little evidence of the use of phones to aid health programs. While mHealth interventions are not without drawbacks [53], interventions such as those encouraging EBF, health-seeking behavior, ANC, PNC, immunization, and dietary diversity would do well to explore the integration of smartphone technology. On the basis of our mapping process, any interventions looking to use smartphones should be mindful of phone access and internet costs and ensure adequate training of caregivers and CHPs. SIM cards could be registered through the project for refugee inclusion, although this needs to be negotiated with the telecommunications companies.

Strengths and Limitations

This study had many strengths, including having a diverse range of participants from the health system and the community and the translation of formative findings into intervention design decisions through frameworks. However, there was low participation of refugees, which was a potential source of bias, as it may have limited the perspectives represented in the study. While the reasons for lower participation among refugees were not systematically assessed, they may have reflected differences in language, mobility, accessibility through the community health system, or other factors. Mitigation measures such as the involvement of CHPs and CBOs working with refugees were taken, which resulted in two-thirds of the refugee caregivers contacted participating in the FGDs. Additionally, despite the guidance from the research team, CHPs may have preferentially reached caregivers who were already connected to health care services. Furthermore, while strategies to reduce bias such as using a predefined coding framework were used, there may still have been researcher bias in the interpretation of the findings, as is inevitable in qualitative studies. Finally, the results may have been specific to the study sample in Eastleigh's informal settlements, limiting their generalizability.

Conclusions

Both refugees and host communities in urban informal settlements experience unique perceived challenges in seeking and accessing maternal health, nutrition, and child development services, with some challenges being unique to the embedded refugees. While health care providers work to bridge the gap, workforce shortfalls and other resource gaps continue to hinder access. Underutilization of technology in low-resource settings, despite advances in mHealth, points to the critical need to prioritize its integration within maternal and child health initiatives, focusing on nutrition and child development. The insights from this study were useful in informing important considerations for the design of a digital intervention to be tested in subsequent research.

Acknowledgments

The authors would like to thank the Kamukunji Sub-County Health Management Community for providing access to the community. They also thank the enumerators and the community health promoters. The authors are grateful to all the caregivers and health care workers who took part in this study. JM acknowledges the support of the Moving Minds Alliance, while AA acknowledges the support of the Developing Excellence in Leadership, Training, and Science in Africa (DELTAS) program.

Generative AI Use

The authors attest that generative AI technology was not used in the generation of text, figures, or other informational content of this manuscript.

Funding

This research was funded by the International Development Research Centre (grant 108872-001) to NJ and SS. AA is partially supported by the Science for Africa Foundation (grant number-Ref: Del-22-002) with support from Wellcome Trust and the UK Foreign, Commonwealth & Development Office and is part of the EDCTP 2 programme supported by the European Union. The funders had no role in study design, data collection and analysis, the decision to publish, or the preparation of the manuscript.

Data Availability

The datasets generated or analyzed during this study are available from the corresponding author on reasonable request.

Authors' Contributions

Conceptualization: JM (lead), AA (equal), MT (equal)
Data curation: JM
Formal analysis: JM (lead), MT (supporting), AA (supporting)
Funding acquisition: NJ, SS
Investigation: JM
Methodology: JM, MT, AA
Project administration: JM
Supervision: MT (lead), AA (supporting), NJ (supporting)
Writing—original draft: JM (lead), MT (supporting)
Writing—review and editing: JM (lead), MT (supporting), AA (supporting), NJ (supporting), SS (supporting)

Conflicts of Interest

None declared.

Multimedia Appendix 1

Interview guides.
[DOCX File (Microsoft Word File), 40 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Coding framework.
[DOCX File (Microsoft Word File), 16 KB-Multimedia Appendix 2]

Checklist 1

COREQ checklist.
[PDF File (Adobe File), 195 KB-Checklist 1]

References

1. Ritchie H, Mathieu E. How many people die and how many are born each year? Our World in Data. Jan 5, 2023. URL: https://ourworldindata.org/births-and-deaths [Accessed 2026-10-27]
2. Trends in maternal mortality 2000 to 2020: estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division. World Health Organization; 2023. URL: https://iris.who.int/server/api/core/bitstreams/c3957b94-cdd5-47d7-85f8-6202be229f8e/content [Accessed 2026-10-27]
3. Levels and trends in child mortality. United Nations Inter-agency Group for Child Mortality Estimation; Mar 7, 2026. URL: https://data.unicef.org/wp-content/uploads/2026/05/UNIGME-Child-Mortality-Report-2025.pdf [Accessed 2026-10-27]
4. Malnutrition. World Health Organization. Mar 1, 2024. URL: https://www.who.int/news-room/fact-sheets/detail/malnutrition [Accessed 2026-10-27]

5. United Nations Children's Fund, World Health Organization, International Bank for Reconstruction and Development/The World Bank. Levels and trends in child malnutrition: UNICEF/WHO/World Bank Group Joint Child Malnutrition Estimates: key findings of the 2023 edition. UNICEF and WHO; May 23, 2023. URL: https://iris.who.int/server/api/core/bitstreams/ccd825e2-e6d0-4101-bedd-8189355dcd81/content [Accessed 2026-10-27]
6. Transforming our world: the 2030 Agenda for Sustainable Development. United Nations, Department of Economic and Social Affairs, Sustainable Development; 2015. URL: https://sdgs.un.org/2030agenda [Accessed 2026-10-27]
7. World urbanization prospects: the 2014 revision. United Nations, Department of Economic and Social Affairs, Population Division; 2015. URL: https://population.un.org/wup/assets/WUP2014-Report.pdf [Accessed 2026-10-27]
8. Wahba Tadros S, Wellenstein A, Das MB, et al. Demographic trends and urbanization. World Bank; 2021. URL: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/260581617988607640 [Accessed 2026-10-27]
9. World cities report 2024: cities and climate action. United Nations Human Settlements Programme (UN-Habitat); 2024. URL: https://unhabitat.org/sites/default/files/2024/11/wcr2024_-_full_report.pdf [Accessed 2026-10-27]
10. Global trends: forced displacement in 2022. United Nations High Commissioner for Refugees; 2023. URL: https://www.unhcr.org/sites/default/files/2023-06/global-trends-report-2022.pdf [Accessed 2026-10-27]
11. A study on health vulnerabilities of urban migrants in the Greater Nairobi. International Organization for Migration; 2013. URL: https://www.iom.int/sites/g/files/tmzbdl486/files/migrated_files/Country/docs/IOM-Urban-Migrants.pdf [Accessed 2026-10-27]
12. Gardner J, Lenette C, Al Kalmashi R. *Who is the host?* Interrogating hosting from refugee-background women's perspectives. J Intercult Stud. May 9, 2022;43(5):621-638. [doi: 10.1080/07256868.2022.2063819]
13. Kabue M, Abubakar A, Ssewanyana D, et al. A community engagement approach for an integrated early childhood development intervention: a case study of an urban informal settlement with Kenyans and embedded refugees. BMC Public Health. Apr 11, 2022;22(1):711. [doi: 10.1186/s12889-022-13185-x] [Medline: 35410147]
14. Pega F, Pabayo R, Benny C, Lee EY, Lhachimi SK, Liu SY. Unconditional cash transfers for reducing poverty and vulnerabilities: effect on use of health services and health outcomes in low- and middle-income countries. Cochrane Database Syst Rev. Mar 29, 2022;3(3):CD011135. [doi: 10.1002/14651858.CD011135.pub3] [Medline: 35348196]
15. Ochola S, Ogada IA, Odera CA. Predictors of the amount of intake of ready-to-use-therapeutic foods among children in outpatient therapeutic programs in Nairobi, Kenya. Food Sci Nutr. Apr 2022;10(4):1135-1145. [doi: 10.1002/fsn3.2745] [Medline: 35432961]
16. Mberu BU, Haregu TN, Kyobutungi C, Ezeh AC. Health and health-related indicators in slum, rural, and urban communities: a comparative analysis. Glob Health Action. Dec 2, 2016;9:33163. [doi: 10.3402/gha.v9.33163] [Medline: 27924741]
17. Hone T, Gonçalves J, Seferidi P, et al. Progress towards universal health coverage and inequalities in infant mortality: an analysis of 4·1 million births from 60 low-income and middle-income countries between 2000 and 2019. Lancet Glob Health. May 2024;12(5):e744-e755. [doi: 10.1016/S2214-109X(24)00040-8] [Medline: 38614628]
18. Orangi S, Kairu A, Ondera J, et al. Examining the implementation of the Linda Mama free maternity program in Kenya. Int J Health Plann Manage. Nov 2021;36(6):2277-2296. [doi: 10.1002/hpm.3298] [Medline: 34382238]
19. Fan YW, Fan HS, Shing JS, Ip HL, Fong DY, Lok KY. Impact of baby-friendly hospital initiatives on breastfeeding outcomes: systematic review and meta-analysis. Women Birth. Mar 2025;38(2):101881. [doi: 10.1016/j.wombi.2025.101881] [Medline: 39919651]
20. Coulson C. Affordable housing lessons for Kenya from Colombia. Business Daily. Sep 29, 2020. URL: https://www.businessdailyafrica.com/analysis/columnists/Affordable-housing-lessons-for-Kenya/4259356-5279810-oc4dghz/index.html [Accessed 2026-10-27]
21. Little MT, Roelen K, Lange BC, et al. Effectiveness of cash-plus programmes on early childhood outcomes compared to cash transfers alone: a systematic review and meta-analysis in low- and middle-income countries. PLoS Med. Sep 28, 2021;18(9):e1003698. [doi: 10.1371/journal.pmed.1003698] [Medline: 34582447]
22. Colaci D, Chaudhri S, Vasan A. mHealth interventions in low-income countries to address maternal health: a systematic review. Ann Glob Health. 2016;82(5):922-935. [doi: 10.1016/j.aogh.2016.09.001] [Medline: 28283147]
23. Sondaal SF, Browne JL, Amoakoh-Coleman M, et al. Assessing the effect of mHealth interventions in improving maternal and neonatal care in low- and middle-income countries: a systematic review. PLoS One. May 4, 2016;11(5):e0154664. [doi: 10.1371/journal.pone.0154664] [Medline: 27144393]
24. Carmichael SL, Mehta K, Srikantiah S, et al. Use of mobile technology by frontline health workers to promote reproductive, maternal, newborn and child health and nutrition: a cluster randomized controlled trial in Bihar, India. J Glob Health. Nov 24, 2019;9(2):0204249. [doi: 10.7189/jogh.09.020424] [Medline: 31788233]

25. Feroz A, Jabeen R, Saleem S. Using mobile phones to improve community health workers performance in low-and-middle-income countries. BMC Public Health. Jan 13, 2020;20(1):49. [doi: 10.1186/s12889-020-8173-3] [Medline: 31931773]
26. Tomlinson M, Rotheram-Borus MJ, Doherty T, et al. Value of a mobile information system to improve quality of care by community health workers. S Afr J Inf Manag. 2013;15(1):10.4102/sajim.v15i1.528. [doi: 10.4102/sajim.v15i1.528] [Medline: 25147730]
27. Wallerstein N, Bonnie D, Oetzel JG, Minkler M. Community-Based Participatory Research for Health: Advancing Social and Health Equity. Jossey-Bass; 2017. ISBN: 9781119258858
28. Woolf SH, Zimmerman E, Haley A, Krist AH. Authentic engagement of patients and communities can transform research, practice, and policy. Health Aff (Millwood). Apr 2016;35(4):590-594. [doi: 10.1377/hlthaff.2015.1512]
29. McGarity-Palmer R, Saw A, Keys CB. Community engagement in psychosocial interventions with refugees from Asia: a systematic review. Asian Am J Psychol. 2023;14(2):117-132. [doi: 10.1037/aap0000285]
30. Hacker K, Tendulkar SA, Rideout C, et al. Community capacity building and sustainability: outcomes of community-based participatory research. Prog Community Health Partnersh. 2012;6(3):349-360. [doi: 10.1353/cpr.2012.0048] [Medline: 22982848]
31. Cunningham-Erves J, Barajas C, Mayo-Gamble TL, et al. Formative research to design a culturally-appropriate cancer clinical trial education program to increase participation of African American and Latino communities. BMC Public Health. Jun 3, 2020;20(1):840. [doi: 10.1186/s12889-020-08939-4] [Medline: 32493245]
32. Kenya population and housing census. Kenya National Bureau of Statistics; 2019. URL: https://www.knbs.or.ke/reports/kenya-census-2019/ [Accessed 2026-10-27]
33. Asoka GW, Thuo AD, Bunyasi MM. Effects of population growth on urban infrastructure and services: a case of Eastleigh neighborhood Nairobi, Kenya. J Anthropol Archaeol. 2013;1(1):41-56. URL: https://scispace.com/pdf/effects-of-population-growth-on-urban-infrastructure-and-1p1ya1iv7q.pdf [Accessed 2026-10-27]
34. Nyamasege CK, Kimani-Murage EW, Wanjohi M, Kaindi DW, Wagatsuma Y. Effect of maternal nutritional education and counselling on children's stunting prevalence in urban informal settlements in Nairobi, Kenya. Public Health Nutr. Aug 2021;24(12):3740-3752. [doi: 10.1017/S1368980020001962] [Medline: 32693855]
35. Kithinji SK. Factors influencing malnutrition among children aged 6-59 months in Kamukunji sub-county, Nairobi County, Kenya [Master's thesis]. Jomo Kenyatta University of Agriculture and Technology; 2026. URL: http://ir.jkuat.ac.ke/handle/123456789/7017 [Accessed 2026-10-31]
36. Sudfeld CR, McCoy DC, Fink G, et al. Malnutrition and its determinants are associated with suboptimal cognitive, communication, and motor development in Tanzanian children. J Nutr. Dec 2015;145(12):2705-2714. [doi: 10.3945/jn.115.215996] [Medline: 26446481]
37. Nyumba TO, Wilson K, Derrick CJ, Mukherjee N. The use of focus group discussion methodology: insights from two decades of application in conservation. Methods Ecol Evol. Jan 2018;9(1):20-32. [doi: 10.1111/2041-210X.12860]
38. Ritchie J, Spencer L. Qualitative data analysis for applied policy research. In: Bryman A, Burgess RG, editors. Analyzing Qualitative Data. Routledge; 1994:173-194. [doi: 10.4324/9780203413081-10]
39. Bozmamadova M, Laouali R, Walder PS. Guidance note on designing and implementing early childhood parenting programs. World Bank; 2024. URL: https://openknowledge.worldbank.org/server/api/core/bitstreams/acd2b574-7759-4be0-8a0a-dddd8fc0f68d/content [Accessed 2026-10-27]
40. Nurturing care for early childhood development: a framework for helping children survive and thrive to transform health and human potential. World Health Organization; 2018. URL: https://www.who.int/publications/i/item/9789241514064 [Accessed 2026-10-27]
41. Behaviour change models and strategies. European Food Information Council. URL: https://www.eufic.org/en/healthy-living/article/motivating-behaviour-change [Accessed 2026-10-27]
42. van Achterberg T, Huisman-de Waal GG, Ketelaar NA, Oostendorp RA, Jacobs JE, Wollersheim HC. How to promote healthy behaviours in patients? An overview of evidence for behaviour change techniques. Health Promot Int. Jun 2011;26(2):148-162. [doi: 10.1093/heapro/daq050] [Medline: 20739325]
43. Rowe ML, Denmark N, Harden BJ, Stapleton LM. The role of parent education and parenting knowledge in children's language and literacy skills among White, Black, and Latino families. Infant Child Dev. Mar 2016;25(2):198-220. [doi: 10.1002/icd.1924]
44. Hess CR, Teti DM, Hussey-Gardner B. Self-efficacy and parenting of high-risk infants: the moderating role of parent knowledge of infant development. J Appl Dev Psychol. Jul 2004;25(4):423-437. [doi: 10.1016/j.appdev.2004.06.002]
45. de Buhr E, Tannen A. Parental health literacy and health knowledge, behaviours and outcomes in children: a cross-sectional survey. BMC Public Health. Jul 13, 2020;20(1):1096. [doi: 10.1186/s12889-020-08881-5] [Medline: 32660459]

46. DeWalt DA, Hink A. Health literacy and child health outcomes: a systematic review of the literature. Pediatrics. Nov 2009;124 Suppl 3:S265-S274. [doi: 10.1542/peds.2009-1162B] [Medline: 19861480]
47. Mangrio E, Sjögren Forss K. Refugees' experiences of healthcare in the host country: a scoping review. BMC Health Serv Res. Dec 8, 2017;17(1):814. [doi: 10.1186/s12913-017-2731-0] [Medline: 29216876]
48. Ginsburg KR, American Academy of Pediatrics Committee on Communications, American Academy of Pediatrics Committee on Psychosocial Aspects of Child and Family Health. The importance of play in promoting healthy child development and maintaining strong parent-child bonds. Pediatrics. Jan 2007;119(1):182-191. [doi: 10.1542/peds.2006-2697] [Medline: 17200287]
49. Golla AM. Engaging informal women entrepreneurs in East Africa: approaches to greater formality. ILO-WED issue brief. International Labour Organization; 2014. URL: https://www.ilo.org/resource/brief/engaging-informal-women-entrepreneurs-east-africa-approaches-greater [Accessed 2026-10-27]
50. Okelo K, Nampijja M, Ilboudo P, et al. Evaluating the effectiveness of the Kidogo model in empowering women and strengthening their capacities to engage in paid labor opportunities through the provision of quality childcare: a study protocol for an exploratory study in Nakuru County, Kenya. Humanit Soc Sci Commun. 2022;9(1):237. [doi: 10.1057/s41599-022-01260-y] [Medline: 35854981]
51. Horwood C, Hinton R, Haskins L, Luthuli S, Mapumulo S, Rollins N. 'I can no longer do my work like how I used to': a mixed methods longitudinal cohort study exploring how informal working mothers balance the requirements of livelihood and safe childcare in South Africa. BMC Womens Health. Aug 6, 2021;21(1):288. [doi: 10.1186/s12905-021-01425-y] [Medline: 34362363]
52. Obura F. Smartphone penetration in Kenya rises 61 per cent to 30.8 million. The Kenyan Wallstreet. Sep 25, 2023. URL: https://kenyanwallstreet.com/smartphone-penetration-in-kenya-rises-61-per-cent-to-30-8million [Accessed 2026-10-27]
53. Ikwunne T, Hederman L, Wall PJ. Designing mobile health for user engagement: the importance of socio-technical approach. In: 1st Virtual Conference on Implications of Information and Communication Technologies for Development: 14th IFIP WG 94 International Conference on Social Implications of Computers in Developing Countries 2021. Springer; 2021:192-206. [doi: 10.48550/arXiv.2108.09786]

Abbreviations

ANC: antenatal care
CBO: community-based organization
CHP: community health promoter
COREQ: Consolidated Criteria for Reporting Qualitative Research
EBF: exclusive breastfeeding
FGD: focus group discussion
KII: key informant interview
LMIC: low- and middle-income country
PNC: postnatal care

Edited by Amaryllis Mavragani; peer-reviewed by Lindya Herbawani; submitted 27.Apr.2026; final revised version received 24.Sep.2026; accepted 11.Oct.2026; published 18.Nov.2026

Please cite as:
Marangu J, Abubakar A, Jensen N, Sibanda S, Tomlinson M
Designing a mHealth Intervention to Enhance Health, Nutrition, and Child Development for Urban Refugees and Host Communities in a Low-Resource Setting: Formative Qualitative Study
JMIR Form Res 2026;10:e99450
URL: https://formative.jmir.org/2026/1/e99450
doi: 10.2196/99450

© Joyce Marangu, Amina Abubakar, Nathaniel Jensen, Simbarashe Sibanda, Mark Tomlinson. Originally published in JMIR Formative Research (https://formative.jmir.org), 18.Nov.2026. This is an open-access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in JMIR Formative Research, is properly cited. The complete bibliographic information, a link to the original publication on https://formative.jmir.org, as well as this copyright and license information must be included.