JULY 2022

LEARNING BRIEF

The "Lucy" Maternal and Child Health Messaging Platform

Introduction

Every day, over 800 women worldwide die from preventable causes related to childbirth and pregnancy. Pregnant women in low-resource settings frequently lack access to critical information on healthy behaviors during pregnancy, birth preparation, and best newborn care practices. This can lead to the continuation of harmful practices as well as the loss of opportunities for beneficial care behaviors. Digital health interventions can help close the health information gap, resulting in better health behaviors at home, increased demand for care and service use, and connect families to appropriate care in formal health facilities, all of which contribute to better maternal and newborn health outcomes.

Benin reported a population of 11.88 million people in 2019, with a fertility rate of 5.7 children per woman and a life expectancy of 61.2 years. It has a 38.5% poverty rate, and only 54.8 % of students completed primary school in the 2018-2019 school year. 32.2% of children were chronically malnourished, and 11% were severely malnourished. As of now, the government spends 3.3% of the GDP on services relating to healthcare in Benin, and despite considerable progress the country has one of the highest infant mortality rates in the world at 57 deaths per 1000 births . In terms of maternal mortality, Benin reported 397 deaths per 100,000 births in 2017.

With more than 5 billion mobile phone users worldwide, text-messaging technology has changed the face of communication and is increasingly used to promote health and to prevent disease. With funding from the Danish International Development Agency (DANIDA), Plan International Benin, PlanBørnefonden, and Maternity Foundation joined forces to leverage the increased penetration of mobile phone coverage, as well as the growing number of mobile device owners throughout Benin, to reach pregnant women, mothers of newborns and their partners with essential health messages. In 2019, the partners alongside the Benin Ministry of Health launched a health innovation project which used human centered design and

Banner Image: Lucy users attending a focus group discussion (Adjohoun, Benin). Photo credit: Plan International Benin

implementation research to develop and iterate a contextually appropriate text and voicemessaging service in Benin - a country where Maternity Foundation has worked previously and has a strong relationship with both government and NGO stakeholders. Program partners developed an SMS and interactive voice response (IVR) mobile messaging service known as "Lucy" for pregnant women, male partners, and parents of infants under one year, and focused on evaluating the platform's uptake and effect on maternal and newborn health care seeking behavior and healthy behaviors at home. Message content centered on key topics for pregnancy and infancy, including priority areas identified in co-creation with Benin clinical experts and end users. The Lucy platform in Benin was an iteration of the Lucy messaging platform developed and tested in Ethiopia in 2017.

Objectives

The aim of the project was to leverage the increased penetration of cell phone coverage and ownership across Benin to reach pregnant women and new mothers with critical maternal, newborn and child health (MNCH) and child development information as well as to develop a mobile messaging service for pregnant women and parents of newborns to stimulate demand for health care and increase healthy behaviors at the household level. Project partners aimed to address this lack of access to information by sending informative text and audio messages in the French or one of two local languages to pregnant women, new mothers, and their partners. The content of the messages is aligned to the stage of pregnancy or the developmental stage of the newborn and includes tips and suggestions that can be easily implemented, such as:

"Your baby can hear your heartbeat. It can also hear your voice. If you talk and sing, it will recognize your voice when it is born. This will make your baby feel safe."- message for 21st week of pregnancy

"It is time to go to the health center to have your baby vaccinated. Vaccinating your baby helps prevent certain disease. They will also weigh your baby to check its growth." - message for 11th week following birth of a child

Lucy Benin: Results at a Glance

- A statistically significant difference in knowledge was observed at endline between the intervention and comparison groups around: danger signs in pregnancy and infancy, early and exclusive breastfeeding.
- Maternal nutrition also saw increased knowledge which corresponded to behavior change with Lucy users makig positive changes to their diet more readily than non-users.
- Other self-reported behaviors where a significant difference was observed included attendance of four antenatal visits, reducing harmful practices, and use of vitamins/mineral supplements provided by the health facility.
- In terms of early childhood development for children under one, Lucy users reported increased prevalence of reading stories, taking children on trips to clinic/school/market, and discussing child development with partner.
- 84% of Lucy users reported sharing the messages with others.
- Above average message completion rate (according to Viamo) at 62%. There was also significant interest, with 71% of those registered continuing to receive messages without dropping out.
- Language used in messages was reportedly easy to understood and information relevant.
- Highest interest in antenatal care appointment reminders, breastfeeding tips, and nutrition messages.

The Lucy SMS/IVR Messaging Platform

Messaging services that enable pregnant women to access information and include care-seeking reminders have been shown to be effective in increasing antenatal care-seeking behavior. For the Lucy project, message topics included (but were not limited to) the importance of attending antenatal care (ANC), birth preparedness, early and exclusive breastfeeding, maternal nutrition during pregnancy and breastfeeding, vaccination, identifying and seeking care for danger signs in pregnancy and newborns, and the use of insecticide-treated bed nets. The priority topics in Benin were based on global guidance (namely UNFPA and WHO), but also took into consideration national indicators that needed improvement as well as priorities set by

the national government (e.g. sleeping under ITNs, nutrition, and breastfeeding). The project also took advice from potential end users in a focus group of pregnant women in the intervention district around what they would like message content to include (or not include).

A human-centred design approach was utilized to gather wishes, concerns, and advice of potential end users (pregnant women and health care workers who care for them), which helped inform the project design and message content. In an aim to overcome challenges of literacy, the platform included both an SMS and Interactive Voice Response (IVR) component so that the user could choose to receive written or audio messages. A smart phone was not needed, which increased accessibility especially for rural women – only a simple phone with minimal capabilities. Maternity Foundation and Plan then aimed to test to what extent SMS and IVR services can contribute to health information sharing, increased knowledge, and positive care-seeking behaviour in the Benin context.

The Lucy testing phase was launched in rural Adjohoun where pregnant women, new mothers, and male partners were enrolled through a local community organization; during the subsequent roll out phase, the platform was extended to users in Cotonou. Lucy users were enrolled both at health facilities as well as markets and community meetings to ensure equity between those currently linked with health services and those who were not. At time of enrollment the user selected their preferred language, whether they prefer to receive text or audio messages, and their gestational age or month of their infant's life.

Receipt of the Lucy messages were timed to the woman's stage of pregnancy or the age of their infant in months, from early pregnancy until the child is one year old. The messages dispelled myths, highlighted warning signs, and encouraged pregnant women and new parents to use local health services. They also provided fetal and child development information, which aimed to motivate caregivers to get the right care at the right time for themselves and their children.

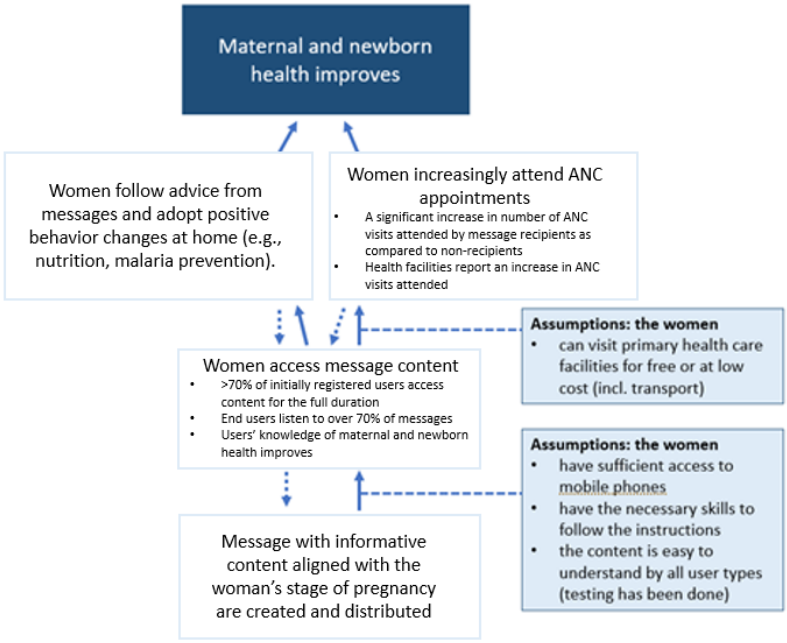

Figure 1 Theory of Change of Lucy Benin project

A Two-Staged M&E Approach

This project was implemented in two phases, the testing phase and roll-out phase. The mobile messaging service was be extended to a total of approximately 5,000 (300 from the pilot project plus 4700 during roll-out) recipients throughout 2021. Therefore, the M&E system was designed to address the information needs for the two phases, testing and roll-out.

Key Insights and Adaptations Following Testing Phase

In the initial testing phase, the partners were interested in feedback on the design of the messages and delivery method. Rich feedback was important to the project team to get an understanding of the users' experience and receive inputs on what worked well, what worked less well, and suggestions for improvements. After three months, a mid-term evaluation with a qualitative focus paired with a quantitative mini-survey found strong interest, appreciation, and relevance of messages.

Topics explored during the focus groups and mini-survey of the testing phase included the sign-up process, message accessibility or challenges, perceived relevance of messages, and indications of change in knowledge and/or behavior.

User feedback was used to iterate on and improve the messaging platform prior to launching a wider roll out phase in Adjohoun and urban areas of Cotonou.

M&E for Testing Phase

- 150 participants, one district (Adjohoun)
- Viamo User Data: The project's tech partners, Viamo, provided regular updates on usage information which was used as a proxy of relevance of the information. This was based on the assumption that the longer the users spend listening, the more likely it is that they find the content relevant and useful.
- Qualitative Feedback
- Quantitative mini-survey

M&E for Roll-Out Phase

- 300 participants in two districts (Adjohoun and Cotonou
- A stratified random sample of 150 participants from those who received a minimum of 5 messages (intervention group) and 150 members of a comparison group identified using proportional random sampling.

The insights from the testing-phase M&E informed substantial changes to the design prior to the roll-out phase. The following changes were made:

- During the testing phase, it was identified that the inclusion of partners (men/fathers) was an important aspect – especially in cases where the household shared the mobile device used for receiving messages. Although the male partner is not the primary target group of this project, it was decided to open the project to also include enrollment of partners if/when interested. Onboarding messages were changed to be inclusive of male partners.
- The number calling users to provide the IVR audio messages was changed from an international to a local number to eliminate a sense of fear about scams.
- French language was identified as a barrier to full onboarding of IVR messages and continued use. Therefore, another predominant local language was added (totaling three language options- French, Wemegbe, Fon).
- Option of SMS messages added alongside IVR.
- The onboarding process was updated to gather more information at community level and shorten the IVR onboarding process, thereby onboarding more people who found the mobile process confusing. New information gathered during onboarding by the local partner NGO FADEC included their current phone number, their choice between receiving SMS or IVR messages, month of pregnancy or age of infant, status as mother or father, and preferred language. Viamo then uploaded this information directly into their system for each registrant, rather than relying on the users to answer questions within the IVR hotline.
- Updates were made to strengthen content around family planning, which were only found to be somewhat informative in the testing phase.
- Content was added around prevention and symptoms of Covid-19.

Endline Methodology

The monitoring and evaluation system for the roll-out phase was designed to document acceptability, changes in knowledge and attitudes related to pregnancy and newborns, as well as changes in care-seeking and health and home-care behavior. A study protocol for the endline was developed by Maternity Foundation and Plan International Benin and submitted for approval to the National Ethics Committee for Health Research. Following ethical approval, a quantitative endline survey was deployed to a str-

- atified random sample from those who received a minimum of 5 messages, totaling 150 in an "intervention" group; 150 community members were identified for a comparison using proportional random sampling to ensure true comparability.

The evaluation focused on the following points: (1.) acceptability and use of messaging services, (2.) knowledge of pregnancy and child development and (3.) behavioral changes at home and regarding care seeking

Results

In this project, the main outputs were the data collected on messaging service usage, the experience of users, and the feasibility of using LUCY. Secondary results were related to knowledge, behavior, and health care-seeking. By December 2021, the Lucy Mobile Messaging Platform reached 2,400 pregnant women, new mothers, and male partners in Benin through text and audio messages – 515 during the testing phase and an additional 1,885 during roll out.

Demographics during the testing phase were distributed evenly. Users were reached in one rural district (Adjohoun), and there was a generally low education among women and moderate degree of education for male partners. There was a high simple phone ownership for women, but under 25% of women asked owned smart phones and just over half of men. During the roll out phase (where urban Cotonou was added), demographics stayed relatively evenly distributed among groups (pregnant women, new mothers, and male partners). Although there was notably low representation of under-18- and over-36-year-old women. There was a high rate of simple phone ownership, but smart phone ownership remained low.

Qualitative Insights

In terms of message content, it was found that language used is appropriate, messages are well understood, information provident is relevant. Both pregnant women and their male partners found reminders about ANC especially important. Parents of infants found information on breastfeeding most useful.

Recipients felt well informed and better able to identify danger signs in pregnancy and in the newborn. Additionally, there was a self-reported increase in adherence to immunization schedule, prenatal consultations, better hygiene and diet (consumption of fruits, vegetables, meat, etc.), sleeping under mosquito nets, as well as strengthened communication between partners. Additionally, new mothers reported feeling more able to respect exclusive breastfeeding and proper maternal nutrition, despite pressure from family (especially older women).

"Every time the call comes, I play it for them too."
- A new mother in Djigbe village reported being able to practice exclusive breastfeeding for her child, despite being told to give the baby porridge by elders.

"We naturally had confidence [in the information] because some calls we are given information that is exactly what we are feeling at the moment or a little before the call."
– Pregnant woman (Adjohoun village)

"We are now able to recognize danger signs such as bleeding in pregnant women."
- Husband of pregnant woman (Adjohoun village), who told story of counseling his friend whose pregnant wife was bleeding to bring her to the hospital

User Data

According to Viamo, the Lucy platform had an above average message completion rate - meaning sent messages were listened to - at 62%. There was also significant interest shown with 71% of those initially registered continuing to receive messages without dropping out. While men made up only 11% of enrolled users, messages sent to male profiles were more actively listened to (67% completion vs. 58%).

Three enrollment methods were tested during the life of the project, and it was identified that on-ground enrollment by community-based partner is best. This would involve selection of message language during enrollment, as completion rate falls significantly (to 10%) when the language is not set, and onboarding messages were received in a sub-optimal language for the user.

Changes in Knowledge and Behavior

Overall, there was a higher level of knowledge and adaptation of healthy behaviors noted in the intervention group as compared to the comparison group. A statistically significant difference in knowledge was observed at endline between the intervention and comparison groups around: danger signs in pregnancy and infancy (78% vs 72%), early and exclusive breastfeeding (91% vs 81%), and maternal nutrition (93% vs. 78%) where increased knowledge also corresponded to behavior change as Lucy users made positive changes to their diet more readily than non-users (62% vs. 55%).

Other self-reported behaviors where a significant difference was observed include attendance of four antenatal visits (100% vs. 91%), reducing harmful practices (46% in intervention group vs. 80% in comparison), and use of vitamins/mineral supplements provided by the health facility (84% vs. 52%) In terms of early childhood development for children under one, Lucy users reported increased prevalence of reading stories, taking children on trips to clinic/school/market, and discussing child development with partner (80% vs. 70%). 84% of Lucy users reported sharing the messages with others.

It is important to note that there was no change in self-reported rates of institutional delivery; however, institutional delivery was not a primary focus for this intervention as indicators for delivery with skilled birth attendants are already quite high in Benin and therefore were not a key priority for the project stakeholders. This contrasts with priorities for the previous Lucy project in Ethiopia, where promoting delivery with skilled birth attendants was a key concern.

Challenges

In analyzing process documentation of the Lucy project in Benin, two main challenges can be identified.

1. Sustainability: given that the SMS/IVR system is resource-intensive and relies on a budget line to keep the platform running. In Benin, it became clear that tech costs were prohibitive to local ownership at end of project, and that once project funds ran out there would need to be continued resources put forth by partners to ensure if the message platform were to continue. In future iterations of Lucy, partners will look to other context-specific, low- and high- tech (where feasible) mechanisms to share the Lucy content via voice, written, and/or visual messages; Maternity Foundation will also explore partnerships with tech and mobile companies to ensure a sustainable approach from the beginning. Some of these potential solutions have already begun been explored through the partnership with Africa Design School and their initial design sprint.

2. Replication without Redundancy: While it does leverage mobile and/or digital technology, sending health-related messages via SMS/IVR is not in itself an “innovation” in social and behavior change communication. However, with the increasing popularity of these types of messaging platforms to reach communities with important health information, a value-add is having documented best practices for this type of approach – something that has previously been sparse. This DANIDA-funded project allowed partners to test, measure, iterate, and document successes and challenges to the Lucy platform, which will benefit future scale within Benin and in other contexts. A current challenge is how to communicate the strengths of this platform - and Maternity Foundation’s expertise – as a replicable,

contextualizable solution within community-focused MNH programs.

Summary and Lessons Learned

Overall, the Lucy SMS/IVR messaging platform for simple phones proved to be an effective and appreciated vehicle to reach community members with maternal and newborn health-focused behavior change communication outside of health facilities. A mixed-methods evaluation showed positive differences between knowledge and self-reported behavior of users when compared to non-users. Partners also captured important process documentation including:

- **Community enrollment is key:** community-based enrollment led by a local NGO was successful for raising awareness of the Lucy SMS/IVR platform and onboarding users.
- **Language is important:** Introductory message in French was a key barrier to comprehension and further use.
- **Delivery Options:** IVR (Interactive Voice Response) more popular than SMS (59% vs 41%), but option of both is ideal.
- **Inclusion of Men:** male partners were more interested in receiving messages than originally envisioned, and their inclusion added benefits to the project both for the men themselves and their female partners. Male involvement remained low at only 11% of users, but male users tended to be more engaged listeners than their female counterparts.
- **Urban vs. Rural:** Higher utilization was identified in rural areas as opposed to urban Cotonou
- **Sharing is Caring:** 84% of Lucy users reported sharing what they learned with others, including family members, friends, and husbands/wives. Thus, the Lucy messages may provide an avenue to start important health-related conversations within families and communities.

It is important to note that during the Lucy project, a "higher tech" solution was explored. Three different prototypes were developed for the high-tech solution in partnership with the Cotonou-based Africa Design School. However, the design research found that at this time, higher tech innovation would not be beneficial in the Benin context due to low smart phone ownership and literacy barriers.

Mobile messaging platforms continue to grow in popularity, for good reason. Yet lack of documented best practices on programmatic practicalities of these platforms can lead to stakeholders re-creating design errors. Learnings from the Lucy platform in Benin will help partners add to the knowledge base and replicate the Lucy platform in other contexts, which Maternity Foundation aims to do.

References

1. Institut National de la Statistique et de l'Analyse Économique INSAE and ICF. 2019. Enquête Démographique et de Santé au Bénin, 2017-2018. Cotonou, Bénin and Rockville, Maryland, USA : INSAE and ICF.

2. World Bank, Newborn Mortality Data. https://data.worldbank.org/indicator/SP.DYN.IMRT.IN?locations=BJ

3. Maternal mortality ratio (modeled estimate, per 100,000 live births) - Benin | Data (worldbank.org)

4. Wagnew F, Dessie G, Alebel A, Mulugeta H, Belay YA, Abajobir AA. Does short message service improve focused antenatal care visit and skilled birth attendance? A systematic review and meta-analysis of randomized clinical trials. Reprod Health. 2018 Nov 22;15(1):191. doi: 10.1186/s12978-018-0635-z

5. Feroz A, Perveen S, Aftab W. Role of mHealth applications for improving antenatal and postnatal care in low and middle income countries: a systematic review. BMC Health Serv Res. 2017 Nov 7;17(1):704. doi: 10.1186/s12913-017-2664-7

Acknowledgements*: This brief was written by Jirawat Arayanakorn, Lauren Bellhouse, and Astrid Grønbæk of Maternity Foundation and Sophia Rockel and Rosanna Rosengren-Klitgaard of PlanBørnefonden. Maternity Foundation would like to express its thanks to partners who supported and facilitated the development and launch of the Lucy Messaging Platform in Benin, including PlanBørnefonden, Plan International Benin, Viamo, and the Benin Ministry of Health.*