

# Using mobile-phone technology to change behaviour: Lessons from mNutrition

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## ABSTRACT

This article presents key lessons learned from a rigorous mixed-method evaluation of mNutrition, a global mobile phone-based advisory service that promotes behavioural change around key nutrition and farming practices to boost the nutritional health of children and adults in low-income countries. The evaluation found that the reach and sustained uptake of mobile mNutrition services remain a challenge among very poor households, with women often being excluded. mNutrition services currently have limited effect on nutrition and agriculture behaviours at scale, although active users (those users who adopted and engaged with the service) report some behavioural change. Still, well-designed mNutrition services can provide individually tailored, practical and context-specific advice that is often lacking from other information sources. Mobile phone-based advisory services alone tend to be insufficient to ensure uptake, engagement and behavioural change. In-person support features may help, but also raise the cost of the service.

## INTRODUCTION

New, innovative approaches are urgently needed to achieve Sustainable Development Goal 2 (SDG 2) and end hunger, achieve food security and improve nutrition by 2030. Effective agricultural and health extension services are vital to achieving this goal, as they provide much-needed support and advice, especially to rural populations (Larsen and Lilleør, 2014). Yet, in many low-income countries (LICs) public agriculture extension and health services are vastly overstretched, unreliable and unable to provide adequate services to meet current and future agricultural and nutritional needs. Communities in remote areas and female farmers are often severely underserved (Bush and Keylock, 2018; Tata and McNamara, 2018).

Mobile phones may offer new, innovative channels to provide hard-to-reach populations with high-quality agriculture and nutrition advisory services and to promote improved behaviours and practices (Dia et al., 2017; Hall et al., 2015). Text (SMS) and voice-based messages may

be particularly effective delivery channels for advisory services, as they only require simple mobile phones and basic (2G) connectivity, both of which are widely available in resource-poor settings.

There is significant interest in leveraging mobile phones to promote better agricultural and nutritional behaviours and practices, yet robust evidence of their effectiveness in LICs is lacking (Barnett et al., 2016). Most studies to date are small, formative assessments of SMS-based interventions to change specific behaviours (such as breastfeeding practices) or observational studies of limited methodological quality (Aker, 2011; Lee et al., 2019; Muyaya and Manwana, 2017). So far, there is a lack of large-scale, scientifically rigorous evaluations. The objective of this article is to share key learnings from our evaluation of a mobile phone-based advisory service called mNutrition. mNutrition aimed to scale up the delivery of nutrition and nutrition-sensitive agricultural information and promote behavioural change around key nutrition practices and farming decisions to help boost nutritional health in poor households. Its services were supported by the UK's Department for International Development between 2013 and 2019, organized by the GSM Association (an industry organization that represents the interests of mobile network

operators worldwide) and implemented by in-country mobile network operators. The mobile phone-based nutrition service was implemented through existing mobile agricultural (mAgri) and mobile health (mHealth) services in 12 countries throughout sub-Saharan Africa and South Asia.

We conducted a mixed-method impact evaluation of mNutrition services in Ghana and Tanzania (see Box 1 for more details on the projects evaluated). Data-collection in both countries was conducted between 2016 and 2019. The overall aim of the evaluation was to assess how effective and commercially viable the mNutrition services were in reaching poor households, increasing knowledge and improving nutrition- and farming-related behaviours. In this article, we distil key evaluation lessons for the design and implementation of mobile phone-based advisory services aimed at improving agriculture and nutrition behaviours in LICs. In particular, we impart findings on (1) the reach of mobile phone-based advisory services; (2) factors to increase the effectiveness of mobile phone-based advisory services in changing behaviours; (3) the development of effective and engaging content; and (4) the advantages of mobile phone-based services over traditional channels to change behaviour.

### Box 1. mNUTRITION PROJECTS EVALUATED IN GHANA AND TANZANIA

#### Ghana

mNutrition was implemented through an mAgri platform called Vodafone Farmers Club (VFC). This service offered an innovative combination of customized agriculture and nutrition information through SMS, by sharing local weather updates and market prices, recorded voice messages with agricultural and nutrition tips, an expert call centre to answer farming- and nutrition-related queries, discounted tariffs and free calls and text messages to other VFC members.

#### Tanzania

mNutrition was implemented through the Healthy Pregnancy, Healthy Baby SMS programme, also known as the Wazazi Nipendeni SMS programme. The programme was run by the mHealth public–private partnership initiated in 2012 by Tanzania's Ministry of Health and Social Welfare. The service offered customized health and nutrition information by text message to pregnant women, mothers with newborns and male supporters to promote good health-seeking behaviour and improve knowledge and practices around optimal childcare and nutrition. Wazazi Nipendeni was not a standalone intervention, but informed by government policy, actively promoting the use of government services for additional support (for example, regular antenatal care visits during pregnancy and child growth monitoring).

<sup>1</sup> See Barnett et al. (2017) for detailed evaluation reports on each country and IDS (2020) for more details on methodology and results.

## METHODS

The evaluation used the same sequential mixed-method design for the two countries (Ivankova et al., 2006). This included three interlinked components, which we explain briefly (Barnett et al., 2017).<sup>2</sup>

### The quantitative component

The quantitative component was designed as an experimental counterfactual design (as a randomized encouragement design in Ghana and a clustered randomized control trial in Tanzania).

**Treatment households were offered the mobile mNutrition service free of charge in a door-to-door in-person visit at the end of quantitative baseline data-collection. If they agreed to sign up for the service, they were assisted through the registration process. Control households were not given the same offer, but households in either group could have learned about the service through other promotional campaigns.**

In Ghana, quantitative data-collection took place in the Central Region and Upper West Region in 207 communities (104 treatment and 103 control). In each community, 19 farmer households were randomly sampled, for a total sample of 3 933 households at baseline in March 2017. The quantitative endline survey took place in November 2019. In Tanzania, quantitative data-collection was carried out in the three rural districts of Iringa region: Iringa rural, Kilolo and Mufindi. At baseline (October 2016), 2 833 households from 180 communities (90 treatment and 90 control) were interviewed. The quantitative endline took place in October 2018.

### The qualitative component

This component comprised three qualitative data-collection rounds: an initial exploratory study, an in-depth midline case study and a rapid follow-up study. Qualitative data-collection took place in a purposefully selected sub-sample of quantitative communities in both Ghana and

Tanzania. Qualitative data-collection was carried out only in treatment communities and consisted of around 100 in-depth-interviews (IDIs), 20 key informant interviews (KIs) and 50 focus-group discussions (FGDs) in each country.

All IDIs, KIs and FGDs were conducted in the local language by experienced interviewers, guided by semi-structured topic guides, audio-recorded (with consent), transcribed and translated into English. Data analysis was done using a directed content analysis approach (Hsieh and Shannon, 2005) and facilitated by NVivo software. For added rigour, data coding was done independently by two researchers and coding schemes were then discussed and merged into a joint scheme.

### The business-model-and-cost-effectiveness component

This component consisted of multiple data-collection rounds, comprising stakeholder interviews, commercial and end-user data analysis, document analysis and evidence from the quantitative and qualitative components. To fully understand the complexity of the partnerships involved in the mobile mNutrition services, we used Osterwalder and Pigneur's (2010) canvas to guide the structure of the analysis.

### Ethics and consent

Ethical approvals for the evaluations were obtained from the Institute of Development Studies (IDS) Research Ethics Committee and the International Food Policy Research Institute's Institutional Review Board. The evaluation in Ghana was approved by the Ethics Committee of the Humanities based at the University of Ghana. The evaluation in Tanzania was approved by the country's Commission for Science and Technology. Informed written or oral consent was collected from all participants prior to the start of the interviews.

### Limitations and strengths of the evaluation

The evaluation has several limitations. First, we only evaluated two of the 12 country mNutrition projects. The findings from these two evaluations do not necessarily reflect the performance of the others. Second, the fluidity and speed of change in the digital landscape can make it difficult to evaluate the full impact and potential of mobile phone-based interventions. During the evaluation, both VFC and Wazazi Nipendeni changed on several occasions (for example, in the

<sup>2</sup> See Barnett et al. (2017) for the detailed methodology of each component, including sampling strategies and data-collection instruments used.

number of messages sent out per month). The evaluation design was adapted accordingly without negatively impacting the internal validity of the design. A notable strength of the evaluation design was the three-pronged mixed-method approach, which allowed comprehensive insights into different aspects of the mobile phone-based services from both a user and supply-side perspective.

## RESULTS

This section sets out the key lessons learned for the design and implementation of mobile phone-based advisory services aimed at changing nutrition and agricultural practices.

### Reach and sustained use of the mNutrition services were low

The impact, cost effectiveness and commercial sustainability of mobile phone-based advisory services rely heavily on the total number of subscribers (McNamee et al., 2016), so reach is particularly salient. For this evaluation, we defined reach as whether and how the intended target groups took up, engaged with and ultimately used mNutrition services. We found that both the reach and sustained use of the mNutrition services were low. Only 34 percent of the treatment households in Ghana reported having used VFC at least once and 66 percent of the treatment households in Tanzania reported having received an SMS message with nutrition information at least once. In Ghana, only 27 percent of participating households had someone still signed up to VFC at the time of the endline survey. In Tanzania, only 18.5 percent of the 545 treatment households that reported ever receiving Wazazi Nipendeni had received a message in the month prior to the survey.

Mobile phone-based information services can only promote behavioural change if they reach and are taken up by the target population. Common barriers to reach and sustained engagement seen in the two studies were shortcomings in the supportive infrastructure (such as limited network coverage, difficult electricity access and multi-SIM-card behaviour, with frequent loss of SIM cards). Other barriers included limitations in the capacity of users (for example, illiteracy or limited familiarity with voice messages), issues with implementation (for instance, some users never received the mobile phone-based information service or the service was suddenly discontinued without reason) and problems in the design of the service (such as a lack of human support to profile households and encourage continued engagement). We also found that women, who often had limited access

to mobile phones and were more likely to be illiterate (so could not read SMS messages), were frequently excluded from mNutrition services.

### Impacts of mNutrition on knowledge and behaviours varied, but were generally small

In Ghana, we found that VFC had no impact on the nutrition, farming knowledge or behaviour of the populations that had been offered the VFC service or that had used the service at least once. Wazazi Nipendeni had some modest impacts on knowledge about infant and young-child feeding practices and on dietary diversity for women and children, but these changes did not translate into improvements in the nutritional status of children. This lack of impact can be explained in part by the low reach of the services and the very limited sustained engagement of households.

Despite the limited measurable overall impact, qualitative and quantitative sub-group analyses of active mNutrition users found a wide variety of self-reported individual changes in behaviour and practice in response to the mobile phone-based service. Users of VFC were more likely to have acted on agricultural advice than on nutrition advice. This suggests mAgri platforms may not be an effective channel for delivering nutrition advice. Our qualitative data suggests that nutrition advice was mainly valued by female farmers, who were usually responsible for all domestic chores in rural Ghana, including food preparation and childcare. In contrast, most male farmers perceived nutrition advice as not relevant and prioritized agriculture advice.

**The qualitative findings suggest that human support (such as in-person training) is necessary to influence practices such as breastfeeding, or to motivate farmers to make higher-risk changes to their agricultural practices. This should be offered to complement mobile phone-based services (for example, by encouraging users to seek interpersonal support from local services). Mobile phone-based services alone cannot help households to develop the skills they need to put the information into practice.**

## Tailored content is important to ensure continued engagement

Households that used the mNutrition services considered most of the agriculture and nutrition advice to be easy to understand, useful and relevant. In particular, users valued the fact that the content was tailored to their specific characteristics and needs (for example, their preferred local language, location, crop cultivated or stage of pregnancy). Tailored information was highly valued and was perceived as more relevant than the general agricultural and nutrition information households usually received from health and agricultural extension workers.

Accurate tailoring of content also helped to build users' trust in the relevance of the service (which was important, as there was no human interaction to build trust and sustained engagement). The need to accurately target agricultural messages, in particular, however, can be involved, making registration processes complex. This is both expensive and difficult to manage at scale and discourages users, who prefer single-click registration processes.

Households appreciated the non-judgemental tone of the mNutrition messages, especially in Tanzania, where users contrasted it with their experience of health workers, who frequently attributed poor child nutrition (such as undernutrition) to maternal failings.

## MOBILE PHONES CAN DELIVER INFORMATION EASILY AND MORE EFFECTIVELY

The evaluation identified several features that distinguished mobile phone-based information services from traditional information services for agriculture and nutrition. Mobile phone-based information services are well suited to the delivery of both area- and time-sensitive information (such as weather forecasts, market prices and time-sensitive information for different stages of pregnancy).

Moreover, they can do this more effectively and cheaply than most other information sources, even in remote, inaccessible areas (provided, of course, there is network coverage, which is often a big challenge). Mobile phone-based information is also more convenient for users, as it can be accessed at a time that best suits the recipient (for voice-based messages, this assumes voicemail is set up), as well as saved and reread or listened to again. This can help to address information asymmetries, saving time and resources on information seeking.

## RECOMMENDATIONS FOR POLICY AND PRACTICES

The evaluation of the mNutrition services in Ghana and Tanzania identified the following lessons for the design and implementation of mobile phone-based advisory services in LICs. To optimize the reach and uptake of mobile phone-based advisory services:

- 1. Ensure supportive infrastructure is in place:** If these requirements are not met, alternative modes of content delivery (such as radio or community outreach) or blended approaches (for example, radio and community workers) may have broader reach and be more inclusive.
- 2. Consider potential gender-based exclusions from mobile phone-based services in the design phase:** In contexts where women lack sufficient autonomy over access to a mobile phone (where access is not controlled or restricted by the phone's owner) different ways of content delivery may be more effective.
- 3. Design your service to match the capacity of the target group:** In areas with high literacy levels, text-based information can be cost effective. However, in areas with low levels of literacy, voice-based information may be a better option, although it is important to ensure people have the required digital literacy to access voice-based messages. It is also crucial to remember that voice-based messages are considerably more expensive than SMS and could substantially increase costs.
- 4. Design features to help increase reach and uptake:** Easy registration and profiling processes, preferably assisted by a trusted person (such as a health worker or agricultural extension worker), clear sender details, so that messages are not mistaken for spam, and the possibility of linking service use to more than one SIM should be considered when designing such services to increase reach and uptake.

To increase the effectiveness of mobile phone-based services in changing behaviour:

- 1. Introduce interactive components (such as call centres) and face-to-face contact (such as local support groups)** to promote behaviour change. Do not rely solely on 'pushing out' information to passive audiences.
- 2. Combine mobile phone-based information services with financial services or ongoing interventions (such as livelihood improvement programmes or social protection programmes)** that provide poor households with the



financial resources needed to act on the information. Users of mobile phone-based services can only act on information if they have the financial resources to do so.

- 3. Integrate a mobile phone-based information service into existing programmes or policies** (as was done in Tanzania), where such services can help to reinforce and embed existing knowledge and ultimately change behaviour.

To develop engaging content:

- 1. Provide practical, low-cost advice** that is actionable and achievable. This type of hands-on information is often missing from other services. Rather than advocating for evidence-based best practices, messages need to be context-specific and feasible in resource-poor settings.
- 2. Ensure that content is carefully tailored to individual characteristics and information needs, as poor targeting can quickly result in disengagement.** However, tailoring is time-consuming, laborious and difficult to conduct at scale.
- 3. Consider alternative channels to engage male farmers with nutrition issues.** Our findings from Ghana show the inclusion of nutrition tips in mAgri platforms is valued by female, but not male farmers. Alternative channels are needed to involve men in nutrition (for example, nutrition education during antenatal care sessions that are mandatory for both parents). Given female farmers' interest in nutrition advice alternative channels that only deliver nutrition information might also be more engaging, as they are more focused (for example, mobile phone-based nutrition services).

Consider the use of mobile phone-based information services:

- 1. Where access to timely information is a challenge** (for example, because of limitations on public extension services). For instance, in Ghana, farmers valued time- and area-sensitive weather, market prices and agricultural information delivered to their mobile phones. In Tanzania, users appreciated information tailored to each week of pregnancy and early childhood.
- 2. Where routine access to information is a challenge.** In both Ghana and Tanzania, users valued the regular flow of information on agriculture, health and nutrition. Mobile phone-based services can be especially useful in terms of supporting overwhelmed and underfunded public services that can only provide very limited contact time for each household.

## CONCLUSIONS

Mobile phone-based services are not a magic bullet, but they are valued by users who engage with them, so could be a valuable addition to programmes aimed at improving nutrition and agriculture-related knowledge and changing behaviour. Mobile phone-based advisory services alone tend not to be enough to affect nutrition outcomes, which generally have complex determinants. Human interactions are vital to support, facilitate and ensure sustained engagement with the services.

There are still multiple outstanding implementation and programmatic issues with mobile phone-based advisory services that hamper large-scale reach, uptake and sustained engagement. Mobile phone-based services can also generate new inequalities, as poor households that cannot afford a phone are excluded from the service (and were excluded from this evaluation). There is a risk that the poorest and most marginalized will be left behind by such services (Hernandez and Roberts, 2018).

Mobile phone-based services to change behaviour are likely to be most effective if embedded in trusted structures (such as agriculture extension services), if they are linked with other programmes that address underlying barriers to change (such as social protection programmes) and paired with established low-tech, inclusive approaches (such as radio).

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