External evaluation of mobile phone technology-based nutrition and agriculture advisory services in Africa

Mobile phones, nutrition, and health in Tanzania: Qualitative follow-up study report

Inka Barnett, Becky Faith, Becky Mitchell, Stephanie Brockerhoff, and Deogardius Medardi

31st March 2020

Acknowledgements

e-Pact	Level 3, Clarendon House	Tel	+44 (0) 1865 207300
	52 Cornmarket Street	Fax	+44 (0) 1865 207301
	Oxford OX1 3HJ	Email	admin@opml.co.uk
	United Kingdom	Website www.opml.co.uk	

e-Pact   i

Disclaimer

This report has been prepared by the e-Pact consortium for the named client, for services specified in the terms of reference and contract of engagement. The information contained in this report shall not be disclosed to any other party, or used or disclosed in whole or in part without agreement from the e-Pact consortium. For reports that are formally put into the public domain, any use of the information in this report should include a citation that acknowledges the e-Pact consortium as the author of the report.

This confidentiality clause applies to all pages and information included in this report.

This material has been funded by UK aid from the UK Government; however, the views expressed do not necessarily reflect the UK Government's official policies.

e-Pact	Level 3, Clarendon House	Tel	+44 (0) 1865 207300
	52 Cornmarket Street	Fax	+44 (0) 1865 207301
	Oxford OX1 3HJ	Email	admin@opml.co.uk
	United Kingdom	Website	www.opml.co.uk

Executive summary

The mNutrition intervention in Tanzania

mNutrition is a global initiative supported by the UK Department for International Development (DFID), managed by Groupe Spéciale Mobile Association (GSMA), and implemented by in-country mobile network operators (MNOs) and third-party providers, which aims to use mobile technology to improve the health and nutritional status of children and adults in low-income countries around the world. The potential to utilise mobile technology to change attitudes, knowledge, behaviours, and practices around health and agriculture to achieve improved nutritional status has been recognised for some time, but to date there have been no rigorous evaluations of m-services at scale. mNutrition is implemented through existing mAgri and mHealth value-added services in 12 countries throughout sub-Saharan Africa and South Asia. The nutrition content aims to promote behaviour change around key farming practices and around dietary and child feeding practices that are likely to result in improved nutritional health within households.

In Tanzania mNutrition is implemented through the 'Healthy Pregnancy, Healthy Baby' (HPHB) SMS (text messaging) programme, which is part of the Wazazi Nipendeni mHealth platform (WN). The programme is run by the mHealth Tanzania public–private partnership, which was initiated in 2012 by the Ministry of Health and Social Welfare, with financial support from the US Government Centers for Disease Control and Prevention (CDC). WN is targeted at pregnant women and mothers of young children and their partners (husbands, etc). It is available nationally and on all phone networks.

The HPHB SMS service sends free text messages in Swahili discussing a range of pregnancy and early childhood issues. Nutrition was a small component of the original HPHB SMS service but this was extended substantially with the addition of the mNutrition content (approximately 120 nutrition messages). The resulting product is referred to as WN plus mNutrition in this report.

Evaluation design

The aim of the impact evaluation is to assess the impact, cost-effectiveness, and commercial viability of two services[1] within the broader portfolio of the GSMA mNutrition programme. The evaluation is being conducted by a consortium of researchers from Gamos, the Institute of Development Studies (IDS), and the International Food Policy Research Institute (IFPRI). The team is drawing on a number of methods and interlinked components to gather evidence about the impact of the WN plus mNutrition, including a qualitative component, a quantitative component, and a business model and cost-effectiveness component. The evaluation is being conducted in Iringa Region in Tanzania.

This report presents the findings of the third and final round of qualitative data collection, conducted in March 2019. Data collection was carried out by Oxford Policy Management (OPM) Tanzania, in close coordination with the IDS qualitative team, led by Dr Inka Barnett.

More specifically, this qualitative follow-up study aims to: (1) identify the underlying reasons for sustained or continuous engagement with WN plus mNutrition in a context within which most

---

[1] An mHealth service plus mNutrition in Tanzania, and an mAgri service plus mNutrition in Ghana.

mothers[2] have disengaged with the service;[3] and (2) explore pathways by which WN plus mNutrition services promote change in infant and young child feeding (IYCF) practices and dietary diversity (among children and mothers). The focus of the final qualitative data collection is on the subgroup of treatment mothers who are still signed up and actively using WN plus mNutrition, and a subgroup of treatment mothers who used WN plus mNutrition for at least 12 months continuously but no longer use the service.[4]

The qualitative follow-up study aims to address the following two questions:

1. What factors influence mothers to continue to engage with WN plus mNutrition services for at least 12 months?

2. What are the pathways by which WN plus mNutrition services promote a change in IYCF practices and dietary diversity (among children and mothers), leading to improved nutrition and livelihood outcomes?

Findings from the qualitative follow-up study will be combined and triangulated with the quantitative endline and business model/cost-effectiveness endline. A combined evaluation report covering all three research components will be available in early 2020.

Findings

Previous findings (both from the qualitative and quantitative evaluations) found only very low levels of continued engagement on the part of mothers with WN plus mNutrition. While much of the limited engagement can be explained by implementation issues both related to the mother's context (e.g. access to a mobile phone) and at the programme level, it also highlights an urgent need to develop more effective strategies to promote mothers' engagement with mobile phone-based services. If mothers fail to engage with WN plus mNutrition, they miss the opportunity to see content that could help them to actively improve IYCF, as well as their own and their household's diets. The qualitative follow-up study found that factors related to the characteristics of the mother, the design and content of WN plus mNutrition, the mode of delivery, and the setting within which WN plus mNutrition is used can influence long-term engagement.

Characteristics of mothers

The qualitative data revealed multiple gendered barriers to long-term engagement with WN plus mNutrition, with mothers who did not own a mobile phone themselves often being excluded from some or even all text messages (e.g. as the owner of the mobile phone did not share the message content with them for various reasons). Access to a mobile phone did not ensure continued access to the service for mothers, however. Mobile phone ownership increased the chances that mothers could access and engage with all text messages but it was not a guarantee of sustained access, as a few husbands closely monitored women's access to their own phones. Merged technology approaches that include alternative communication channels (e.g. radio) are likely to be more

---

[2] Here we refer only to mothers in the quantitative treatment group that were signed up to WN plus mNutrition by the quantitative evaluation team at baseline. While the quantitative sample mainly consisted of mothers, in a sub-sample of households both the mother and a male household member (usually the father) were registered with WN plus mNutrition. In the following we will only refer to 'mothers', for the sake of simplicity.
[3] Previous qualitative rounds and the quantitative evaluation suggest a multitude of reasons for disengagement, with most related to problems around the implementation of WN plus mNutrition (both at the level of mothers and of the programme) and not around the content of the service.
[4] Based on quantitative endline data n=101 mothers from the treatment group reported still using WN plus mNutrition services in the month preceding the quantitative endline survey (Gilligan *et al.*, 2020).

inclusive in contexts with limited female mobile phone ownership. Radio ownership was generally high in all qualitative communities and most women said that they regularly listened to the radio.

The qualitative follow-up study found that mothers in their twenties were most likely to engage in the long-term, which is not surprising given that this is the peak of fertility for women in Tanzania and the time when there is the most need for information on infant and young childcare and feeding practices. Both first-time mothers as well as experienced mothers continued to engage, although the reasons for their engagement varied. First-time mothers sought to receive guidance and reassurance from the messages, whereas experienced mothers wanted to get access to the latest knowledge on childcare and sought information on specific childcare-related problems that they had not experienced with their previous children. Considering the different information needs of first-time and experienced mothers in the messages may help to increase the long-term engagement of different types of mothers (however, it might also increase the implementation costs).

While mothers from poor and less poor households continued to engage with the service, the qualitative findings suggest that mobile phone-based services may be less effective in reaching very poor mothers in the long term. Incorporating other more inclusive channels (e.g. radio and community meetings) could ensure that very poor mothers are reached.

First-time mothers appreciated the anonymity of the messages, as they lacked confidence to approach healthcare workers or experienced mothers with their specific questions. Overworked and unappreciated mothers felt acknowledged and cared for by frequent messages, and the messages also helped to alleviate the feeling of social isolation among new mothers. These findings suggest that mobile phone-based messages can potentially act as an important support structure for mothers, far beyond delivering information.

Design and content of WN plus mNutrition

Mothers were motivated to continue to engage with WN plus mNutrition as the service provided supportive information without implying that poor child health and nutrition outcomes were their fault. To ensure that mothers continue to engage, occasional messages praising mothers for their continuous efforts may further motivate mothers.

The focus on practical, hands-on advice that was often lacking from their healthcare workers (because healthcare workers were overstretched and did not have time to provide advice), and the empowering properties of WN plus mNutrition, emerged as strong motivators for continued engagement.

Mode of delivery of WN plus mNutrition

With regards to the mode of delivery, the mothers who did continue to engage with WN plus mNutrition explained that this was because the service satisfied their need for continuous reassurance and information regarding childcare and feeding, and was tailored to the age of their baby. At the time of the fieldwork this need was not addressed (or addressed poorly) by other sources, and the service provided a high level of flexibility. This suggests that it is useful to ensure that the messages are sent frequently, especially during the first months after birth, when mothers are eager for both information and reassurance.

Setting in which WN plus mNutrition was used

Overcrowded health facilities and overstretched health workers meant that mothers only occasionally obtained access to individualised advice. In this context, the text messages helped to satisfy mothers' needs for frequent information. In a context of poorly-performing healthcare systems, mobile phone-based services may offer the opportunity to help to address some of the shortcomings in service delivery (with regards to access to information and ongoing support), with the caveat that the barriers that prevented most mothers from continuously engaging with WN plus mNutrition would need to be addressed.

A very common request among mothers was to combine text messages with some form of human support (e.g. a call centre which mothers could contact if they have further questions). There is evidence in support of this in the literature, which highlights the importance of some kind of real-time human support to increase continued engagement with digital behaviour change interventions.

Findings on the pathways by which WN plus mNutrition promoted change, and recommendations for policy and practice

Some mothers used the WN plus mNutrition messages to enhance their bargaining power in intra-household spending negotiations by convincing husbands to purchase more nutritious foods or to provide mothers with money to do so. For these women, the messages gave their requests more weight and credibility as the messages were believed to be based on the objective advice of the government/national experts. The trustworthiness and credibility of the messages should be promoted widely to support women's use of the messages as an effective tool in intra-household decision-making processes.

Some mothers perceived the WN plus mNutrition messages as a form of constant monitoring of their childcare practices. They believed that the messages guided them in the manner of a 'friendly coach', pointing out sub-optimal practices in a supportive manner (and without reproaching them). To maintain the perception of a friendly and omnipresent coach, the non-judgemental tone and the accurate timing of the messages (e.g. in regard to particular stages during pregnancy) needs to be sustained. The high frequency of messages is also important.

Mothers used advice from WN plus mNutrition to develop their own context-specific approaches, adapted to their financial conditions and capabilities (e.g. feeding meat whenever they could afford it, rather than several times a week). We should not expect unilineal knowledge transfer and the translation of mobile phone-based advice into practice to take place; rather, the flexible use of the information to inform learning should be encouraged.

In some mothers WN plus mNutrition messages increased uptake of various healthcare services (e.g. antenatal care) by acting as a frequent reminder and promoter. However, increasing the demand for healthcare services without increasing their availability and quality is unlikely to lead to significant improvements in maternal and child health and nutrition.

Table of contents

List of figures and tables

List of abbreviations

CDC	US Centers for Disease Control and Prevention
DFID	UK Department for International Development
GSMA	Groupe Spéciale Mobile Association
HPHB	Healthy Pregnancy, Healthy Baby
IDS	Institute of Development Studies
IFPRI	International Food Policy Research Institute
IYCF	Infant and young child feeding
MNO	Mobile network operator
OPM	Oxford Policy Management
PPI	Poverty Probability Index
SMS	Short messaging service
USAID	United States Agency for International Development
WN	Wazazi Nipendeni

1   Introduction

1.1   mNutrition

mNutrition is a global initiative supported by DFID, organised by GSMA, and implemented by in-country MNOs and third-party providers, which aims to use mobile technology to improve the health and nutritional status of children and adults in the developing world. The potential to utilise mobile technology to change attitudes, knowledge, behaviours, and practices around health and agriculture to achieve improved nutritional status has been recognised for some time, but to date there have been no rigorous evaluations of m-services at scale. A consortium of researchers from Gamos, IDS, and IFPRI have been contracted to conduct a rigorous mixed-methods evaluation to estimate the impact of two mNutrition services on children and adults, and to understand how the context and the components of the mNutrition intervention shape its impact.

mNutrition is being implemented through existing mAgri and mHealth services in 12 countries throughout sub-Saharan Africa and South Asia. The nutrition content aims to increase knowledge and promote behaviour change around key farming decisions and practices, and around maternal and other household practices, which are likely to result in improved nutritional health within a household. The mNutrition initiative aims to lead to the following changes in outcomes: (i) increased adoption of new nutrition-sensitive agricultural practices, improved agricultural productivity, and greater use of post-harvest technologies; (ii) improvements in nutrition practices relating to women during pregnancy, IYCF, and micronutrient supplementation of children at risk; and (iii) increased demand for nutrition and agriculture extension services.

The evaluation is expected to measure the impact, cost-effectiveness, and commercial viability of mNutrition, using a mixed-methods design. Evaluations are being conducted on two services: Ghana mAgri and Tanzania mHealth (the focus of this report). In order to satisfy the objectives of the terms of reference, the evaluation is composed of the following components:

- A **quantitative impact evaluation**, employing a randomised encouragement design to determine the causal effect of the service on dietary diversity, agricultural income, and production. A baseline survey occurred before the start of the encouragement activities, and an endline survey occurred 18 months later.
- A **qualitative impact evaluation**, which consists of three qualitative data collection rounds (i.e. an initial exploratory qualitative study, in-depth case studies at midline, and rapid explanatory qualitative work after the quantitative endline survey data collection). This aims to provide understanding of the context, underlying mechanisms of change, and the implementation process of mNutrition.
- A **business model and cost-effectiveness evaluation** employing stakeholder interviews, commercial and end-user data, document analysis, and evidence from the quantitative and qualitative evaluations to generate a business model framework and estimate the wider imputed benefits from the value-added service for the range of stakeholders involved.

The mixed-methods evaluation design addresses the following research questions specified in the terms of reference (see Annex A):

1. What are the impacts of mobile phone-based nutrition and agriculture services on nutrition, health, and livelihood outcomes, especially among women, children, and the extreme poor, and how cost-effective are they?

2. How effective are mobile phone-based services in reaching, increasing the knowledge, and changing the behaviour of the specific target groups?

3. Has the process of adapting globally agreed messages to local contexts led to content that is relevant to the needs of children, women, and poor farmers in their specific context?

4. What factors make mobile phone-based services effective in promoting and achieving behaviour change (if observed), leading to improved nutrition and livelihood outcomes?

5. How commercially viable are the different business models being employed at country level?

6. What lessons can be learned about best practices in the design and implementation of mobile phone-based nutrition services to ensure (a) behaviour change and (b) continued private-sector engagement in different countries?

The primary target user of the evaluation results is DFID, along with other key stakeholders, including GSMA and its national members (including local MNOs implementing WN plus mNutrition services), national governments (in particular, ministries of health and agriculture), and international agencies and donors, as well as community-level health and agriculture extension workers. The reports from the evaluation will be publicly available on IFPRI and IDS's websites.

1.2   Objectives of mNutrition in mHealth

In Tanzania, mNutrition is implemented through the HPHB SMS (text messaging) service. The mass media programme accompanying the service is called WN. WN is a project that is funded by the CDC and that brings together multiple partners who are contributing towards shared goals. Phase 1 of the programme, launched in 2012, was initially developed in coordination with the Tanzania Capacity Communication Project, a United States Agency for International Development- (USAID-) funded programme led by the Johns Hopkins Center for Communication Programs. WN is one of several behaviour change communication programmes using methods as diverse as TV drama series, radio distance learning for community health volunteers, and several integrated mass media campaigns. The public–private partnership was initiated by the Ministry of Health and Social Welfare,[5] with financial support from CDC.[6] WN is available nationally and on all phone networks.

The HPHB SMS service sends free text messages containing healthcare information to pregnant women, mothers with newborns, male supporters, and general information-seekers in Tanzania to drive health-seeking behaviour. The SMS messages are sent in Swahili. Originally, the messages were sent to women up to 16 weeks post-partum on a range of pregnancy and early childhood issues. Now, anyone interested in receiving healthy pregnancy information and appointment reminders can text the word 'MTOTO' (child) to the short code 15001. Registrants receive instructional messages, allowing them to indicate the woman's current week or month of pregnancy (or the age of the newborn baby) during the enrolment process. This process allows recipients to receive specific text messages relevant to the time and stage of their pregnancy and age of their child.

The mNutrition programme has supported mHealth projects in eight countries through the development of nutrition content, and GSMA has assisted projects with product development, primarily through subscriber experience research and business intelligence support. Nutrition-

---

[5] This has since been renamed the Ministry of Health, Community Development, Gender, Elderly and Children.
[6] The WN campaign and text messaging service is funded by the US Government through USAID, the CDC, the US President's Malaria Initiative, and the US President's Emergency Plan for AIDS Relief. It is run in coordination with the National Malaria Control Program, the National AIDS Control Program, and the Health Promotion and Education Section. On the ground, health facility orientation support is also provided by the US Government, and Aga Khan Health Services. Other implementing partners include Jhpiego, EGPAF, the Mwanzo Bora Program, CCBRT, Tunajali Project, Plan International, the Aga Khan Foundation, and others.

related content was a small component of the original HPHB SMS service but this was extended substantially with the addition of content contributed by GSMA under the mNutrition programme. mNutrition added roughly 120 nutrition messages, which are delivered to caregivers of children up to five years old. Messages provide information on diet/micronutrient intake during pregnancy, breastfeeding, complementary feeding practices, and care and feeding of young children. The resulting product is referred to as 'WN plus mNutrition' in the following sections of this report.

1.3 Purpose and scope of the qualitative follow-up study

This endline report presents the findings of the third and final round of qualitative data collection conducted in March 2019. Data collection was carried out by OPM Tanzania, in close coordination with the IDS qualitative team led by Dr Inka Barnett.

This report is narrower in scope than the previous qualitative reports: its main objective is to explore some of the issues and impact areas highlighted in the previous rounds of the evaluation as requiring more depth and exploration. More specifically, the qualitative follow-up study aims to: (1) identify the underlying reasons for sustained or continuous engagement with WN plus mNutrition in a context within which most mothers[7] have disengaged with the service;[8] and (2) explore pathways by which WN plus mNutrition services promote change in IYCF practices and dietary diversity (among children and mothers). The focus of the final qualitative data collection is on the subgroup of treatment mothers who are still signed up and actively using WN plus mNutrition, and the subgroup which used WN plus mNutrition for at least 12 months continuously but who no longer use the service.[9]

The qualitative follow-up study aims to address the following two questions:

1. What factors influence mothers to continue to engage with WN plus mNutrition services for at least 12 months?
2. What are the pathways by which WN plus mNutrition services promote a change in IYCF practices and dietary diversity (among children and mothers), leading to improved nutrition and livelihood outcomes?

This report has also been shared with the OPM Tanzania team and other members of the consortium in Tanzania and the UK (i.e. Cardo and GSMA) as part of ongoing regular communication between evaluation and programme staff to support and inform programme decision-making. Findings from the qualitative endline study will also be combined and triangulated with the findings from the other two qualitative evaluation rounds, the quantitative endline, and the business model/cost-effectiveness endline in an overall final evaluation report to be published in early 2020.

1.4 Organisation of the report

Following the description of the methodology in Section 2, a brief contextual overview of the two regions selected for this evaluation is given in Section 3. Sections 4 and 5 present the thematic

---

[7] While the quantitative sample mainly consisted of mothers, in a sub-sample of households both the mother and a male households member (usually the father) were registered with WN plus mNutrition. In the following we will only refer to 'mothers', for the sake of simplicity.
[8] Previous qualitative rounds and the quantitative evaluation suggest a multitude of reasons for disengagement, with most related to problems around the implementation of WN plus mNutrition (both at the level of mothers and of the programme) and not around the content of the service.
[9] Based on quantitative endline data n=101 mothers from the treatment group reported still using WN plus mNutrition services in the month preceding the quantitative endline survey (Gilligan *et al.*, 2020).

findings of the analysis, structured around the two aims of the qualitative follow-up study. Section 6 draws together the findings of the qualitative follow-up study and provides recommendations for policy and practice.

2 Methodology

2.1 Aims of the endline qualitative study

The qualitative follow-up study is narrower in scope than previous qualitative rounds and focuses on specific issues and impact areas highlighted in the previous qualitative and quantitative rounds as requiring more depth and exploration.

The previous qualitative rounds (and, in particular, the qualitative midline study) and the quantitative evaluation have already provided in-depth insights into the challenges observed in the implementation and with the uptake of WN plus mNutrition (Barnett *et al.*, 2018; Barnett *et al.*, 2019; Gilligan *et al.*, 2020 (forthcoming)). These included contextual challenges, such as gendered barriers to access to a mobile phone, and programme-related challenges, such as the fact that a large number of treatment households never received WN plus mNutrition or received the service only for a limited time. The reports also noted multiple or dual SIM card behaviour, with a preference for a SIM card different to the one that was used to sign up to WN plus mNutrition, the loss of a SIM card or mobile phone, and mistaking WN plus mNutrition messages as spam. The quantitative impact evaluation quantified many of these findings and concluded that implementation challenges contributed to the low uptake of, and lack of engagement with, WN plus mNutrition services. Only 545 (of n=1,428) treatment households reported ever having received WN plus mNutrition, and only 18.5% of these households (n=101) reported still receiving a message in the month preceding the survey (Gilligan *et al.*, 2020).

Despite the very limited use of WN plus mNutrition, mothers who did actively engage with the service (i.e. read the text messages) generally trusted and valued WN plus mNutrition, as is shown both in the qualitative and quantitative evaluations. This qualitative follow-up study specifically focuses on this sub-sample of mothers who engaged with WN plus mNutrition services over at least 12 months. Focusing on these mothers provides in-depth insights into factors that influence long-term engagement with WN plus mNutrition, highlighting the programmatic strengths and areas that could be improved to increase the efficacy and reach of the service. The qualitative follow-up study aims to address the following two overarching questions:

1. What factors influence mothers to continue to engage with WN plus mNutrition services for at least 12 months?

A better understanding of the factors that influence continuous engagement with WN plus mNutrition services can help to inform the design of future mHealth and mNutrition interventions (e.g. by addressing specific information needs). Previous evaluation and research studies have shown that a lack of engagement with digital behaviour change interventions is common, and some studies have suggested a reciprocal relationship between the effectiveness of the intervention in changing users' behaviour and the length and level of engagement (Donkin *et al.*, 2011; Alkhaldi *et al.*, 2016). Lower levels of engagement were often associated with lower intervention effectiveness. Finding strategies to promote sustained engagement with mobile phone-based interventions is therefore important.

2. What are the pathways by which WN plus mNutrition services promote a change in IYCF practices and dietary diversity (among children and mothers), leading to improved nutrition and livelihood outcomes?

The qualitative midline found that mothers who engaged with the service also acted upon at least some of the advice. However, contextual barriers often impeded the translation of the advice into

practice. The most commonly cited barriers were financial constraints, followed by a limited availability of fresh food and work outside the home, which could negatively affect childcare practices. The quantitative impact evaluation found that there were some, though minimal, impacts of WN plus mNutrition services on dietary diversity (among children and mothers), and on knowledge about optimal IYCF among fathers and mothers (Gilligan *et al.*, 2020). The qualitative follow-up study also aims to extend the understanding of the pathways of behaviour change and how the mobile phone-based WN plus mNutrition service contributed to the change.

2.2   Sampling strategy

Iringa Region was selected as the study region for both the quantitative and qualitative data collection during the baseline phase and remained the focus for midline and endline data collection (see Figure 1).

Figure 1:   Iringa Region in Tanzania

Other regions in Tanzania
Iringa
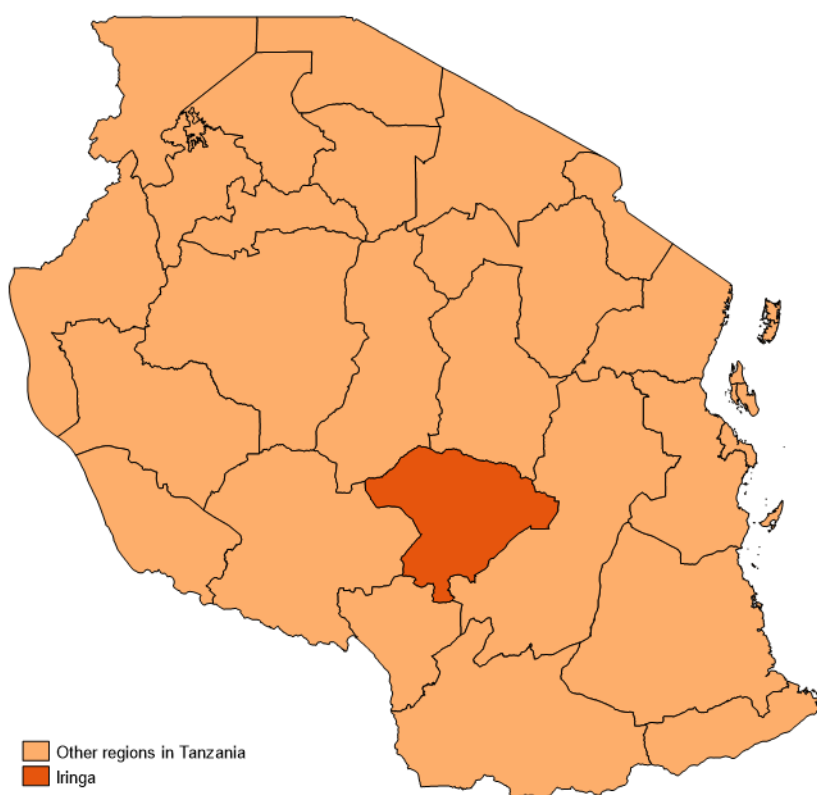
Source: Gilligan *et al.*, 2020.

2.2.1   Community selection

The qualitative endline data collection took place in three sites (two in Mufindi and one in Iringa Rural). The sites were selected based on the quantitative endline data and only included treatment villages.

The initial plan was to conduct the qualitative follow-up study in the communities that were also the focus of the qualitative midline study (see inception report for this impact evaluation (Barnett *et al.* 2018)). However, in light of the quantitative endline data on the use of WN plus mNutrition it soon became obvious that the number of mothers that still actively used WN plus mNutrition was extremely small (i.e. between one and four households per village). To achieve our aim of

interviewing at least 50 mothers, we had to go beyond our initial selected villages and also include neighbouring villages with active WN plus mNutrition users. We also decided to include mothers who used WN plus mNutrition services over the long term (i.e. for at least 12 months) but no longer engaged with the service. Table 1 provides a detailed description of the mothers selected for the qualitative follow-up. In each village, all mothers who still actively engaged with WN plus mNutrition or who were engaged for at least 12 months were identified (based on the quantitative data; see column 5) and invited to participate in the interviews. Overall, 79 mothers were invited to be interviewed and 57 participated in the interviews. Most of the mothers who were invited but were not interviewed were either travelling or could not be reached.

The very limited number of active users of WN plus mNutrition per village (and the geographical distance between villages, as determined by GPS mapping) also made it logistically difficult to recruit sufficient numbers of mothers to conduct focus group discussions, which we had originally planned to do (Barnett *et al.*, 2016). We therefore decided not to carry out any focus group discussions.

Table 1: **Detailed descriptions of the participant selection for the qualitative follow-up study**

District	Cluster	Villages	Treatment individuals	Long-term WN users who are no longer active		Long-term WN users who are still active	
				Invited	Interviewed	Invited	Interviewed
Mufindi	Cluster 1	Mlevelwa	17	1	0	0	0
		Ikanga	17	1	1	2	2
		Mpanga	17	1	1	0	0
		Sawala	18	3	3	2	1
		Vikula	17	3	2	1	0
		Kasanga	18	3	2	1	1
Mufindi	Cluster 2	Utosi	16	1	1	3	3
		Tambalang	18	1	1	3	1
		Ihanzutwa	17	1	0	0	0
		Uhambila	18	2	1	2	2
		Nyanoro	17	1	1	1	0
		Mangawe	17	1	1	2	1
Iringa Rural	Cluster 3	Weru	19	1	1	2	2
		Kilambo	19	4	4	4	2
		Ugwachanya	18	2	1	1	0
		Tanangozi	17	3	3	1	0
		Mangalali	16	3	3	1	1
		Magubike	15	1	1	2	1
		Ilambilole	18	3	1	3	3
		Usengelinde	16	4	4	3	1
		Igula	19	3	3	2	1
Total		**21**	**364**	**43**	**35**	**36**	**22**

* Village names have been anonymised.

Source: Authors' own

2.2.2   Community engagement

In all villages, the team followed the following steps to mobilise participants for the fieldwork.

Informing participants and village officials over the phone: In each village, the team leader made phone calls to individual participants, in which they introduced the research and checked in on their availability. Later, the team made phone calls to village officials in order to introduce the research, explain the legitimacy of our activities, and request the assistance of the chairperson in introducing the research team.

Physical visits to households: If participants could not be reached over the phone or by the village chairman, the team leader physically visited the household. In these cases, attempts were made to reach participants in this way in order to obtain additional contact details, and to schedule interviews when possible.

2.3   Data collection methods

2.3.1   Development and pilot testing of the tools

As per the baseline and midline phases, the qualitative fieldwork was conducted by OPM Tanzania, in close collaboration with IDS, who drafted the data collection tool (i.e. the topic guide with lists of questions and prompts). Tool development was informed by the literature, findings, and tools from the previous phases of the project.

Once drafted, the topic guide was shared with Professor Laura Camfield from the University of East Anglia for external peer review, as well as with IFPRI and Gamos for their input. Following receipt of feedback, IDS reworked the tools and presented them for discussion and refinement as part of a joint IDS–OPM Tanzania researcher training workshop held between 3 and 6 March 2019 in Tanzania.

The topic guides were piloted as part of a fieldwork pilot carried out in Kilambo village in Iringa Rural District on 6 March 2019. Following the piloting process, the tools were further discussed and modified by the research teams. The modification included changes to the wording and structure of some of the questions to enable them to flow better and maintain the engagement of participants. OPM Tanzania's lead researcher, as well as the IDS team (via WhatsApp), was also available to provide continued guidance and support during the entire data collection.

The final set of topic guides (in English and Swahili) are included as Annex B.

2.3.2   Training of data collection team

The OPM Tanzania core research team comprised five experienced qualitative researchers, three of whom were involved in the midline data collection and two of whom were part of the endline quantitative research team and so already had a good prior knowledge of the regional context, programme, and evaluation design and expectations. As in the baseline and midline phases, training of the endline data collection team was carried out jointly by the IDS team (co-Principal Investigator Dr Inka Barnett and Evaluation Programme Manager Becky Mitchell) and OPM staff (Fieldwork Manager Deogardius Medardi).

Training activities covered: 1) an overview of the mNutrition programme design in Tanzania; 2) a review of nutrition SMS content; 2) the evaluation objectives, design, and methods; 3) a review of the findings from the baseline and midline phases of data collection (qualitative, quantitative, and business model); 4) in-depth review and refinement of draft topic guides; 5) collaborative translation of the tools into Swahili; 6) mock interviews involving research team members; and 7) field protocols and logistics, including ethical considerations, the field manual, and expectations regarding daily debriefs, transcription, and notes.

2.3.3 Data collection implementation

The researchers worked in pairs, with one adopting the role of interviewer and the other the role of note-taker. Each team discussed their findings extensively in debriefing sessions that were organised each evening after data collection. In-depth interviews were conducted in Swahili. Interviews were audio-recorded (with consent), transcribed, and translated into English by the qualitative team.

2.4 Data management and analysis

After data collection was completed, the field research team reconvened for a two-day synthesis workshop (with IDS participating remotely). During the workshop, initial emerging themes from the data were explored and discussed. Final data analysis was undertaken by the qualitative research team at IDS, led by co-Principal Investigator Dr Inka Barnett, together with Dr Becky Faith and Becky Mitchell. Qualitative data analysis software (NVivo) was used to manage and code data. Qualitative data were analysed using a directed content analysis approach focused on the main qualitative evaluation questions. Data analysis started with open coding of several interviews and the development of an initial coding scheme that guided the coding of the remaining data. To enhance the rigour of the data analysis, coding was carried out by three researchers independently. Their coding schemes were then discussed and merged into one joint scheme. While the scheme guided the coding, the scheme was flexible enough to allow for unforeseen topics that emerged to be added at any point. The draft report was shared with the OPM Tanzania team to ensure that the IDS team had correctly interpreted the raw data collected, and to allow for additional details to be added that would enhance the quality of the report.

2.5 Ethical approval

The ethics approval granted for the project by the IDS Research Ethics Committee in 2016 remains in place for the duration of the project. The research permissions provided by the Tanzania Food and Nutrition Centre and the President's Office – Regional Administration and Local Government were renewed in August 2018 and run for the duration of the project. The Tanzania Commission for Science and Technology research permit was also renewed in August 2018 and runs until August 2019. The research team also secured permission from lower government authorities in Iringa Region and all districts involved in the research.

As an overall guiding principle, the research team sought to conduct itself in a professional and ethical manner throughout the study, with respect for integrity, honesty, confidentiality, voluntary participation, impartiality, and the avoidance of personal risk. These principles were guided by the Organisation for Economic Co-operation and Development's (2010) 'Development Assistance Committee Quality Standards for Development Evaluation' and DFID's (2011) 'Ethics Principles for Research and Evaluation', which are being followed for the duration of the evaluation.

2.6 Limitations and challenges

Several methodological limitations need to be considered.

We were able to interview only 57 of the sampled 79 WN plus mNutrition users (72%). However, we believe that this did not limit the conclusions that could be drawn as most of the WN plus mNutrition mothers that could not be interviewed could simply not be reached (as the telephone numbers provided were no longer active, the mothers were travelling, or the individuals were no longer living in the sampled communities). Also, it should be noted that 57 in-depth interviews is still a considerable number of interviews for a qualitative study.

Second, low engagement with WN plus mNutrition, and resulting very low numbers of actively engaged WN plus mNutrition mothers, prompted us to adapt the sampling approach to include mothers who were no longer engaged with WN plus mNutrition but who had been engaged for at least 12 months. Because of these adaptations to the sampling approach logistics for the data collection in 21 villages became more challenging. It was also impossible to conduct in-depth contextual analysis for all 21 villages. However, as the villages in each of the selected districts were located close to each other, the context is likely to be very similar.

Third, all interviews were conducted by a team of young, educated, field researchers. The characteristics of the field team might have affected participants' comfort and degree of honesty when answering questions (e.g. introducing a social desirability bias on the part of the participants). However, the team was very experienced, familiar with local customs, and dressed appropriately according to local custom, in order to make participants feel at ease. A session was also organised at the end of the training to explain to the team how bias can have an impact on data quality.

3   District profiles

This section provides a brief description of the districts selected for the follow-up study.

3.1   Mufindi District

Mufindi District is one of the four districts of the Iringa Region of Tanzania. It is bordered to the north by Kilolo District and Iringa Rural District, to the south by the Njombe Region, to the east by the Morogoro Region, and to the west by the Singida Region. Mufindi is mountainous, and has one of the coolest and rainiest climates in Tanzania. The district is particularly known for its tea and timber industries.

Mufindi District is highly populated (total population of 283,032) and most households are involved in smallholder agriculture. Most smallholders are involved in crop farming only, followed by crop and livestock production. 38% of households in Mufindi are female-headed. The average household size is five members per household. The district has a high literacy rate, which is reflected in the concomitant high level of school attendance in the district.

The district is important in the region for its maize production, with a planted area of over 55,370 hectares, and the planted area per household is also moderate for the region. The most common source of drinking water is unprotected wells, followed closely by piped water. Mufindi is one of the districts in Iringa Region with the highest percentage of households having three meals per day. The district has the second highest percentage of households in the region that do not eat meat or fish once a week, and most households in the district never experience problems in satisfying the household food requirements.

3.2   Iringa Rural District

Iringa Rural is one of the four districts of the Iringa Region of Tanzania. It is bordered to the north by the Dodoma Region, to the east by Kilolo District, to the south by Mufindi District, to the southwest by the Mbeya Region, and to the northwest by the Singida Region.

Iringa Rural is sparsely populated (27 people/km^2), with a total population of 254,032 and with notable inter-divisional variation. Many households in Iringa Rural are involved in smallholder agriculture. Most smallholders are involved in crop farming only, followed by crop and livestock production. Neither livestock-only households nor pastoralist households are found in the district. A large percentage of households in Iringa Region engage in off-farm activities and it has one of the highest percentages of households with more than one member with off-farm income. Compared to other districts in the region, Iringa Rural has the third highest percentage of female-headed households (31%) and is among the districts that share the second lowest average age of head of household. The adult literacy rate is 76%.

Iringa Rural District has the highest percentage of households with no toilet facilities. It has the largest number of households owning mobile phones and the third largest number of households owning radios, irons, bicycles, and TV/video. It also has the second largest number of households owning wheelbarrows. The district has the second largest number of households using mains electricity in the region. The most common source of drinking water in the district is piped water. The district has the highest percentage of households in the region having one or two meals per day, and it has the lowest percentage of households having three meals per day. The district has

the third highest percentage of households that did not eat meat or fish during the week prior to enumeration, and most households have no problems in satisfying their food requirements.

4 Results: What factors influence long-term engagement with WN plus mNutrition services?

This section starts with a description of mothers' patterns of engagement with WN plus mNutrition. This is followed by a presentation of the various factors that have influenced mothers to engage with the service for at least 12 months.

4.1 Patterns of WN service use

We interviewed 57 mothers,[10] of whom 22 were still actively engaged with WN plus mNutrition and 35 who had been engaged for at least 12 months but were no longer engaged at the time of the interview (see **Error! Reference source not found.**). None of the disengaged mothers said that they had actively decided to discontinue their engagement. Most of these mothers (n=24) reported that the messages had just suddenly stopped, for no obvious reason (i.e. they still used the same SIM card and MNO, and their mobile phones were in full working order). Five mothers said their phones broke; four lost the SIM card that they had used to subscribe to the service; and two reported that relatives had started to use their phones and had consequently removed their SIM cards (to insert their own SIMs). Several users also reported not receiving messages after renewing their SIM cards. All disengaged mothers said that they would like to re-activate their engagement but were unsure of how to do this (or no longer had a working phone).

The literature on engagement with digital interventions suggests that users often move dynamically between stages of engagement, disengagement, and re-engagement, and that engagement often includes different levels of usage over time (O'Brien and Toms, 2008; Perski *et al.*, 2016). Six mothers reported that they had temporarily disengaged with WN plus mNutrition but then re-engaged. Reasons for disengagement included caring for a sick, dying family member (n=2), staying with friends/relatives who did not have access to electricity to charge the mobile phone (n=2), and disengagement for a few weeks to recover from a difficult childbirth (n=2). The remaining mothers all said that they engaged consistently and read every message (if they had access, see below).

4.1.1 'Access' to a mobile phone is not sufficient to ensure that mothers are reached by WN plus mNutrition

All of the 57 interviewed mothers said that they had access to a mobile phone if they wanted to (based on the quantitative baseline survey) (Gilligan *et al.*, 2018). However, only 35 mothers had registered with WN plus mNutrition using their own mobile phones. The remaining mothers signed up using the telephone numbers of their spouse (n=20), sister (n=1), or brother (n=1). As shown in Table 2, mothers who had registered with somebody else's phone often received only some (n=7) or even none (n=5) of the WN plus mNutrition SMS messages.

---

[10] And in five instances also the fathers who happened to be present for parts of the interviews.

Table 2:   **Household member who owned a phone and received WN plus mNutrition SMS messages, and sharing behaviour with mother**

Person who received WN plus mNutrition and whether messages were shared with mother		Number
Mother on her own phone		29
Father on his phone		20
	Never shared	5
	Shared some messages	6
	Shared most messages	7
	Shared all messages	2
Sister on her phone, shared all messages		1
Brother on his phone, shared some messages		1
Mother and father, both on their own phones		6
Total		**57**

Source: Authors' own

The reasons why fathers/brothers did not share the messages with the mothers were usually because they simply forgot to share, they deleted the messages by mistake, they frequently travelled and took the phone with them, or they mistook some/all or the messages for spam[11]. One young mother of two children explained:

> *Most of the time, he [the father] does not keep the phone here at home. Sometimes he is away for work and he can receive these text messages [the WN plus mNutrition messages] when he is at work and when he returns, he might forget or delete them. When these text messages are sent when he is at home, he would give me the phone to read because he is aware that they are sent for the benefit of the children.*
>
> *(Mother, 20 years old, two children, poor, Iringa Rural)*

Six of the 15 mothers who had signed up with their spouse's phone numbers said that they occasionally asked their husbands about whether they had received new WN plus mNutrition messages. The motivation for enquiring was usually a strong interest in the content of the messages, as a 37-year-old mother described:

> *I keep asking my husband whether he got any new messages […] I realised they [the WN plus mNutrition messages] challenge us to many things even what we did not know about, making us see what we are supposed to give the child.*
>
> *(Mother, 37 years old, one child, poor, Mufindi)*

4.1.2   Mothers like to save and re-read the WN plus mNutrition messages

There was no indication of 'message fatigue' or complacency (i.e. that mothers got bored, or were irritated or indifferent) in regard to receiving text messages on an ongoing basis. In fact, the opposite appeared to be the case, with many mothers saving and re-reading the messages. Re-reading SMS messages could be difficult or even impossible if the mothers did not own a mobile

---

[11] Irrelevant or unsolicited messages sent by text message, typically to a large number of users, for the purposes of advertising.

phone. A mother whose husband only rarely shared messages explained how she used every opportunity to access his mobile phone to read the messages:

> *I like to read them repeatedly, which is why when he leaves his mobile phone on the table and goes to bath you find me picking up his mobile phone to read these text messages.*

> *(Mother, 21 years old, two children, poor, Iringa Rural)*

Another mother who did not own a mobile phone said:

> *I would prefer receiving the text messages on my own phone because it is easier for me to re-read them and understand for a couple days before deleting them, rather than reading through my husband's phone where I just read them for a minute.*

> *(Mother, 27 years old, one child, less poor, Iringa Rural)*

While mothers who owned a mobile phone generally did not face barriers to accessing and reading all of the messages, three mothers explained that their husbands often borrowed their phones for several days or even weeks at a time, and that they could not access WN plus mNutrition messages during that time. Five other mothers who owned a mobile phone explained that their husbands monitored their phone use and occasionally checked their phones and then deleted contacts and messages. Another mother explained that her husband had imposed rules on her with regards to how and for what she was allowed to use her phone. She was only allowed to own a phone when she complied with these rules. While she was allowed to access the WN plus mNutrition messages, breaking the rules could negatively affect her access to the mobile phone (and thus the messages).

> *When he allowed me to own a phone, he told me how I should use it and I know the limits. That is how we agreed upon usage of the mobile phones and I cannot break the rules.*

> *(Mother, 23 years old, two children, poor, Mufindi)*

In conclusion, the qualitative data suggest that mothers who do not own a mobile phone might be more likely to be excluded from some or all mobile phone-based services and even those who own a phone do not have unconstrained access to it. Alternative communication channels (e.g. radio) or merged technology approaches (e.g. radio and mobile phone) may be more inclusive approaches in contexts with limited female mobile ownership.

The radio was generally mentioned as a more inclusive and accessible information channel for mothers.

> *SMS messages are a good way but as I have said, this information should be sent even in radios as there are so many people who listen to radios. We listen to it frequently and most people have radios.*

> *(Mother, 38 years old, seven children, poor, Mufindi)*

4.2   Factors that influence long-term engagement with WN services

For a mobile phone-based intervention to effectively trigger a desired change in behaviours, some form of sustained or repeated exposure to and engagement with the intervention is important (Perski *et al.*, 2016). With regards to the sustained engagement with WN plus mNutrition, different

factors of influence emerged from the data, These included factors related to the mothers (and in this case demographic and psychosocial characteristics), the design and content of WN plus mNutrition, the mode of delivery, and the setting in which WN plus mNutrition was used.

4.2.1   Factors related to the mothers

Demographic characteristics of mothers

Table 3, Table 4, and Table 5 in Annex C present the demographic characteristics of the mothers included in the qualitative data collection. Individual and household-level characteristics were extracted from both the quantitative endline data and the qualitative data. In what follows, the influence of the different demographic characteristics of mothers on long-term engagement with WN plus mNutrition services will be discussed.

Mothers in their twenties are most likely to engage with WN plus mNutrition in the long term

The majority of mothers (n=34) who engaged for at least 12 months with WN plus mNutrition were in their twenties, which is not surprising as women in Tanzania reach the peak of their fertility during this time (Ministry of Health, Community Development, Gender, Elderly and Children, 2017). Three mothers were under 20 years of age and the remaining mothers were in their thirties or early forties.

Both first-time mothers and experienced mothers continue to engage, but for different reasons

Those women who continued to engage included first-time mothers, and mothers with two, three, and more children. Reasons for continued engagement, however, varied between first-time and more experienced mothers. First-time mothers (and fathers) often felt ill-prepared to care for their first child and looked for reliable guidance in the messages:

> *Even during pregnancy, beginners like me have no idea what it is like to be pregnant. The fact is that when you get a child you need to learn more on how to take good care of him. This is what pushed me to read these messages. More importantly, every time I did something wrong, these messages corrected me on what I should do.*
>
> *(Mother, 27 years old, one child, poor, Iringa Rural)*

Mothers who already had one or more children usually felt more confident in caring for a young child. Nevertheless, many of those who continued to engage with the messages were experienced mothers who explained that they wanted to keep up to date and to learn about new practices in childcare and feeding. For example, a mother of five children (who had her first child 19 years ago) reflected:

> *There are several issues we did not know in the past. For example, we never used lishe porridge in the past and we never bothered much about it as we did not think it was important. Also, concerning three meals a day, in the past we were not aware of this but for now we try as much as possible so that the child can get three meals, although sometimes we fail because of the economic situation.*
>
> *(Mother, 35 years old, five children, poor, Mufindi)*

Experienced mothers also looked for information on child health and feeding issues that they were currently experiencing with their youngest child but had not yet experienced with their other children (e.g. skin rashes, food aversions).

A few experienced mothers also explained that one or several of their previous children suffered from poor health (i.e. frequent illnesses, failure to thrive). Some of these mothers hoped that following the advice in the messages could help to prevent similar problems with their youngest child:

> *In the past when I gave birth to my first child, I used not to know how to care for him well. This led to poor health such that the child reached two to three years when the weight was very low. You could find him weighing only eight kilogrammes. Therefore, with the second child, I had to value these text messages much so that I can improve the health of my second child.*
>
> *(Mother, 21 years old, two children, poor, Iringa Rural)*

Less poor and poor mothers are more likely than very poor mothers to stay engaged with WN plus mNutrition in the long term

The majority of mothers who continued to engage with the service for a long time were from less poor (n=28) or poor households (n=26).[12] Only three mothers from very poor households, who all came from Iringa Rural District, engaged with WN plus mNutrition for 12 months or more. It should be highlighted that most mothers who were included in the treatment group can be categorised as poor (70% of all treatment households) or very poor (19%). Less continued engagement among very poor mothers could be because of implementation issues (e.g. access to mobile phones and electricity) or because they found the WN plus mNutrition service less relevant or less useful (e.g. because they lacked resources to act on WN plus mNutrition advice). This finding suggests that mobile phone-based services might be an effective channel for reaching poor (and less poor) mothers, but possibly not as effective for reaching very poor mothers (even if these mothers have access to a mobile phone).

Illiteracy may not be a barrier to long-term engagement with WN plus mNutrition in Tanzania

All but one of the mothers in the qualitative sample who continued to engage with the service were literate in Swahili and thus able to read the WN plus mNutrition messages. This is not surprising as the literacy rate among females in Tanzania is very high (73%) (United Nations Educational, Scientific and Cultural Organization, 2016).

Psychosocial characteristics of mothers

WN plus mNutrition messages provide anonymous advice for first-time parents, who are often less confident about asking for advice

Seven young first-time mothers said that they continued to engage with WN plus mNutrition as the messages answered specific questions (around pregnancy, childbirth, and breastfeeding) that they

---

[12] Data on the poverty status of the households were extracted from the quantitative baseline survey. The quantitative survey used the Poverty Probability Index (PPI) to determine poverty levels. The PPI uses a country- and year-specific set of 10 questions to calculate the likelihood that a household is living below different national and international poverty lines. For the purpose of the qualitative follow-up study, terciles of PPI scores were used to categorise very poor, poor, and less poor households.

did not dare to ask when visiting health workers. They explained that health workers were usually focused on completing the required health tests and that they did not feel confident enough to ask specific, private questions (especially as other mothers often could overhear them, e.g. during community-based growth monitoring).

> *[…] it was my first pregnancy and they don't discuss such things at the clinic rather than taking tests and measuring the child's weight so I cannot just start asking about such things.*
>
> (Mother, 23 years old, one child, poor, Mufindi)

Insecurity and fear of being perceived as naïve also prevented (especially very young) mothers from approaching other more experienced mothers for advice. WN plus mNutrition messages were a welcome source of information that did not require parents to engage with others.

WN plus mNutrition messages give overworked, stressed mothers a feeling of being cared for and remembered

Most mothers in the qualitative sample led very busy lives, juggling childcare, subsistence farming, and household chores. They could not rely on their husbands for support as they were either absent (as many fathers worked in nearby towns or even in Dar Es Salam) or had the opinion that childcare was primarily the task and responsibility of mothers. Constant worries about the economic well-being of the family put additional stress on mothers. In this context mothers valued and continued to engage with WN plus mNutrition as the messages gave them the feeling of being continuously supported, acknowledged, and remembered by the 'team from Dar Es Salam' (most mothers believed that the WN plus mNutrition messages were sent by the OPM Tanzania quantitative research team).[13] They appreciated this feeling as they did not experience a lot of support or acknowledgement from other sources.

One mother with four children who runs a small business and also does subsistence farming described how she continued to engage with the messages as they gave her the feeling of being important and special:

> *I feel good in my heart because I know that they care for all of us mothers with no discrimination. I feel special because of being remembered.*
>
> (Mother, 41 years old, four children, less poor, Mufindi)

They also appreciated salutations such as 'Dear mama', 'Dear mum', or similar in the text messages, as these clearly showed that the messages were targeted at them.

Regular WN plus mNutrition messages can support mothers who feel isolated and alone

The feeling of social isolation among mothers (whether they are first-time mothers or mothers who already have children) has been reported repeatedly in the literature (Russell, 2005; Slomian *et al.*, 2017; Lambert *et al.*, 2018) and was also reported by several mothers in the qualitative sample. This issue was often further exacerbated by the fact that pregnancy, birth, and care of young children was commonly perceived as a 'private family issue', not to be discussed with people outside of the household (see also the two previous qualitative evaluation rounds, Barnett *et al.*, 2018; Barnett *et al.*, 2019). Some of these mothers explained how receiving WN plus mNutrition messages on a regular basis helped them to fight feelings of loneliness and isolation as the

---

[13] Please see also the qualitative midline for an in-depth discussion on the credibility of the message content: Barnett *et al.* (2019).

messages gave them the feeling that somebody 'looked out' for them. A poor mother of five children whose husband worked away from home for weeks at a time stated:

> *Most of the time I'm just at home with my children or at the farm. I seldom walk around and I don't really meet friends […] So, some of these messages were like they see my and my baby's situation and help me.*

<div align="center">

(Mother, 30 years old, five children, poor, Mufindi)

</div>

WN plus mNutrition messages support mothers in coping with the loss of their child

Three mothers in the qualitative sample sadly lost the focus child[14] shortly after signing up for WN plus mNutrition. Two children were still-born and the third child died for unexplained reasons when he was four months old. All three mothers continued to engage with the WN plus mNutrition messages and described how the messages helped them to cope with the child's death. All three mothers believed that the messages would help them to prevent the death and ill health of subsequent children.

> *During this time that I have no child [as her child had died], the messages helped me to understand childcare so even when I have another child I will know what to do. I am now in a better position to care for a child, particularly with regards to cleanness and nutrition.*

<div align="center">

(Mother, 18 years old, child died shortly after birth, poor, Mufindi)

</div>

As highlighted in a recent article in the *Lancet*, support for mothers who lose a child during child-birth or shortly afterwards is still minimal in many countries in sub-Sahara Africa (Kiguli *et al.*, 2016). Health workers are usually only concerned with maternal and child health, and provide little or no support to grieving mothers/parents. Additionally, many mothers experience harsh judgement from their communities and are blamed for the death (Kiguli *et al.*, 2016). The consistency and non-judgemental tone of the WN plus mNutrition messages helped to provide the mothers concerned with some much-needed reassurance and the feeling that they could still be good mothers after all (by following the advice for their other children and for subsequent future children). While very sad, this is also a good example of a positive unintended outcome – that women felt supported and validated in their maternal identity, even when others were not giving them that support and validation.

4.2.2   Factors related to the design and content of WN plus mNutrition

Mothers' perceptions of the accessibility of the design and the content of WN plus mNutrition have already been explored in the qualitative midline study (Barnett *et al.*, 2019). The midline found that many mothers valued the WN plus mNutrition messages as a personalised guide through various stages of pregnancy and early childhood, as a reminder of existing knowledge, and as a provider of practical advice that complemented theoretical advice from health workers. The midline also found that many mothers had high levels of trust in the credibility of the information because the information was well-timed and tailored, they had heard the majority of it from other sources previously (mainly during antenatal care visits), and they acquired it through a face-to-face registration process. All of these design- and content-related features of WN plus mNutrition also emerged as important factors for continued engagement with the services in the qualitative follow-up study. However, there were also some additional factors that promoted sustained engagement.

---

[14] Meaning the child that was targeted with the WN plus mNutrition service.

Tone of the messages: messages provide information without blaming or judging mothers

Several mothers highlighted that they continued to engage with the services as they liked that the messages provided supportive information in a non-judgemental manner. For example:

> *I think the messages are good, they don't blame anyone nor use vulgar language.*

> *(Mother, 30 years old, six children, poor, Mufindi)*

Mothers valued this as it was often different from their experiences with health workers, who frequently blamed them for poor child nutrition outcomes, such as undernutrition (e.g. publicly, during community-based growth monitoring). For instance, a mother of three children told us that she had been scolded by the community health worker in front of other mothers on several occasions and therefore now preferred the WN plus mNutrition messages:

> *I like the messages best, because honestly some days we are so many [mothers with children who attend the child growth monitoring session], maybe if your child was on the green [i.e. normal weight] zone and the next month it happened that the child shifted to red zone [i.e. underweight] then she will talk to you right there in front of the other mothers.*

> *(Mother, 25 years old, three children, poor, Iringa Rural)*

Previous research suggests that poor attitudes of health workers can be a common barrier to health service utilisation in rural Tanzania (Nyamtema *et al.*, 2012; Dhingra *et al.* 2014). It is therefore not surprising that mothers were attracted by the blame-free messages.

Messages helped mothers to be more self-sufficient and independent with regards to child feeding and care

Many mothers who continuously engaged said that the messages improved their confidence in caring well for their infants and young children. A few mothers also stressed that they were now more self-sufficient with regards to childcare and did not feel the need to consult a health worker so much. They valued this as this enabled them to save time and money (as they did not have to go to the health facility). For example, a busy shopkeeper and mother explained:

> *The messages teach us many things about childcare as well as about our own health. Therefore, if you take those messages into consideration you can take care of your child better and the child will be in better health. It is a good thing and I would advise others to continue to use it because they help and makes it not necessary to go to the clinic to get instructions for each and everything or go to the nurse for each and everything.*

> *(Mother, 26 years old, one child, less poor, Iringa Rural)*

Mothers like practical and specific information that they lack from other sources

All of the mothers who continuously engaged explained that they had access to at least one other trusted source for childcare and feeding information (apart from WN plus mNutrition). In most cases mothers referred to the healthcare facilities and growth monitoring sessions. Mothers agreed that the content of WN plus mNutrition complemented and often echoed other services; however, many of the WN plus mNutrition messages went further and provided more detailed and hands-on advice, which mothers often did not receive from health workers. For instance, one poor mother reflected:

> *Yes. For the [antenatal care] clinic they never give this type of information [i.e. practical information] often. You might attend the clinic for nine months during pregnancy and hear about this information only in two months. For the rest of the months they will be testing you and you leave the place without any information […] What motivated me to continue with WN plus mNutrition were the child's nutrition issues, such as how frequent should a child eat and what the child should eat, for example if it's some fruits then how many times and so on.*

> *(Mother, 34 years old, two children, less poor, Iringa Rural)*

It should be highlighted that not all of the WN plus mNutrition messages contain practical advice. They are also not tailored to the particular economic status and level of resources available to users. There are also a large number of messages with general child feeding information. While most mothers also appreciated these messages, some felt they merely repeated what they had already heard from other sources and did not add any further details.

To ensure ongoing interest and engagement of mothers with WN plus mNutrition, the provision of practical advice is important.

A common request from mothers regarding the design of WN plus mNutrition messages is to provide human support

While all mothers liked the WN plus mNutrition messages, almost all of them said that they wished the messages would be combined with some kind of interpersonal, human support feature, such as a call centre:

> *For example, when a text message states that there is a need to feed the child with certain food varieties. When a text message is sent, after reading it you will find that I wish to ask questions like if I did not feed the child the way I am advised, what could be the effects?*

> *(Mother, 26 years old, three children, less poor, Mufindi)*

> *Because there are service providers there and if you have a question you can ask and be answered straight away unlike watching the TV, reading the text message and other sources where we get information directly.*

> *(Mother, 29 years old, one child, less poor, Mufindi)*

The availability of some kind of real-time human support (e.g. through a call centre) has been shown to increase continued engagement with digital behaviour change interventions (Michie *et al.*, 2017). The literature further suggests that interactive digital interventions in which users are given the opportunity to contact experts for support and advice report higher levels of engagement than one-way interventions (i.e. interventions in which information is only pushed out) (Couper *et al.*, 2010). To increase active and continued engagement with WN plus mNutrition, the add-on of a human support feature should be considered.

4.2.3   Factors related to the delivery through mobile phones

Mobile phone-based information services can be used flexibly whenever and wherever there is a demand for information

One feature that distinguishes mobile phone-based behaviour change interventions from 'traditional' face-to face behaviour change (e.g. via community health workers) is that participants

have the flexibility to access messages when and where they want to (and not, for example, when the health worker has arranged a community meeting) (Michie *et al.*, 2017).

The findings from the qualitative follow-up study show how mothers often saved the messages and re-read them at times that were convenient for them. This quote from one mother summarises what several stated:

> *I prefer the messages [to the clinic] because you don't have to delete the message on the phone and can re-read it at any time you want. The text messages in the mobile phone can be referred to at any time because it is saved there and so you can have more time to re-read them. I hear from the clinic only once in a month or less.*
>
> *(Mother, 22 years old, two children, poor, Mufindi)*

Some mothers also referred back to previous messages when they faced an acute health and nutrition-related problem (e.g. a child had diarrhoea or a health worker during growth monitoring told the mother that the child was not growing well). Some mothers actively sought solutions for their specific problems at these times and the 'library' of WN plus mNutrition messages was often able to provide help.

Mothers who continued to engage with WN plus mNutrition preferred mobile phone-based information because they found it more convenient and because it was less likely that they would miss information.

Mothers like the reliable frequency of WN plus mNutrition messages

It is well established in the literature that women become frequent information-seekers during pregnancy and in the first few years following delivery (Bernhardt and Felter, 2004). Occasional clinic visits and monthly growth monitoring sessions often did not satisfy the mothers' ongoing need for reliable information, especially as mothers do not always receive information during these meetings:

> *[…] the text messages come very often, unlike the clinic where you go only once per month. At the clinic after measuring the child you leave the place meaning that they do not give health and nutrition information every time you attend. Sometimes it just measuring height and weight only without any advice. So, through the mobile phone, we do get the health and nutrition information often, unlike in the clinic.*
>
> *(Mother, 26 years old, three children, poor, Mufindi)*

This suggests that a high frequency of messages is important.

4.2.4   Factors related to the setting

Overstretched health workers focus on delivering required health checks but do not have the time to give individualised advice

The staff shortage in the health workforce in rural Tanzania has been discussed widely in the literature (Kwesigabo *et al.*, 2012). In the interviews, mothers described that health workers were usually under enormous time pressure to complete all required health checks (e.g. based on the antenatal care protocol or the guidelines for growth monitoring). This left little or no time to discuss

with mothers and provide more specific advice. For example, as already quoted above, one mother stated:

> *For the clinic they never give this information often. You might attend the clinic for nine months during pregnancy and hear about this information only in two months. For the rest of the months they will be testing you and you leave the place without any information.*

> *(Mother, 26 years old, three children, poor, Mufindi)*

While most mothers said that they would prefer face-to-face advice from a health worker, they also acknowledged that this rarely happened within their health facility. Text messages were therefore highly appreciated, in order to address their need for information:

> *If they [health workers] would give us all the information, this would be better because I like talking face to face. However, in reality it is easier on phone, because we get more information. Health workers are committed to give us information but in reality, normally they don't give us information. The messages from phones always do.*

> *(Mother, 37 years old, one child, poor, Mufindi)*

Within the context of an understaffed and overstretched healthcare system, mobile phone-based services were valued as a reliable and credible source of information.

Overcrowded healthcare facilities and lack of space make it difficult to understand healthcare workers' advice

Many mothers complained about overcrowded antenatal care and child growth monitoring sessions. Overcrowding of maternal and child health services in rural Tanzania has also been highlighted in the literature (Msuya *et al.*, 2008; Mselle *et al.*, 2013). In this context there is often no space for private conversations between mothers and health workers, and noise levels are usually high (especially as many babies and young children are present). Many mothers said that they found it difficult to hear and concentrate on advice given by the health workers. Mobile phone-based messages that could be read in a private and calm environment were easier to comprehend:

> *I do trust in the text messages more because I am able to read them myself but when I am at the health facility sometimes there are so many of us [mothers] and I cannot concentrate to understand well compared to when I have this information in the mobile phone that I can always refer to when I need that information. The text messages in the mobile phone can be referred to at any time because it is saved there and so you can have more time to re-read them.*

> *(Mother, 28 years old, four children, poor, Iringa Rural)*

Health workers only provide advice when there is already an acute health problem (e.g. a child is severely underweight)

Several mothers said that the health workers in their clinic would only discuss with them and provide tailored advice when they had detected an acute problem with the nutritional status or health of their children. Although mothers were given group seminars with general advice during antenatal visits, this did not provide them with tailored nutritional advice. If there was no problem, they would not get advice. Mothers regretted this and desired more frequent feedback and advice (as delivered with the WN plus mNutrition messages).

> *I was not getting any information on diet or childcare in those days, even at the clinic you will get the information only when they [health workers] see that the*

> *child has lost weight. That is when they will tell you that you should make efforts on feeding the child. But the information we receive through mobile phones keeps on coming and reminding you.*

(Mother, 30 years old, five children, poor, Mufindi)

Literature summarised in our earlier review suggests that providing feedback and advice to parents at every contact point can help to reassure them and motivate them to practise optimal IYCF behaviours (Barnett *et al*., 2016).

In a context with limited feedback and advice from health workers, mobile phone-based messages can help to satisfy mothers' need for continuous reassurance and feedback.

4.3 Summary of motivators for continued engagement with WN plus mNutrition

Section 4 has presented some underlying motives that help to explain why a small subgroup of mothers continued to engage with WN plus mNutrition for at least 12 months or longer.

The findings suggest that the majority of the small number of mothers who still engaged with the service engaged consistently, meaning they read every WN plus mNutrition text message they could access. There was no indication of message fatigue or complacency regarding receiving text messages on an ongoing basis. In fact, mothers liked to save and re-read messages if possible. They also referred back to saved messages when they were in need of specific information (e.g. when a child was ill), as they believed the messages could help them to address their acute problem.

The qualitative data revealed multiple gendered barriers to the depth of continued engagement with WN plus mNutrition, with mothers who did not own a mobile phone themselves often being excluded from some or even all text messages (e.g. as the owner of the mobile phone did not share the message content with them). Access to a mobile phone did not always ensure continued access to the service for mothers, however, as a few husbands closely monitored and often restricted women's access to their own phones. This suggests that merged technology approaches that include alternative communication channels (e.g. radio) are likely to be more inclusive approaches in contexts with limited female mobile phone ownership.

The qualitative follow-up study found that continued engagement was influenced by the characteristics of the mothers who used the service; the design, content, and mode of delivery of WN plus mNutrition messages; and the setting in which WN plus mNutrition was used. With regards to the demographic characteristics, mothers in their twenties were most likely to engage over the long term. Both first-time mothers as well as experienced mothers continued to engage, although the reasons for their engagement varied. First-time mothers sought guidance and reassurance from the messages, whereas experienced mothers wanted to get access to the latest knowledge on childcare and sought information on specific childcare-related problems that they had not experienced with their previous children. While mothers from both poor and less poor households continued to engage with the service, the qualitative findings suggest that mobile phone-based services may be less effective in reaching and maintaining the engagement of very poor mothers.

First-time parents who were insecure and lacked the confidence to approach healthcare workers, or more experienced mothers with childcare-related questions, appreciated the anonymity of the messages. Overworked and unappreciated mothers felt acknowledged and cared for by the

frequent messages. Regular, tailored messages helped to alleviate the feeling of social isolation among a few mothers, and supported three mothers to cope with the loss of a child.

With regards to design- and content-related influences, mothers were motivated to continue to engage with WN plus mNutrition as the service provided supportive information without mother-blaming (which they often experienced at their health facilities). The focus on practical, hands-on advice, which was often lacking from their healthcare workers, and the empowering properties of WN plus mNutrition, emerged as strong motivators for continued engagement.

With regards to the mode of delivery, mothers continued to engage with WN plus mNutrition because the service satisfied their need for continuous reassurance and information regarding childcare and feeding that was currently not addressed (or not addressed well) by other sources. They also liked the high level of flexibility the service provided, as if they had their own phone and a supportive partner they could access the messages whenever they needed them. With regards to the setting, overcrowded health facilities and overstretched health workers meant that mothers often only occasionally got access to individualised advice. In this context the constant flow of information and advice on childcare and feeding from WN plus mNutrition was highly valued.

5 Results: what are the pathways by which WN services promote a change in IYCF practices and dietary diversity?

All of the mothers interviewed explained that they had acted on at least some of the advice and had changed specific IYCF and caring behaviours, as well as the foods they ate themselves/served to their families. This corroborates the findings from the quantitative evaluation that found an improvement in the dietary diversity of young children and mothers in the treatment households (Gilligan *et al.*, 2020). However, the qualitative midline identified several contextual barriers that frequently impeded the translation of the advice into practice. The most commonly cited barrier in the midline was financial constraints that prevented households from purchasing recommended foods and eating more diverse diets (Barnett *et al.*, 2018).

To further expand these findings, the qualitative follow-up study focused on exploring the pathways by which WN plus mNutrition helped to trigger and promote changes in dietary and child feeding practices among mothers who engaged with WN plus mNutrition for at least 12 months. Overall, the specific mechanisms of behaviour change are likely to be different for different types of mothers and within different household and community-level settings.

5.1 Mothers use WN plus mNutrition messages to convince their husbands about the necessity of better childcare and nutrition

In the qualitative sites, childcare and feeding were strictly governed by societal norms and most families believed them to fall into the female sphere of responsibilities:

> *Caring for children is the wife's responsibility. It is normal here, that's how men behave here.*
>
> *(Mother, 22 years old, two children, poor, Mufindi)*

A few mothers attempted to challenge this norm and used the text messages to convince their husbands to be more involved in childcare, as this quote from one mother of seven children suggests:

> *I scold him that he has no time with his children to talk to them. They will even forget that he is their father. I show him the messages and say that he should use most of his free time to play with them and observe them. That is how parenting works.*
>
> *(Mother, 38 years old, seven children, poor, Mufindi)*

However, most mothers chose a less confrontational approach and used the messages simply to raise their husband's general awareness of, and support for, improved childcare practices. For example:

> *Because when it comes to breastfeeding sometimes I am in the farm and spend a lot of time breastfeeding. My husband got annoyed and could shout because I spent a lot of time breastfeeding and not doing farming. The messages helped to explain the importance of breastfeeding to my husband.*
>
> *(Mother, 21 years old, two children, poor, Iringa Rural)*

> *Personally, I think that when he read the messages it convinced him. Because when I just tell him he could just forget about it and not make any follow-up but when he saw messages, he realised the importance of nutrition to children.*

> *(Mother, 34 years old, two children, less poor, Mufindi)*

> *Yes, wherever we have time to discuss about the messages we sit and discuss. I like this because we then both know what is important, we get on the same page in knowing the child's progress and finding how to go about it.*

> *(Mother, 26 years old, three children, less poor, Mufindi)*

Mothers also frequently used the messages in an attempt to convince their husbands of the necessity of buying more nutritious foods for the children, or when asking for money to purchase these foods themselves. In most households, men were the primary breadwinners and also made all decisions regarding how and on what the household's financial resources were spent. According to many mothers, using the messages to support intra-household spending negotiations was often successful as the messages gave their requests more weight and power to convince. The reason for this was that most mothers/husbands believed that the messages were sent by learned experts based in Dar Es Salam (either from the government or OPM) and thus were likely to be true.

> *I started the discussion by showing him the messages. I did this because the child needed the nutrients so I asked him for the money to buy them. [...] He gets encouraged to take care of the child from what I tell him about the advices. He then often gives me the money to buy foods.*

> *(Mother, 39 years old, five children, poor, Iringa Rural)*

> *In past my husband thought that fruit and vegetables and other healthy foods I told him about would make the child full. He refused to buy those foods. But after I showed him the messages, he has learnt something. Now it is easy for him to give me money to buy things.*

> *(Mother, 23 years old, two children, less poor, Mufindi)*

However, mothers were not always successful in convincing their husbands to support them and to provide financial resources to act on the messages, as the following quote highlights. In this instance, the mother repeatedly attempted to engage her husband using the messages, to spend more time with the children. However, he showed no interest and the mother in the end resorted to the use of her private savings to act on the messages:

> *It is true, I feel that there are effects; both parents should be closer to their children as children are for both parents. But I now find it so hard to talk about the messages and what we should do with him [my husband] because he usually ignores me and leaves me without giving me money, nor does he bring foods for the children as I asked him to. I now take my own money even if it was a saving and buy what I need to give to my children.*

> *(Mother, 38 years old, seven children, poor, Mufindi)*

This finding is supported by findings from additional analysis of the quantitative survey data that suggest that mothers in the treatment groups shifted more money towards expenditure for their children compared to mothers in the control group (Gilligan *et al.*, 2020).

5.2 Mothers perceive WN plus mNutrition messages as a constant monitoring of their childcare practices

Several mothers said that they felt like the senders of the messages (and here they were thinking either about the government or OPM) constantly monitored their childcare practices in order to detect sub-optimal practices early on and ensure that the mothers did the best for their children. The feeling of being continually watched over was further enhanced by the fact that the messages (especially during pregnancy and the first weeks after delivery) were very time-sensitive and tailored to the specific stages the women and their children were at.

> *It is because of those messages [...] when I don't do what these messages tell me it feels like you are watching me. I feel like if I don't do this, they are watching me.*
>
> *(Mother, 43 years old, five children, poor, Iringa Rural)*

> *It is like they have seen the real situation of the child that's why they have sent that message to me, because by that time when we were receiving messages about putting more effort to feed the baby, our child was not in good condition.*
>
> *(Mother, 30 years old, five children, poor, Mufindi)*

Rather than feeling pressurised by the perceived constant monitoring, mothers saw WN plus mNutrition as a 'friendly coach' who guided them, and not as a mechanism to control and reproach them for poor practices:

> *Every time I did something wrong, these messages corrected me on what I should do. I liked this and it helped me to take better care of my child.*
>
> *(Mother, 27 years old, one child, poor, Mufindi)*

5.3 Mothers use the information from WN plus mNutrition to develop their own contextualised and adapted approaches

It is well established that information (knowledge) alone is not necessarily enough to change behaviour (Levin, 2013). There are complex relationships between mediators (e.g. knowledge, attitudes, and beliefs) and actual behaviour: mothers may gain the knowledge, confidence, and intention to change feeding practices, but this will not impact on their actual practices unless their environment enables them to act.

For example, as with the qualitative midline, at follow-up financial constraints emerged as a major obstacle to the translation of the advice received through WN plus mNutrition into practice. However, in contrast to the midline, the mothers included in the qualitative follow-up were all highly motivated and tried to adapt the advice to work within their financial conditions. The following quotations indicate how mothers tried their best to follow the advice provided by WN plus mNutrition, despite financial constraints:

> *To be honest we are never able to give the children five meals a day because we do not have enough money for so much food. However, I now at least make sure that they get three meals a day in the morning, afternoon, and in the evening [...]. This is different from what we did before. I used to give him [the youngest child] food only when he cried of being hungry, but I had not known the importance of feeding him on time.*

> *(Mother, 26 years old, three children, less poor, Mufindi)*

> *I would practise the advice when I was capable of affording it. If I was not able to afford it, I would leave it. What should I do if I don't have money? Should I steal? [...] For example, if I cannot afford certain nutritious food and I will end up feeding this food once in a while only and not once a week as recommended. For example, meat and other costly food varieties.*

> *(Mother, 26 years old, three children, poor, Mufindi)*

5.4   WN plus mNutrition messages increase the utilisation of healthcare services

As already highlighted in the qualitative midline study, WN plus mNutrition messages actively encouraged women to increase their utilisation of healthcare services (Barnett *et al.*, 2018). Eight WN plus mNutrition messages encouraged parents to bring their child to a clinic for health and nutrition advice and services (NUT 43, 57, 61, 73, 91, 107, 109, and 110), six further messages urged mothers to seek services and advice from health workers (NUT 20, 56, 58, 82, 94, 112), and other messages promoted uptake of community-based child growth monitoring. The qualitative follow-up study collaborated these findings and also provided some further explanations of how these messages helped to successfully increase health service uptake.

Mothers appreciated the frequent reminders to use various healthcare services (e.g. antenatal care). Mothers with previous children said that they used services much more frequently than they had done with previous children because of being 'nagged' to do so by 'insistent messages' on a frequent basis.

Several mothers also said that they now understood the purpose of some of the routine health check and growth monitoring better, thanks to the messages:

> *I thought the child was weighed for fun only but I now learnt that the weight has to increase relative to age.*

> *(Mother, 23 years old, two children, poor, Mufindi)*

The effectiveness of text messages to promote and remind parents to use child healthcare services in low- and middle-income countries has also been highlighted in a recent systematic review (Bright *et al.*, 2017).

5.5   Summary of findings on the pathways to change

This section has presented the findings on the pathways by which WN plus mNutrition triggered a change in IYCF practices and dietary diversity (of both children and mothers). The findings suggest that mothers frequently used the text messages to encourage their partners to take more responsibility in childcare-related activities. The messages also enhanced some mothers' bargaining power in intra-household spending negotiations by convincing husbands to purchase more nutritious foods or to provide them with money to do so. Husbands were more likely to listen to and engage with these requests as they perceived the messages to be based on objective advice from government/national experts. Some mothers perceived the WN plus mNutrition messages as constant monitoring of their childcare practices and believed that the messages guided them in a way similar to that of a 'friendly coach', pointing out sub-optimal practices in a supportive manner (and without reproaching them). Mothers used advice received from WN plus

mNutrition *to develop their own context-specific approaches, adapted to their financial conditions and capabilities.*

WN plus mNutrition messages increased uptake of various healthcare services, by acting as a frequent reminder and promoter.

6 Conclusions and recommendations

The qualitative follow-up study had the aims of: (1) identifying the underlying reasons for long-term engagement with WN plus mNutrition in a context within which most mothers have disengaged with the service; and (2) exploring the pathways by which WN plus mNutrition promotes a change in IYCF practices among mothers. The focus of the final qualitative data collection was on the small subgroup of treatment mothers who actively used WN plus mNutrition for at least 12 months. It should be emphasised that the majority of mothers no longer engaged with WN plus mNutrition or had never engaged due to various issues related to the implementation of the service (see qualitative midline report, Barnett *et al.*, 2018). In this section, key findings from the analysis will be summarised and recommendations presented.

6.1 Factors that influenced continuous engagement with WN plus mNutrition, and implications for policy and practice

6.1.1 Characteristics of the mothers

The qualitative data revealed multiple gendered barriers to long-term engagement with WN plus mNutrition, with mothers who did not own a mobile phone themselves often being excluded from some or even all text messages (e.g. as the owner of the mobile phone did not share the message content with them for various reasons). However, access to a mobile phone did not ensure continued access to the service for mothers as a few husbands closely monitored, and often restricted, women's access to their own phones.

Recommendation: Merged technology approaches that include alternative communication channels (e.g. radio) are likely to be more inclusive approaches in contexts with limited female mobile phone ownership.

Both first-time mothers as well as experienced mothers continued to engage, although the reasons for their engagement varied. First-time mothers sought guidance and reassurance from the messages, whereas experienced mothers wanted to get access to the latest knowledge on childcare and sought information on specific childcare-related problems that they had not experienced with their previous children.

Recommendation: Consider the different information needs of first-time and experienced mothers in the messages to increase the long-term engagement of different types of mothers (however, this might also increase the implementation costs).

While mothers from poor and less poor households continued to engage with the service, the qualitative findings suggest that mobile phone-based services alone may be less effective in reaching very poor mothers in the long term.

Recommendation: To effectively reach very poor mothers use more inclusive channels such as radios or community outreach workers.

6.1.2 Design and content of WN plus mNutrition

Mothers were motivated to continue to engage with WN plus mNutrition as the service provided supportive information without blaming them for poor child health and nutrition outcomes.

Recommendation: To ensure that mothers continue to engage, occasional messages praising mothers for their continuous efforts may further motivate mothers.

Focus on practical, hands-on advice, which was often lacking from their healthcare workers.

6.1.3   Mode of delivery of WN plus mNutrition

Mothers continued to engage with WN plus mNutrition because the service satisfied their need for continuous reassurance and information regarding childcare and feeding (something that was currently not addressed – or not addressed well – by other sources of information), and because of the high level of flexibility the service provided in that women were able to save the messages and refer to them again as they wished.

Recommendation: Ensure that messages are sent frequently, especially during the first months after birth, when mothers are eager for both information and reassurance.

6.1.4   Setting in which WN plus mNutrition was used

Overcrowded health facilities and overstretched health workers meant that mothers only occasionally got access to individualised advice. In this context, the text messages helped to satisfy mothers' needs for frequent information.

Recommendation: In a context of weak healthcare systems mobile phone-based services may offer the opportunity to help to address some of the shortcomings in access to information and ongoing support.

6.2   Key findings on the pathways by which WN plus mNutrition promoted change, and recommendations for policy and practice

Some mothers used the WN plus mNutrition messages to enhance their bargaining power in intra-household spending negotiations by convincing husbands to purchase more nutritious foods, or to provide them with money to do so. The messages gave mothers' requests more weight and credibility as messages were believed to be based on objective advice from government/national experts. The trustworthiness and credibility of messages should be promoted widely to support women's use of the messages as an effective tool in intra-household decision-making processes.

Some mothers also perceived the WN plus mNutrition messages as constant monitoring of their childcare practices and believed that the messages guided them in a way similar to a 'friendly coach', pointing out sub-optimal practices in a supportive manner (and without reproaching them). To maintain the perception of a friendly and omnipresent coach, the non-judgemental tone and the accurate timing of the messages (e.g. at different stages during pregnancy) need to be sustained.

Mothers used advice from WN plus mNutrition to develop their own context-specific approaches, adapted to their financial conditions and capabilities. We should not expect unilineal knowledge transfer and the translation of mobile phone-based advice into practice to take place; rather, the flexible use of the information to inform learning should be encouraged.

WN plus mNutrition messages increased uptake of various healthcare services, by acting as a frequent reminder and promoter. However, increasing the demand for healthcare services without

improving the availability and quality of the supply side is unlikely to lead to significant improvements in maternal and child health and nutrition

References

Alkhaldi, G., Hamilton, F. L., Lau, R., Webster, R., Michie, S., and Murray, E. (2016) 'The effectiveness of prompts to promote engagement with digital interventions: a systematic review', *Journal of Medical Internet Research* 18(1), pp. 6–12.

Barnett, I., Faith, B., Gordon, J., Brockerhoff, S., and Medardi, D. (2019) 'Mobile phones, nutrition and health in Tanzania: Qualitative midline study report, external evaluation of mobile phone technology-based nutrition and agriculture advisory services in Africa and South Asia', IDS, Brighton.

Barnett, I., Srivastava, S., and Gordon, J. (2018) 'External evaluation of mobile phone technology-based nutrition and agriculture advisory services in Africa and South Asia: Mobile phones, nutrition and health in Tanzania: Initial exploratory qualitative study report', IDS, Brighton.

Barnett, I., Sulistyo, S., Befani, B., Kari Sari, K., Sharmin, S., and Dewi, D. (2016) 'Mixed-method impact evaluation of a mobile phone application for nutrition monitoring in Indonesia', IDS, Brighton.

Bernhardt, J. M., and Felter, E. M. (2004) 'Online pediatric information seeking among mothers of young children: results from a qualitative study using focus groups', *Journal of Medical Internet Research* 6(1), pp. 7–10.

Bright, T., Felix, L., Kuper, H., and Polack, S. (2017) 'A systematic review of strategies to increase access to health services among children in low and middle income countries', *BMC Health Services Research* 17(1), pp. 252–260.

Couper, M. P., Alexander, G. L., Maddy, N., Zhang, N., Nowak, M. A., McClure, J. B., Calvi, J. J., Rolnick, S. J., Stopponi, M. A., and Little, R. J. (2010) 'Engagement and retention: measuring breadth and depth of participant use of an online intervention', *Journal of Medical Internet Research* 12(4), pp. 52–58.

Dhingra, U., Gittelsohn, J., Moh'd Suleiman, A., Moh'd Suleiman, S., Dutta, A., Ali, S. M., Gupta, S., Black, R. E., and Sazawal, S. (2014) 'Delivery, immediate newborn and cord care practices in Pemba Tanzania: a qualitative study of community, hospital staff and community level care providers for knowledge, attitudes, belief systems and practices', *BMC Pregnancy and Childbirth* 14(1), pp. 173–189.

Donkin, L., Christensen, H., Naismith, S. L., Neal, B., Hickie I. B., and Glozier N. (2011) 'A systematic review of the impact of adherence on the effectiveness of e-therapies', *Journal of Medical Internet Research* 13(3), pp. 52–58.

Gilligan, D., Hidrobo, M., Ledlie, N., and Palloni, G. (2018) 'External evaluation of mobile phone technology-based nutrition and health advisory services in Africa and South Asia: Mobile phones, nutrition, and health in Tanzania: Quantitative Baseline Report', IFPRI and IDS, Brighton.

Gilligan, D., Hidrobo, M., Ledlie, N., and Palloni, G. (2020) 'External evaluation of mobile phone technology-based nutrition and agriculture advisory services in Africa and South Asia: Mobile phones, nutrition, and health in Tanzania: Quantitative Endline Report', IDS, Brighton.

Kiguli, J., Munabi, I. G., Ssegujja, E., Nabaliisa, J., Kabonesa, C., Kiguli, S., and Josaphat, B. (2016) 'Stillbirths in sub-Saharan Africa: unspoken grief', *The Lancet* 387(10018), pp. 16–18.

Kwesigabo, G., Mwangu, M. A., Kakoko, D. C., Warriner, I., Mkony, C. A., Killewo, J., Macfarlane, S. B., Kaaya, E. E., and Freeman, P. (2012) 'Tanzania's health system and workforce crisis', *Journal of Public Health Policy* 33(1), pp. 35–44.

Lambert, J., Etsane, E., Bergh, A.-M., Pattinson, R., and Van den Broek, N. (2018) '"I thought they were going to handle me like a queen but they didn't": A qualitative study exploring the quality of care provided to women at the time of birth', *Midwifery* 62(2), pp. 256–263.

Levin, B. (2013) 'To know is not enough: Research knowledge and its use', *Review of Education* 1(1), pp. 2–31.

Michie, S., Yardley, L., West, R., Patrick, K., and Greaves, F. (2017) 'Developing and evaluating digital interventions to promote behavior change in health and health care: recommendations resulting from an international workshop', *Journal of Medical Internet Research* 19(6), pp. 232–240.

Ministry of Health, Community Development, Gender, Elderly and Children; NBS; OCGS; and ICF (2017) *Tanzania DHS, 2015–16*, Ministry of Health, Community Development, Gender, Elderly and Children, NBS, OCGS, and ICF, Dar Es Salam.

Mselle, L. T., Moland, K. M., Mvungi, A., Evjen-Olsen B., and Kohi, T. W. (2013) 'Why give birth in health facility? Users' and providers' accounts of poor quality of birth care in Tanzania', *BMC Health Services Research* 13(1), pp. 174–180.

Msuya, S. E., Mbizvo, E., Hussain, A., Uriyo, J., Sam, N., and Stray-Pedersen, B. (2008) 'Low male partner participation in antenatal HIV counselling and testing in northern Tanzania: implications for preventive programs', *AIDS Care* 20(6), pp. 700–709.

Nyamtema, A. S., Bartsch-de Jong, A., Urassa, D. P., Hagen, J. P., and van Roosmalen, J. (2012). 'The quality of antenatal care in rural Tanzania: what is behind the number of visits?', *BMC Pregnancy and Childbirth* 12(1), pp. 70–78.

O'Brien, H. L., and Toms, E. G. (2008) 'What is user engagement? A conceptual framework for defining user engagement with technology', *Journal of the American Society for Information Science and Technology* 59(6), pp. 938–955.

Perski, O., Blandford, A., West, R., and Michie, S. (2016) 'Conceptualising engagement with digital behaviour change interventions: a systematic review using principles from critical interpretive synthesis', *Translational Behavioral Medicine* 7(2), pp. 254–267.

Russell, S. (2005) 'Helping alleviate social isolation and PND', *Community Practitioner* 78(2), pp. 41–48.

Slomian, J., Emonts, P., Vigneron, L., Acconcia, A., Glowacz, F., Reginster, J.-Y., Oumourgh M., and Bruyère, O. (2017) 'Identifying maternal needs following childbirth: A qualitative study among mothers, fathers and professionals', *BMC Pregnancy and Childbirth* 17(1), pp. 213–220.

United Nations Educational, Scientific and Cultural Organization (2016) 'United Republic of Tanzania education', from http://uis.unesco.org/country/TZ.

Annex A   Terms of reference

Call-down Contract

Terms of Reference

PO 6420: External evaluation of mobile phone technology-based nutrition and agriculture advisory services in Africa and South Asia

Introduction

DFID (Research and Evidence Division) wishes to commission an external impact evaluation of mNutrition, a mobile phone technology-based nutrition and agricultural advisory service for Africa and South Asia. mNutrition is a programme supported by DFID that, through business and science partnerships, aims to build sustainable business models for the delivery of mobile phone technology-based advisory services that are effective in improving nutrition and agricultural outcomes.

mNutrition is primarily designed to use mobile phone-based technologies to increase the access of rural communities to nutrition and agriculture related information. The initiative aims to improve knowledge among rural farming communities especially women and support beneficial behaviour change as well as increasing demand for nutrition and agriculture extension services. The mNutrition initiative launched in September 2013 will work in 10 countries in Africa (Cote d'Ivoire, Ghana, Malawi, Mozambique, Nigeria, Tanzania, Kenya, Rwanda, Uganda, Zambia) and four countries in South Asia (Bangladesh, India, Pakistan and Sri Lanka). The desired impact of mNutrition will be improved nutrition, food security and livelihoods of the poor.

Mobile phone-based services have been endorsed by WHO as an effective strategy for behaviour change and for driving adherence to anti-retroviral treatment protocols (Horvath, Azman, Kennedy and Rutherford 2012). There is currently scant evidence on the impact and cost-effectiveness of mobile phone technology-based services for nutrition and agriculture and on the sustainability of different business models for their provision. A rigorous evaluation of mobile phone technology-based nutrition services would add significantly to the current evidence base. An external evaluation team managed by the Evaluator, independent of the programme delivery mechanism, will conduct an assessment of the impact, cost-effectiveness and sustainability of mobile phone technology-based information and behaviour change messages for nutrition and agriculture.

Background to mNutrition

Introduction

Undernutrition is a major challenge to human and economic development globally. It is estimated that almost one billion people face hunger and are unable to get enough food to meet their dietary needs. Agriculture is a major source of livelihood in many poor countries and the sector has a potentially critical role in enhancing health, specifically maternal and child health and nutritional status. A well-developed agriculture sector will deliver increased and diversified farm outputs (crops, livestock, non-food products) and this may enhance food and nutrition security directly through increased access to and consumption of diverse food, or indirectly through greater profits to farmers and national wealth. Better nutrition and health of farmers fosters their agricultural and economic productivity. Current agricultural and health systems and policies are not meeting current and projected future global food, nutrition and health needs.

Despite major investment in agricultural and nutrition research and its uptake and application, there is significant social and geographic inequality in who benefits from these investments. Furthermore, in many developing countries, public extension systems for agriculture, health and nutrition are inefficient, have limited capacity and have a poor track record of delivery, especially in terms of supporting women and girls and the most marginalised populations (Alston, Wyatt, Pardey, Marra and Chan-Kang 2000; Anderson 2007; IFPRI 2010; Van den Berg and Jiggins 2007).

Several research and mobile network operators (MNOs) are testing a range of information and communication technology (ICT) solutions for improving access to a wide range of information and advisory services. Mobile phone-based technologies are among the most promising ICT strategies, although current initiatives in nutrition are relatively small and fragmented.

What is mNutrition?

Enhancing access to the results of nutrition and agricultural research and development is potentially critical for improving the nutrition, health and livelihoods of smallholders and rural communities. mNutrition will harness the power of mobile phone-based technologies and the private sector to improve access to information on nutrition, health and agricultural practices especially for women and farmers (both male and female). Specifically, mNutrition will initiate new partnerships with business and science to deliver a range of services including:

- An open-access database of nutrition and agriculture messages for use in mobile phone-based communication (for example, information and behaviour change messages on practices and interventions that are known to have a direct impact on nutrition or an indirect impact via for example agriculture);
- A suite of mobile phonebased nutrition and agriculture information, extension and registration services designed to: improve knowledge and generate beneficial behaviour change in nutrition and agriculture; increase demand for nutrition, health and agriculture goods and services; register and identify target populations for support; and, using real-time monitoring, support the conduct of nutrition risk assessments by community health workers.

The impacts of mNutrition are expected to include improved nutrition, food security and livelihoods of the poor, especially women in 10 countries in Africa (Cote d'Ivoire, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zambia) and 4 countries in South Asia (Bangladesh, India, Pakistan and Sri Lanka). This impact will result from the increased scale and sustainability of mobile phone-based nutrition and agricultural-based information services, delivered through robust public private partnerships in each country.

mNutrition has two major outcomes. One outcome will be cost-effective, sustainable business models for mobile phone enabled nutrition and agriculture services to 3 million households in 10 countries in Africa and 4 countries in South Asia that can be replicated in other countries. Linked to this outcome, the second outcome will expect these services to result in new knowledge, behaviour change and adoption of new practices in the area of agriculture and nutrition practices among the users of these mobile phone-based services.

These outcomes will be achieved through four outputs:

- Improved access to relevant mobile based health, nutrition and agricultural advisory services for 3 million poor people and community health workers across 10 SSA and 4 Asian countries;
- Launch and scaling of mobile phone-based health, nutrition and agricultural advisory services targeted to poor people and community health workers;

- Generation and dissemination of high quality research and evidence on the impact, cost-effectiveness and sustainability of mobile phone-based advisory services in nutrition and agriculture in South Asia and SSA; and

- Development of locally relevant content for mobile phone technology-based agriculture and nutrition services meeting demands from users and community health workers.

In terms of promoting behaviour change and/or adoption of new practices, mNutrition will seek to achieve changes in one or more of the following areas:

- Adoption of new agricultural practices that are nutrition sensitive, improve agricultural productivity and utilise post-harvest technologies

- Changes in nutrition practices in either one or several knowledge domains including improved maternal nutrition practices during pregnancies; infant and young child feeding practice; and micro-nutrient supplementation to children at risk (i.e. Vitamin A, Zinc and Oral Rehydration Solution (ORS)).

mNutrition has started implementation from September 2013. For the 2 countries selected for the impact evaluation (Tanzania and Ghana), mobile network operators and content providers have been identified through a competitive process during the first half of 2014. The MNOs and content providers started developing and launching their services during the 4th quarter of 2014 and early 2015. The mobile phone-based advisory services are expected to run at least until the 3rd quarter of 2018.

mNutrition Project Coordination

DFID support to mNutrition will be channelled to GSMA, as well as directly to this associated independent external impact evaluation. GSMA is a global body that represents the interests of over 800 mobile operators. GSMA already works with the major mobile operators across Africa, (including Airtel, MTN, SafariCom/VodaCom) with a collective mobile footprint of more than 67% of total African connections. GSMA has a number of existing development initiatives, including mHealth and mFarmer, that are part of GSMA's Mobile for Development which brings together mobile operator members, the wider mobile industry and the development community to drive commercial mobile services for underserved people in emerging markets. GSMA will provide technical assistance to mobile phone operators, and support new partnerships with content providers to develop and scale up new nutrition and agriculture message services. GSMA will ensure sharing of best practices and promote wider replication and uptake of effective business models.

Objective and Main Questions

The objective of this work is to conduct an external evaluation of the impacts and cost-effectiveness of the nutrition and agriculture advisory services provided by mNutrition compared to alternative advisory services available in the two selected countries (Ghana and Tanzania), with particular attention paid to gender and poverty issues. The impact assessment is required to answer the following questions that relate to impact, cost-effectiveness and commercial viability:

- What are the impacts and cost-effectiveness of mobile phone-based nutrition and agriculture services on nutrition, health and livelihood outcomes, especially among women, children and the extreme poor?

- How effective are mobile phone-based services in reaching, increasing the knowledge, and changing the behaviour, of the specific target groups?

- Has the process of adapting globally agreed messages to local contexts led to content which is relevant to the needs of children, women and poor farmers in their specific context?
- What factors make mobile phone-based services effective in promoting and achieving behaviour change (if observed) leading to improved nutrition and livelihood outcomes?
- How commercially viable are the different business models being employed at country level?
- What lessons can be learned about best practices in the design and implementation of mobile phone-based nutrition services to ensure a) behaviour change and b) continued private sector engagement in different countries?

Further evaluation questions related to other aims of mNutrition will be addressed in at least 1 country (either Ghana and/or Tanzania):

- Are mobile phone-based services a cost-effective way to register and identify at risk populations to target with nutrition support?
- Are mobile phone-based services a cost-effective way for community health workers to improve the quality and timeliness of data surveillance (a core set of nutrition-related indicators)?

The content for the mobile phone-based advisory services will be based on international best practices and widely endorsed protocols (i.e. by the World Health Organisation) and evidence-based nutrition-sensitive agricultural practices identified by international experts. Through an iterative multi-stakeholder process, international and country experts will localise and adapt the content to make it relevant to the specific target audience in the 14 countries. The adapted content and nature of messages is expected to vary across specific target audiences within and across countries. The main purpose of assessing the relevance of the content is not to evaluate the overall health and nutrition content but on how this content has been localised and adapted and to what extent the needs of the specific target groups within their particular context have been met.

In assessing the commercial viability, it is recognised that evaluating the sustainability/long-term financial viability of the mobile phone-based advisory services will be difficult as mobile network operators may not be willing to provide this potentially commercially sensitive information. Therefore, GSMA will provide support through its access to aggregated confidential financial results of the mobile network operators providing the service. GSMA will provide a financial summary report on the commercial viability of the business models without compromising the commercial sensitivity of the data for the mobile network operators. The evaluator will assess and validate commercial sustainability through an analysis of the aggregated information provided by GSMA and additional qualitative business analysis approaches.

The Evaluator has the option of proposing refinements of the existing evaluation questions during the inception phase as part of developing the research protocol. These suggestions will be considered by the Steering Committee and an independent peer review during the review of the research protocol as part of the inception phase.

Output

The output of this work will be new and robust evidence on the impact, cost-effectiveness and commercial viability of mobile phone-based advisory services focusing on nutrition and agriculture delivered by public and private partners, and including the development of robust methodological approaches to impact assessment of phone-based advisory services.

Recipient

The primary recipient of this work will be DFID, with the beneficiaries being GSMA, governments, international agencies, foundations, MNOs and other private companies and civil society involved in policies and programmes in nutrition and agriculture that are aimed at improving nutritional, health and agricultural outcomes. The findings of this impact evaluation are intended as global public goods.

Scope and timeline

The scope of this work is to:

- Develop a research protocol for the external evaluation of mNutrition;
- Design and undertake an external evaluation of mNutrition in two countries: Ghana and Tanzania;
- Contribute to the communication of the learning agenda, evaluation strategy and evaluation results.

The evaluation will be in two of the 14 mNutrition target countries; Ghana and Tanzania. These countries have been selected based on the phased start-up of mNutrition programme activities. The focus and approach in the two respective countries will be different allowing for a comparison of the effectiveness of approaches applied. In Tanzania, mNutrition will focus on mobile phone technology-based nutrition and health services and registration and identification of target population. In Ghana, the mobile phone technology will focus on nutrition and agriculture sensitive services.

In terms of coverage in number of people being targeted for these services, in total 3 million people will be reached through mNutrition; including 2 million for nutrition sensitive agriculture advisory messages in 4 Asian and at least 2 African countries and about 1 million beneficiaries for mobile phone-based nutrition services in 10 countries in SSA.

The evaluation contract period will be September 2014 to 31st December 2019. The development of the research protocol must be completed by month 4 for review and approval by DFID. Full details on tasks and deliverables are provided in sections below.

Statement on the design of the mNutrition evaluation

The evaluation design is expected to measure the impact, cost-effectiveness and commercial viability of mNutrition, using a mixed methods evaluation design and drawing on evidence from two case study countries and the M&E system of the programme. Overall, the proposed design should ensure that the evidence from the two case study countries has high internal validity and addresses the priority evidence gaps identified in the Business Case. Being able to judge the generalisability/replicability of lessons learned from the programme is of equal importance and so a credible approach to generalization and external validity will be an important component of the overall evaluation design. The final evaluation design and methodology to generate robust evidence will be discussed in detail with DFID and GSMA before implementation.

For assessing cost-effectiveness, the Evaluator will further fine-tune their proposed evaluation approach and outline their expectations in terms of data they will require from implementers. A theory-based evaluation design, using mixed methods for evaluating the impact has been proposed. During the inception phase, the Evaluator will put forward a robust evaluation design for the quantitative work, either an experimental or a quasi-experimental method, with a clear outline of the strengths and limitations of the proposed method relative to alternatives. During the

inception phase, the Evaluator is also expected to identify clearly what will be the implications of the design for implementers in terms of how the overall programme would be designed and implemented and for evidence to be collected in the programme's monitoring system. The Evaluator will also assess the degree to which it is realistic to assess impacts by early 2019 for a programme where implementation started mid-2015 and, if there are challenges, how these would be managed.

The Evaluator, in its 6 monthly reports, will be required to provide information to feed into the DFID Annual Review and Project Completion Report of mNutrition.

Gender and inclusiveness

The impact evaluation will pay particular attention to gender and other forms of social differentiation and poverty issues. From current experiences, it is clear that access to and use of mobile services is differentiated along a range of factors, including gender, poverty, geographic marginalisation, education and illiteracy levels. Therefore, the impact evaluation will look at and analyse differentiated access to and potential utilisation of mobile phone-based services for improved nutrition and agricultural production. Based on the findings, it will identify opportunities and challenges in having an impact on women in general and more specifically the poor and the marginalised.

Tasks

The Evaluator will perform the following tasks:

A. Finalise a coherent and robust evaluation approach and methodology based on their proposal (inception phase)

- Conduct landscape analysis of existing experiences in mobile phone-based services for nutrition and agriculture based on available publications and grey project documents to identify additional critical lessons and priorities for evidence gathering and programme design and implementation;
- Ensure that gender issues and poverty issues are well integrated into the impact evaluation design;
- Develop robust sampling frameworks, core set of indicators and research protocols that allow the consistent measurement and comparison of impacts across study countries, taking into account differences in business models and programmes as needed;
- Work closely with mNutrition programme team in GSMA to familiarise them with impact assessment methodology, discuss evaluation approaches, identify and agree on data provided by programme monitoring system and possible modifications to design;
- Identify risks to the evaluation meeting its objectives and how these risks will be effectively managed;
- Review existing evaluation questions and if deemed relevant propose refinement of existing questions and/or add other questions;
- Prepare a research protocol, including an updated workplan, project milestones and budget. The research protocol will be subject to an independent peer review organised by DFID; and
- Develop a communication plan.

B. Implement and analyse evaluations of impact, cost-effectiveness and commercial viability in accordance with established best practices

- Based upon the agreed evaluation framework, develop and test appropriate evaluation instruments which are likely to include data collection forms for households, community health workers, service providers including health and agricultural services, content providers and private sector stakeholders including mobile network operators. Instruments will involve both quantitative and qualitative methods;
- Register studies on appropriate open access study registries and publish protocols of studies where appropriate;
- Conduct baselines and end-lines, qualitative assessments and business model assessments in both of the two impact evaluation countries;
- Conduct and analyse the evaluations and present findings in two well-structured reports addressing the evaluation questions. The reports should follow standard reporting guidelines as defined by, for example, the Equator Network. Primary findings should be clearly presented along with a detailed analysis of the underlying reasons why the desired outcomes were/were not achieved;
- The Evaluating Organisation or Consortium may sub-contract the administration of surveys and data entry, but not the supervision of those tasks, study design, or data analysis; and
- The country-specific mixed methods evaluation reports, cost effectiveness and business models studies and final evaluation report will be subject to an independent peer review organised by DFID.

C. Contribute to the communication of the learning agenda, impact evaluation strategy, and evaluation results.

- Develop a communication plan outlining the main outputs and key audiences;
- Conduct lessons learnt workshops in each of the 2 impact evaluation countries and key dissemination events; and
- Assist in communicating the results of the evaluation and contribute to the development and communication of lessons learnt about mobile phone-based extension approaches in nutrition and agriculture.

Deliverables

The Evaluator will deliver the following outputs[15]**:**

During the design and study inception phase of maximum 4 months:

- A publishable landscape analysis report highlighting lessons learnt from existing initiatives on mobile phone-based advisory services related to nutrition and agriculture by month 4;
- A updated work plan with project milestones and budget by end of month 1 (possibly adjusted based on the approved research protocol by month 4);
- A communication plan outlining the key outputs, audience and timeline for review and approval by month 4; and
- A full research protocol by month 4 for review and approval. The research protocol should be registered with appropriate open access study registries;

---

[15] Exact timeframe of deliverables will be agreed on during the design phase as appropriate.

Interim reports:

- 4 biannual progress reports for the External Evaluation as a whole, and for each country evaluation, against milestones set out in the workplan;
    - ο Two desk reviews submitted by June 2016
    - ο Two Baseline quantitative reports submitted by April 2017
    - ο Two Baseline qualitative reports submitted by February 2017
    - ο Two Cost-effectiveness reports 1 submitted by March 2017
    - ο Two Business Model reports 1 submitted by March 2017
    - ο Two Mixed Methods Baseline reports completed by September 2017
    - ο Two Midline qualitative reports submitted by March 2018

- All survey data collected during the evaluation provided in a suitable format to DFID for public release.

At project's end:

- Two Endline quantitative reports submitted by June 2019
- Two Endline qualitative reports submitted by August 2019
- Two Cost-effectiveness report 2 submitted by July 2019
- Two Business Model report 2 submitted by July 2019
- Two Evaluation reports submitted by October 2019
- At least 1 article, based on the findings from the country evaluation reports, published in a research journal;
- A shared lesson learnt paper published and at least one presentation highlighting key lessons for similar initiatives of promoting mobile based technologies for providing extension services and the promotion of uptake of technologies by December 2019.

Research protocol and all final reports will be independently peer reviewed. This will be organised by DFID. Outputs are expected to be of sufficiently quality so that a synthesis of findings can be published in a leading peer-reviewed journal.

Coordination and reporting requirements

A mNutrition Advisory Group (AG) will be established for the programme which will a) provide technical oversight and b) maximise the effectiveness of the programme. The Advisory Group will meet on a bi-annual basis and comprises of representatives of DFID, NORAD and GSMA representatives and independent technical experts. The Evaluator will be managed by DFID on behalf of the mNutrition Advisory Group. The Evaluator will work closely with the mNutrition programme team in GSMA and its specific country implementing partners. The Evaluator will:

- Ensure coherence and lesson learning across all pilot impact assessments on the key evaluation questions and indicators identified.
- Incorporate a clear code of ethics; incorporate plans for open access publications and public access to data sets.

The Evaluator will work closely with the mNutrition project management team, in particular in the design of the overall evaluation framework and the evaluation plan for the specific project components and the countries selected for the evaluation. Collaboration and regular communication between Evaluator and mNutrition project management team and implementing

partners in selected case study countries is crucial as the evaluation design may have implications for project implementation and vice versa. The mNutrition project management team will lend support in communication as requested by the Evaluator or the Advisory Group. The Evaluator will report directly to DFID who will manage the evaluation on behalf of the mNutrition Advisory Group. The main point of contact for technical matters is Louise Horner, Livelihoods Adviser and Hugh McGhie, Deputy Programme Manager for all other project related issues. The mNutrition Advisory Group will be the arbiter of any disputes between the evaluation function and the overall programme implementation.

At the end of each 6 months, the Evaluator will submit a brief report outlining key achievements against the agreed deliverables. Pre-agreed funding will then be released provided that deliverables have been achieved.

In addition to the 6 monthly reports outlined above, the Evaluator will provide information to feed into the DFID Annual Review of mNutrition. The 6 monthly reports will be a key source of information used to undertake the Annual Review and Project Completion Report for the programme. These reviews will be led by the Livelihoods Adviser and Deputy Programme Manager, in consultation with the mNutrition AG. All reviews will be made available publicly in line with HMG Transparency and Accountability Requirements.

Mandatory financial reports include an annual forecast of expenditure (the budget) disaggregated monthly in accordance with DFID's financial year April to March. This should be updated at least every quarter and any significant deviations from the forecast notified to DFID immediately. In addition the Evaluator will be required to provide annual audited statements for the duration of the contract.

Contractual Arrangements

The contract starts in September 2014 and will run till end of December 2019 subject to satisfactory performance as determined through DFID's Annual Review process. Progression is subject to the outcome of this review, strong performance and agreement to any revised work plans or budgets (if revisions are deemed appropriate).

A formal break clause in the contract is included at the end of the inception period. Progression to the implementation phase will be dependent on strong performance by the Evaluator during the inception period and delivery of all inception outputs, including a revised proposal for implementation period. Costs for implementation are expected to remain in line with what has been agreed upon for this contract, with costs such as fee rates fixed for contract duration. DFID reserves the right to terminate the contract after the inception phase if it cannot reach agreement on the activities, staffing, budget and timelines for the implementation phase.

DFID reserves the right to scale back or discontinue this assignment at any point (in line with our Terms and Conditions) if it is not achieving the results anticipated. The Evaluator will be remunerated on a milestone payment basis. DFID has agreed an output-based payment plan for this contract, where payment will be explicitly linked to the Evaluator's performance and effective delivery of programme outputs as set out in the ToR and approved workplan. The payment plan for the implementation phase will be finalised during the inception period.

Open Access

The Evaluator will comply with DFID's Enhanced and Open Access Policy. Where appropriate the costs of complying with out open access policy should be clearly identified within your commercial proposal.

Branding

The public has an expectation and right to know what is funded with public money. It is expected that all research outputs will acknowledge DFID support in a way that is clear, explicit and which fully complies with DFID Branding Guidance. This will include ensuring that all publications acknowledge DFID's support. If press releases on work which arises wholly or mainly from the project are planned this should be in collaboration with DFID's Communications Department.

Duty of Care

The Evaluator is responsible for the safety and well-being of their Personnel (as defined in Section 2 of the Contract) and Third Parties affected by their activities under this contract, including appropriate security arrangements. The Evaluator is responsible for the provision of suitable security arrangements for their domestic and business property. DFID will share available information with the Evaluator on security status and developments in-country where appropriate.

The Evaluator is responsible for ensuring appropriate safety and security briefings for all of their Personnel working under this contract and ensuring that their Personnel register and receive briefing as outlined above. Travel advice is also available on the FCO website and the Evaluator must ensure they (and their Personnel) are up to date with the latest position.

The Evaluator has confirmed that:

- The Evaluator fully accepts responsibility for Security and Duty of Care.
- The Evaluator understands the potential risks and have the knowledge and experience to develop an effective risk plan.
- The Evaluator has the capability to manage their Duty of Care responsibilities throughout the life of the contract.

Annex B   Topic guide for in-depth interviews with WN plus mNutrition users

(treatment group only)

Purpose:

- Explore what motivates mothers/users to continue to engage
- Explore cycles/dynamics of engagement
- Perceptions about the value of mobile phone-based information compared to other information sources
- Pathways of change: Translation of information into action
- Patterns of and motivation for sharing mobile phone-based information with peers

Sample: Mothers/users who still engage with the WN plus mNutrition messages (sample will be given by IDS)

Location: Household

Time for the interview: Approximately 60-75 minutes

Instructions:

Thank the female respondent for taking part in the study and explain that you are part of a research team. Explain that she/her household has been receiving free text messages that contain health and nutrition information for several months now. This service is called mNutrition provided by Wazazi Nipendeni. You know that they have recently been visited by a team of researchers who asked them questions WN plus mNutrition. You belong to the same team of researchers and would like to ask some further questions. Say that you do not work for a mobile phone company but for a research organisation.

Explain that everything they say will be treated as confidential, will not be shared with other people in their village or household and that you will not use their real names. Explain to them that their participation is voluntary, and they can stop anytime and withdraw their data at any time.

Tell them that the discussion will take around 60-75 minutes and that you (and other note taker) would like to take notes and audio-record (so that you do not miss any information). Check that this is okay with them. Ask whether they have any questions.

Be aware that the question about child feeding might be sensitive and women might easily feel judged as 'not being a good mother' when they don't follow certain infant and young child feeding recommendations (e.g. breastfeeding practices) or do not have the correct knowledge. Be neutral and do not judge. There are many reasons why mothers might not be able to follow the recommendations.

Name (just first name, so you can use their name during the interview)	ID Number (given by IDS sample):	Do you recall receiving a WN plus mNutrition text message last 2 months (60 days)?	Does she get the SMS on her own phone/somebody else's phone (specify)?
Gender of interviewee:	Date of the interview	Village	

1. Warm-up

Small talk – build a rapport (e.g. about village, her children)

Interviewer should ask all the questions in bold then if they don't say anything in response to the question, the interviewer systematically probes their experiences with the bullet points. If they have given a full answer to the question above this isn't necessary.

2. Motivators for continued engagement

		•
1	**What has motivated you to continue to read WN plus mNutrition message for the last 2 years? Why?**	• Were there periods when you did not engage with WN? Why? • What made you engage again? Ask for internal and external motivators to engage again? (e.g. child's age, mother does not need advice) • Why did you disengage?
2	**When you receive a WN text messages how does it make you feel? Why?**	• E.g. special, reduce loneliness, feel that his/her concern are validated • Annoyed, disturbed • Why?
3	**Do the WN messages change how you feel about your mobile network provider (e.g. Airtel)**	• Why? • Are you more likely to stay with this provider because of the WN messages? • Why/why not?
4	**In the last 2 years have you changed your main mobile phone provider? Why?**	• Other services mobile phone provider offered motivated me to change (e.g. mobile money) • Others
5	**Have the WN text messages changed how and for what you use your mobile phone?**	• E.g. have you signed up for other mobile phone-based information services? • Have you become more confident in using different functions of your phone? (e.g. SMS) • Has you getting these messages on your phone changed the way your husband views your access to the phone?
6	**Does your husband read the messages? OR Do you share the messages with your husband? What effect does this have?**	• Husband supports mothers to read/follow message content • Husband unsupportive
7	**<u>Only ask women who own a mobile phone:</u>**	• How? • Why?

	Has your husband's attitude towards your use of a mobile phone changed in the last 2 years?	

3. Perceived usefulness of WN plus mNutrition

8	In your opinion, how useful and relevant is the <u>nutrition information</u> in the mNutrition text messages for you?	• Messages were overall useful/not useful at all. Ask why? • What messages did you find particularly useful (e.g. messages about nutrition during pregnancy, breastfeeding, young child feeding, general health & nutrition advice) Why? Can you give me an example of how you used this information? • Why? Can you give me an example of specific messages?
9	Do you think that the information you receive through WN plus mNutrition text messages is different from nutrition information you receive through other channels)? <u>Why?</u>	• Probe regarding other information sources (e.g. radio, health worker, other mothers, family members) • Is the advice you get from different sources the same?

10	Have you ever followed the advice given in the WN plus mNutrition text messages? Why/Why not? (ask for examples)	• <u>Why</u> did you decide to try the advice given? What motivated you? What role did the WN message play? (e.g. key motivator or last drop) Was there anything that prompted you to change?
		• Have you heard the same information from a different source? How did this influence your decision to try and follow the advice?
		• <u>What, if any, problems </u>have you encountered when trying to do something differently?
		  ○ <u>Belief in own abilities:</u> How confident were you about it? How easy or difficult did you find it?
		  ○ <u>Knowledge:</u> Did you feel the message provided enough information about the issue? Why not? What did you do? (e.g. ask others, access other information sources)
		  ○ <u>Social influences:</u> How did views/opinions/expectations of your husband/family/friends influence you? To what extent?
		  ○ <u>Access to resources to follow up on the advice:</u> In what way did your personal circumstances influence you (e.g. access to food or services, demands on your time, poverty)

11	**Compared to other information sources (e.g. health worker, family, radio), are you more or less likely to follow advice given through the SMS messages? Why?**	• What makes the WN plus mNutrition SMS more or less effective in providing information? Why? • Do you think WN plus mNutrition SMS can be useful on its own? • What do you think makes it not useful compared to other sources? (e.g. too short; can't ask questions)
12	**Have you shared any of the advice you got through WN plus mNutrition text messages with others? Why? What motivated you to share?**	• How did people respond when you shared the information? • Who did you share it with – was it family or friends? Did they say that the information came from a mobile phone-based message? Why/why not?

Thank you. Do you have any questions?

Annex C   Characteristics of qualitative interviewees

Table 3:   Cluster 1: Mufindi

No	Village	Engagement with WN	Age	Number of children	Received WN SMS	Signed up with	Mother's work	Poverty level
1	Vikula	Long-term engaged	22	2	Father (he shared some messages)	Young child	Farming	Poor
2	Vikula	Long-term engaged	22	2	Mother (on her own phone)	Young child	Tailor	Poor
3	Kasanga	Still active	20	1	Father (he shared all messages)	Pregnancy	Farming	Less poor
4	Kasanga	Long-term engaged	30	5	Sister (she shared all messages)	Young child	Farming	Poor
5	Kasanga	Long-term engaged	23	2	Mother (on her own phone)	Pregnancy	Herbalist	Poor
6	Ikanga	Still active	38	7	Mother and father	Young child	Farming	Poor
7	Ikanga	Long-term engaged	37	1	Father (he shared some messages)	Young child	Tailor	Poor
8	Ikanga	Still active	26	3	Mother (on her own phone)	Pregnancy	Farming	Poor
9	Mpanga	Long-term engaged	26	1	Mother (on her own phone)	Young child	Farming	Less poor
10	Sawala	Long-term engaged	29	1	Mother (on her own phone)	Pregnancy	Teacher	Less poor
11	Sawala	Long-term engaged	26	2	Mother (on her own phone)	Pregnancy	Farming	Less poor
12	Sawala	Still active	23	1	Mother and father	Pregnancy	Caretaker in school	Poor
13	Sawala	Long-term engaged	23	2	Mother (on her own phone)	Pregnancy	Farming	Less poor

Source: Authors' own

Table 4:   Cluster 2: Mufindi

	Village	Engagement with WN	Age	Number of children	Received WN SMS	Signed up when	Mother's work	Poverty level
1	Usengelindete	Long-term engaged	34	3	Father (he shared most messages)	Pregnancy	Farming	Poor
2	Usengelindete	Long-term engaged	37	3	Mother (on her own phone)	Pregnancy	Farming	Poor
3	Usengelindete	Still active	29	2	Father (he shared most messages)	Pregnancy	Farming	Less poor
4	Usengelindete	Long-term engaged	25	2	Mother (on her own phone)	Pregnancy	Farming	Less poor
5	Usengelindete	Long-term engaged	27	2	Mother (on her own phone)	Pregnancy	Farming	Less poor
6	Utosi	Long-term engaged	28	1	Father (he never shared messages)	Pregnancy	Farming	Poor
7	Utosi	Still active	18	1 (child died)	Mother (on her own phone)	Young child	Farming	Poor
8	Utosi	Never active	22	4	Father's phone (he never shared messages)	Pregnancy	Farming	Less poor
9	Utosi	Still active	30	6	Father's phone (he shared some messages)	Young child	Farming	Poor
10	Tambalang'ombe	Still active	25	2	Mother (on her own phone)	Young child	Farming	Poor
11	Tambalang'ombe	Long-term engaged	35	5	Mother and father	Pregnancy	Farming	Less poor
12	Uhambila	Long-term engaged	17	1	Mother (on her own phone)	Young child	Farming	Less poor
13	Uhambila	Still active	26	3	Father (he shared some messages)	Young child	Farming	Less poor
14	Uhambila	Still active	34	2	Mother (on her own phone)	Pregnancy	Farming	Less poor

Source: Authors' own

Table 5: Cluster 3: Iringa Rural

	Village	Engagement with WN	Age	Children	Received WN SMS	Signed up when	Mother's work	Poverty level
1	Igula	Long-term engaged	27	1	Father (he shared all messages)	Pregnancy	Farming	Less poor
2	Igula	Long-term engaged	43	5	Father (he shared most messages)	Pregnancy	Farming	Poor
3	Igula	Still active	31	3	Mother (on her own phone)	Young child	Business woman	Poor
4	Igula	Long-term engaged	26	1	Mother (on her own phone)	Pregnancy	Business woman	Less poor
5	Mangalali	Long-term engaged	31	3	Mother (on her own phone)	Young child	Farming	Poor
6	Mangalali	Long-term engaged	23	1	Mother and father	Pregnancy	Farming	Less poor
7	Mangalali	Still active	20	2	Father (he shared most messages)	Pregnancy	Farming	Poor
8	Mangalali	Long-term engaged	25	2	Mother (on her own phone)	Young child	Farming	Less poor
9	Weru	Still active	25	1	Father (he never shared messages)	Pregnancy	Farming	Less poor
10	Weru	Long-term engaged	39	6	Mother (on her own phone)	Pregnancy	Farming	Poor
11	Weru	Still active	31	4	Brother (he occasionally shared messages)	Pregnancy	Farming	Poor
12	Magubike	Long-term engaged	39	3	Mother (on her own phone)	Young child	Farming	Less poor
13	Magubike	Still active	35	5	Mother and father	Young child	Farming	Less poor
14	Kilambo	Long-term engaged	32	6	Mother and father	Pregnancy	Farming	Very poor
15	Kilambo	Long-term engaged	29	3	Father (he shared most messages)	Pregnancy	Farming	Very poor
16	Kilambo	Long-term engaged	20	2	Father (he shared most messages)	Pregnancy	Farming	Poor
17	Kilambo	Still active	28	3	Father (he never shared messages)	Pregnancy	Farming	Less poor
18	Kilambo	Long-term engaged	19	1	Mother (on her own phone)	Pregnancy	Farming	Less poor
19	Kilambo	Still active	25	3	Father (he shared some messages)	Pregnancy	Farming	Less poor
20	Tanangozi	Long-term engaged	21	4	Mother (on her own phone)	Pregnancy	Farming	Poor

21	Tanangozi	Long-term engaged	23	1	Mother (on her own phone)	Pregnancy	Farming	Less poor
22	Tanangozi	Long-term engaged	28	1	Mother (on her own phone)	Young child	Farming	Poor
23	Ugwachanya	Long-term engaged	22	2	Mother (on her own phone)	Young child	Farming	Less poor
24	Ilambilole	Long-term engaged	26	4	Mother (on her own phone)	Pregnancy	Business woman	Poor
25	Ilambilole	Still active	39	5	Mother (on her own phone)	Pregnancy	Farming	Poor
26	Ilambilole	Never active	30	2	Father (he never shared messages)	Pregnancy	Farming	Less poor
27	Ilambilole	Still active	28	3	Father (he shared most messages)	Young child	Farming	Poor
28	Nyangâoro	Still active	41	4	Mother (on her own phone)	Pregnancy	Farming	Less poor
29	Mangawe	Still active	21	2	Father (he shared some messages)	Pregnancy	Farming	Less poor
30	Mangawe	Long-term engaged	31	1	Mother (on her own phone)	Young child	Farming	Very poor

Source: Authors' own