MOZAMBIQUE

mNutrition Market Access Document

The Costs and Health Impacts of Mobile Messaging for Nutrition

JULY 2015

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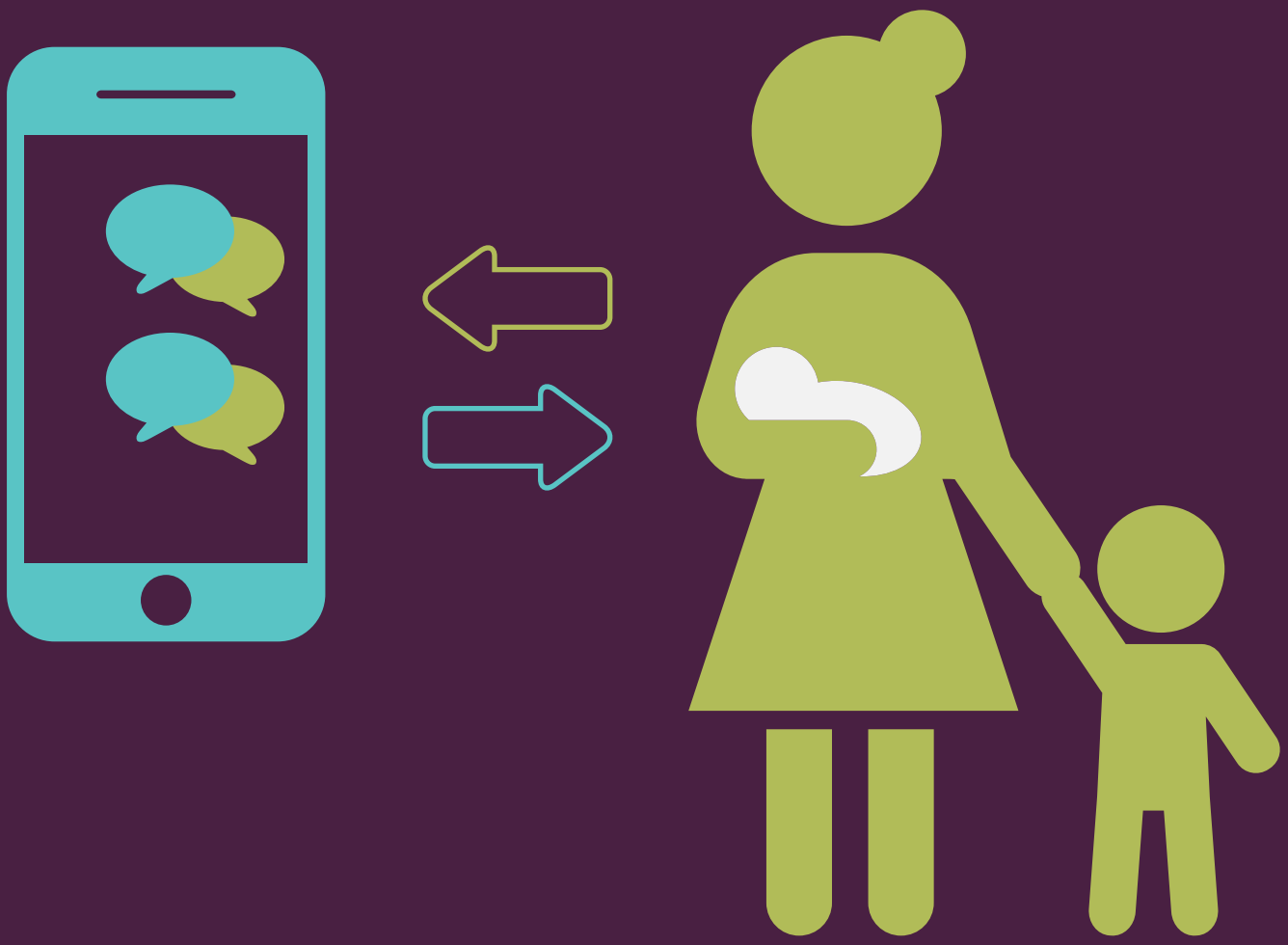
ACRONYMS

BCC	Behavior Change Communication
BOP	Base of the Pyramid
CSR	Corporate Social Responsibility
FFM	Financial Forecast Model
GNI	Gross National Income
GSMA	Groupe Speciale Mobile Association
ICT	Information and Communications Technology
IVR	Interactive Voice Response
LiST	Lives Saved Tool
MNCH	Maternal, Newborn and Child Health
MoH	Ministry of Health
MZN	Mozambique New Metical
NFP	Not for Profit
NGO	Non-Governmental Organisation
PPP	Public-Private Partnership
SMS	Short Messaging Service
USSD	Unstructured Supplementary Services Data
VAS	Value Added Services
VfM	Value for Money

EXECUTIVE SUMMARY



BACKGROUND

The rapid expansion of mobile phone access to base of the pyramid (BOP) populations presents an unprecedented opportunity to increase coverage of consumer health services to this traditionally overlooked market. Moreover, free (or very low cost) health services or information delivered via mobile have the potential to serve as a new way to increase mobile user satisfaction and increase usage of other low-cost mobile services. The Groupe Speciale Mobile Association (GSMA) has partnered with UK aid from the Department for International Development (DFID) to support the scale-up of mobile nutrition (mNutrition) services. The overarching aim is to create long-term sustainability of mNutrition services by facilitating the development of localised nutrition content, working to incorporate that content into consumer-facing mobile services, and thereafter supporting the launch and scale-up of those services.

Palladium is supporting this effort by strengthening the case for sustainable mNutrition in Mozambique through the application of quantitative cost and health impact modelling techniques, and targeted stakeholder interviews

mNutrition FINANCIAL FORECAST

Understanding the true cost of the mNutrition service is essential for long-term sustainability. In consultation with the GSMA, Palladium developed the mNutrition Financial Forecast Model (FFM) to calculate the potential uptake and cost of a national messaging service that is based on short-messaging service (SMS) and interactive voice response (IVR). The FFM was adapted to the Mozambican context using the proposed product concept, data from stakeholder interviews, and national demographic data sources.

Demographic analysis reveals that in 2015, an estimated 2.75 million Mozambican women of reproductive age (WRA) live in households with access to mobile. Of these women, 1.2 million are either pregnant or have children under the age of 24 months—the "addressable population."

The Palladium team developed two programmatic scenarios to represent different possible versions of the mNutrition product concept. "Scenario 1: SMS Only" represents the costs and uptake of a stage-based mNutrition messaging service in which women have the choice of receiving information only via SMS. In this scenario, registration can occur either via SMS or unstructured supplementary services data (USSD). Alternatively, in "Scenario 2: SMS and IVR," subscribers also have the choice of receiving messages via interactive voice response (IVR) instead of SMS. Both literate and illiterate women could opt to receive either SMS or IVR messages. However, for the purposes of this model, only literate women can effectively register and understand SMS messages. The addition of the IVR channel extends the reach of the programme to illiterate women. It is impossible to know in advance the proportion of each group that would opt for the SMS or IVR service. Therefore, in this application of the model, literate women will opt for SMS-based messaging and illiterate women for IVR. Based on a review of the literature and stakeholder interviews, we assume 5 percent of the addressable population can be persuaded to join the mNutrition service in any given year. We gathered costing inputs from key stakeholder interviews and reported results in 2015 US dollars.

Under the conditions of Scenario 1: SMS Only, in which only the literate population can be effectively reached with health information, the mNutrition service can expect as many as 158,728 registrations within the first 5 years, for a total programme cost of US$602,000 (22.9 million Mozambican New Metical, or MZN). If an IVR option is added, expanding the addressable population to include illiterate women, as in Scenario 2: SMS and IVR,

registrations could grow to 293,116, for a 5-year cost of US$2.8 million (105.5 million MZN). In Scenario 1, the dominant driver of total programme cost is SMS connectivity, at 50 percent of total costs, and in Scenario 2, the majority of cost is due to voice connectivity, at 73 percent of the 5-year total.

HEALTH IMPACTS OF mNutrition

In addition to estimating the overall costs of the mNutrition product, the Palladium team adapted and applied the established Lives Saved Tool (LiST) to estimate the potential impact of the service on morbidity and mortality at the national level.

Using the FFM uptake scenarios, we estimated the potential changes in coverages of key nutrition interventions for pregnant women and children, such as antenatal supplementation and breastfeeding. A review of studies of SMS-based messaging services with target outcomes found that SMS reminders resulted in an average 32 percent reduction in the number of people not covered by medical checkups and testing. Applying this same effect to mNutrition subscribers, we used the LiST model to calculate the overall health impact in children's lives saved and avoided stunting and wasting among children.

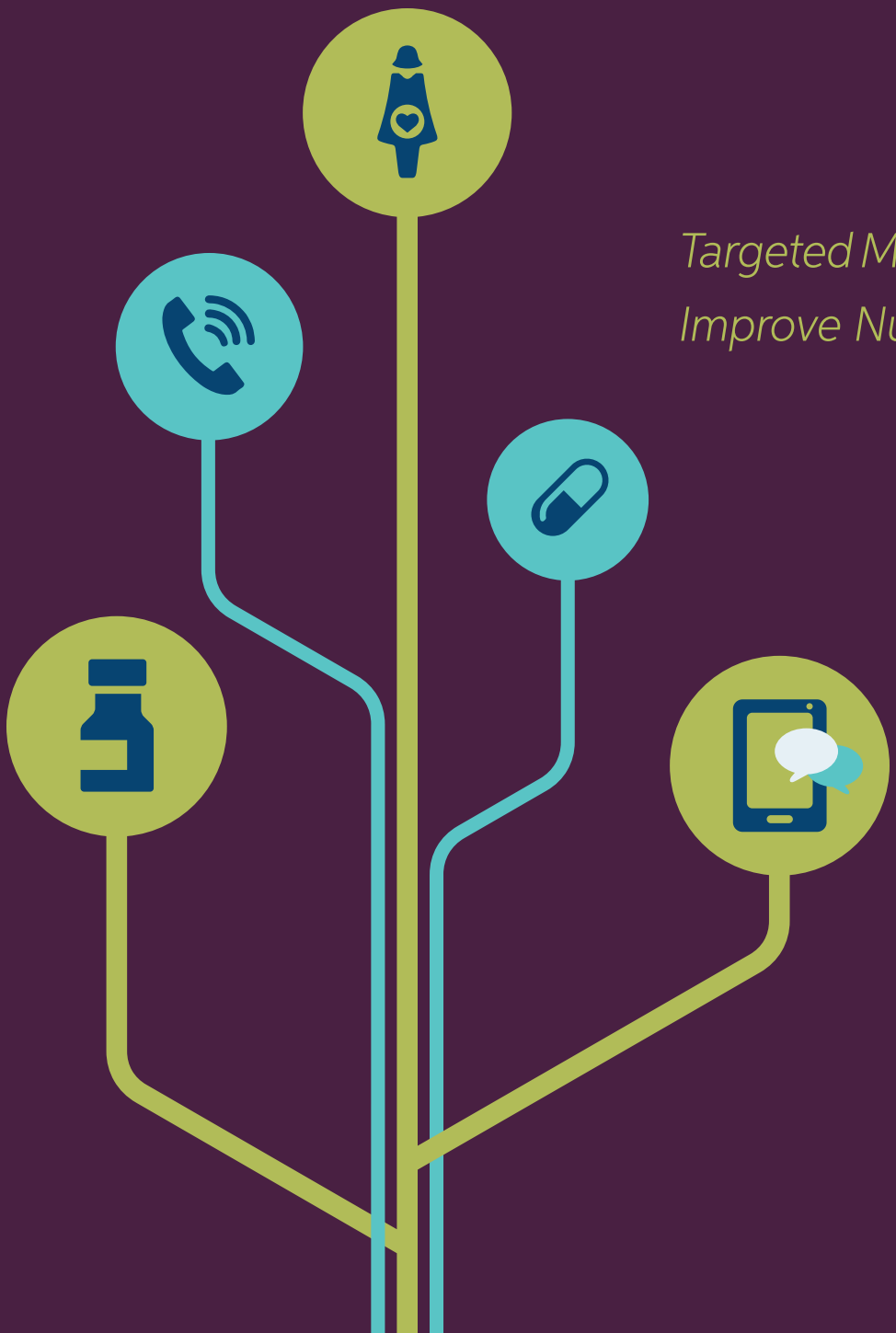
Under the assumptions of Scenario 1: SMS Only, the mNutrition service results in 561 fewer Mozambican child deaths during the 2015–2020 timeframe. Moreover, the service results in 10,396 fewer years of stunting and 8,341 fewer years of wasting in children under 5 in that same time span. However, in Scenario 2: SMS and IVR, 1,050 child deaths are prevented. Likewise, 19,878 years of stunting and 16,166 years of wasting are prevented in children by 2020.

VALUE FOR MONEY OF THE mNutrition PRODUCT

By combining the cost and impact estimates, we can start to truly understand the potential value for money (VfM) of the proposed mNutrition product. For example, for every US$10,000 spent under Scenario 1: SMS Only, 9.3 deaths, 139 years of wasting, and 173 years of stunting are prevented in children under 5. If IVR also is offered, as in Scenario 2: SMS and IVR, 3.8 deaths, 58 years of wasting, and 72 years of stunting are prevented in Mozambican children for every US$10,000. In this latter scenario, however, the addition of the IVR service expands the service to illiterate women and results in a greater number ultimately being reached at the BOP.

mNutrition
PRODUCT CONCEPT

Targeted Mobile Messaging to Improve Nutrition Knowledge and Behaviour



PROJECT BACKGROUND & JUSTIFICATIONS

The rapid expansion of mobile phone access to base of the pyramid (BOP) populations presents an unprecedented opportunity to increase coverage of consumer health services to this traditionally overlooked market. Building on market growth observed from mobile banking and other mobile services, there is a growth opportunity for mobile operators to expand business offerings while providing a valuable health service to BOP communities. mHealth services have largely been the purview of not-for-profit (NFP) organisations and donors, with few projects achieving sustainable financing and national scale. Mobile operators' significant market penetration and existing revenue models make them well positioned to deliver sustainable and impactful mHealth services.

With that in mind, the Groupe Speciale Mobile Association (GSMA) mHealth programme has developed a product concept for an mNutrition maternal messaging service. Referred to as the "mNutrition product" in this report, it has the potential to positively affect health at the BOP while achieving sustainability through a "freemium" approach to offering personalised mNutrition messaging. In collaboration with global and regional nutrition experts, the GSMA is developing stage-based nutritional messages for pregnant women and mothers of young children (under 24 months) targeting specific health improvements to reduce child morbidity and mortality rates. These messages will be delivered directly to a participant's (or household's) mobile phone at very low to no cost via short messaging service (SMS) or interactive voice response (IVR).

This most basic mNutrition messaging service seeks to promote healthy nutrition behaviours during pregnancy while simultaneously driving users towards premium services. These services are intended

to generate revenue for the mNutrition partners, making the product sustainable. Programme advertising and marketing may be accomplished through multiple channels, possibly including SMS blasts to targeted populations. Customers interested in the mNutrition service will register via SMS or unstructured supplementary services data (USSD).

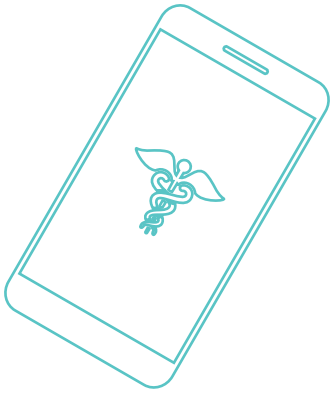
Based on extensive stakeholder interviews, this report documents and synthesises identified opportunities to introduce the proposed mNutrition product into the Mozambican mHealth ecosystem. The Palladium team modelled costs and health impact of several implementation scenarios to inform the adaptation of the product concept and implementation strategies for Mozambique.

mNutrition PRODUCT DESCRIPTION-CORE COMPONENTS

- Stage-based nutritional information service targeted to pregnant women and mothers of young children under age 24 months
- Offered free of charge to all mobile users
- Marketed through various media, possibly including SMS blast to the target population
- Free registration via USSD, SMS, and (potentially) IVR
- Content of health messages developed by global and regional nutrition experts to target country-specific nutrition issues
- Partnerships with existing health programme to endorse and standardise health content
- Mobile operators may offer other revenue-generating services to mNutrition users to promote financial sustainability

THE BUSINESS CASE FOR mHealth

Health and Economic Proof Points



Although mobile technology for behaviour change communication (BCC) may hold promise for targeted delivery of health messages to large numbers of Mozambicans, the appeal to possible payers ultimately will depend on the strength of the "business case" for mHealth. Will it achieve the desired outcomes in a cost-effective way? Of course, answering this question requires reliable information about both the cost and health impact of the programme as designed. mHealth for BCC is a new and growing field, and programme concepts are constantly adapting to local contexts. Thus, it is difficult to draw direct conclusions using examples of similar programmes. However, these challenges can be addressed through targeting modelling methodologies that take into account unique product adaptations. The following sections provide a high-level summary of modelling analyses to estimate the costs and potential health impacts of a nationwide mNutrition service in Mozambique.

FINANCIAL FORECAST MODEL

Estimating the Total Cost of Ownership of the mNutrition Messaging Service

To estimate the total cost of ownership of the proposed product, we developed a new mHealth financial forecast model (FFM) and adapted it to the Mozambican context. The FFM is a tool for estimating the resources needed from all programme partners to establish and operate the proposed mNutrition product. Based on demographic data, mobile penetration, and uptake assumptions, the FFM estimates new registrants and active users each year. It then calculates total annual messaging volume using the planned product concept. The FFM also requires that the user specify quantities and unit costs for various capital and operational expenditures associated with a mobile messaging service, such as programming, infrastructure, and connectivity costs. The result is a 5-year cost estimate for a nationwide mNutrition service.

As with any costing exercise, the results of the FFM are heavily dependent on the scope of costing. The Palladium team designed the model to account for the incremental cost of establishing the product concept in a particular target country. For this reason, we deliberately excluded from the cost analysis those costs incurred by the GSMA at the global level (with applications across all target countries). Start-up costs related to country engagement and market research may be included if desired, however.

SCENARIOS

For the purposes of modelling the mNutrition product, the team developed two scenarios from the proposed product concept and stakeholder

feedback. We limited the scope to the core nutrition messaging service to maintain comparability across countries. In Scenario 1: SMS Only, the SMS channel is used as the primary means of communication with users in each phase of the service: registration and messaging. In this scenario, the text-based nature of the service restricts its reach and impact to literate women only. In Scenario 2: SMS and IVR, the availability of IVR enhances the service to include the options for voice-based registration and messaging. The potential drawback is that IVR is a more resource-intensive channel, since voice connectivity requires greater bandwidth on the network; however, the addition of the IVR option makes the service far more accessible to illiterate women and mothers.

TABLE 1: mNutrition SCENARIOS FOR FINANCIAL FORECAST AND IMPACT MODELING

Scenario 1

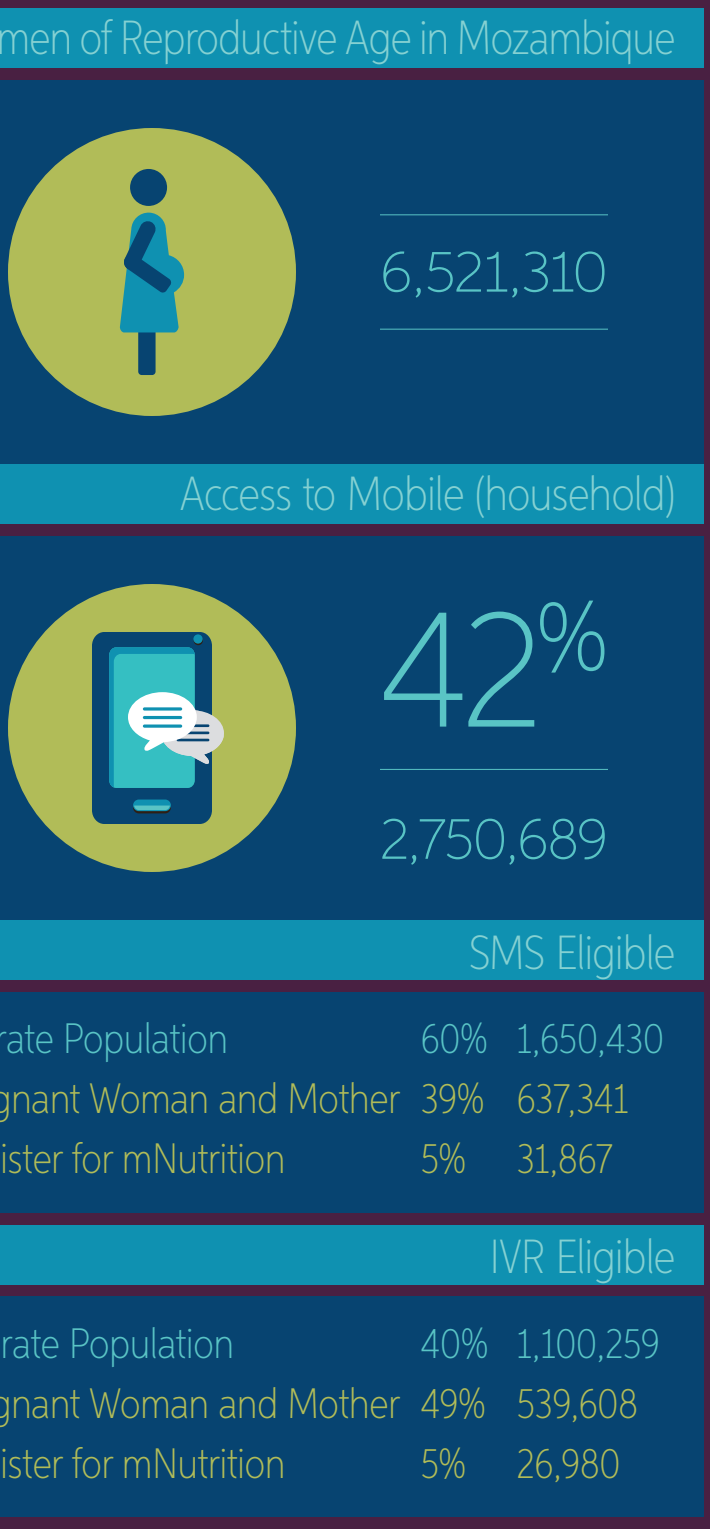
Advertising	Cost excluded
Registration	SMS
Messaging	SMS
Target Population	Literate pregnant women and mothers of children under 24 months

Scenario 2

Advertising	Cost excluded
Registration	SMS
Messaging	SMS IVR
Target Population	Literate and illiterate pregnant women and mothers of children under 24 months

FIGURE 1: Mozambique mNutrition target population and registrants (Year 1)[2]

Ultimately, a woman's ability to register for the mNutrition service is limited by her access to mobile and her level of literacy. However, even if a woman meets the necessary criteria, she still must ultimately make the decision to register. During interviews, representatives from mobile operators and value-added service (VAS) providers emphasised the difficulty of estimating registration rates for a new service. A study in South Africa reported a 10 percent registration rate for an SMS service promoting HIV testing in response to a single SMS blast to a population of mobile users who previously had responded to mobile advertising. Therefore, for purposes of this modelling exercise, we made the conservative assumption that 5 percent of the target population would register in a given year in response to all forms of advertising (see Figure 1 below). This registration rate could be improved through targeted marketing efforts and aggressive implementation plans through both the public and private sectors.



1 del Tolley et al., 2012

2 Mozambique Demographic and Health Survey data set, 2011

COSTING INPUTS

The Palladium team collected input data for the FFM during the semi-structured stakeholder interviews conducted in June 2015. As currently envisaged, the subscriber will receive 1 SMS message weekly during pregnancy and until the child reaches the age of 24 months. In Scenario 2: SMS and IVR, illiterate subscribers will receive IVR messages with similar content on the same schedule.

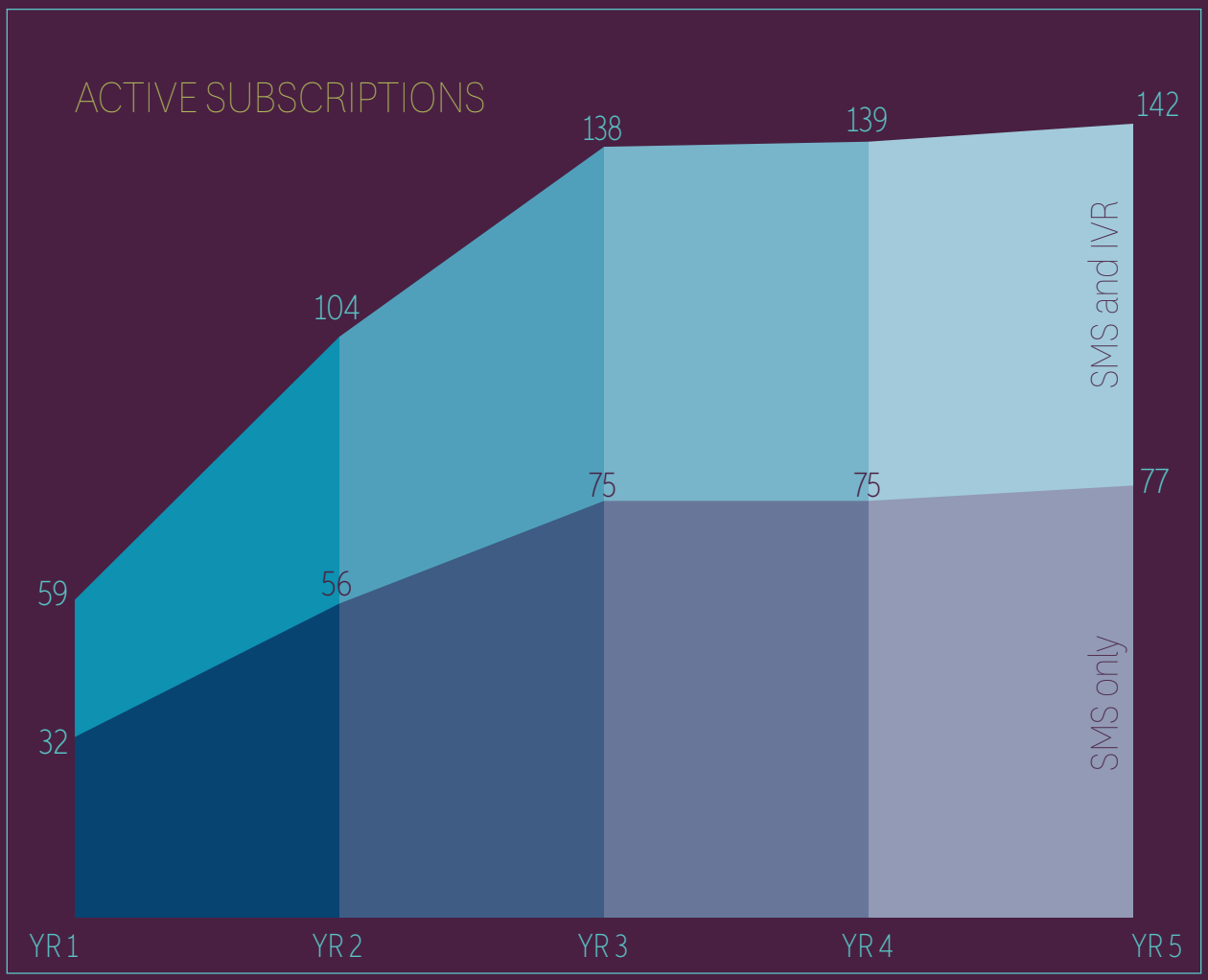
TABLE 2: mNutrition Key Costing Variables From Product Concept and Local Respondents

INPUT	VALUE
mNutrition Messages:	
SMS	1 per week
IVR (if available)	same as SMS schedule
Duration of Service	Pregnancy through 24 months post-delivery
Registration Stage (average)	4th month of pregnancy
SMS Connectivity Costs:	
SMS (per message	US$ 0.026 (1 MZN)
Short Code Setup (one-time)	US$ 592 (22,500 MZN)
Short Code Fee (annual)	US$ 66 (2,500 MZN)
IVR Connectivity Costs:	
Voice (per minute)	US$ 0.21 (8 MZN)
Length of IVR Message	1 minute
E 1 Line	1 line

FFM RESULTS: Service Volume

Based on the demographics of the Mozambican population and the costing assumptions above, the FFM estimates that 158,728 literate women could subscribe to mNutrition messaging over the first 5 years of the programme if SMS only is offered (Table 3). Programme reach increases to 293,116 if illiterate women are given the option of IVR.

TABLE 3: mNutrition SERVICE VOLUME (thousands)



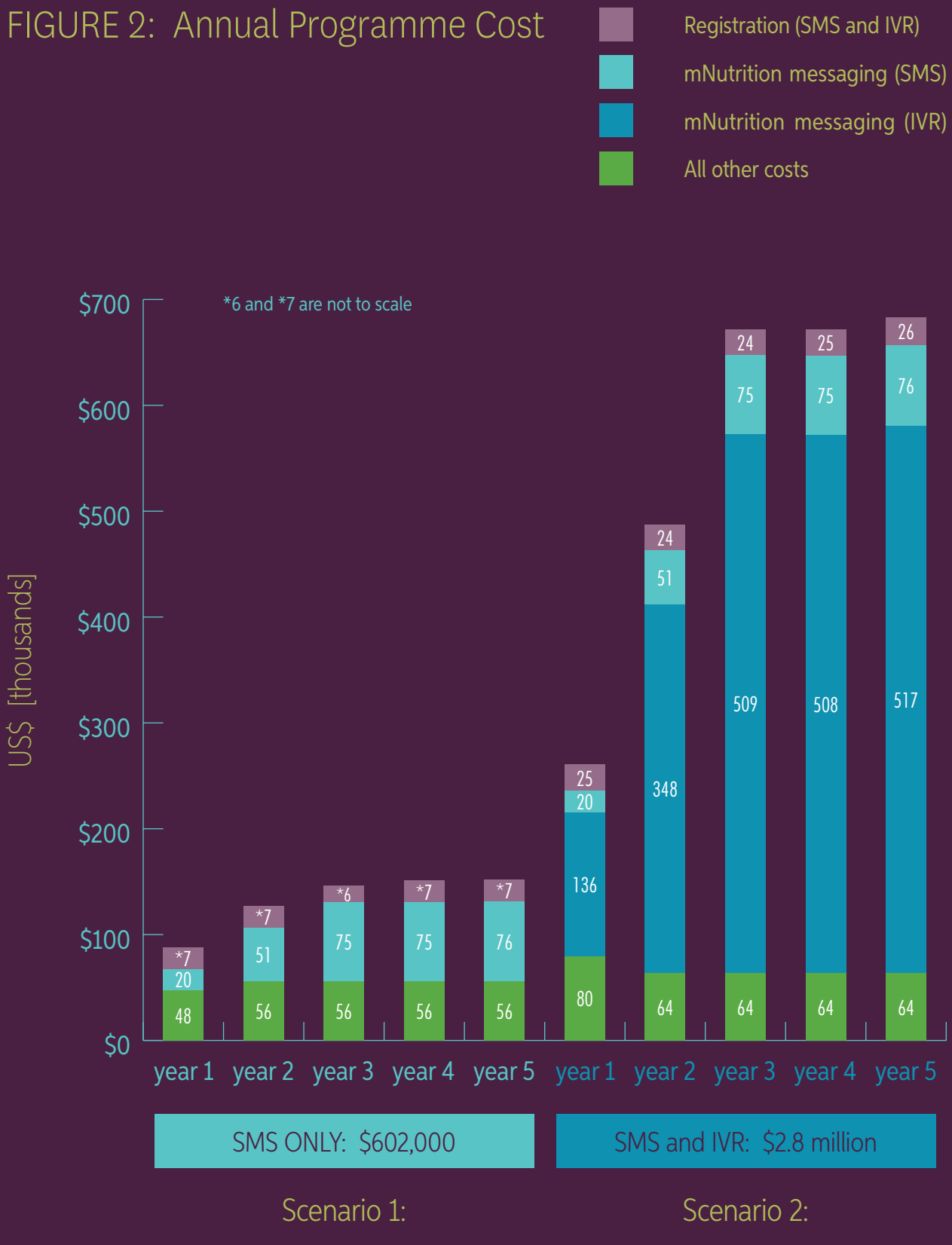
SMS ONLY		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
New Registrations	*(thousands)*	32	31	31	32	33	159
Active Subscriptions	*(thousands)*	32	56	75	75	77	n/a
SMS Messages	*(millions)*	1.02	2.20	3.10	3.10	3.16	12.6
SMS AND IVR		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
New Registrations	*(thousands)*	59	58	57	59	61	293
Active Subscriptions	*(thousands)*	59	104	138	139	142	n/a
SMS Messages	*(millions)*	1.0	2.18	3.08	3.08	3.14	12.5
IVR Messages	*(millions)*	.74	1.74	2.50	2.50	2.55	10.0

FFM Results: Programme Cost

The estimated total cost of the programme for the first 5 years, excluding the GSMA contributions, is US$602,000 (22.9 million MZN) in Scenario 1, in which only the SMS service is offered. In Scenario 2: SMS and IVR, the cost increases to US$2.8 million (105.5 million MZN) due to the addition of the IVR option and greater number of registrants. Figure 2 presents an estimate of the total programme costs for the first 5 years in both scenarios. In both cases, the primary driver of mNutrition programme cost is messaging volume. Detailed costing results are available in Annex 1.

Using these registration estimates, the costs per person reached in Scenarios 1 and 2 are estimated to be US$3.44 (131 MZN) per SMS registrant and US$16.60 (631 MZN) per IVR registrant over the first 5 years. In Scenario 2, this equates to an average cost per registrant of US$9.47 (360 MZN). In Scenario 1, the dominant driver of total programme cost is SMS connectivity, at 50 percent of total costs, and in Scenario 2, the majority of cost is due to voice connectivity, at 73 percent of the 5-year total.

FIGURE 2: Annual Programme Cost



THE HEALTH IMPACTS OF mNutrition

The core value of the mNutrition product concept lies in its potential to positively impact the health of large numbers of Mozambican children. Previous mHealth studies support this idea; however, the interventions in previous assessments differed in various ways from the mNutrition product concept, making direct comparisons difficult. Therefore, we applied established modelling techniques to estimate the potential mNutrition product benefits in terms of child health indicators.

The Lives Saved Tool (LiST) is a module within Spectrum, a suite of computer-based models of demographics and health outcomes. LiST is used to estimate the impact of changes in community-based interventions on child mortality. The tool works by comparing the total coverage of maternal, neonatal, and child health (MNCH) interventions under different possible scenarios and calculating the resulting morbidity and mortality in the target populations. When compared, these scenarios demonstrate the differences in mortality due to changes in coverage of particular MNCH interventions, accounting for the presence of all other interventions occurring in the same population.

SCENARIOS

To coincide with the FFM, the LiST analysis used the same two programmatic scenarios as above. Both scenarios (Scenario 1: SMS Only and Scenario 2: SMS and IVR) were compared to a hypothetical baseline scenario in which the coverages of all MNCH interventions were held constant for the modelled period, representing maintenance of the status quo. The programmatic scenarios, on the other hand, expanded coverage of key nutrition interventions

among pregnant women and mothers of young children, representing the potential impact of targeted nutrition messaging via mobile. As before, the true reach of the programme is dependent on several demographic factors, including access to mobile, literacy, and maternal status (Figure 1).

The LiST model has the ability to estimate the impact of many maternal and early childhood health interventions but only those directly related to nutrition increase as a result of the mNutrition product. Annex 2 contains a detailed list of interventions and coverages in the mNutrition scenarios.

One of the most difficult parameters for estimating the impact of the mNutrition product is the effectiveness of mobile messaging for achieving the desired behaviour change. To establish a plausible range of potential programme impact, we conducted a broad review of the mHealth literature for studies in sub-Saharan Africa that report the magnitude of the behaviour change due to a mobile messaging intervention. Table 4 summarises the results of the literature search. In the studies that quantitatively report programme impact, the uptake among women not previously engaging in the behaviour (reduction in non-coverage) fell by between 19 and 50 percent, with an average 32 percent reduction. For purposes of calculating the health impact of the mNutrition service in the LiST model, we assumed that non-coverage of all nutrition-related services would decrease by 32 percent among users who received any nutrition messages in a given year.

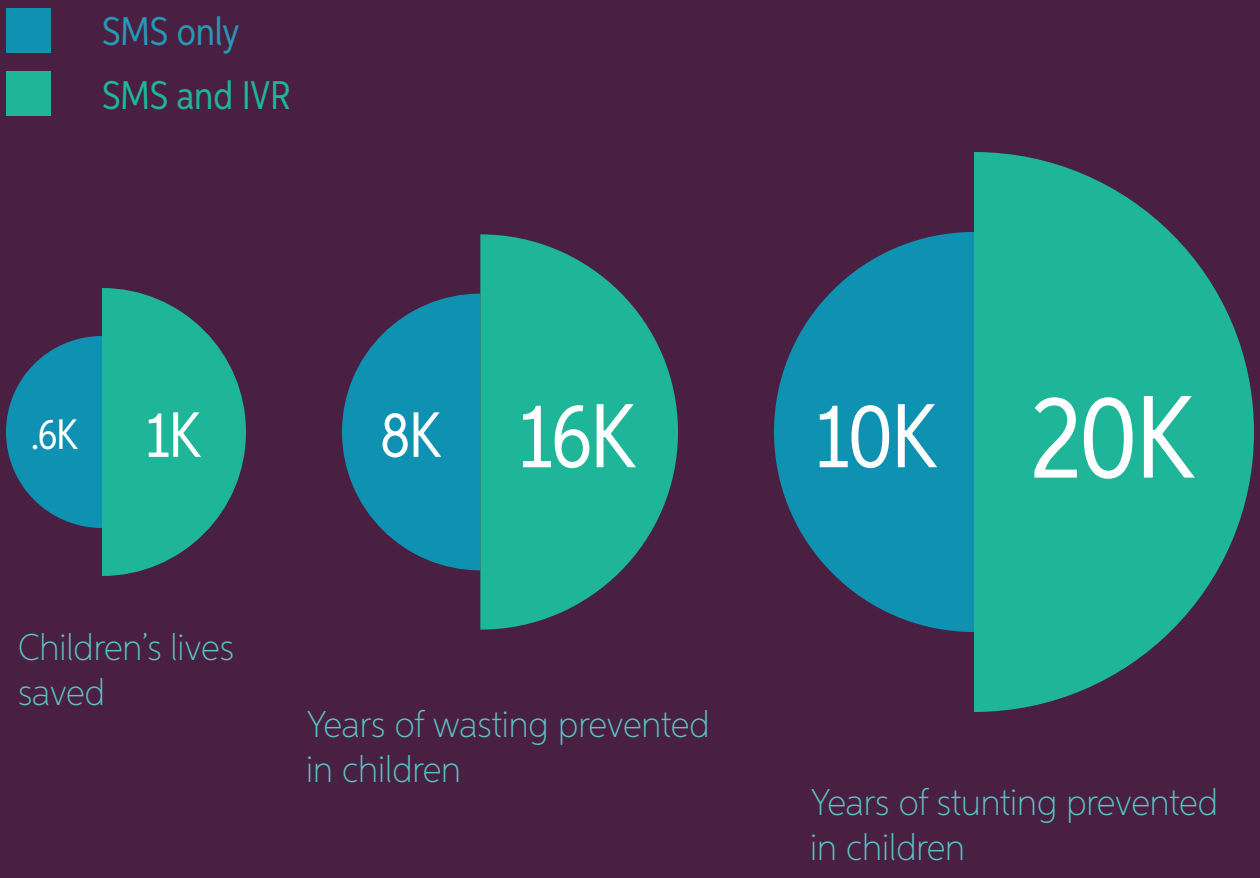
TABLE 4: Literature Review of Impact of SMS Messages on Health Service Uptake

ARTICLE/PROGRAM	SETTING	INDICATOR	REDUCTION IN NON-COVERAGE
Adanikin, et al., 2014	Nigeria	Post natal check-up attandance	50%
Wired Mothers	Tanzania	Skilled birth attendance	40%
Owiti, et al. 2012	Kenya	Tuberculosis clinic attendance	42%
Tamrat and Kachnowski, et al. 2012	Thailand	Antenatal check-up attendance	26%
Lund, et al. 2014	Zanzibar	Antenatal check-up coverage	19%
		Tetanus vaccination coverage in pregnancy	36%
		Preventive malaria treatment coverage in pregancy	27%
Pop-Eleches, et al., 2011	Kenya	Antiretroviral therapy adherence	22%
Lester, et al., 2010	Kenya	Antiretroviral therapy adherence	23%
AVERAGE CHANGE			32%

IMPACT MODELLING RESULTS

Under these assumptions of programme effect, Scenario 1 is estimated to prevent 561 child deaths by 2020. However, prevented mortality is only a small part of the story. Improved coverage of key nutrition interventions could prevent 10,396 years of stunting and 8,341 years of wasting among children under 5. Expanded coverage under Scenario 2 means those numbers could be even greater, saving 1,050 children's lives in the same timeframe. In this case, up to 19,878 years of stunting and 16,166 years of wasting could be prevented in children (see Table 5).

TABLE 5: HEALTH IMPACTS OF mNutrition COMPARED TO STATUS QUO



SMS ONLY	2016	2017	2018	2019	2020	TOTAL
Children's Lives Saved	35	72	111	151	192	561
Years of stunting prevented in children	456	1,878	1,869	2,347	3,845	10,396
Years of wasting prevented in children	469	1,436	1,457	2,473	2,506	8,341
SMS AND IVR	2016	2017	2018	2019	2020	TOTAL
Children's Lives Saved	67	136	208	282	357	1,050
Years of stunting prevented in children	914	3,280	3,260	5,211	7,213	19,878
Years of wasting prevented in children	1,410	2,873	2,916	3,951	5,016	16,166

VALUE OF THE mNutrition PRODUCT

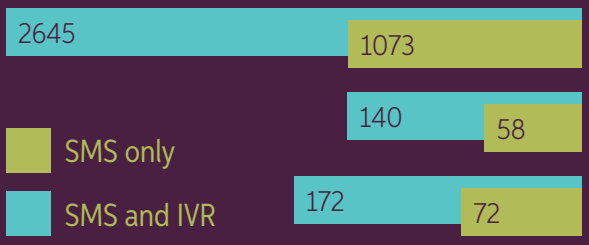
Determining whether the mNutrition product represents value for money (VfM) challenges public officials to evaluate the intervention using the criteria of economy, efficiency, and effectiveness. The end result should be to achieve an optimum combination of whole-life cost and quality to meet users' requirements.[3] In Mozambique's context, that may involve comparisons to existing MNCH interventions, reaching Millennium Development Goals (MDGs), and achieving the strategic plan targets or other parallel programmes.

[3] Jackson, 2012

PUBLIC SECTOR VfM

In the absence of specific comparative national public sector MNCH interventions, one of the most basic arguments is the cost per life saved compared to Mozambique's gross national income (GNI) per capita. Put most simply, if an infant death is averted, how does the cost compare to the average income in Mozambique? At a total of US$602,000 (22.9 million MZN), Scenario 1 equates to US$1,073 per child's life saved, US$58 per year of stunting prevented in children, and US$72 per year of wasting prevented. When IVR is added and coverage increases, as in Scenario 2: SMS and IVR, the cost is US$2,645 per child's life saved, US$140 per year of stunting prevented, and US$172 per year of wasting prevented (see Table 6).

TABLE 6: COST PER HEALTH OUTCOME (US$)



	SMS ONLY	SMS AND IVR
Total Programme Cost (US$)	602,000	2.8 million
Children's Lives Saved	561	1,050
Cost Per Child's Life Saved (US$)	1,073	2,645
Stunting Prevented in Children (years)	10,396	19,878
Cost Per Year of Stunting Prevented (US$)	58	140
Wasting Prevented in Children	8,341	16,166
Cost Per Year of Wasting Prevented (US$)	72	172

The World Bank estimates that Mozambique's GNI per capita was US$630 as of 2014.[4] Given these assumptions of programme impact, we estimate that the mNutrition product is a cost-effective intervention for the prevention of child deaths in both the SMS only and IVR scenarios. Although the one-time cost per child's life saved exceeds the annual GNI estimates, the contribution to GNI over a child's productive lifetime far exceeds the initial cost. Figure 3 depicts the value of a US$10,000 investment in the programme. In addition to lives saved, both intervention scenarios reduce years of child stunting and wasting.

Stunting and wasting also present long-term challenges to productivity and quality of life. Stunting due to nutritional deficiency generally occurs before age 2, and its effects are largely irreversible. These include delayed motor development, impaired cognitive function, and poor school performance. Wasting, or low weight for height, is a strong predictor of mortality among children under 5.[5] The health effects of avoidable stunting and wasting negatively impact Mozambique's economy by reducing the population's capacity not only to maintain current levels of productivity but also increase it over time.

FIGURE 3: Health Impact per US$10,000 Spent

4 World Bank, 2015

5 UNICEF, 2015

PRIVATE SECTOR OR MOBILE OPERATOR VfM

Private sector stakeholder interviews indicated that while programme cost is a primary consideration in determining value for money (VfM), stakeholders also incorporate estimates of health impact in their processes for determining investment. The final determination for mobile operators to sign on to a programme is determined by its cost and service, and the overall benefit to the target population. Although the goal of their overall business model is to produce a profit, mobile operators are willing to make strategic investments in mHealth programmes such as mNutrition as long as it is financially feasible.

Mobile operators in Mozambique are currently investigating a combined model in which paid service revenues are used to support free mHealth programmes like mNutrition, with the goal of improving sustainability. Private sector stakeholders recognise that programmes dependent purely on corporate social responsibility (CSR) funding do not provide long-term sustainability.

Mobile operators may elect to use the FFM tool to further investigate the breakdown of the total cost of ownership for the mNutrition programme and determine at what point they could support and benefit from it. Further modelling by the mobile operators using predicted uptake of "freemium" services, increased stickiness through a combined service (using mHealth as a retention method), and applicable profit margins through incremental upsell could determine whether this cost-shifting concept will be sufficient for mobile operator business models. Note that the overall VfM assigned by the mobile operator to the mNutrition product may be a combination of CSR and estimated profit margins, breakeven points, or potential losses.

THE VfM OF PUBLIC-PRIVATE PARTNERSHIP

Ideally, the VfM of the mNutrition product would be assessed under a public-private partnership (PPP) model, with contributions from both sectors to achieve the desired health impacts. A structured memorandum of understanding (MOU) between the parties would provide a framework of negotiation and decision points surrounding the mNutrition product. A PPP arrangement would be particularly valuable in the scale-up period, providing the mobile operators with an opportunity to properly structure their overall mHealth strategies and freemium products. Granted the findings of the Market Access Document (MAD) and the realities of both private and public sector motivations and goals, the VfM partnership may best serve the interests of all stakeholders. The GSMA is perfectly situated to broker these partnerships to create sustainable mNutrition products, delivered at scale across Mozambique's full socio-economic spectrum.

STAKEHOLDER INTERVIEWS

Overview and Methodology

In June 2015, the GSMA, in collaboration with Palladium, conducted semi-structured interviews with Mozambican stakeholders in the governmental, telecommunications, and NFP sectors. The interviews focused on ascertaining stakeholder interest in the proposed mNutrition product and identifying key opportunities and obstacles to successful product implementation. The interview team conducted 8 interview sessions: 1 in government, 5 in the telecommunications sector, and 2 from NFP organisations. Interviews often included more than one representative from a designated organisation or government unit.

Each interview was approximately 1 hour long and held in the stakeholder's office using an interview guide comprising a basic framework of mHealth themes. Interview questions addressed mHealth strategy and organisational priority in Mozambique, applicability of the proposed mNutrition product to the Mozambican context, and government and health system procurement processes. The team also asked questions using a Likert scale to gauge informants' overall mHealth familiarity, interest in the specific mNutrition product, interest in funding the mNutrition product, and the relative priority of this product in comparison to other MNCH interventions. (See Annex 3 for an overall summary of Likert results.)

Mozambican stakeholders expressed varied levels of familiarity with mHealth, given Mozambique's nascent stage of mHealth implementation. Behaviour change messaging via mobile has been used by other public health initiatives in Mozambique, and supporters of these programmes

COMMON STAKEHOLDER THEMES

- Stakeholders viewed IVR as a potential solution to overcoming the illiteracy barrier.
- Messages should be kept simple and customised to the local language and culture.
- Higher enrollment rates can be achieved through community advertising via local leaders and/or field workers.
- Partnering with the Ministry of Health (MoH) from the programme design through implementation is critical.
- Malnutrition is viewed as a major problem in Mozambique and is an MoH priority.
- Mobile network coverage in rural areas may be a challenge to national scale-up.

expressed enthusiasm about mHealth's potential to change nutrition behaviours. mHealth initiatives are increasing among mobile operators as mobile subscriptions grow, but scaling these programmes remains a challenge due to low network coverage, illiteracy, and myriad languages in rural areas. The majority of stakeholders provided positive feedback about the mNutrition product concept—citing a great need for nutrition interventions and a belief that mobile messaging could make an impact.

Stakeholders observed the need for community advertising as a key component of the mNutrition product, suggesting that literate local leaders and health workers could both promote the programme and share mNutrition messages with illiterate community members. Incorporating a local connection could significantly increase enrollment or uptake numbers, thereby increasing the programme impact.

All stakeholders viewed the MoH as a key player in the development and implementation of mHealth initiatives, agreeing that messaging should be aligned to government priorities, and that the government should be involved early and often throughout the programme. Government stakeholders are willing and interested in supporting mHealth but, due to limited budgets, financing will require partnership. In the short term, sustainable mHealth may be achieved through telecom CSR programmes, as investments in CSR for health are expected to increase.

GOVERNMENT STAKEHOLDERS

INTERVIEWS CONDUCTED

- MoH, Department of Nutrition

MAJOR THEMES

- Nutrition is a major MoH priority, but currently the budget has no nutrition line item.
- The MoH must vet the mNutrition messaging content in its final form, likely in several tranches.
- Use of IVR messaging will help overcome the illiteracy barrier, but multiple languages will remain a challenge.
- The messaging strategy should include key household decisionmakers.

mHealth appeared to be a relatively new concept for Mozambique's government stakeholders, but they expressed support for it, and the mNutrition product concept in particular. Interviewees noted that nutrition behaviour change is aligned with current MoH priorities. They viewed GSMA's intention to scale the mNutrition product nationally as an opportunity to help coordinate Mozambique's various nutrition messaging platforms and work directly with its Technical Secretariat for Food Security and Nutrition (SETSAN).

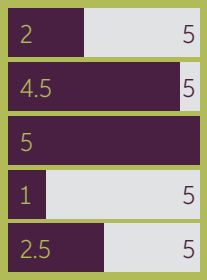
Government stakeholders identified several challenges to the product concept, including illiteracy, language variation, and gender inequity. Respondents felt that an IVR option would help to ameliorate coverage of illiterate populations. They also recognised that Mozambique's more than 50 languages would pose a challenge for the product in cost and implementation. Interviewees suggested dividing Mozambique into three regions and selecting the most common language for each. They also proposed consideration of a more inclusive gender strategy. In addition,

they felt that key household decisionmakers—husbands and mothers-in-law—should be part of the behaviour change strategy.

Stakeholders explained the initial vetting process for messages, starting with a technical group (composed of both government and non-governmental organisation, or NGO, representatives) that would approve message content and translation. The MoH would revise this technical content but expect implementing partners to field-test messages, ensuring that community members understand and respond appropriately to behaviour change content. Stakeholders mentioned that a review should be conducted in several tranches to speed the process.

Although nutrition is an MoH priority, it appears not to have a dedicated budget line, which may be linked to the low Likert score regarding the use of MoH funds for the product. Government stakeholders acknowledged that an mHealth initiative would require donor funding—minimally, in its early implementation phases. The eventual goal is to have the mNutrition programme become part of the national health strategy and subsequently integrated into the stated budgeting process. One stakeholder explained that "It's difficult because mHealth is a new approach. If we use new technology, we must go slowly because the community is not used to it."

LIKERT SCORES: GOVERNMENT STAKEHOLDERS



TELECOMMUNICATION STAKEHOLDERS

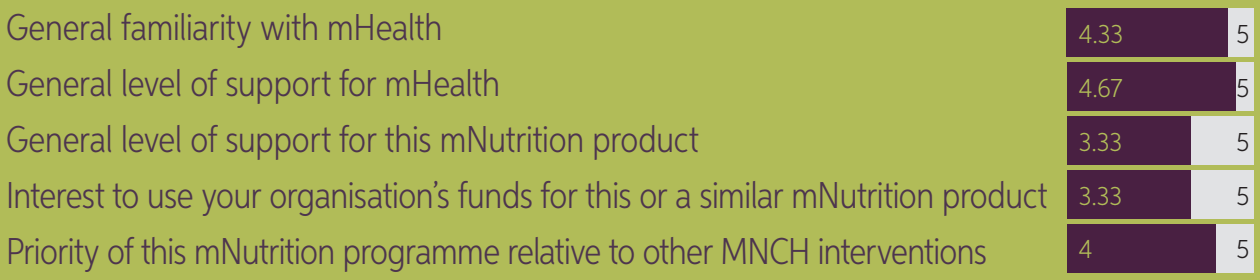
INTERVIEWS CONDUCTED

- mcel
- Movitel
- Vodacom
- Mconnect
- Dimagi

MAJOR THEMES

- Mobile operators are increasingly implementing CSR initiatives in partnership with NGOs.
- Government approval and support is essential for CSR projects, and any CSR initiatives should fit government priorities.
- Mobile operators agree that they would best operate as a channel for messages only, with a third party managing the platform.
- Illiteracy is a major barrier to SMS-based mHealth initiatives.
- IVR is seen as an appropriate solution to reaching illiterate populations.
- Messaging should be customised to the local language and must remain basic and practical to ensure enrollment and create behaviour change.
- SMS campaigns are a novel concept for Mozambique's population; people are open to these messages and like receiving SMS.
- SMS-blast advertising will have weak results; local leaders or health workers should be recruited to promote at the community level.

LIKERT SCORES: TELECOMMUNICATION STAKEHOLDERS



mHealth initiatives have gained support from mobile operators only recently, both through CSR and discounted/free-of-charge connections or services. However, telecommunications stakeholders expressed interest in supporting current and future mHealth initiatives, several having designed and implemented small-scale mHealth programmes of their own. As one stakeholder explained, "Health is one of the main things this country needs—[therefore we] are very keen on these kinds of CSR projects."

Interviewees met the question of whether mobile operators might be willing to partner on a single national programme with a range of answers. Several mobile operator stakeholders commented that if an initiative falls under the "social responsibility" category, then no competition exists; all of the operators would serve as a messaging channel. One VAS provider, however, insisted that mobile operators would want to maintain exclusivity in exchange for donated services.

Although mHealth is currently limited to CSR initiatives in Mozambique, mobile operator stakeholders expressed interest in the concept of embedding the mNutrition product within a broader mHealth portfolio. In this wraparound product scenario, stakeholders expressed a willingness to provide discounted contracts, free-of-charge connections, and/or free SMS messages. They limited this willingness to their core business,

however, with a preference towards the active platform management being held within a partnered VAS or aggregator.

Although they viewed SMS as an "effective and cheap" way to reach people with health messages, all telecommunications stakeholders named illiteracy as a major barrier to an SMS-based mHealth initiative. Interviewees acknowledged that illiterate individuals might ask a literate family member or neighbour to read an SMS. However, they viewed IVR as an appropriate solution if the messages are kept simple, with no more than four questions during the registration process. They viewed customisation of messages to the local language and cultural norms as essential to ensuring both the uptake and impact of the mNutrition product. One stakeholder noted that customisation is vital because "the end user may not realise it is a machine on the other side."

Stakeholders also advised that advertising should be more than just an SMS blast. They suggested working with local leaders or field workers to do community advertising to improve uptake and increase impact. One mobile operator stakeholder currently works directly with local leaders in explaining the value of mobile access, building trust, and increasing acceptance of mobile products and services among community members. Consequently, this mobile operator also boasts the most robust rural coverage and subscriber base.

All telecommunications stakeholders noted the importance of partnering with the government beginning at an early stage. The stakeholders reported varied experiences in working with government—one said that the partnership was "smooth," but another explained that although the government provides support and approval, it did not provide operational help. Overall, stakeholders agreed that government support and alignment with government priorities is essential for the success of any mHealth initiative.

NOT-FOR-PROFIT STAKEHOLDERS

INTERVIEWS CONDUCTED

- Pathfinder International
- Population Services International (PSI)

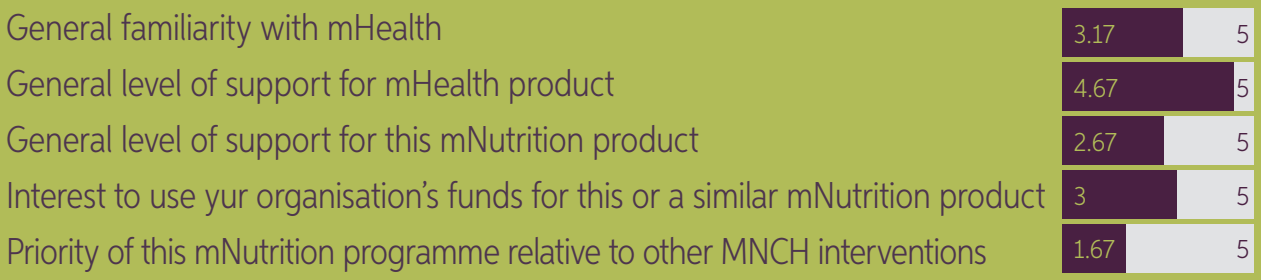
MAJOR THEMES

- Achieving national scale will be difficult because of low network coverage in rural areas.
- It is essential to involve government early in the design process and keep the MoH engaged during programme implementation.
- There was concern that blast SMS messages would not result in the desired behaviour change.
- Community engagement will be an important factor in enrollment and uptake.
- Phone sharing and unprompted information sharing is common, meaning that mNutrition messages may reach many people in addition to the direct message recipients.

Mozambique's NFP stakeholders have significant mHealth implementation experience, but no projects have achieved national scale. Interviewees noted that one of the greatest challenges to scaling mHealth projects is rural network coverage, which has been slow to grow, given the low population densities and poverty in central and northern Mozambique. Interviewees also mentioned the sheer number of languages spoken in Mozambique as a limiting factor to SMS use and scale.

Respondents viewed partnerships as essential and mentioned the MoH, mobile operators, and VAS providers as potential partners in mHealth initiatives. Several stakeholders highlighted the importance of involving the MoH early in the programme design process, particularly for vetting message content. They noted that if the product is not aligned with the

LIKERT SCORES: NOT-FOR-PROFIT STAKEHOLDERS



national eHealth strategy, it is not likely to move beyond the pilot phase. However, they felt that nutrition is indeed in line with current government priorities. Gaining government support could help garner mobile operator support because, as one stakeholder noted, several mobile operators are owned by politicians and thus influenced by their agendas.

Several NFP stakeholders reported partnering with mobile operators on CSR initiatives, although these initiatives are relatively new in Mozambique. Interviewees spoke mostly of working with intermediary VAS providers, with whom they reported having positive experiences. One stakeholder observed that larger initiatives generate more interest from mobile operators due to the potential of reaching a larger market share.

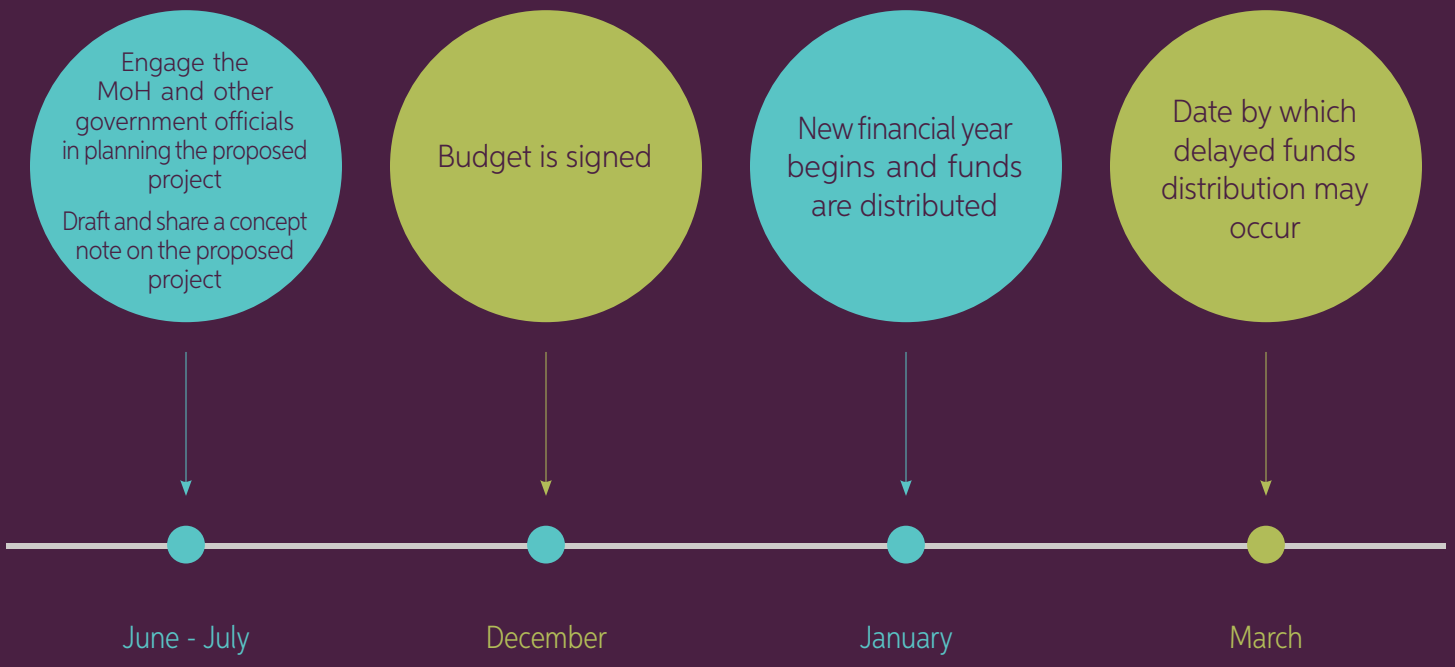
Several NFP stakeholders noted that meeting first with local leaders to explain the programme generally results in higher uptake. Literate local leaders often will share the information they receive via SMS with their communities, which can help address the issue of illiteracy so common in many rural areas. Stakeholders also referenced the need for more local context when building message content; they believe that broadcasting generic SMS messages would likely lead to lower enrollment, attrition, and non-compliance.

MOZAMBIQUE

GOVERNMENT PROCUREMENT PROCESSES

One important pathway to sustainable funding is to incorporate the mHealth product into the government's annual budget. This section describes the standard government procurement process (Figure 4).

FIGURE 4: Standard Government Procurement Process



The fiscal year is 1 January –31 December

MOZAMBICAN GOVERNMENT PROCUREMENT PROCESS

There are many potential pathways to sustainable mHealth funding. For purposes of national implementation and stability, the government's endorsement is critical, but achieving public sector support through institutionalised funding is ideal.

The standard government procurement process is outlined in Figure 3. The fiscal year in Mozambique coincides with the calendar year, from 1 January through 31 December. For a new project, stakeholders recommend beginning the process in June of the previous year. Calculated engagement of the MoH and other relevant government stakeholders will ensure strategic and programmatic alignment, with the goal of ultimately obtaining official ministerial endorsement. As one stakeholder said, "You need to be part of the strategy itself before you can be part of the budget." The mNutrition product would have to appear as a component within the overall nutrition strategy. Stakeholders also noted that the mNutrition programme must align with the strategic priorities of SETSAN. Once the MoH has approved a proposal and included it in the budget, the Ministry of Finance (MoF) must approve the plan. The budget plan typically is signed by year's end, although the cash flow is often delayed until March, so programme funds may not be available immediately.

CONCLUSION

mHealth has great potential as a cost-effective tool to reach BOP populations in Mozambique. This is the case with the proposed mNutrition programme, which will deliver lifesaving health nutrition

messages to improve maternal and child health. To optimise impact, the design of any mHealth service must be context sensitive as to socio-economic characteristics, access to mobile, and functional literacy; it also must be a collaborative effort among the public and private sectors.

Through this research, we have investigated and contributed to the evidence base of health and economic proof points to provide the basis for continued exploration of sustainable models to deliver sustainable mHealth services at scale. The results of the health impact modelling give public officials solid evidence to allocate a definitive value to the mNutrition product, while mobile operators can use the financial forecasts to build sustainable business plans. Implemented wisely, all of the mNutrition stakeholders can benefit, but none as much as the target population of mothers and young children. Unprecedented access to health and nutrition information can result in lives saved, healthier mothers, and healthier children.

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ANNEX 1: Detailed Financial Forecast Results in US$

SMS ONLY	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Programme Design and Content	12,996	-	-	-	-	12,996
Infrastructure and Setup	10,855	-	-	-	-	10,855
Advertising (SMS)	-	-	-	-	-	-
Registration (SMS)	6,709	6,582	6,473	6,712	6,940	33,416
mNutrition messaging (SMS)	20,127	51,334	75,198	74,933	76,339	297,931
mNutrition messaging (IVR)	-	-	-	-	-	-
Service fees and upgrades	66	10,592	10,592	10,592	10,592	42,434
Supervision and maintenance	24,000	24,000	24,000	24,000	24,000	120,000
Content management	-	21,053	21,053	21,053	21,053	84,211
TOTAL	74,753	113,561	137,316	137,290	138,924	601,843

SMS and IVR	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Programme Design and Content	30,816	-	-	-	-	30,816
Infrastructure and Setup	21,118	-	-	-	-	21,118
Advertising (SMS and IVR)	-	-	-	-	-	-
Registration (SMS and VR)	24,778	24,310	23,907	24,790	25,632	123,417
mNutrition messaging (SMS)	20,127	51,334	75,198	74,933	76,339	297,931
mNutrition messaging (IVR)	136,325	347,701	509,332	507,538	517,062	2,017,958
Service fees and upgrades	3,645	19,434	19,434	19,434	19,434	81,382
Supervision and maintenance	24,000	24,000	24,000	24,000	24,000	120,000
Content management	-	21,053	21,053	21,053	21,053	84,211
TOTAL	260,809	487,833	672,923	671,748	683,520	2,776,833

ANNEX 2: Nutrition Interventions Included in Lives Saved Tool and Coverages (percentage of intervention target populations)

SMS ONLY	2015	2016	2017	2018	2019	2020
Folic acid supplementation/ fortification	0.00	0.27	0.53	0.80	1.07	1.33
Calcium supplementation	0.00	0.27	0.53	0.80	1.07	1.33
Iron folate supplementation	25.90	26.10	26.30	26.49	26.69	26.89
Multiple micronutrient supplementation	0.00	0.27	0.53	0.80	1.07	1.33
Balanced energy supplementation	0.00	0.27	0.53	0.80	1.07	1.33
Promotion of breastfeeding	39.05	39.23	39.41	39.59	39.77	39.94
Complementary feeding—education only	83.60	83.65	83.70	83.75	83.79	83.84
Complementary feeding——supplementation and education	83.60	83.65	83.70	83.75	83.79	83.84
Vitamin A supplementation	99.00	99.00	99.01	99.01	99.01	99.01
Zinc supplementation	0.00	0.30	0.59	0.89	1.18	1.47
Zinc—for treatment of diarrhea	5.90	6.18	6.46	6.73	7.01	7.29
Therapeutic feeding—for severe wasting	0.00	0.30	0.59	0.89	1.18	1.47
Treatment for moderate acute malnutrition	0.00	0.30	0.59	0.89	1.18	1.47

SMS and IVR	2015	2016	2017	2018	2019	2020
Folic acid supplementation/ fortification	0.00	0.47	0.94	1.40	1.86	2.32
Calcium supplementation	0.00	0.47	0.94	1.40	1.86	2.32
Iron folate supplementation	25.90	26.25	26.59	26.94	27.28	27.62
Multiple micronutrient supplementation	0.00	0.47	0.94	1.40	1.86	2.32
Balanced energy supplementation	0.00	0.47	0.94	1.40	1.86	2.32

Promotion of breastfeeding	39.05	39.39	39.73	40.07	40.40	40.74
Complementary feeding—education only	83.60	83.69	83.78	83.87	83.96	84.05
Complementary feeding——supplementation and education	83.60	83.69	83.78	83.87	83.96	84.05
Vitamin A supplementation	99.00	99.01	99.01	99.02	99.02	99.03
Zinc supplementation	0.00	0.56	1.12	1.67	2.23	2.77
Zinc—for treatment of diarrhea	5.90	6.43	6.95	7.47	7.99	8.51
Therapeutic feeding—for severe wasting	0.00	0.56	1.12	1.67	2.23	2.77
Treatment for moderate acute malnutrition	0.00	0.56	1.12	1.67	2.23	2.77

BASELINE SCENARIO	2015	2016	2017	2018	2019	2020
Folic acid supplementation/ fortification	.0	.0	.0	.0	.0	.0
Calcium supplementation	.0	.0	.0	.0	.0	.0
Iron folate supplementation	25.9	25.9	25.9	25.9	25.9	25.9
Multiple micronutrient supplementation	.0	.0	.0	.0	.0	.0
Balanced energy supplementation	.0	.0	.0	.0	.0	.0
Promotion of breastfeeding	39.05	39.05	39.05	39.05	39.05	39.05
Complementary feeding—education only	83.60	83.60	83.60	83.60	83.60	83.60
Complementary feeding——supplementation and education	83.60	83.60	83.60	83.60	83.60	83.60
Vitamin A supplementation	99.00	99.00	99.00	99.00	99.00	99.00
Zinc supplementation	.0	.0	.0	.0	.0	.0
Zinc—for treatment of diarrhea	5.90	5.90	5.90	5.90	5.90	5.90
Therapeutic feeding—for severe wasting	.0	.0	.0	.0	.0	.0
Treatment for moderate acute malnutrition	.0	.0	.0	.0	.0	.0

ANNEX 3: Results of Likert Scale Questions

LIKERT SCALE QUESTION	SCALE	GOVERNMENT	TELECOMMUNICATIONS SECTOR	NOT-FOR-PROFIT SECTOR
Familiarity with mHealth	0: not at all familiar 5: very familiar	2.00	4.33	3.17
General level of support for mHealth	0: not supportive 5: very supportive	4.50	4.67	4.67
General level of support for mNutrition product	0: not supportive 5: very supportive	5.00	3.33	2.67
Interest to use your funds for this or similar mNutrition product	0: no interest 5: very interested	1.00	3.33	3.00
Priority of this mHealth programme relative to other MNCH interventions	0: not a priority 5: high priority	2.50	4.00	1.67

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