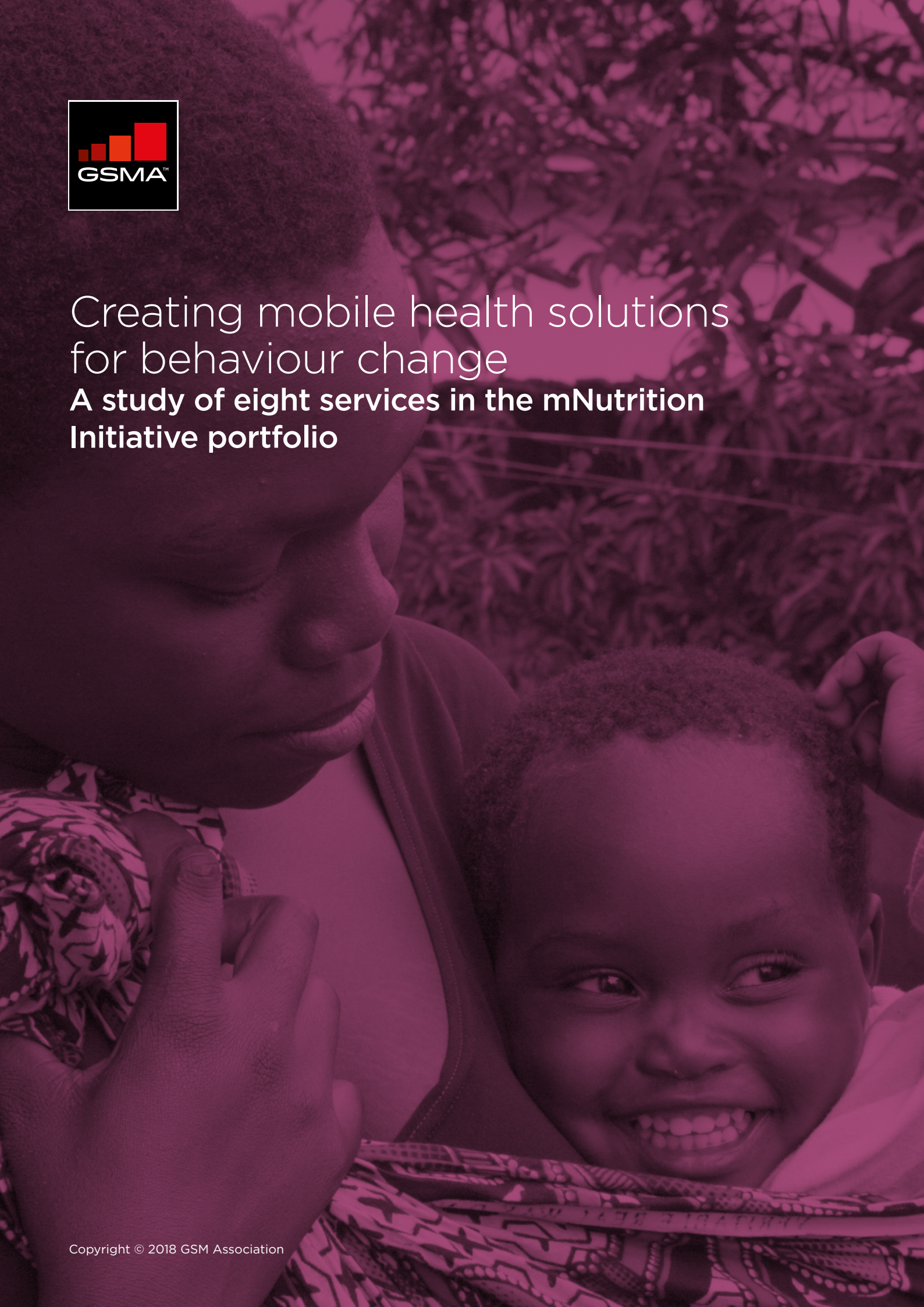

Creating mobile health solutions for behaviour change

A study of eight services in the mNutrition Initiative portfolio

The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with almost 300 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai, Mobile World Congress Americas and the Mobile 360 Series of conferences.

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This publication is the output of a project funded by UK aid, Department for International Development (DFID), for the benefit of developing countries. The views expressed are not necessarily those of DFID.

mHealth

By forging stronger connections between the mobile and healthcare industries, the GSMA mHealth Programme is supporting commercially sustainable health services that transform the lives of people in need and promote the wellbeing of mothers and families in developing countries.

Mobile can increase the quality, reduce the cost and extend the reach of healthcare to benefit millions. mHealth services have the potential to generate significant impact by reaching women and children who lack access to essential healthcare and nutritional information.

Learn more at www.gsma.com/mobilefordevelopment/programmes/mhealth

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Published April 2018

Altai Consulting provides strategy consulting & research services to private companies, governments and public institutions in developing countries. Our teams currently operate in more than 45 countries in Africa, the Middle East and South Asia. For more information, please visit the Altai Consulting website: www.altaiconsulting.com

ABBREVIATIONS

BCC	Behaviour change communication
BI	Business intelligence
B2B	Business-to-business
B2C	Business-to-consumer
B2G	Business-to-government
CHW	Community health worker
HCD	Human-centred design
ICT	Information and communications technology
IVR	Interactive voice response
KPI	Key performance indicator
LCP	Local content partner
MEL	Monitoring, evaluation and learning
mHealth VAS	Mobile health value-added service
MNCH	Maternal and newborn child health
MNO	Mobile network operator
MoH	Ministry of Health
M&E	Monitoring and evaluation
NGO	Non-governmental organisation
OBD	Outbound dialling
PIW	Product iteration workshops
PPP	Public-private partnership
SDG	Sustainable development goal
SMS	Short messaging service
UX	User experience

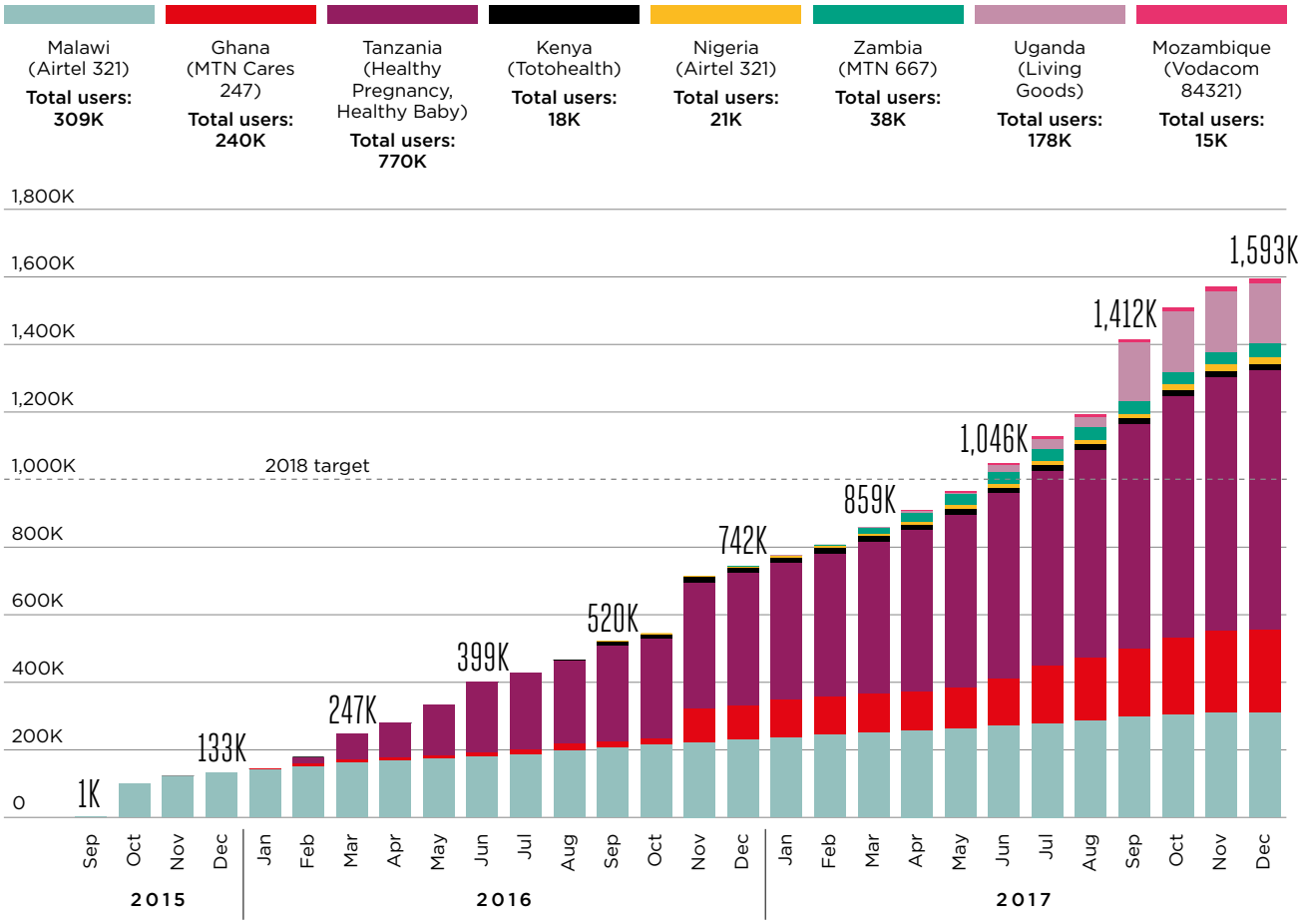
CONTENTS

1. Executive Summary

The GSMA mHealth programme, under the mNutrition Initiative funded by UK aid (the UK Department for International Development, DFID), has been working with mobile network operators (MNOs) and other mobile and health sector stakeholders to support the launch and scale of mobile health (mHealth) value-added services (VAS). As of December 2017, these services have cumulatively delivered lifesaving maternal and newborn child health (MNCH) and nutrition information to over 1.59 million women and their families across eight Sub-Saharan African markets: Malawi, Ghana, Tanzania, Kenya, Nigeria, Zambia, Uganda and Mozambique (Figure 1).

FIGURE 1

The scale of the GSMA mHealth portfolio under the mNutrition initiative



The number of users reached through each of the eight mHealth services, from the first service launch in October 2015 to Dec 2017.

By providing mHealth services, MNOs can play a vital role in improving people's lives and increase their relevance in the market. In particular, MNOs derive value from offering mHealth services through indirect benefits of improved customer loyalty and brand perception. MNOs may also potentially generate business-to-consumer (B2C) revenue, although the majority of the target market have little disposable income to pay for healthcare services. B2C as a direct revenue opportunity for mHealth service providers, monetised to the extent of commercial break-even, requires significant scale and is yet to be proven, with early examples of commercial B2C services delivered at scale in South Asia.[1]

Providing an mHealth service that can be leveraged by governments and other businesses is an emerging opportunity for MNOs and health tech providers that could lead to business-to-government (B2G) or business-to-business (B2B) revenues. Annual government health spend in developing countries globally is approximately $1 trillion. If local governments allocate 0.5 per cent of that to digital health initiatives over the next five years, a cumulative $25 billion would be available for digital health providers, including MNOs.[2]

GSMA and its implementing partners adopted a human-centred design (HCD) and iterative product optimisation approach across all eight markets, leveraging findings from business intelligence (BI), user experience (UX) research and monitoring and evaluation (M&E) user feedback surveys. The mHealth services under the mNutrition Initiative have demonstrated the ability of mHealth VAS to drive health outcomes by improving nutrition knowledge levels among users and empowering them to adopt beneficial nutrition practices for their families. Findings from this initiative validate the premise that mobile technology can accelerate progress towards Sustainable Development Goal (SDG) 2: Zero Hunger and SDG 3: Good Health and Well-Being.[3]

This report presents key findings from the implementation of the GSMA mNutrition Initiative, including service design lessons, and presents nutrition behaviour change outcomes achieved throughout the programme.

Key findings

- **Adopting a HCD approach to product development and optimisation led to increased user engagement.** Engagement levels with mNutrition services have varied throughout the product life cycle, but most have shown continued improvement as products evolved to respond to user requirements over time. Thirty-five per cent of users who had ever registered on mNutrition portfolio services (total user base) were active[4] in Q4 2017—an increase from a 16 per cent active user base in Q1 2016. The number of power users[5] across eight services has increased five-fold from four per cent of the total user base in Q1 2016 to over 19 per cent in Q4 2017—representing 52 per cent of the total active user base.

- **mHealth service users demonstrated improved nutrition behaviours over non-users[6] across all implementing markets**. Overall, 69 per cent of mHealth service users demonstrated appropriate nutrition behaviours in comparison to only 56 per cent of non-users—a 13 percentage point improvement on average across all markets.

- **mHealth services resulted in an average improvement of 12 percentage points in overall nutrition knowledge among users across all eight markets.** Sixty-nine per cent of mHealth service users correctly recalled knowledge on all tested nutrition practices in comparison to only 57 per cent of non-users.

- **Mobile information services improve knowledge, even when existing knowledge around certain nutrition topics is reasonably high.** In some markets, existing knowledge around certain breastfeeding practices is reasonably high, with credit to existing government breastfeeding education efforts. For example, in Uganda, 90 percentage point of non-users correctly recalled that breastfeeding should be initiated within one hour of birth. mHealth service users still demonstrated a seven percentage point improvement on this, with an average of 97 per cent of mHealth service users correctly recalling this practice.

1. GSMA, 2016, "The Journey of Telenor My Health in Pakistan".
2. GSMA Intelligence, 2017, "Scaling digital health in developing markets".
3. United Nations Sustainable Development Goals, 2015.
4. *Active users* are users who have been active on the mHealth service in the last 30 days.
5. *Power users* are a sub-group of active users who are returning users (in the case of on-demand services) or have been using the service for longer than six months (in the case of subscription services).
6. *Non-users* are service users who had not been exposed to content on the nutrition topics tested in M&E surveys.

- **Mobile information services have a stronger impact with poorly understood concepts.** Existing knowledge around appropriate supplementation of vitamins and minerals is particularly low, with an average of only 33 per cent of non-users across eight markets correctly recalling appropriate supplementation practices. mHealth service users demonstrated an average 16 percentage point improvement in supplementation knowledge over non-users. This improvement was most impressive in Kenya, where 41 per cent of users correctly recalled appropriate supplementation practices, in comparison to only five per cent of non-users.

- **Repetition of messages about key health practices reinforces the behaviour.** User research revealed that customers appreciate the reminders about certain practices and do not see it as an annoyance. In Uganda, providing four messages on exclusive breastfeeding as opposed to just two over a four-week period, increased adherence to this practice by eight percentage points. Reminder notifications are highly valued and adhered to by users. In Tanzania, 73 per cent of users recalled receiving messages reminding them to go to the clinic. Of this group, 78 per cent reported that they went to the clinic in response to receiving the reminder.

- **Forty-two per cent of mNutrition service users report sharing the information they learn with their family, friends and communities.** The majority of these users share information verbally (62 per cent), while others read or listen to messages with other members of the family or community (21 per cent). Of the users in Zambia who report sharing information, 25 per cent forward the messages to others via their phone.

- **Public-private partnerships (PPPs) are key to delivering impactful and sustainable digital health solutions at scale.** Individual stakeholders do not possess the complete set of capabilities or resources required to do so on their own.

- **Government support and endorsement is essential for establishing trusted and quality mHealth services.** Government is a key player in both validation of health information and adoption of the service in government health facilities. Partnership with government also adds credibility to the service, promoting trust in the service among its users. To facilitate the government's support, it is fundamental to demonstrate the ability of the mHealth service to drive health outcomes among the target population as well as the cost benefits of implementing a digital solution.

- **It is important to engage governments early in the project.** Government engagement can be complex and takes time. Establishing this relationship early on enables better service alignment with government priorities and timely input from government where needed (e.g. content validation).

- **Agent-assisted registration for mHealth services can be an effective marketing route when an existing agent network is leveraged.** Assisted registration via community health workers (CHWs) or other agents can overcome the trust barrier many mHealth services face. It also mitigates the potential technical challenges faced by users during registration, especially less tech-literate users. It can be a cost-effective solution as an addition to mass media campaigns, provided that agents' incentives are embedded in the existing remuneration package (e.g. they are paid government workers or regularly paid by a private health provider) and the added role for the agent does not require significant additional operational costs.

- **Mass media campaigns raise awareness, but work best in combination with on-the-ground promotion.** When combined with on-the-ground promotion, mass media channels such as radio can play a crucial role in giving mHealth services legitimacy and awareness. For example, CHWs in Tanzania who assisted users in registering for the mHealth service report that it was easier to convince people to register for the service if they had already heard the radio advertisements. Although users recall an advertisement, they will often complete the call to action and register only when encouraged by a CHW.

- **Traditional mobile-based marketing methods, such as end-of-call notifications and airtime top-up messages, have proved to be highly effective at driving service uptake.** These messages are delivered to customers at a moment in time when they are already interacting with their phone, making it more likely that users will respond and explore a service.

- **Shortened self-registration increases registration rates.** Only essential information should be collected at registration, with additional information gathered after on-boarding users.

- **Use relevant terminology and language to reach target users.** Even users who can read English often do not fully comprehend the meaning of a text message. Translation of messages from English to a local language in Uganda resulted in a 13 percentage point increase in appropriately recalled nutrition knowledge among users.

- **Ensuring action ability of content is essential.** During content testing in Uganda, all 12 user research participants named access and cost as the main barriers for acting on messages that promote the consumption of high quality animal proteins (such as meat). To overcome this common challenge, mHealth services should always offer alternative, cheaper and locally available sources, e.g. in the Ugandan context - silver fish and legumes.

- **Dynamic and tailored services that offer more interactivity are highly valued by users**. Services with a high degree of customisation, offering on-demand medical and emotional support, become trusted partners for their customers. Dynamic content features like 'recipe of the week' encourage regular usage. Across all eight markets, users describe variants of dial-a-doc services as their ideal mHealth service.

Photo courtesy of frog

2. Introduction to the GSMA mNutrition Initiative

The GSMA mNutrition Initiative, launched in September 2013, is a programme supported by UK aid (UK DFID). It aims to improve nutrition for underserved populations by promoting behaviour change through accessible mobile-based services, delivered at scale through sustainable business models.

As part of the mNutrition Initiative, the GSMA mHealth programme collaborated with MNOs, VAS providers, Ministries of Health, non-governmental organisations (NGOs) and other health sector stakeholders, across eight markets in Sub-Saharan Africa with the aim of reaching one million users with mobile-based health and nutrition information by 2018. As of December 2017, over 1.59 million customers have been reached by partner mHealth services across the eight markets: Malawi, Ghana, Tanzania, Kenya, Nigeria, Zambia, Uganda and Mozambique (see Figure 2).

Local implementing mHealth partners include:

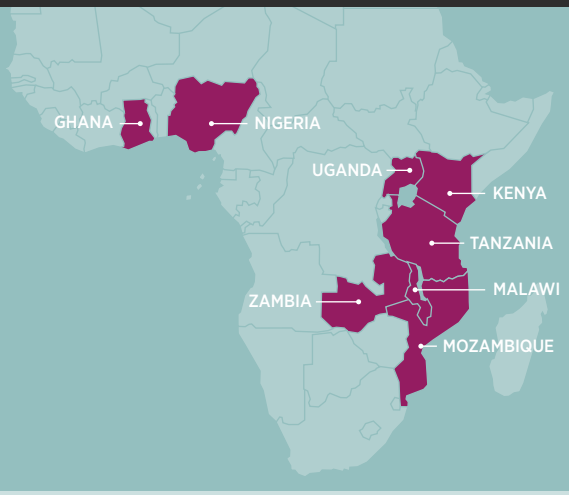
- Malawi: Airtel and Viamo (*Airtel 321*)
- Ghana: MTN and Mobile Content.Com Ltd. (*MTN Cares 247*)
- Tanzania: mHealth Tanzania Public-Private Partnership including Airtel, Vodafone, Tigo and Zantel (*Healthy Pregnancy, Healthy Baby*)[7]
- Kenya: Totohealth (*Totohealth*)
- Nigeria: Airtel and Viamo (*Airtel 321*)
- Zambia: MTN and Viamo (*MTN 667*)
- Uganda: Living Goods (*Living Goods*)
- Mozambique: Vodacom and Viamo (*Vodacom 321*)

GSMA provided a package of in-kind support to partners throughout the implementation period, from early stages of partnership brokering between MNOs and health stakeholders to service design, implementation and development support. Each service benefitted from the availability of localised nutrition content in digital format, developed in partnership with local Ministries of Health and integrated as part of the MNCH service offering. As part of a service diagnostic process, the GSMA mHealth programme and its global partners provided service design consultancy, BI support and M&E. The GSMA also facilitated annual knowledge sharing workshops between implementing partner organisations and their on-the-ground partners.

7. Access the Healthy Pregnancy, Healthy Baby case study or watch the webinar.
8. Topics tested included the appropriate supplementation of vitamins and minerals for pregnant women, new mothers and young children, as well as food sources of certain vitamins and minerals.
9. Percentage point improvement.
10. Percentage point improvement.
11. Breastfeeding topics that were tested included early initiation of breastfeeding, on-demand breastfeeding, exclusive breastfeeding up until six months of age and continued breastfeeding up until the age of two years.
12. For further information on the nutrition content, or to get access to the content, please contact mobilehealth@gsma.com.
13. Users who have been active on the mHealth service in the last 30 days.
14. A subset of active users who are returning users (in the case of on-demand services) or have been using the service for longer than six months (in the case of subscription services).
15. New mobile health services targeting the needs of underserved populations using GSMA's nutrition content, mHealth resources and/or tools.

FIGURE 2

The mNutrition Initiative at a glance



1.59m
mHealth VAS users across 8 markets

43% share information with at least **4** OTHER PEOPLE

4.29m
people reached

16% improvement in knowledge about vitamin supplements among users[8,9]

11% improvement in knowledge about breastfeeding practices among users[10]

69%
of mHealth service users are implementing appropriate nutrition practices

13% improvement
in behaviours over non-users[11]

mHEALTH SERVICES ARE REACHING THE UNDERSERVED

RURAL 40%
60% URBAN

MEN 38%
62% WOMEN

ABOVE 34% POVERTY LINE
66% BELOW

Localised
nutrition content
available in
21 different languages
across all eight markets[12]

36%
ACTIVE USERS[13]
Q4 2017

53%
POWER USERS[14]

SIX
services crowded in[15]

Nigeria: MTN, Vas2Nets and The Audrey Pack (*Audrey Care*)
Mozambique: PSI (*Tem+*)
Ghana: Vodafone and Viamo (*321*)
Malawi: TNM and Click Mobile (*Thanzi Lathu*)
Tanzania: Vodacom and Viamo (*Elimika*)
Uganda: UNICEF (*Family Connect*)

3. Global context

The Food and Agriculture Organization of the United Nations (FAO) estimates that about 795 million people, or one in nine people globally, were undernourished between 2014 and 2016.[16] The undernourished population of Sub-Saharan Africa represents approximately 28 per cent of the global burden of malnutrition, with 34 per cent of children under-five in Sub-Saharan Africa (56.8 million) being stunted.[17]

In some mNutrition markets, stunting prevalence in children under-five is even higher (see Table 1).[18] Although the proportion of the Sub-Saharan African population that is undernourished has decreased from 33 per cent between 1990 and 1992 to 23 per cent between 2014 and 2016, much progress still needs to be made to achieve the 'zero hunger' targets of SDG 2 by 2030 (Table 2).

TABLE 1

Stunting prevalence and breastfeeding indicators across mNutrition Initiative markets

Key nutrition indicators	Malawi	Nigeria	Kenya	Mozambique	Zambia	Tanzania	Ghana	Uganda
% of children under 5 who are stunted	37%	37%	26%	43%	40%	34%	19%	33%
% of infants who are not exclusively breastfed	39%	83%	39%	57%	27%	41%	48%	37%
% of infants who are not breastfed within one hour of birth	24%	67%	38%	23%	34%	49%	44%	47%

0–20% 21%–40% 41%–60% 61%–80% 81%–100%

TABLE 2

Targets for SDG 2: Zero hunger[19]

By 2030 end hunger and ensure access by all people, in particular the poor and people in vulnerable situations including infants, to safe, nutritious and sufficient food all year round

By 2030 end all forms of malnutrition, including achieving by 2025 the internationally agreed targets on stunting and wasting in children under-five years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons

16. Food and Agriculture Organization of the United Nations, 2015, "The State of Food Security in the World".
17. Stunting refers to a child who is too short for his or her age. Stunting is the failure to grow both physically and cognitively and is the result of chronic or recurrent malnutrition. World Health Organisation, 2017, "Levels and Trends in Child Malnutrition".
18. Data from most recent Demographic and Health Survey (DHS) reports for Malawi, Nigeria, Kenya, Mozambique, Zambia, Tanzania, Ghana and Uganda.
19. United Nations, Sustainable Development Knowledge Platform, Sustainable Development Goal 2.

Optimal breastfeeding[20] practices alone could save the lives of over 820,000 children under the age of five each year.[21] Yet, across most markets in Sub-Saharan Africa, the proportion of infants who are not breastfed within one hour of birth or exclusively breastfed for the first six remains high (see Table 1). Enabling access to information is essential to improve nutrition knowledge, thereby empowering people to make better and informed decisions about nutrition practices in their households.

Mobile is well positioned to play a key role in distributing critical information. As of the end of 2016, 75 per cent of global mobile subscribers lived in low- and middle-income countries.[22] In Sub-Saharan Africa, mobile penetration rates will reach 50 per cent, a total of 535 million unique subscribers, by 2020.[23] MNOs, VAS providers and other organisations are gradually crowding into the digital health space: the total number of active mHealth services in Sub-Saharan Africa in 2017 was 202,[24] a 58 per cent increase from 2016.[25]

An estimated 65 per cent of the female population across the eight mNutrition Initiative markets have access to a mobile phone,[26] representing an addressable market of over 64.6 million women of reproductive age who can learn about MNCH and nutrition through a mobile phone.[27] In 2017, 11 per cent of the general population in Sub-Saharan Africa reported to have accessed health services via their mobile phones, 44 per cent of whom are female.[28] This demonstrates that women and their families are already viewing their mobile phones as a source of healthcare information or support.

Photo courtesy of frog

20. The key breastfeeding practices promoted by the World Health Organisation (WHO) include: early initiation of breastfeeding within one hour of birth; exclusive breastfeeding for the first six months of life; and introduction of nutritionally adequate and safe complementary (solid) foods at six months together with continued breastfeeding up to two years of age or beyond.
21. WHO, July 2017, "Infant and young child feeding".
22. GSMA Intelligence, 2017, "The Mobile Economy 2017".
23. GSMA Intelligence, 2017, "The Mobile Economy, Sub-Saharan Africa 2017".
24. GSMA mHealth deployment tracker
25. GSMA Intelligence, 2017, "2017 Mobile Industry Impact Report: Sustainable Development Goals".
26. Females included in the Gallup survey were aged 15 years and older. Gallup, 2013, "Africa Continues Going Mobile".
27. Women of reproductive age are defined as between 15 and 49 years old. Since the inclusive age range of the Gallup survey had no upper limit, the actual addressable market may be marginally lower than estimated, but this is offset by the fact that household phone access had an annual increase of five per cent between 2008 and 2013 with continued growth beyond this period. The addressable market is modelled on household population data from Demographic and Health Surveys for mNutrition Initiative markets.
28. GSMA Intelligence Consumer Survey, 2017.

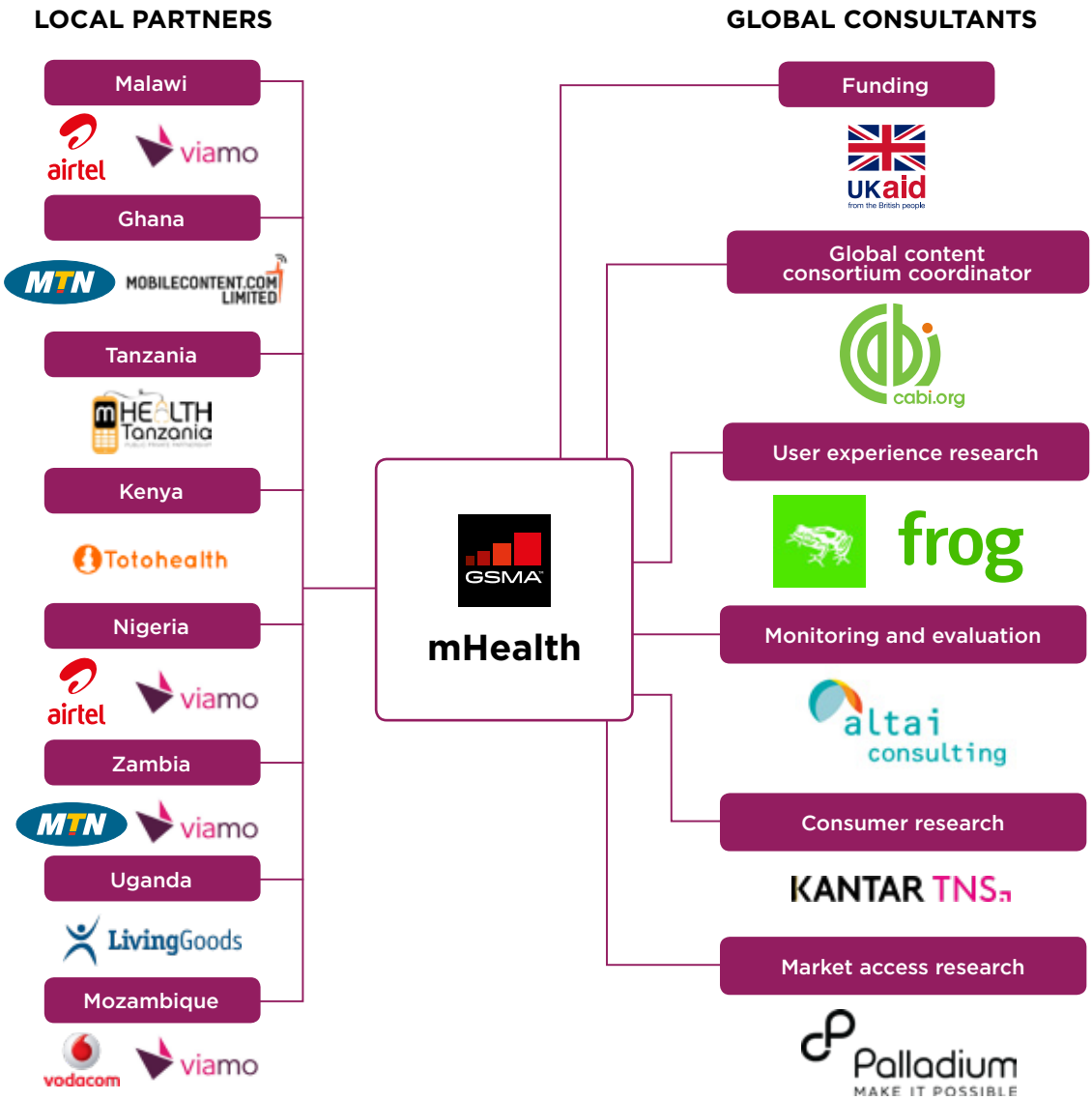
4. mNutrition Initiative implementation

4.1 Engagement structure

The GSMA mHealth Programme coordinated the work of global and local consultants in addition to its support for local implementing mHealth partners (Figure 3).

FIGURE 3

The global partnership structure for the mHealth mNutrition Initiative



Local partners

The partnership structure varied across markets, with MNOs taking a stronger lead as service owners in some markets and VAS providers or NGOs fulfilling this role in others.

As part of the partnership agreement under the mNutrition Initiative, local partners committed to the following:

1. Sharing relevant data on service usage;
2. Providing dedicated and relevant resources to support the mNutrition Initiative;
3. Marketing the service in collaboration with other partners; and
4. C-Level commitment to support the service and its evolution.

Within the GSMA mNutrition Initiative, the Ministry of Health (MoH) within each market played a vital role in the development of nutrition content and in the content validation process. In some markets (e.g. Tanzania), the MoH endorsed and/or took ownership of the mHealth services.

GSMA in-kind support

The GSMA offered a range of in-kind support to local partners:

Market engagement manager:

- Primary source of support for product management and GSMA oversight;
- Provided partnership brokering, support for government engagement; and
- Provided ongoing product support for the initial launch and iterative improvement (identifying risks, proposing mitigation strategies and managing escalation) and facilitated product iteration workshops (PIWs).

BI manager:

- Provided regular analytics of user log data; and
- Managed M&E research, including phone surveys.

Content specialist:

- Key point of contact for global content consortium;
- Ensured timely delivery of quality-assured content; and
- Organised content user-testing activities and content validation workshops.

UX specialist:

- Dedicated resource throughout product inception and development periods; and
- Responsible for managing and supporting global and local UX consultants.

Global consultancy network

GSMA's in-kind support was further enhanced by partnerships with relevant global consultants.

The mNutrition Initiative's global content consortium is coordinated by the Centre for Agriculture and Bioscience International (CABI) and includes knowledge and implementation partners, International Livestock Research Institute (ILRI), Global Alliance for Improved Nutrition (GAIN), Oxfam, and the British Medical Journal. The consortium was responsible for researching the nutrition landscape in each country, contracting local content partners (LCPs) and assuring the quality of their output.

Frog design provided two rounds of on-the-ground UX research in each country, followed by analysis and the development of recommendations for product improvement.

Altai Consulting developed the monitoring, evaluation and learning (MEL) framework for the mNutrition Initiative. Based on the MEL framework, Altai Consulting conducted user feedback surveys and qualitative focus groups across all eight markets. Both were essential to demonstrating the impact of mHealth services on behaviour change.

Through primary and secondary research, the Palladium Group[29] produced market access reports for each market to support government engagement. TNS conducted primary consumer research in each market.

29. An international advisory and management business specialising in positive impact research.

Key lessons:

- **Public-private partnerships (PPPs) are key to delivering impactful and sustainable digital health solutions at scale.** Individual stakeholders do not possess the complete set of capabilities or resources required to do so on their own.[30]

- **mHealth service key performance indicators (KPIs) should be agreed in advance and aligned with the business goals of all partners.** Different stakeholders within the digital health sector, for example, MNOs, Ministries of Health, NGOs and donors, often have vastly different business objectives and establishing a set of common KPIs can be challenging. To ensure continued collaboration, it is essential that the service delivers value to all stakeholders. Continuously monitoring these KPIs and ensuring visibility of service performance for all stakeholders is therefore of fundamental importance to maintain their support of the service.

- **Government support and endorsement is essential for establishing trusted and quality mHealth services.** Government is a key player in both the validation of health information and the adoption of the service in government health facilities. Partnership with government also adds credibility to the service, promoting trust in the service among its users. To facilitate government support, it is fundamental to demonstrate the ability of the mHealth service to drive health outcomes among the target population, as well as the cost benefits of implementing a digital solution.

  "I trust it [the mHealth service] because it is something certified by the government. Because the government supports it then we are fine."
  – Rural non-user, Tanzania

- **Working with a large global consultancy network provides expertise on many subjects, but can be challenging to manage.** Facilitating communication and collaboration between global consultants was a challenge, sometimes resulting in a lack of cohesion between work streams. For example, the content development process could have benefitted from having a stronger link to the UX research, leveraging user insights to further inform content optimisation. To manage large partnership networks effectively, it is important to map out potential intersections between respective work areas and establish mechanisms for effective communication between all parties.

- **Contracting LCPs to oversee content development in-country provides access to existing local network and experience.** However, this decentralisation of the content development resulted in added challenges with respect to project timelines and consistency in content quality.

- **Having an in-house GSMA content specialist improved the quality of the consumer-facing content.** A central resource helps to identify key lessons from content development and quality assurance processes and to replicate those across markets.

- **Including quality KPIs in contracts and linking deliverables to payments has improved service delivery.** Development projects could benefit significantly from applying commercial frameworks for contractual agreements with consultants. As the mNutrition Initiative evolved, there was a need to amend contracts with global consultants to clarify requirements and meet new challenges. Contracts need to include key objectives while also being sufficiently flexible to adapt to changes.

30. In Tanzania, the Healthy Pregnancy, Healthy Baby service boasts an impressive PPP network. Leveraging each partner's assets (an MNO's network) and resources (an NGO's existing workforce) has enabled impressive reach of the service to over 1.8 million families since its launch in 2012. Furthermore, ownership of the service by the MoH has ensured longevity of the solution. A web-based KPI dashboard enables all partners to view and monitor service performance on an ongoing basis.

4.2 Project timeline and life cycle

The mNutrition initiative followed six main phases of implementation in each market (Figure 4):

1. **Due diligence and preparation:** Primary and secondary research was conducted for each market to gather an understanding of the landscape and to identify key players in the mHealth space.[31] The main objective of this phase was to identify potential partners for the programme.

2. **Primary research and market feasibility studies:** Initial research was conducted with the key target audience[32] to get an understanding of the existing needs, interests and limitations of this segment to inform product development.

3. **Partnership brokering and government engagement:** Following the identification of potential partners in the due diligence phase, the GSMA initiated conversations with key stakeholders, including MoH, to establish common interests and agreements to collaborate.

4. **Content development:** GSMA, with its global content consortium, developed locally tailored, open source nutrition content for each market.[33] LCPs developed local nutrition fact sheets,[34] which provided the basis for final user messages. Messages were translated into local languages, followed by content testing. Insights from content testing informed the next iteration of the messages.

5. **Market engagement and product development:** In each market, the GSMA worked with selected partners on the development of new services or the expansion of existing services to include a nutrition component. Following launch, the GSMA team has provided iterative user-centric product diagnostic and optimisation support.

6. **Marketing:** The GSMA also provided marketing support for products that had undergone several iterations and established a reasonable quality user experience. Marketing support was offered in conjunction with the other partners involved in the service.

Key lessons:

- **Conducting robust due diligence and research is essential to the success of mHealth initiatives, especially when entering a new market.** Enough time should be allocated for this activity at the very beginning of a project to inform the strategy, including programme objectives and timelines.

- **It is important to engage governments early in the project.** Government engagement can be complex and takes time. Establishing this relationship early on enables better service alignment with government priorities and timely input from government where needed (e.g. content validation).

- **Content development should be closely aligned with broader product development.** The two are closely linked and content development should follow early product ideation. This allows for more efficient use of resources, particularly at the development and product testing stages.

- **Marketing should only be conducted after the service is proven to be of satisfactory quality.** Several rounds of product iteration may be required before the user experience meets agreed quality standards. Premature promotion of the service could have a negative effect on the credibility of the service.

31. Desk research and structured interviews were conducted with all relevant stakeholders, namely, MNOS, Ministries of Health, VAS providers and NGOs. Research objectives included the identification of key health issues and government health priorities, as well as establishing a firm understanding of the mobile environment and opportunity for MNOs within health. Workshops were conducted to share early insights from this research and gather further input from all stakeholders. All insights from this research are available in country feasibility reports for each respective market.
32. Pregnant women and mothers with babies under two years of age.
33. For further information on the nutrition content, or to get access to the content, please contact mobilehealth@gsma.com.
34. Factsheets provide evidence related to various nutrition practices and the sources of the information.

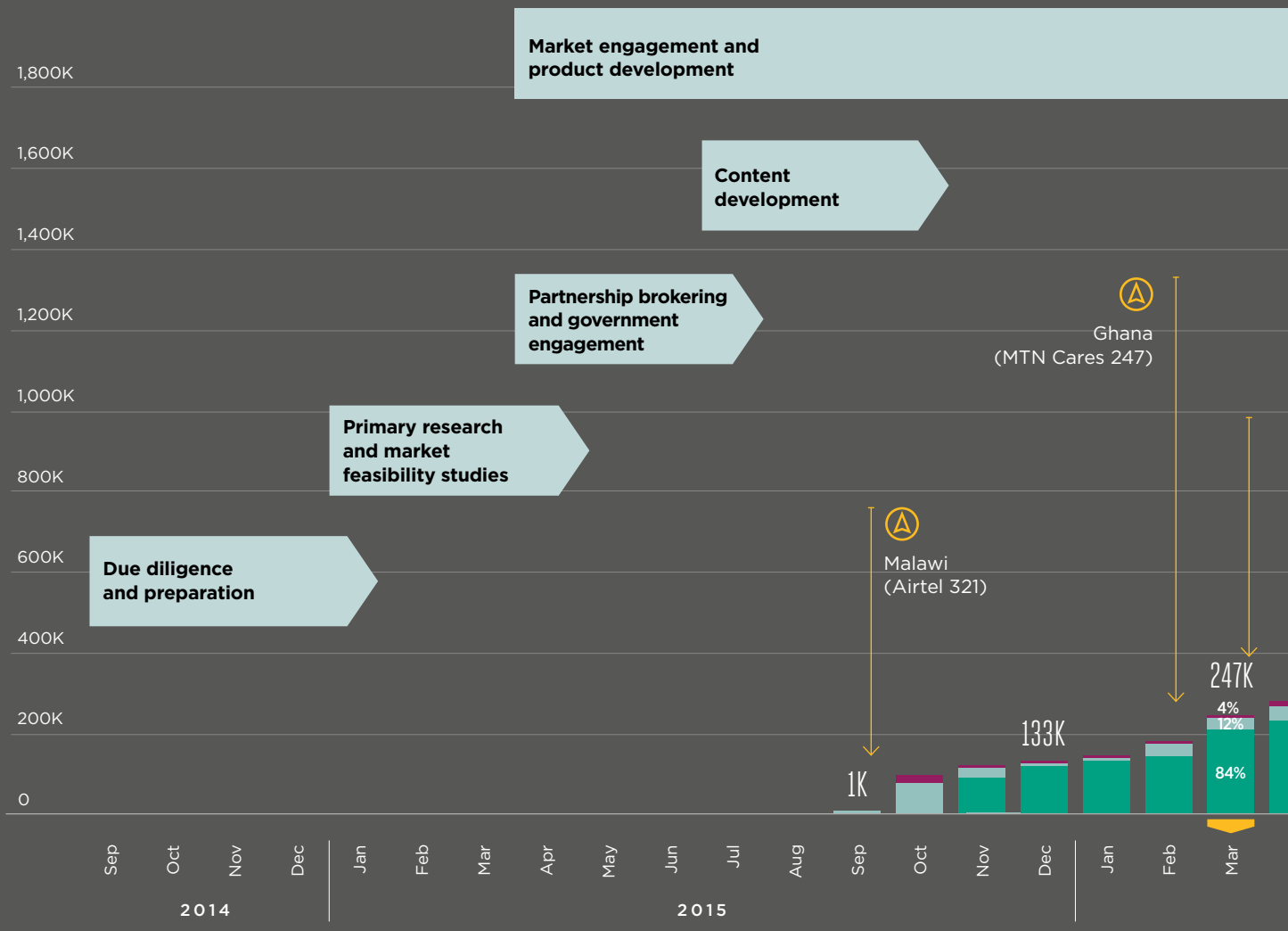
Following launch, several PIWs were held with the implementing mHealth service providers in each market. Each PIW was attended by a senior C-Level service sponsor and relevant members of the cross-functional product team to get team buy-in and ownership for all required service changes. During PIWs, all available research insights were mapped along the customer journey. As a result of product review with the whole team, solutions to identified challenges were ideated and prioritised before being incorporated into product roadmaps. Those were then signed off by the C-Level sponsor for resourcing and auctioning, following which product changes were actioned and monitored.

Prioritisation of service changes mapped along the customer journey at a PIW.

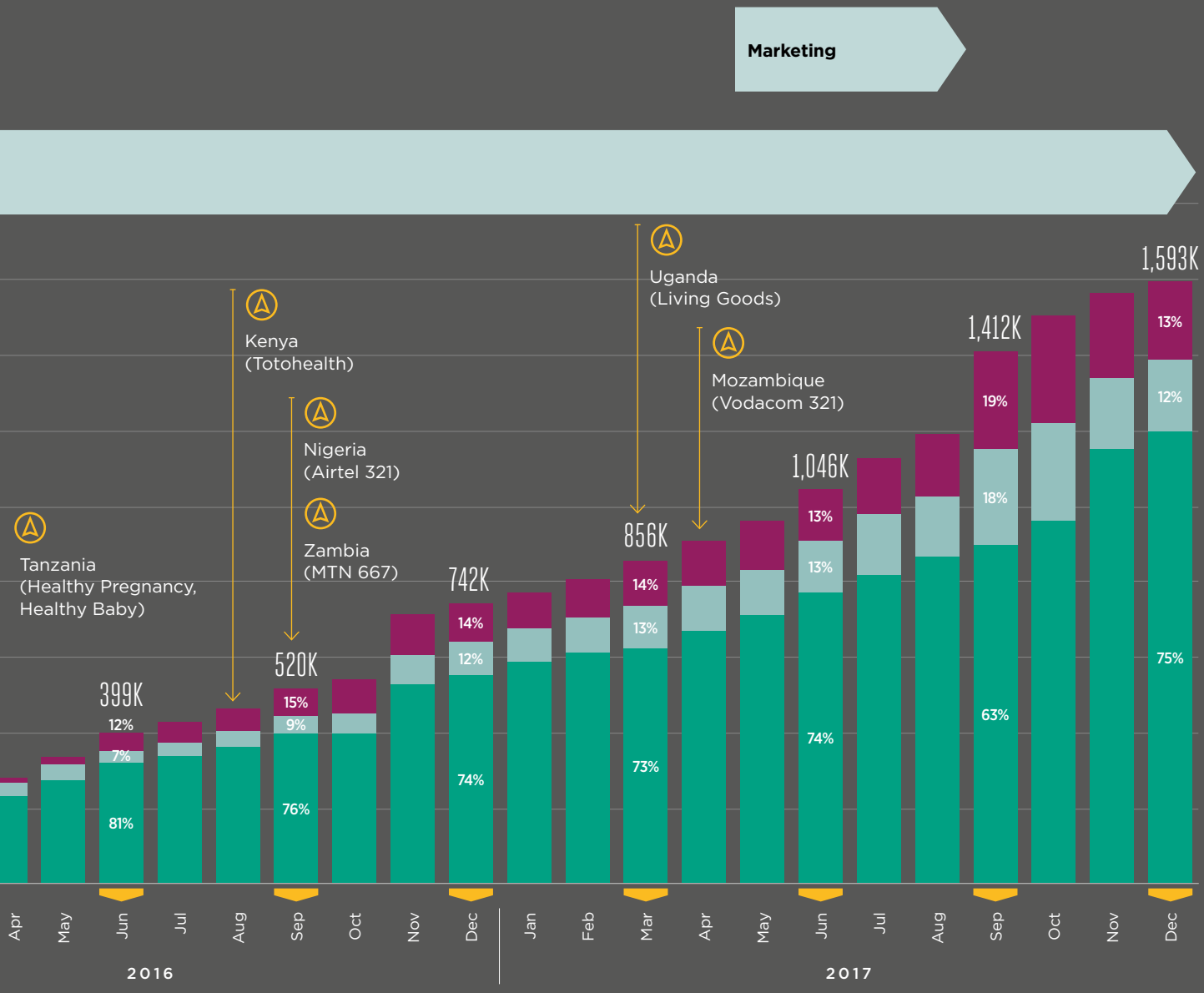
FIGURE 4

Project timeline and life cycle

Source: platform data from eight mHealth services, September 2015 – December 2017
Service launches and GSMA support activities initiated at different points, so an idealised timeline is shown.



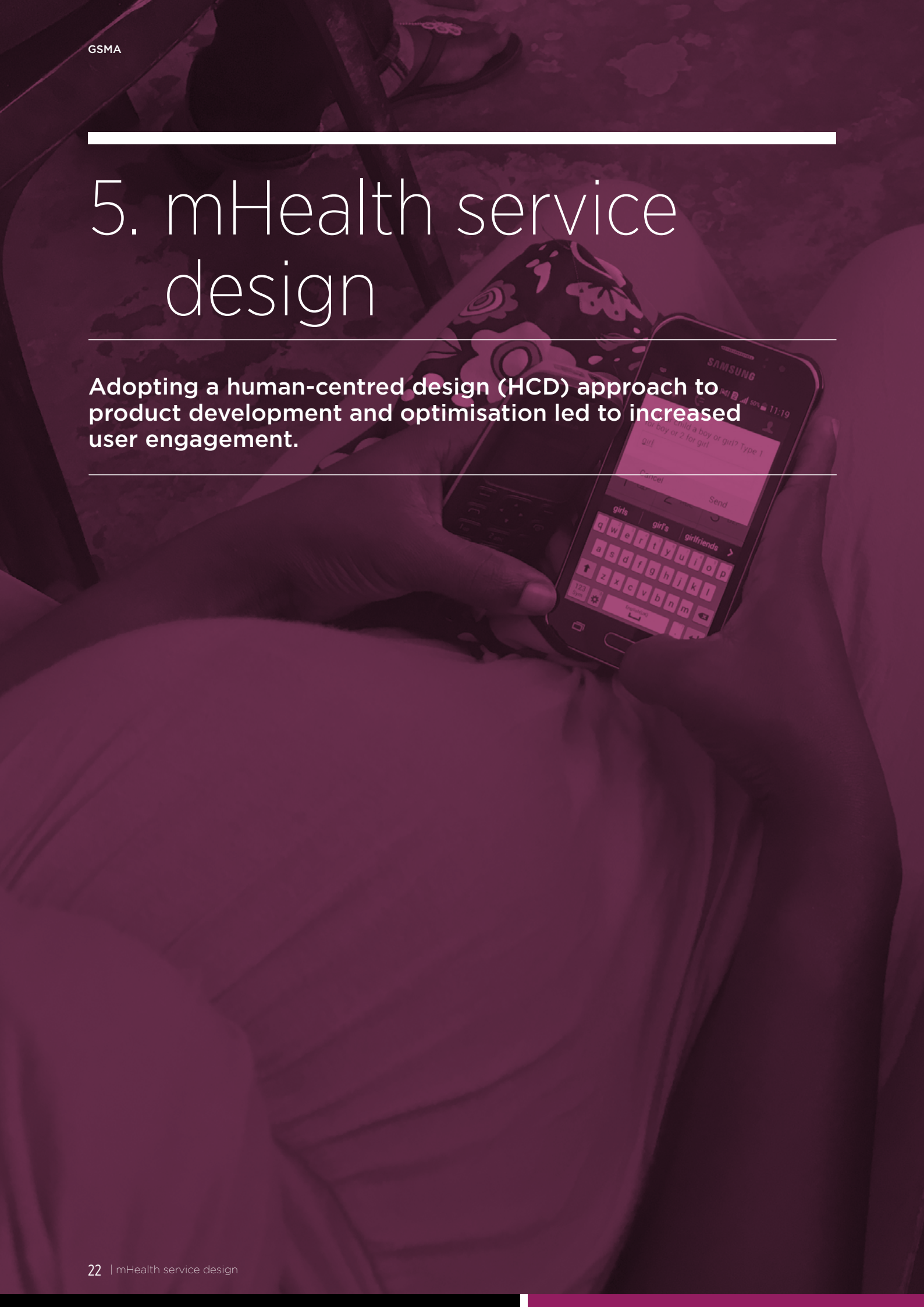
COUNTRY	SERVICE	PARTNERS	ON-DEMAND (PULL) / SUBSCRIPTION (PUSH)	END USER REVENUE MODEL
Malawi	Airtel 321	Airtel and Viamo	Pull	Freemium
Ghana	MTN Cares 247	MTN and Mobile Content.Com Ltd.	Push	Subscription
Tanzania	Healthy Pregnancy, Healthy Baby	mHealth Tanzania PPP	Push	Free
Kenya	Totohealth	Totohealth	Push	Subscription
Nigeria	Airtel 321	Airtel and Viamo	Pull	Freemium
Zambia	MTN 667	MTN and Viamo	Pull	Freemium
Uganda	Living Goods	Living Goods	Push	Free
Mozambique	Vodacom 321	Vodacom and Viamo	Pull	Freemium



Inactive users	*Inactive users* are users who have not been active on the mHealth service in the last 30 days
Active users	*Active users* are users who have been active on the mHealth service in the last 30 days
Power users	A subset of active users who are returning users (in the case of on-demand services) or have been using the service for longer than six months (in the case of subscription services)
Product iteration workshop	An idealised timeline of quarterly workshops between the GSMA mHealth team, local partners and global consultants. Data which has been collected throughout the quarter (from BI, UX and phone surveys) is presented along the customer journey and solutions are suggested.
Launches	Initial service launch (usually a pre-marketing 'soft' launch)

5. mHealth service design

Adopting a human-centred design (HCD) approach to product development and optimisation led to increased user engagement.



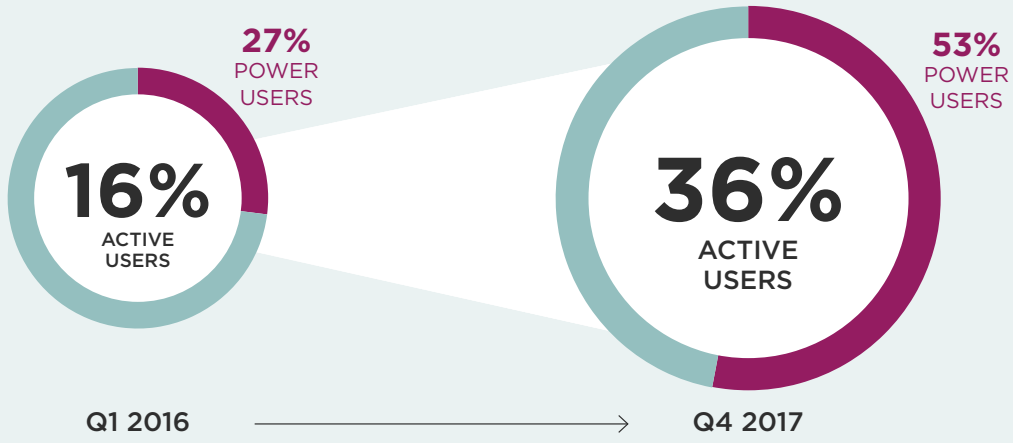
5.1 Adopting a human-centred design approach

The GSMA mHealth Programme and its partners incorporated HCD principles to develop and improve the services through iterative development cycles. These cycles focused on gathering continuous feedback and involving the user in every step of the product development process. The main objective of this approach is to develop products or services that users find valuable, resulting in increased service adoption, user engagement and ultimately improving nutrition knowledge levels and behaviours among users.

Engagement levels on mHealth services have varied throughout the product life cycle, but most have shown continued improvement in user engagement over time. Thirty-six per cent of users who had ever registered (total user base) were active in Q4 2017 (535,000 active users)[35]—an increase from a 16 per cent active user base in Q1 2016 (Figure 5). The percentage of power users has increased five-fold from four per cent of the total user base in Q1 2016 to just over 19 per cent in Q4 2017—representing 52 per cent of the total active user base.

FIGURE 5

Growth in active and power mHealth user segments across the mNutrition Initiative portfolio



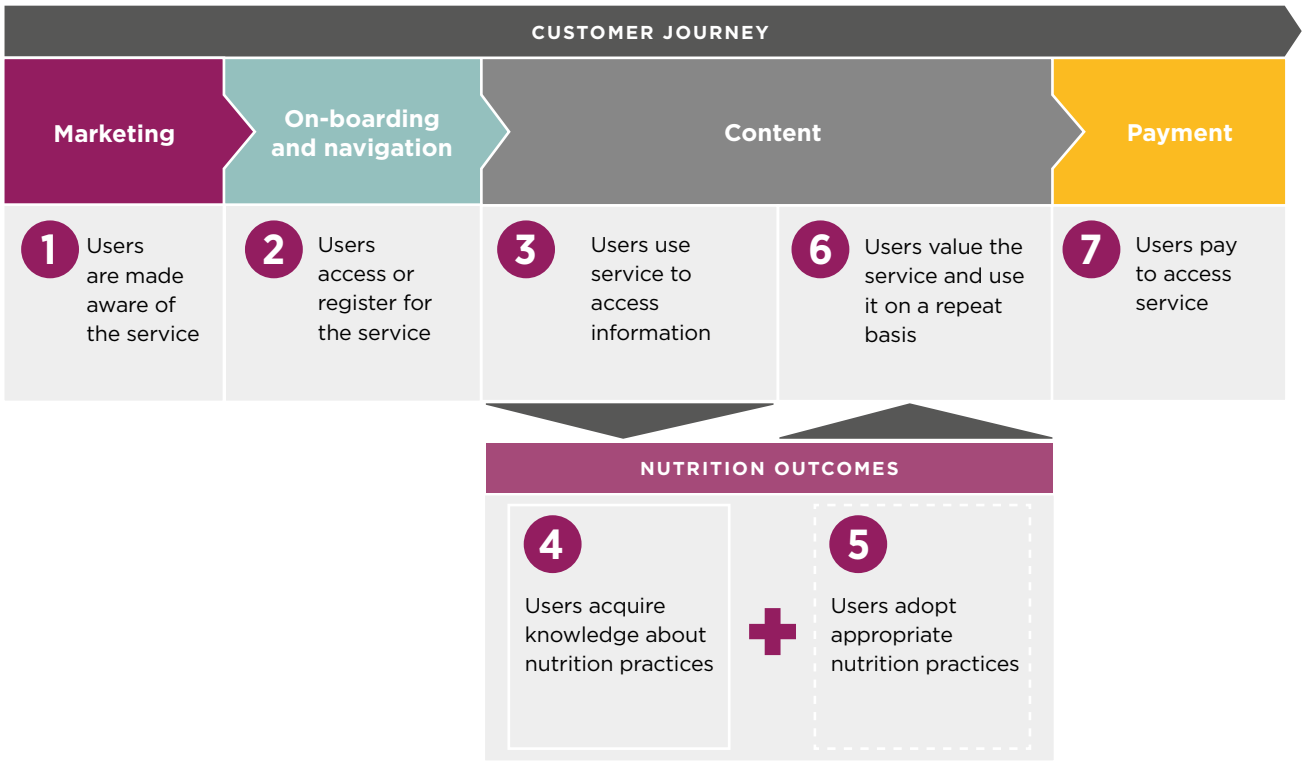
35. Based on October 2017 data (last month with available active and power user data for all markets).

5.2 The mNutrition Theory of Change

The Theory of Change (ToC) for the programme is based on several hypotheses. Users progress along the customer journey (1 and 2) (further detailed in Figure 6) and are exposed to the information available on the service (3). As a result, users either acquire new knowledge or their existing knowledge around nutrition practices will be reinforced (4), following which users will implement these practices in their households (5). Satisfied by their experience of the service and the health benefits for their family, users will continue to engage with the service (6) to get access to more information. For some services, a payment is required for all or some features (7).

FIGURE 6

The mNutrition Theory of Change



5.3 Customer journey

The customer journey framework has been a key tool in understanding the barriers to service adoption. The framework uses data from BI, UX research and user feedback phone surveys to reveal the main barriers to service adoption and devise possible solutions or identify areas for further research (See examples in Table 3). Collecting service usage data, such as the unique subscriber identifier, time stamp, duration and content accessed, has been vital for identifying product development challenges.

Photo courtesy of frog

TABLE 3

Examples of insights along the customer journey

	Marketing	On-boarding and navigation
Questions	• How do users become aware of services? • How are they educated on the value proposition of the services? • What types of marketing are most effective for mHealth services?	• How are users registered for services? • How do service providers offer both a personalised service and a simple registration process? • How do service providers ensure an excellent user experience once users are on-boarded?
Typical use case within the mNutrition Initiative	• Advertisement of service through mass media, mobile-based messaging, and community-based promotion campaigns.	• Users access on-demand content via USSD/IVR or receive push content via SMS.
Insights from the mNutrition Initiative	• UX research suggested that radio advertising alone does not always convince people to register to a service. However, it plays an important role in raising awareness about a service, improving the effectiveness of CHW assisted registration campaigns.	• BI data showed that users struggled to complete registration processes. UX research confirmed that users struggled to complete USSD registration before USSD time-out.
Recommendations	• Investigate which marketing channels deliver greater user acquisition rates and feasible cost of acquisition.	• Shorten and simplify registration process. Test alternatives to USSD, such as SMS registration.

	Content	Payment
	• What type of content keeps users engaged with a service? • How should information be presented to lead to behaviour change?	• Is the target segment willing to pay for mHealth services? • If so, how do they prefer to pay?
	• Messages offer actionable advice on how to improve health habits.	• Services charge per message/call or charge a flat rate subscription fee. Some operate a freemium model. One service is free of charge.
	• UX research found that many users struggle with technical language in messages and are not sure what to do as a result.	• BI has shown that most users will not pay for a service without having trialled the service.
	• Work with users to find terminology that describes technical terms in everyday language.	• Allow users to trial service before asking them to pay. If users will not convert to paid plans, explore partnerships to offer service for free to users.

5.4 Key findings along the customer journey

Marketing

Across eight markets, the primary service promotion strategies employed by mHealth service owners included a combination of mass media campaigns,[36] mobile-based messaging campaigns,[37] and community-based promotion campaigns.[38]

- **Agent-assisted registration for mHealth services can be an effective marketing route when an existing agent network is leveraged.** Assisted registration via CHWs or other agents can overcome the trust barrier that many mHealth services face. It also mitigates the potential technical challenges faced by users during registration, especially less tech-literate segments. It can be a cost-effective solution as an addition to mass media campaigns, provided that agents' incentives are embedded in the existing remuneration package (e.g. they are paid government workers or regularly paid by a private health provider) and the added role for the agent does not require significant additional operational costs.

- **Branded gear serves to strengthen the role of agents within the community.** Many people are hesitant to give their phone to a stranger for assisted registrations. Branded items such t-shirts, baseball hats and pins signal that agents are official representatives of the service, hence instilling trust.

- **Mass media campaigns raise awareness, but work best in combination with on-the-ground promotion.** When combined with on-the-ground promotion, mass media channels such as radio can play a crucial role in giving mHealth services legitimacy and awareness. For example, CHWs in Tanzania who assisted users in registering for the mHealth service report that it was easier to convince people to register for the service if they had already heard the radio advertisements. Although users recall an advertisement, they will often complete the call to action and register only when encouraged by a CHW.

> *"I used to see it on the TV as an advertisement but I did not know about it. When I was pregnant, a lady [CHW] came to me and I agreed to subscribe."*
> – Rural user, Tanzania

- **Traditional mobile-based marketing methods, such as end-of-call notifications and airtime top-up messages, have proved to be highly effective at driving service uptake.** These messages are delivered to the customers when they are already actively engaging with their phone, making it easy to respond and explore a service at the moment the promotional message is read.

While it is crucial to ensure that marketing messages are factually accurate, successful marketing campaigns cannot solely communicate facts, but need to appeal to the audience's emotions, communicate a clear value proposition and include a concrete call to action. We encourage mHealth services owners and their marketing partners to consider insights from user research in their creative development to ensure that the advertising speaks to its target audience.

36. Within the mNutrition Initiative, this refers to various print resources, radio advertisements or talk show slots, and television advertisements.
37. Users receive end-of-call notifications, airtime top-up notifications and blast SMSs on their mobile phones.
38. CHWs or trained agents promote the mHealth service and assist users in registering for the service.

On-boarding and navigation

- **Shortened self-registration increases registration rates.** Only essential information should be collected at registration, with additional information gathered after on-boarding users. After reducing the steps required to register for the service, the conversion rate of attempted to successful registrations of MTN Care 247 users in Ghana increased from 17 per cent to 68 per cent.

- **For services that require users to navigate through menus, it is paramount to find the right balance between the number of menu options and menu depth.** If users are faced with too many options throughout navigation, they might feel overwhelmed. If users have to make too many choices before receiving valuable content, they might give up. Menu titles should use simple language and clearly describe what content is available, to ensure easy navigation and content discovery. This is especially important for on-demand services, as users usually seek answers to specific questions. It is therefore important to ensure that menu titles reflect content in a meaningful way.

- **To build long-term trust, users must feel that they can control their relationship with the service.** Users should be able to easily unsubscribe and resubscribe to the service, as well as track their spending. Service providers should include administrative tips about the service (e.g. how to re-register to the service when getting a new SIM card). This also reminds users of the registration short code and process, should they wish to help other users to subscribe. Providing immediate feedback on transaction status, with further instructions where necessary, gives users essential feedback and guides them throughout their decision-making process.

Spotlight

Interactive education increases on-boarding success rates in Zambia

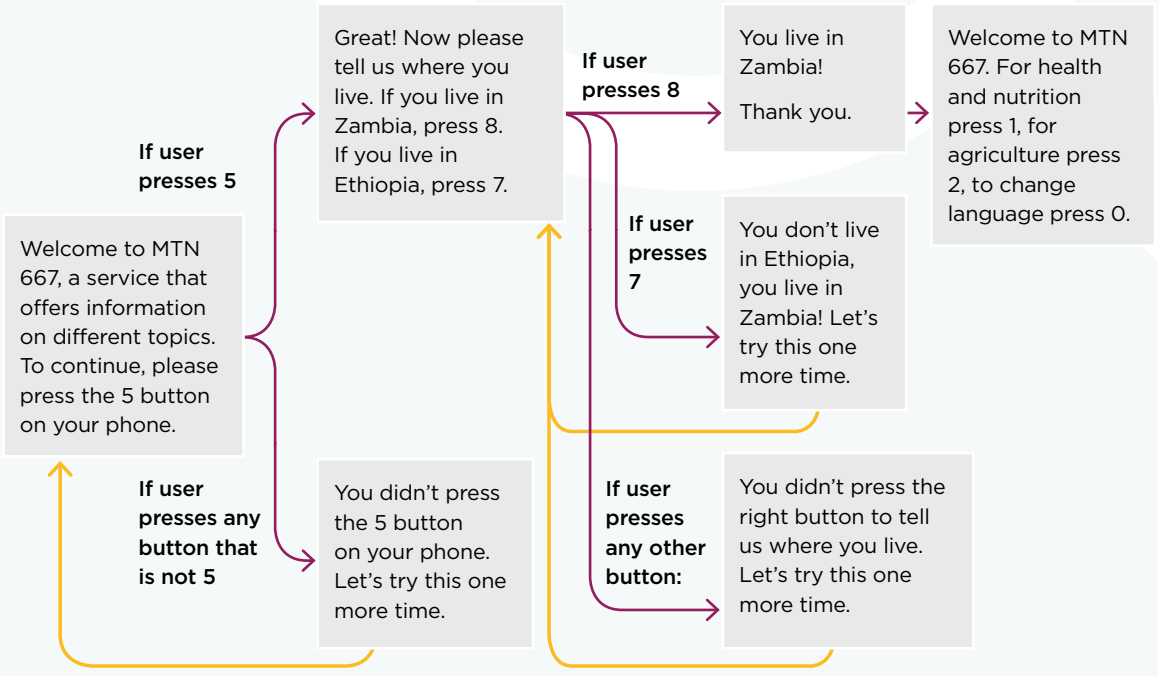
667 is an on-demand information service available on the MTN network in Zambia. Users dial 667 and navigate through an IVR menu to access voice messages on various topics, including nutrition, health and agriculture. Users can also access the service via USSD.

While conducting usability testing for the service, it was found that a number of participants struggled to navigate the IVR menu, preventing them from successfully accessing content.

To overcome this challenge, two on-boarding mechanisms that teach users how to use IVR before allowing them to access the main service were trialled with a subset of users:

1. **Learn IVR Game:** Users complete a series of increasingly difficult tasks using their keypad (see figure 7). If a user provides the incorrect response, the system will explain the error and will prompt the user to try again. Access to the full service is enabled after users complete all the tasks correctly.

FIGURE 7



2. **Mini IVR:** Users initially get access to only a small part of the total content available. This prevents decision paralysis resulting from being confronted with too many options, also making the service less intimidating for new users. On the first call, users have to choose only between two possible options. As the user starts calling MTN 667 on a regular basis, they will get access to full menus and options. This is enabled by tracking the activity of users over time.

While the pilot is still ongoing, initial results have been promising. These smart on-boarding mechanisms introduce users to the system gradually, increasing complexity in line with their competency levels, and allowing them to become more comfortable and confident as they experience the service over time. During prototype testing, some participants made mistakes while navigating through the on boarding mechanism for the first time. However, they quickly learned how to correct mistakes and the majority eventually completed on-boarding successfully. Participants who completed on-boarding were able to navigate subsequent menus with confidence and listen to desired content successfully.

It is advised to trial on-boarding features product with users prior to service launch using a minimum viable product. This allows for the early identification of any potential barriers for service adoption and usage. The final product with a complete set of features should only be developed after considering feedback from trial users.

Content

- **Use relevant terminology and language to reach target users.** Even users who can read English often do not fully comprehend the meaning of a text message. Translation of messages from English to a local language in Uganda resulted in a 13 percentage point increase in appropriately recalled nutrition knowledge among users. Service providers should also be cautious around the communication of related, but seemingly conflicting behaviours.[39]
- **Content needs to be actionable, dynamic and tailored.** In Uganda, some messages delivered through the service promoted the consumption of high-quality animal proteins, notably meat. However, many people struggle to access meat due to cost and availability constraints. To overcome this common challenge, messages should always offer alternative, cheaper and locally available sources (e.g. in Uganda, silver fish and legumes). Dynamic content features like 'recipe of the week' encourage regular usage.

> *"I just like the call and listen [feature], because **I can call in whenever I want to**. I can have the information on demand."*
> – Urban user, Nigeria

> *"I liked everything [about the service]. **I didn't like the part where there was no one to speak to. And the information is all the same,** it doesn't change."*
> – Urban user, Mozambique

39. For example, users in Malawi became confused when one message recommended the use of iodised salt, followed by a message that recommended to reduce salt intake.

Spotlight

Personalised, interactive content strengthens the value proposition for Kenyan users

Totohealth is a content subscription service that is available on the Safaricom network delivers MNCH information via SMS and outbound dialling (OBD) twice per week.

Totohealth focuses on offering a highly personalised service experience and enabling users to engage in two-way interactions with the service. These features are highly popular with users.

Totohealth users are requested to provide their name and their child's name and gender. This should be done after registration to avoid increasing the length if registration process. Thereafter, all messages are addressed directly to that user and their child is always referenced by name, as opposed to more generic language such as "your child". Users have reported to like this approach, as it creates a personal experience, making them feel recognised and cared for as an individual.

> *"I think the **personalisation** of the messages **makes me feel that it truly belongs to me** and not to any other person."*
> – Roy, urban user

Another unique feature of Totohealth are so-called diagnostic messages, which enable the identification of certain child health conditions that might develop at a specific age. When a user's child reaches a specific age, the service sends an SMS asking parents simple questions about the child. Based on the responses from the parent, Totohealth staff ascertain whether the child might be at risk of having or developing the corresponding medical condition, and where relevant, Totohealth SMS staff make timely referrals to health facilities.

Furthermore, Totohealth allows users to send health-related questions to an SMS helpline. For certain conditions, Totohealth staff will recommend treatment plans remotely via SMS. For example, while conducting user research, a user recounted how she was able to heal her son's diarrhoea after a short SMS exchange with Totohealth. The queries submitted to the SMS helpline cover a broad range of nutrition and health topics, some of which are incredibly personal. This demonstrates the demand, need and trust users have in the service. Focus group studies conducted by the GSMA in partnership with Altai Consulting showed that users highly value these two-way interactions.

> *"The part that was attractive [about Totohealth] is that you don't only receive information but **you can ask questions also**."*
> – Faith, urban user

> *"What really influenced me is that **Totohealth is interactive and responds.** Whenever I send a message they respond and tell me what I should do with my child. Especially when my child got into an accident they helped me. **They really guided me** on how to take care of my child."*
> – Florence, rural user

Payment

- **Clearly articulating the value proposition is essential to explain why a customer should spend their money on a service.** As it can be difficult to see the immediate benefit of many mHealth services, people feel hesitant to pay, especially before trying one. Freemium[40] models allow users to experience the value of a service first-hand before paying.

- **Complex or unclear charging models are confusing to people,** creating uncertainty about cost and preventing people from fully embracing services. If charging users, payment must be as simple as possible.

- **'Willingness to pay' uncovered through traditional market research does not necessarily convert into actual paying users for a service, if it is poorly designed or the value proposition is not clearly presented.** In Kenya, consumer research by the GSMA and TNS revealed that 69 per cent of the female target audience[41] would be either likely or very likely to pay for an MNCH messaging service (the questionnaire did not specify a specific service on offer). Yet, only seven per cent of all users who showed interest (initiated registration) in the Totohealth service in Kenya actually went on to pay the low subscription fee[42] due to significant user experience barriers to registration, service trial and payment.

Photo courtesy of frog

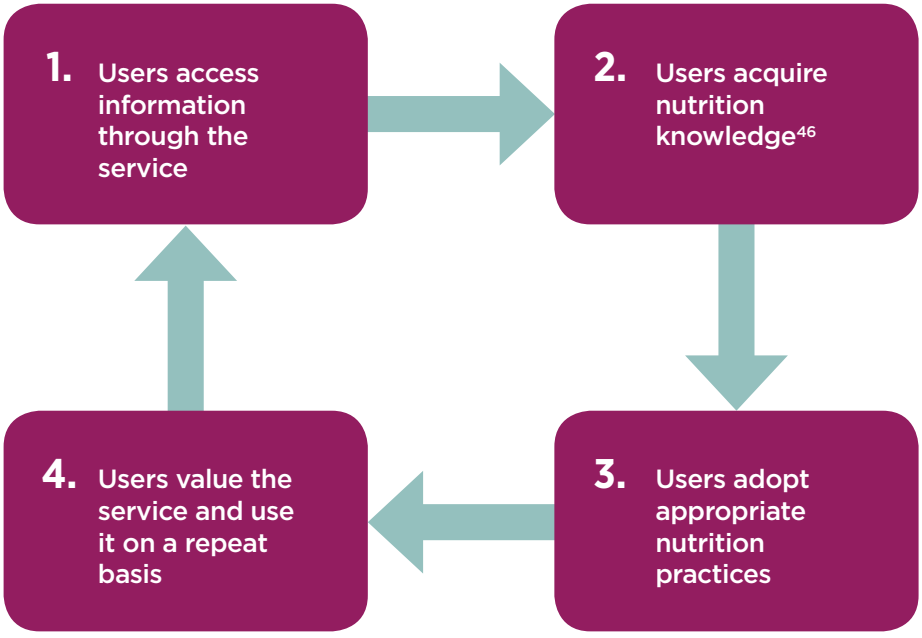
40. The freemium business model works by offering simple and basic services for free for the user to try and more advanced or additional features at a premium.
41. Men were slightly more in favour of paying, with 72 per cent saying that they were either likely or very likely to pay for the MNCH messaging service.
42. KSH 25 (roughly $0.25) for a one month subscription.

6. Improved nutrition outcomes

Surveys[43] conducted with both users[44] and non-users[45] were designed to investigate how the mHealth services in the mNutrition Initiative portfolio are improving nutrition knowledge and behaviours. The same surveys tested user satisfaction, which should in turn contribute to repeat service usage as per the ToC (see Figure 8).

FIGURE 8

Pathway to knowledge and behaviour change for mNutrition services



43. Phone surveys conducted in all eight countries between January 2016 and January 2018, three to 15 months after service launch.
44. Users are individuals who, according to service usage logs, accessed content on key nutrition topics through the service prior to participating in the survey.
45. Non-users are individuals, similar in profile to users, but who did not access content on key nutrition topics through the service prior to participating in the survey.
46. In addition to acquiring nutrition knowledge, users need to overcome other barriers in order to implement appropriate nutrition practices (see section 6.2).

6.1 Improving nutrition knowledge

Several insights from research[47] conducted with the key target audience[48] highlighted several gaps in nutrition knowledge:

- **A false understanding of good nutrition leads people to believe that their diet is fine or that they are already following best practice.** Across the majority of implementing markets, around two in 10 women have a positive perception of their diet, but are in fact at high nutritional risk based on their current diet. Surprisingly, this is not restricted to poorer or uneducated populations.

- **Knowledge around supplementation of vitamins and minerals for the prevention and treatment of illness is particularly poor across all eight markets.** For example, primary research in Ghana revealed that 73 per cent of women among the key target audience were not confident in the use of low concentration oral rehydration salts solution or zinc supplementation to treat acute diarrhoea in children under-five.

- **Although confidence and knowledge levels around appropriate breastfeeding practices are markedly higher, there are gaps in knowledge and misconceptions that lead to poor practices.** For example, many women believe that a baby would not have enough food or water if exclusively breastfed. Similarly, many women do not know the importance of the first milk and early initiation of breastfeeding. There are further misunderstandings about correct weaning practices. While these knowledge gaps are more common among poorer and less well-educated women, different socio-demographic groups have different knowledge gaps and misunderstandings.

Evidence generated through M&E surveys conducted by GSMA and its partners suggests that **mobile services can help overcome this knowledge barrier:**

- **mHealth services under the mNutrition Initiative caused an average improvement in overall nutrition knowledge levels of 12 percentage points across all eight markets.** Sixty-nine per cent of mHealth service users correctly recalled knowledge across all tested nutrition practices in comparison to only 57 per cent of non-users (see Figure 9).

- **Mobile information services improve knowledge, even when existing knowledge around certain nutrition topics is reasonably high.** In some markets, existing knowledge around certain breastfeeding practices is reasonably high, with credit to existing government breastfeeding education efforts. For example, in Uganda, 90 per cent of non-users correctly recalled that breastfeeding should be initiated within one hour of birth. mHealth service users still demonstrated a seven percentage point improvement, with an average of 97 per cent of mHealth service users correctly recalling this practice.

- **Mobile information services have a stronger impact with poorly understood nutrition concepts.** During the mNutrition Initiative, we found that existing knowledge around appropriate supplementation of vitamins and minerals was particularly low, with an average of only 33 per cent of non-users across all markets correctly recalling appropriate supplementation practices. mHealth service users demonstrated a 16 percentage point improvement in supplementation knowledge over non-users. In Kenya, this improvement was most impressive, with 41 per cent of users correctly recalling appropriate supplementation practices, in comparison to only five per cent of non-users.

- **Mobile is extending access to vital nutrition information among audiences who have no other sources.** On average, one out of three users report that the mHealth service is their only source of nutrition information.

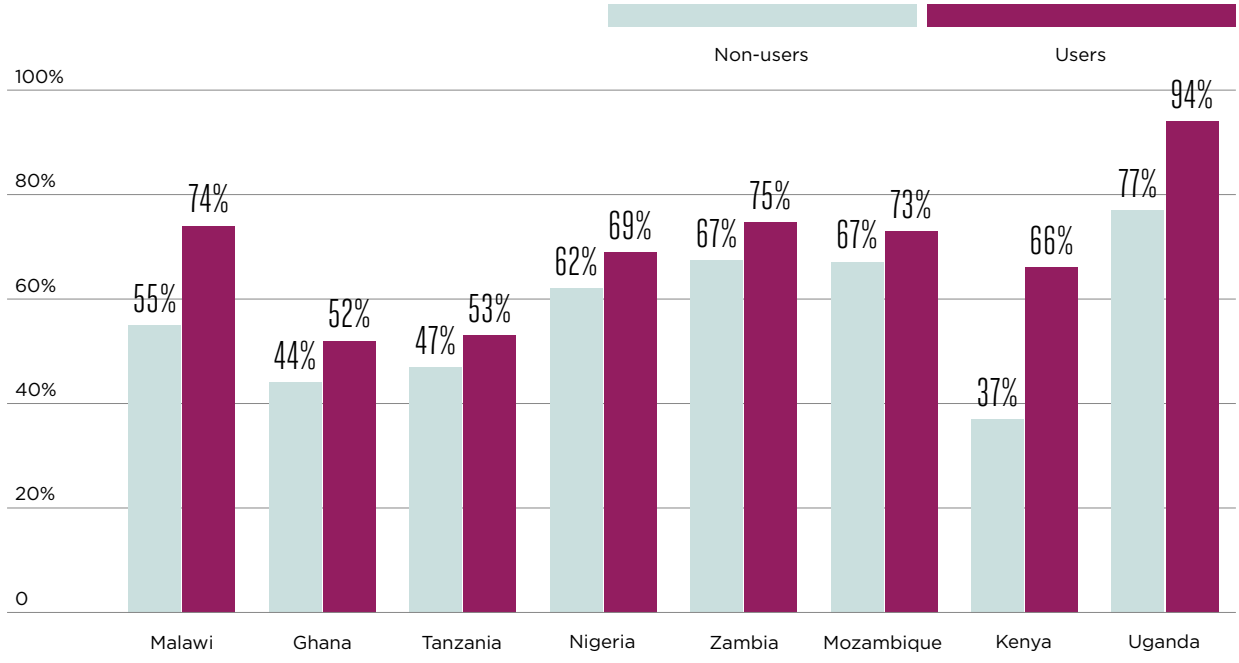
47. Primary research conducted by TNS, UX research conducted by frog and GSMA, and M&E research conducted by Altai Consulting and GSMA.
48. Pregnant women and mothers with babies under two years.

> *"**We don't know what we are supposed to do** for example for most of us, our parents were ignorant and didn't go to school. We got at least some knowledge from school but if our parents knew they could have taught us these practices."*
> – Urban user, Uganda

> *"To add on that I will insist on the issue of the **lack of information, lack of sensitization and not knowing what we need to do.** When a mother is told to take the child to the hospital, she won't be taught anything **since the clinic has no time to teach anything.**"*
> – Rural user, Uganda

FIGURE 9

Percentage of users and non-users who correctly recall appropriate nutrition practices



6.2 Changing nutrition behaviours

In addition to improved nutrition knowledge, changing behaviours among users depends on overcoming several other barriers.

- **In addition to a lack of knowledge of appropriate nutrition practices, the cost and availability of nutritious foods remains a barrier to behaviour change.** Across almost all mNutrition markets, it was observed that greater diet diversity was directly related to higher income. Availability of nutritious foods is marginally less constraining than price, but this varies from market to market and season to season. During pre-harvest season or droughts, lack of availability of nutritious foods becomes the main concern. While mHealth services cannot directly affect affordability, mHealth services can provide information content that increases the awareness of the nutritional value of affordable and available foods.

  "Maize was expensive. People stopped thinking of applying nutritional practices, all they were thinking was to find a meal to fill their stomachs."
  – Rural user, Malawi

- **Women may make decisions around nutrition, but men manage the household budget.** Across most of the eight markets, women are key decision makers or are in a position to support decisions related to the nutrition and health of their families. Women's influence in decisions around nutrition practices also appears to grow with age. In many cases though, this influence is not accompanied by an increase in knowledge around appropriate nutrition behaviours, as older women often have worse diets. Older women in the household would be important in encouraging behaviour change and should be considered a key target group for nutrition education. Men, however, manage the budget allocation and are therefore also key influencers for behaviour change.

  *"Here in the north, it is the **husband that brings money** home and caters for the family needs. Then the woman ensures that she cooks the food that is provided."*
  – Rural user, Nigeria

- **Changing cultural and deeply embedded food habits is very hard.** For example, our research showed that Ugandans prioritise their budgets on starch-rich foods. These carbohydrate-heavy meals are often low in diversity and nutrients, but resistance to changing this behaviour is high. Introducing subtle changes, such as adding a side dish or increasing use of a particular ingredient, may be most effective.

  "The way you behave sometimes, it's very difficult to change, you have been doing it that way for long, so changing is sometimes not possible."
  – Urban user, Ghana

- **Several practical and social pressures prevent women from adhering to appropriate breastfeeding practices.** Working women face the practical challenge of being away from the baby for long periods of time, making continued breastfeeding challenging. Information about ways of balancing breastfeeding with working life, such as expressing milk, could be helpful for this user segment. There are also poor societal perceptions of breastfeeding women.[49] Reinforcing the importance of breastfeeding and enhancing positive associations with mothers who breastfeed will motivate women to persist beyond these challenges.

- **CHWs are trusted members of the community and influential in educating families on nutrition practices.** Many users of mHealth services report following advice from CHWs. Trust and adherence to mobile nutrition messages is improved when information aligns with and reaffirms advice heard from government clinics and CHWs.

  *"I trust the service, because whatever I hear is true. Every time I hear about something, I consult **people in the health sector to confirm and they are always in agreement. That is why I trust the service.**"*
  – Rural user, Zambia

49. Such as existing beliefs that men are not attracted to breastfeeding women, that breastfeeding makes you gain weight and that breastfeeding is something that should be looked down on.

Evidence generated through M&E surveys conducted by GSMA and its partners suggests that **mobile services can drive behaviour change among users:**

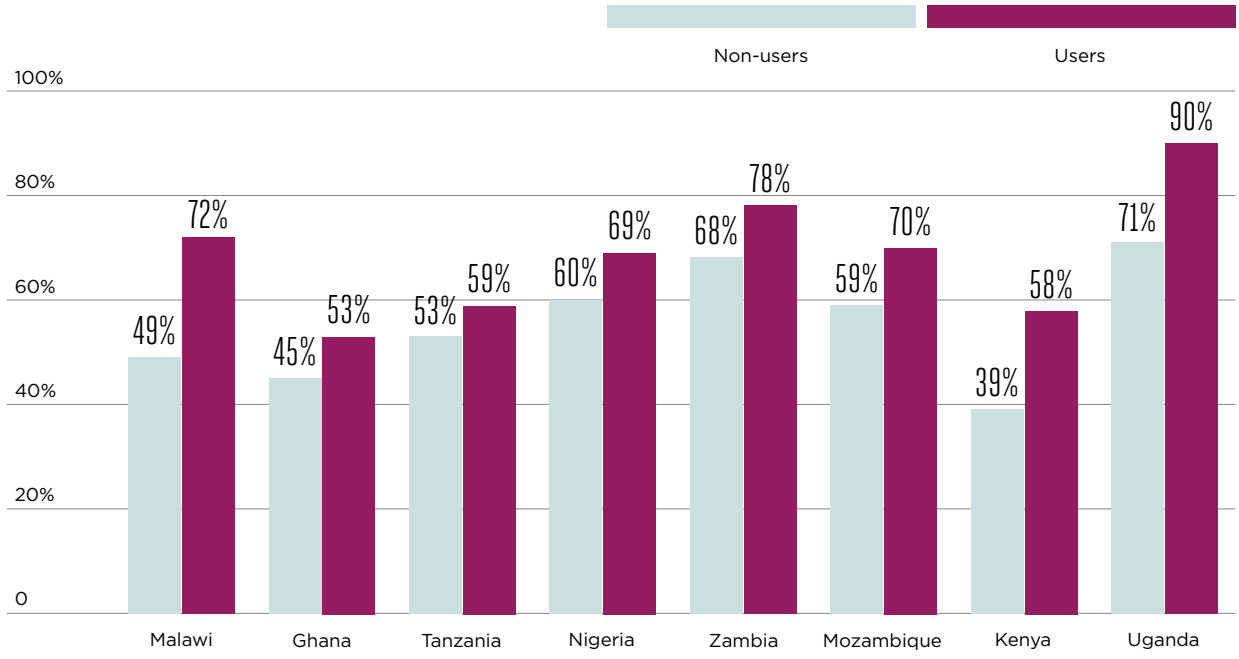
- **mHealth service users demonstrated improved nutrition behaviours over non-users across all markets.** Overall, 69 per cent of mHealth service users demonstrated appropriate nutrition behaviours in comparison to only 56 per cent of non-users—an average increase of 13 percentage points across all markets. (see Figure 10).

- **Repetition of messages on key health practices reinforces the behaviour.** User research revealed that customers appreciate the reminders about the practice and do not see it as an annoyance. In Uganda, providing four messages on exclusive breastfeeding as opposed to just two over a four-week period, increased adherence to this practice by eight percentage points. Reminder notifications are highly valued and adhered to by users. In Tanzania, 73 per cent of users recalled receiving messages reminding them to go to the clinic. Of this group, 78 per cent reported that they went to the clinic in response to receiving the reminder.

*"**It reminds us a lot of things**. There is a month you get reminded to attend clinic, we are reminded on how the baby is postured, [..], they will keep reminding you on the phone all the time, so **nothing comes as a surprise to you.**"*
– Urban user, Tanzania

FIGURE 10

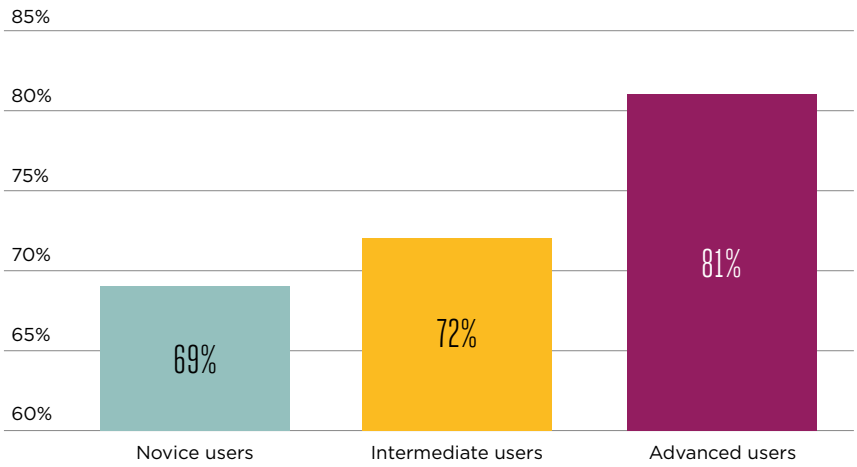
Percentage of users and non-users implementing appropriate nutrition practices



- **Behaviours are positively influenced over time as users engage with mHealth services.** When comparing exclusive breastfeeding behaviours of three different segments of mHealth service users in Ghana, advanced users[50] demonstrated improved adherence to advocated practices in comparison to intermediate users[51] and novice users.[52] Behaviours appear to improve as users engage with services over time (see Figure 11).

FIGURE 11

Percentage of novice, intermediate and advanced users who report to exclusively breastfeed their babies for the first six months



- **Users report that acquiring new knowledge from the mHealth services has helped them to adopt appropriate nutrition behaviours:**

> *"**I wanted to give the baby porridge once but after receiving the message from Toto I changed my mind**. You see: Toto has made me change for the baby and the mother."*
> – Urban user, Kenya

> *"**I now eat a balanced diet**, and my food is always clean too. Before I didn't eat the six classes of food. I used to eat more of carbohydrate. **I was ignorant about all of this**."*
> – Rural user, Nigeria

> *"I didn't take vegetables as something important. I knew if I had my beans and posho I was good to go **but now I ensure I make some greens** at least every two days and **I ensure to pass on the message to the pregnant women I know** and to those with children below five years."*
> – Urban user, Uganda

50. Users who had been subscribed to the service for more than three months at the time of the survey.
51. Users who had been subscribed to the service between one and three months at the time of the survey.
52. Users who had been subscribed to the service for less than one month at the time of the survey.

Spotlight

Product improvements result in better health outcomes in Malawi

Airtel 321 is a mobile information service available to users on the Airtel network in Malawi. Users dial 321 and navigate through IVR menus to access voice messages containing information on various topics, including health, nutrition, gender, agriculture and weather. Users can also access the content via USSD and SMS. Following service launch in Q4 2015, Viamo[53] has undertaken a number of service improvement initiatives based on regular user testing of features and functionalities:

1. **Shortening and simplification of welcome messages:** The 321 welcome message was shortened and simplified to give users relevant information as effectively as possible, allowing users to access content faster.

Old welcome message

Thanks for calling 321, a new way of giving you important messages. You can call 8 times for free, then it's MWK 15 per message after. You have 6 options, listen carefully then make your choice.

- If you want to know about health, press 1
- If you want to know about agriculture, press 2
- If you want to know about nutrition, press 3
- If you want to know about gender, press 4
- If you want to know about weather, press 5
- If you want to receive SMS from 321, press 0

New welcome message

Welcome to 321, a service that offers information on different topics. In each month you have 8 free calls, starting with the 9th call, each call you make to 321 will cost 15 kwacha.

- Health, press 1
- Agriculture, press 2
- Nutrition, press 3
- Gender, press 4
- Weather, press 5
- To register and get free SMS, press 0

2. **Adaptation of menu options:** Titles of nutrition menu options and subsequent message titles were altered to better reflect the content of each section or message, making it easier for users to find the information they are looking for.

3. **Introduced dynamic content:** A recipe of the week section was added to encourage repeat usage. These recipes are changed each week and users can access the previous and current

53. The social enterprise organisation that manages the 321 service.

week's recipe. Two thirds of users who listened to a recipe went on to try the recipe, all of whom said they would make the recipe again and intend to share the recipe with friends/ family. Users felt empowered by this new content and it inspired them to start thinking of new opportunities, such as selling new dishes/ meals.

"We tried the pumpkin porridge after hearing the recipe from 321... It was great because we never knew we could make porridge from pumpkins... We decided to try because we had everything in hand so why not."
– Yona, rural user

"[My sister-in-law] listened to Airtel 321 and discovered that some of the given nutritional recipes are locally available, then she started preparing soya beans plus other beans mixed with maize, milled it and started preparing porridge for her child. As we are speaking the kid is now healthy and nourished."
– Melvis, rural user

4. **Stylisation of content to fit with the audience context and preferences:** Message style was changed from prescriptive monologues, as instructions provided by health experts in a sterile way, to engaging and familiar dialogues, which recreate real life situations and bring topics to life in a relatable manner (see example below for a message on breast milk storage). Stylising the content to the local population's culture, communication style and traditions enhances user engagement and, in turn, helps to drive uptake and create the desired impact on behaviours.

Old monologue style

Use your hands to squeeze milk from your breasts in a clean covered cup to feed your baby if he cannot feed from the breast or if you cannot keep your baby with you all day. Keep the breast milk in a covered container up to 6 hours at room temperature or up to 5 days with refrigeration. Be sure to wash your hands before using them to squeeze milk from your breasts into a clean covered cup. This will help prevent the milk from spoiling sooner.

New dialogue style

Nurse, my wife and I are planning to make a short trip and we can't take the baby with us. Is it possible to store breast milk?

Bengo

That's very possible Bengo!

Nurse

Oh really? How do you store breast milk?

Bengo

Do not worry, it is very easy! Explain to your wife exactly as follows: Use your hands to squeeze milk from your breasts in a clean covered cup. Keep the breast milk in a covered container up to 6 hours at room temperature or up to 5 days with refrigeration. Be sure to wash your hands before using them to squeeze milk from your breasts into a clean covered cup. This will help prevent the milk from spoiling sooner.

Nurse

These service improvements have resulted in higher user satisfaction rates and improvements in nutrition knowledge and behaviours among 321 users. Since these changes were implemented, the percentage of users who correctly recalled appropriate nutrition practices increased from 55 per cent to 72 per cent, while the percentage of users who reported to be implementing appropriate nutrition practices increased from 49 per cent to 70 per cent. This demonstrates the power of iterative product development and the application of HCD approaches for delivering quality services that deliver value to end users and improve their nutrition behaviours.

6.3 Additional benefits of mHealth services

Users across all mNutrition services express high levels of satisfaction. Several insights revealed intended as well as some unintended benefits for end users:

- **mHealth services provide emotional support and a private source of companionship or help for end users:**

  *"Even when you are fed up and tired, **the messages encourage you and make you feel special and even your own husband may not tell you that.** It is very important to have someone who cares about you. They follow up and **they do show that they care which encourages you** to move on."*
  – Urban user, Uganda

  *"It is making you learn new things. **You kind of feel you are not alone in this.**"*
  – Urban user, Kenya

  *"**The privacy.** You know about things at times you don't want to tell people that you are pregnant. **You just have to tell your phone.**"*
  – Urban user, Kenya

  *"In the area of health, nutrition and family planning all will be useful to me. **People want to make use of it, but for them it is shameful to ask.** So, having such advantages on mobile devices will be a good advantage for people like us."*
  – Rural non-user, Nigeria

- **mHealth services reassure women and provide clarity in a world of conflicting sources of information.** At any moment, women receive a myriad of inconsistent advice about pregnancy and child rearing. Grandmothers give advice based on traditional beliefs. Clinics give recommendations that people cannot afford. Neighbours share rumours of a new health conspiracy. Among all this noise, mHealth services have established themselves as a source of trustworthy information. Interviewed users felt reassured by the information they receive through mHealth services and feel confident that they are making the right choices for their families.

  *"I liked because that service **gives you a straightforward piece of information that does not leave you with doubts.** It does help you to change the dietary habits and to want to know more about the topic."*
  – Urban user, Mozambique

- **mHealth services save users time and empower them.** Users express satisfaction in the fact that mHealth services save them the time and money of travelling to a clinic unnecessarily. In Malawi, while cooking a recipe provided by the mHealth service, one user, without any prompting, started discussing selling the fritters in town.

  *"First of all I will be able to access information of something that is very useful and important. It also helps to **save the time going to the hospital** and make a line: i**t saves time and a child's life if I get such messages**."*
  – Rural user, Uganda

  *"If you go to the doctor, before being treated, **you have to pay. So it also saves money.**"*
  – Urban user, Kenya

- **mHealth services are empowering men to play a stronger role in ensuring the well-being of their families.** Messages tailored for fathers specifically were very well received by both men and women. Both groups felt that these messages provoked greater ownership and responsibility among men for the health and well-being of their families.

  *"I found my wife listening to those messages concerning children's health. I believe it is a very important service. I also got curious and started to listen and understanding about nutrition. **It is also useful to show women that we are active, because sometimes we want to talk about something and they will tell us that we can't.**"*
  – Urban user, Mozambique

  *"The **one [message] for fathers is good.** Most of the fathers see the babies belonging to the mother, but this concept **can educate them on supporting their wives.**"*
  – Urban user, Tanzania

When users are satisfied with their experience of a service and start to witness first-hand the benefits of adhering to the advice shared by the service, they become self-appointed advocates for the service. Eighty per cent of all service users say that they absolutely would recommend the mHealth service to their friends and relatives.

- **Forty-two per cent of mNutrition service users report sharing the information they learn with their family, friends and communities.** The majority of these users share information verbally (62 per cent), while others read or listen to messages with other members of the family or community (21 per cent). Of the users in Zambia who report sharing information, 25 per cent forward the messages to others via their phone. Traditionally in Tanzania, it has been the woman's role to take care of family health, while many men have lacked the knowledge to participate. Yet, the husband of a woman user reported that he usually reads the messages together with his wife. He also shares the messages with several colleagues at the boda boda (motorcycle taxi) stand where he works.

  *"**We share by listening together** and at times we even give [our neighbours] a phone to dial."*
  – Rural user, Malawi

  *"It is good for us to learn a lot and to know a lot. Like this **I can share information in my community. That's why I am using it**."*
  – Urban user, Ghana

  *"I subscribed to be able to **share the nutrition knowledge at church**."*
  – Rural user, Ghana

- **Users store messages on their phones for long periods, or even write them down to share the information with other people.** Forty-one per cent of all mHealth users keep messages on their phones. They re-read messages to keep knowledge fresh and reference messages when they have a specific question. Even more users would like to keep messages, but limited memory on the phone prevents them from doing so, hence, users often write down messages that they consider important. In Tanzania, one in 10 users store messages by writing them down.

A user in Ghana copied all messages onto paper to share with his sister, whose phone was broken. Photo courtesy of frog

7. Service sustainability

Service sustainability is defined by covering operational costs and demonstrating enough benefits (direct or indirect) for the service owners to ensure continued service delivery. For mHealth services, finding a source of revenue is an ongoing challenge and the majority of them rely on donor funding. Typically donors fund mHealth initiatives only for a set period, leaving services vulnerable once funding ends.

When operated at scale, mobile-enabled behaviour change communication (BCC) services have high operating costs, which are largely related to content delivery. In Tanzania, for example the estimated annual cost of message delivery, offset by MNO partners as part of their in-kind contribution to the service, was over £330,000, contributing to 63 per cent of total operating costs.[54] In return for this kind of investment, MNO partners can derive value, primarily through indirect benefits of improved customer loyalty and brand perception. Sixty-seven per cent of Healthy Pregnancy, Healthy Baby users have been subscribed to the service for longer than six months. This, along with the extensive content offering,[55] suggests that users who are tied into the service may be less likely to leave a network provider (resulting in reduced customer churn rate). Airtel Tanzania has been zero-rating the message delivery costs for service users on their network since 2012 and have agreed to do so until 2020—an eight-year commitment to the Healthy Pregnancy, Healthy Baby service, with the likelihood of extending their support even further.

"Our subscribers know that they can get this information for free at any time on our network and this presents longer term opportunities to build customers' loyalty to our brand and stick with us."
– Airtel Tanzania

There is potential for mHealth services to generate B2C revenue, although the majority of the target market have low disposable income to pay for healthcare services. B2C as a direct revenue opportunity for mHealth service providers, monetised to the extent of commercial break-even, requires significant scale and is yet to be proven, with early examples of commercial B2C services delivered at scale in South Asia.[56]

Building large-scale mHealth services that can be leveraged by governments and other businesses is an emerging opportunity that could lead to B2G or B2B revenues for the service. Services which are free to end users achieve market scale faster. Once a service has a large user base, it generates a substantial amount of data and provides access to a large audience that can be of value to governments, international agencies and advertisers, opening the door to new revenue streams.

Annual government health spend in developing countries globally is approximately $1 trillion. If local governments allocate 0.5 per cent of that to digital health initiatives over the next five years, a cumulative $25 billion will be available for digital health companies, including MNOs.[57] Governments across all mNutrition markets have endorsed the mHealth services and there is growing government ownership of digital health services,[58] but they are not yet ready to cover service delivery costs with existing health budgets. Digital health stakeholders need to stimulate government investment by demonstrating how digital health solutions help address national healthcare issues of poor access, quality and cost inefficiencies.

Health service providers subsidise digital solutions when those optimise their core business and reduce costs. Living Goods Uganda uses mobile to improve

54. GSMA, 2018, "Healthy Pregnancy, Healthy Baby – A mobile health service offered in partnership with leading mobile operators in Tanzania".
55. The content offering spans the full duration of a woman's pregnancy and up until a child is five years old.
56. GSMA, 2016, "The Journey of Telenor My Health in Pakistan".
57. GSMA, 2017, "Scaling digital health in developing markets".
58. The Government of Tanzania has recognised the Healthy Pregnancy, Healthy Baby service as a viable channel for health education among a mass audience and has assumed ownership of the service.

health service and information delivery by offering a digital channel for frontline health workers—for example, support apps embedded on their smartphones—and an additional mobile channel targeting end customers through a free SMS information service. This use of mobile has optimised service delivery on several fronts as detailed in the spotlight on page 39.

Several of the services within the mNutrition Initiative portfolio have pursued diversified business models. Instead of relying on a single source of income, successful services generate revenue from multiple sources, increasing the financial resilience of the service.

This approach allowed 321 Malawi to cover operational expenses through multiple sources of revenue or in-kind contributions: The service has generated B2C revenue through customer payments for premium service access.[59] B2B revenue is generated through organisations that pay to embed their content on the 321 service[60] or make use of the data collection[61] or customised technical development services that Viamo offers. Supplementary funding is provided by donors. Furthermore, Airtel Malawi provides mobile-based marketing and zero-rates the usage of certain core mobile services as part of its in-kind contribution to the 321 service.[62]

Photo courtesy of frog

59. The first eight calls per month are free and thereafter, users are charged MKW 15 per call.
60. This covers content development support, including voice production and testing. Monthly data insights reports are provided at an additional fee.
61. Viamo facilitates field-based data collection and direct-to-population data collection.
62. Mobile-based marketing includes end-of-call notifications and airtime top-up messages. Airtel zero-rated unlimited SMS and USSD interactions on the service, as well as eight IVR calls per user per month.

Spotlight

Living Goods enhances its core services and streamlines operations through digital channels

In Uganda, Living Goods used digital channels to optimise their core operations – community healthcare provision and essential health commodities and medication distribution.

Living Goods Uganda deploys a network of door-to-door Community Health Workers (CHWs), who are responsible for guiding families towards improved health and well-being. They do this by counselling families on appropriate health and nutrition practices, providing disease diagnosis, some treatment services and selling life-enhancing products to the families they visit. As of January 2018, Living Goods has a network of more than 2,300 CHWs providing services to over 400,000 households. At the current rate of expansion, Living Goods is forecasted to reach 4,500 CHWs and 600,000 households by the end of 2018.

The Living Goods community-based product sales model generates revenues that recover 100 per cent of the product costs, a retail margin that covers the income of the CHWs and a wholesale margin that covers most of the product distribution costs. Supplementary donor funding covers the remaining operating costs, as well as the costs of the mobile-based service components: support apps embedded on the CHWs' smartphones and an additional mobile channel targeting end customers through a free SMS information service.

Living Goods sees the mobile channels as a viable investment as they streamline operations, increase efficiency and reduce costs. Mobile channels:

1. **Save time and reduce the cost of managing service delivery at scale.** By replacing paper-based data capturing and collection processes, mobile reduced the resource requirements to collect, digitise, clean and analyse the data, in turn reducing data management overheads.

2. **Improve the quality and consistency of care provided by the Living Goods service.** Improvements occur on three fronts:

    a. Guided counseling and diagnostic tools in the mHealth app ensure consistency of care and treatments and accuracy of diagnosis;

    b. Improved data visibility and service monitoring through a real-time dashboard enable timely decision making and improved performance management of both CHWs and branch teams; and

    c. Communication of vital health and nutrition information directly to customers improves their knowledge and behaviours. In comparison to non-users, breastfeeding knowledge and behaviours increased by 17 and 19 percentage points respectively among Living Goods customers.

3. **Mobile strengthens the product sales workstream.** Tools embedded in the CHW Community App, such as the product catalogue, cost-savings calculator and the FAQ section, support CHWs in their product sales efforts.

These improvements, which are made possible by the implementation of digital tools, contribute to achieving greater health outcomes, strengthening the value proposition of the Living Goods service to the Ugandan MoH. Mobile-enabled data collection in particular is already benefitting the government. At present, Living Goods share quarterly aggregated district-level health data, aligned with existing government health data requirements, with the MoH. Living Goods is also engaged in discussions with the eHealth Technical Working Group and the MoH on improved integration with the District Health Information Software (DHIS2) and greater adoption of the Living Goods model by the MoH.

Partnership with the Living Goods service presents potential value for MNOs. As a preferred network provider to all Living Goods CHWs an MNO would ensure direct revenues from core services used by the growing CHW network.[63] If CHWs make quarterly calls to each household, this could generate annual revenue of over UGX 720 million[64] for MNOs. As Living Goods expands its operations, these benefits will become more significant.

In addition, the use of mobile money could further streamline operations, for example by allowing for timely and secure cash transfers between the CHWs, the end users and back-end LGI staff. By adopting mobile money, Living Goods could reduce cash handling costs. Potential use cases include CHWs paying LGI for restocking of goods via mobile money, allowing end users to pay digitally CHWs for big ticket purchases.

63. An MNO could offer in-kind contributions, such as reduction of data bundle costs or mobile money transaction fees for CHWs, to secure them as customers on their network.
64. Roughly $201,600; estimate based on call durations of one minute at a per minute call rate of UGX 300 and calls made to a total of 600,000 households by 4,500 CHWs.

8. The future of mHealth services

Within the mNutrition Initiative, the GSMA mHealth programme has focused on behaviour change interventions aimed directly at consumers. Services range in degree of interactivity, from passive content push services to holistic healthcare delivery solutions empowering frontline health workers via apps. Universally, the more interactivity a service offered, the more value people saw in the service. Beyond providing information, such services become trusted partners for their customers that offer medical and emotional support when needed. For example, as described in the spotlight on page 23, Totohealth users saw significantly more value in the interactive SMS component of the service than in the passive push content. Virtually all research participants provided testimonials of how Totohealth had a positive health impact on someone they knew. Across all eight markets, users describe variants of dial-a-doc services as their ideal mHealth service.

Currently, dial-a-doc services, while highly desired by users, are very difficult to scale and sustain. Requiring a large number of trained staff to respond to user inquiries, they are costly to operate. However, various emerging technologies, such as AI and chat bots, allow for the automation of significant parts of such services, hence reducing costs and making dial-a-doc services financially feasible.

It is important to note that consumer-facing services represent only one of many possible mHealth applications. In particular, there are vast opportunities in digitising health systems, such as medical procurement, digital patient records, clinic management and infectious disease detection. To realise the full potential of these applications, interoperability is crucial, allowing different applications to integrate into holistic health management and service delivery systems.

MNOs will play a crucial role in enabling these technologies in emerging markets, from offering necessary infrastructure to building mobile platforms that allow these services to function. To remain relevant in the digital health space, operators need to adopt strategies that can strengthen their role as information and communications technology (ICT) and digital service providers within the digital health ecosystem by:

- Pursuing a holistic approach that looks at digital health as an integrated, as opposed to fragmented, portfolio of services;
- Positioning themselves at the centre of the ecosystem as ICT and digital service partners for governments, health providers and health tech companies;
- Building their ICT and health skills and resources by establishing strategic partnerships. Acquisitions of health tech companies can also be considered to expand operator presence.

For other mHealth publications and tools, please visit
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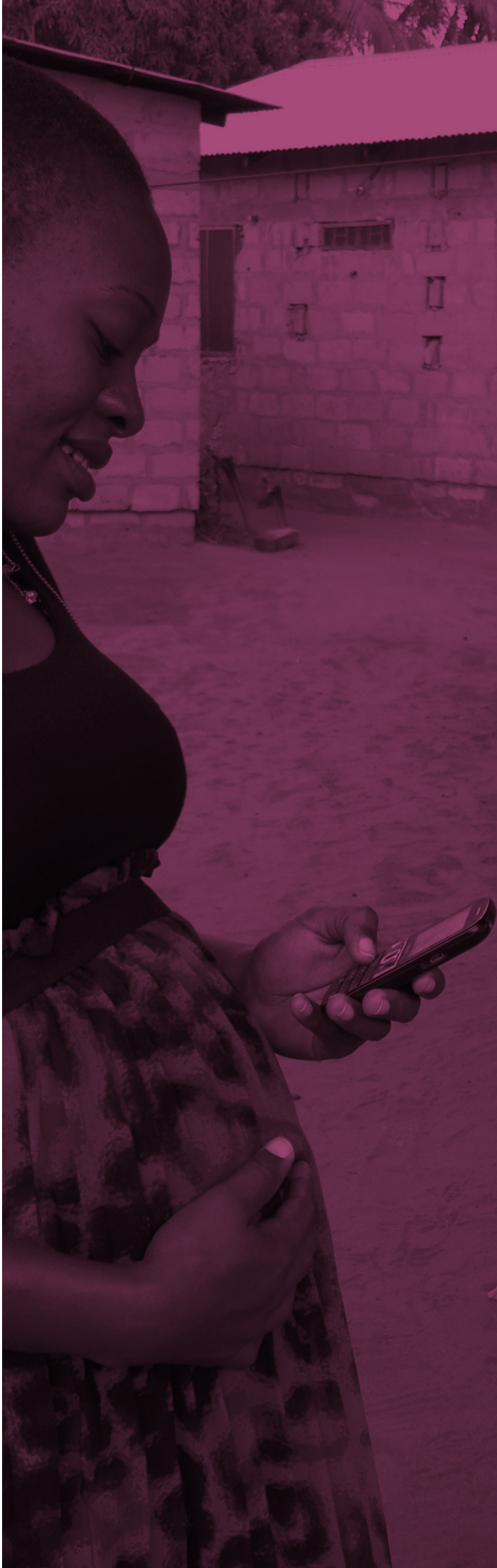

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