Mobile for Development

mHealth Country Feasibility Report: Uganda

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Background

The GSMA Mobile for Development mHealth programme connects the mobile and health industries, with the aim of developing commercially sustainable mHealth services which meet public health needs.

In September 2013, the GSMA mHealth programme partnered with UK aid from the Department for International Development (DFID) to support the scale-up of mobile nutrition (mNutrition) services targeting maternal and child health, in alignment to the Millennium Development Goals 4, 5 and 6. The mNutrition initiative is closely aligned to the UN's Every Woman Every Child Initiative, Scaling Up Nutrition (SUN) and the Global Nutrition for Growth Compact.

For more information on the GSMA Mobile for Development mHealth programme, please contact mhealth@gsma.com
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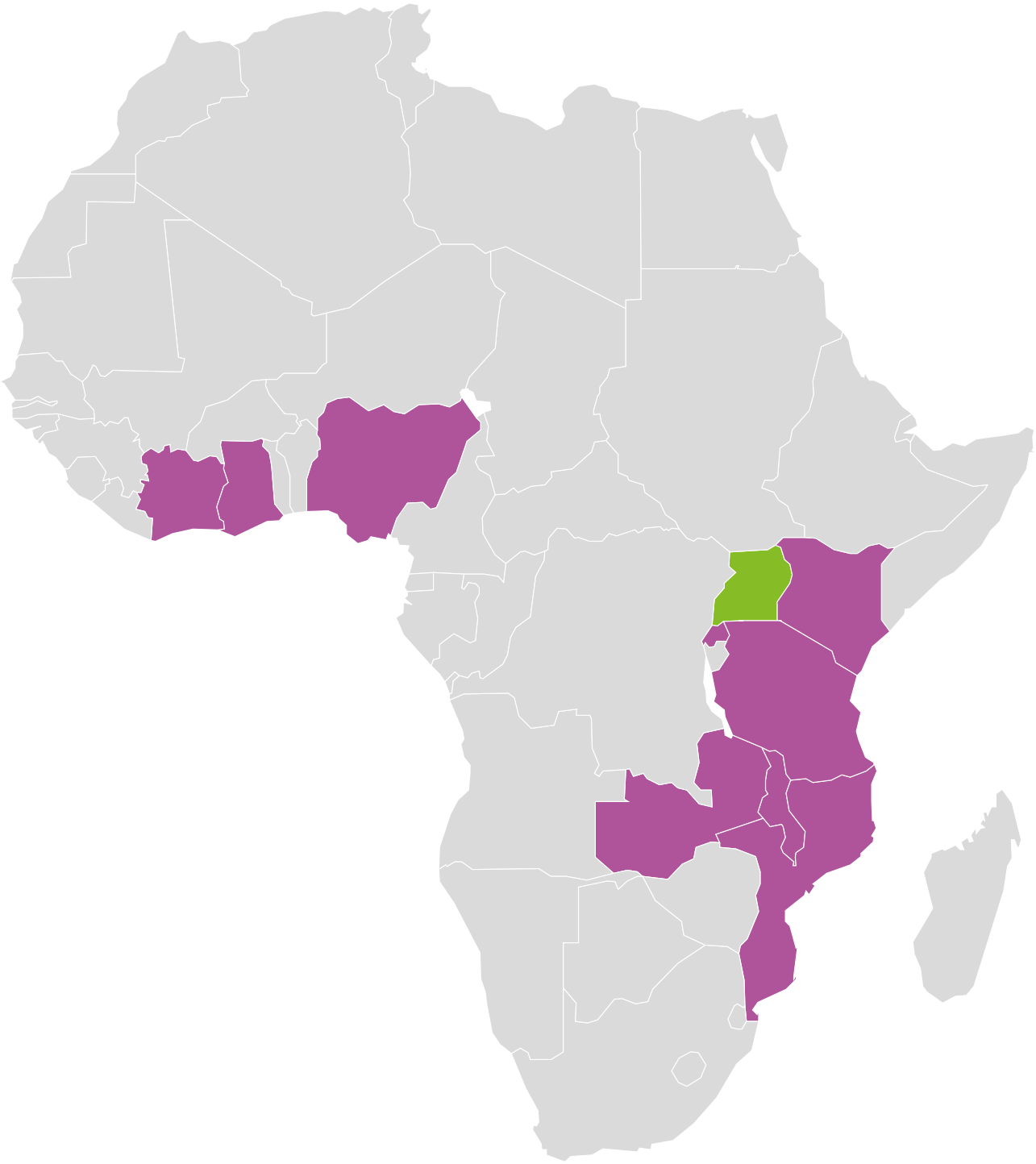


3-year mNutrition initiative, developing nutrition services across 8 countries in Sub-Saharan Africa. For the purposes of data comparison, 10 countries have been considered

Uganda has been selected as a GSMA priority country.

- Côte d'Ivoire
- Ghana
- Kenya
- Malawi
- Mozambique
- Nigeria
- Rwanda
- Tanzania
- Uganda
- Zambia

Executive summary

This report aims to carry out a comprehensive analysis of the current state of mHealth in Uganda. Information has been gathered and presented in the context of the GSMA mNutrition initiative, which aims to develop commercially sustainable mHealth services which meet public health needs, in the areas of demand generation, registration and data surveillance in 8 countries in Sub-Saharan Africa. An additional 2 countries, Côte d'Ivoire and Kenya, have been included for the purposes of modelling and data comparison.

1 The case for nutrition and maternal and child health in Uganda

What problems can mHealth help to solve?

- Infant mortality rates are approximately 45 deaths per 1000 births and there were approximately 69 deaths per 1000 of children under-five. This places Uganda as the third lowest for these indicators across the 10 modelled GSMA mNutrition countries. Of the infant and young child mHealth interventions tracked by the GSMA, 24% are related to infant and children under-five health. Mobile in Uganda is well positioned to do more in this area by reducing the likelihood of child mortality and stunting, using a mixture of stage-based messaging, behaviour change and education.
- Nationally 33% of children under-five are stunted and 14%[1] suffer severe stunting. Only 16% of those mHealth services tracked by the GSMA focus on infant and young child nutrition. Mobile is uniquely positioned to tackle and improve on this health indicator through its unique coverage and its capacity to reach the largest possible audience in Uganda.
- It is recognised that there is a critical shortage of Community Health Workers (CHW's) in Uganda (approx. 1.6 CHW's per 1000 population). The National Community Health Worker (CHW) Strategy seeks to tackle this imbalance by formalising and standardising the role of CHW's in the health sector. The mHealth services tracked by the GSMA and targeting health workers have reached 154,091 (Q1 2015). Scaling up and integrating mobile services with CHW assets will greatly assist the National CHW Strategy initiative. It has a particular role in training and retention, acting as a remote access device for training, decision support and incentivization for CHW's through mobile remittance.

1. Uganda Demographic and Health survey (2011)

- Malnutrition is an underlying cause in 60% of under-five deaths and 25% of maternal deaths in Uganda[2]. Micronutrient deficiencies are also an issue, with 20% of children having a vitamin A deficiency, 33% with iron deficiency anaemia rising to 50% of women of a reproductive age. Zinc deficiency ranges from 20% to 70% (dependent on region) of young children in Uganda. Mobile has an important role to play in this area, being a powerful tool in the education of efficient nutrient intake which can be disseminated countrywide and to remote rural districts.
- Maternal Newborn and Child Health (MNCH) health problems are distributed across Uganda but only 16% of mHealth services tracked by the GSMA are available nationally. Of these services only one is nutrition related, despite national stunting rates which are just below the Sub-Saharan Africa (SSA) average at 33% (average is 40%[3]). This places Uganda in the lower 45th percentile.
- The distribution of health services is impacted by regional variations in Uganda. The percentage of stunted children in the Karamoja cluster is 45%, compared with 13.5% in Kampala, but there are currently only 2 mHealth services tracked by the GSMA in this region, which have a nutrition component. The rural urban split in health sees 52.8 % of births delivered by a skilled provider in rural areas, compared with 89.1% in urban areas. Taking these features into account, mobile has a role to play in supporting front line health workers whilst providing the most up-to-date maternal support materials to remote and under-served patients.

2 The opportunity for mHealth to support nutrition and maternal and child health initiatives

What is conducive to mHealth success in a country?

- The potential addressable market for literate (able to read SMS) maternal segments is 0.71 million in Uganda. This estimate is forecast to rise to 1.8 million by 2020 for combined literate and illiterate maternal segments.
- The strong growth in population, particularly in the addressable segments of potential maternal service users, means Uganda has the largest growth for this segment (58%) over the forecast 2015-2020 periods. This growth will create a corresponding health burden which creates a role for mobile health and, in particular, for MNCH messaging.
- Data from Uganda shows that women with no education are more likely to have children who are stunted (42% comparative with 25% of those who have a secondary education) and are more likely to suffer child mortality (59 deaths per 1,000 live births compared to 23 deaths per 1,000 live births). This presents a unique opportunity for mHealth service providers to alleviate a gap in access to information by providing nutritional information messaging and education tools for women. This can be provided across educational and economic demographics using a combination of SMS and Interactive Voice Response (IVR).

2. Uganda nutrition action plan 2011-2016
3. UNICEF - key facts and figures on nutrition 2013 & http://www.unicef.org/pon00/leaguetos1.htm

3 The readiness of stakeholders to support mHealth in Uganda

What position are stakeholders in to facilitate mHealth?

- The challenges of nutrition, in relation to improving health, are well understood in Uganda. The country's Nutrition Action Plan (UNAP) 2011- 2016 has a clear set of prescribed aims focused on improving nutrition health outcomes. At the forefront of the UNAP strategy is the promotion of MNCH feeding and nutrition practices to improve awareness and increase healthy feeding behaviours. Stage-based messaging of key nutritional facts and pregnancy advice, using culturally adapted content, is crucial in realising this national objective.
- The Ugandan government has instituted a number of initiatives to tackle the lack of health personnel in the country. For example, it is a member of the One Million Community Health Workers' Campaign which is a broad partnership, across all major NGO and UN agencies, aimed at increasing the number and quality of lay health workers. Currently, however, Uganda is below the World Health Organization (WHO) minimum defined standard with 1 doctor, nurse or midwife per 439 people (defined as a critical shortage)[4]. Mobile provides a route to connect CHW's in regions where health needs are underserved, providing access to standardized health content and allowing data to be pushed to field operatives. Capacity can also be increased quickly due to the inbuilt scalability of mobile.
- CHW motivation has been identified as a major issue in Uganda. Attrition rates for doctors and nurses are 35% and 32% respectively, with personnel going to the private sector or out of the sector entirely. Lower seniority levels see even higher rates of attrition according to the Ugandan Health Sector Strategic Plan (HSSP) II. Combining mobile with financial and other incentives can assist retention while mobile-based training and decision support provide development opportunities for health workers, meeting career aspirations and empowering front-line workers.
- Mobile money services are well established in Uganda with MTN and Airtel offering high profile services. In all there are 5 mobile financial services active in the country (as of 2014[5]). Financial services require a degree of regulatory intervention. In Uganda, this is well advanced through the Bank of Uganda mobile money guidelines released in 2013 which defined the roles and responsibilities of mobile operators and banks in partnership relationships. These regulatory and market features combine to create an opportunity for mHealth, financial services and insurance to combine and service the needs of the Ugandan people.

4. Uganda HSSP II
5. Digital Financial Inclusion in Uganda - InterMedia

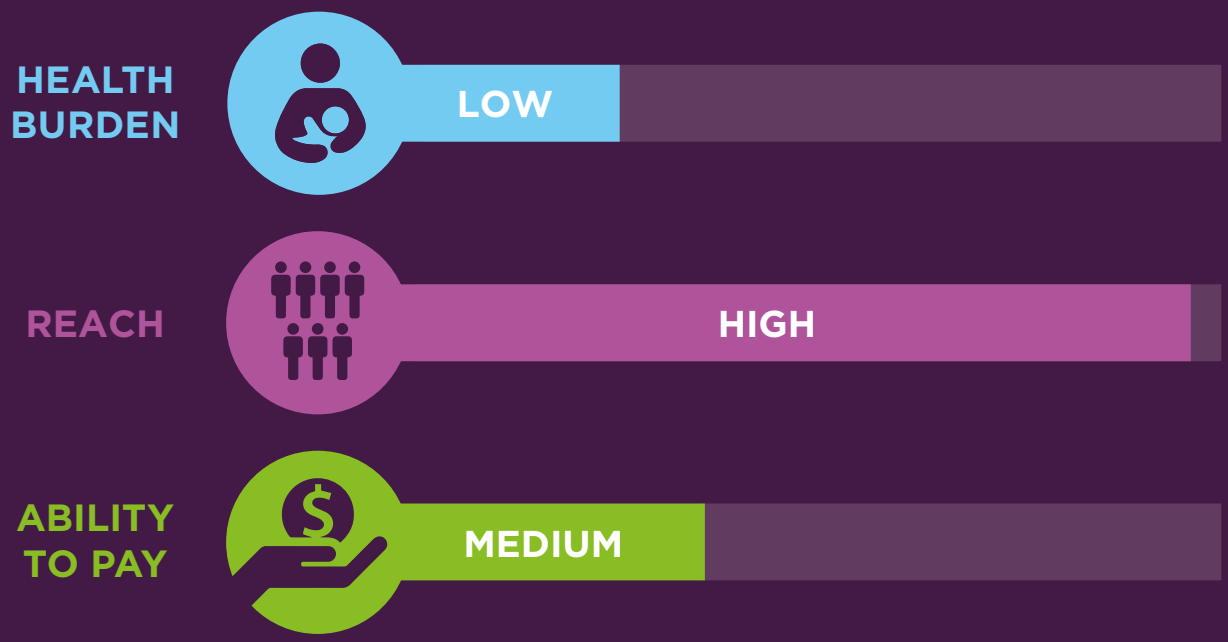
Market conditions in Uganda

mHealth indicators

Uganda shows strong potential to scale mHealth, as indicated by its top five positioning in 43% of the selected indicators compared with the other ten GSMA modelled target countries.

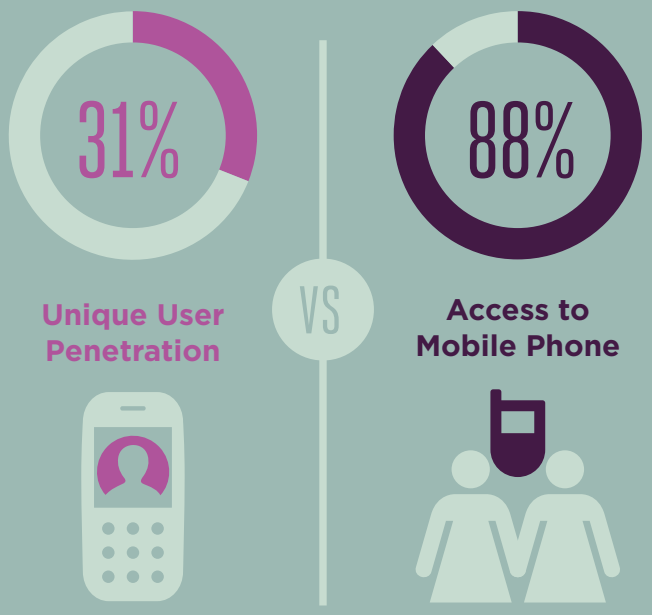
Advantageous for mHealth

Current state of Rwanda health



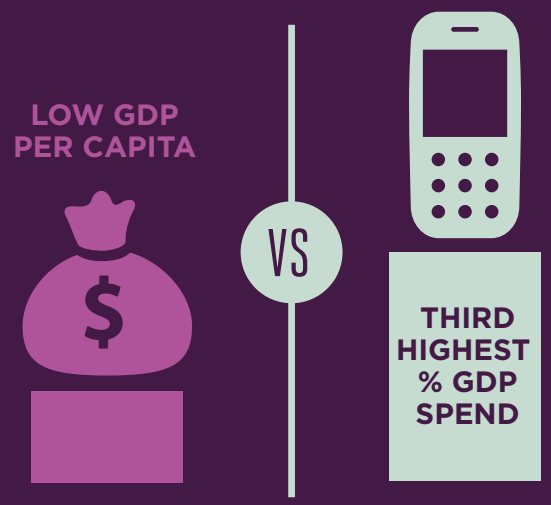
Penetration versus access

Indicates a strong potential for mHealth that is not necessarily seen if only unique user penetration is considered.



Advantageous for mHealth

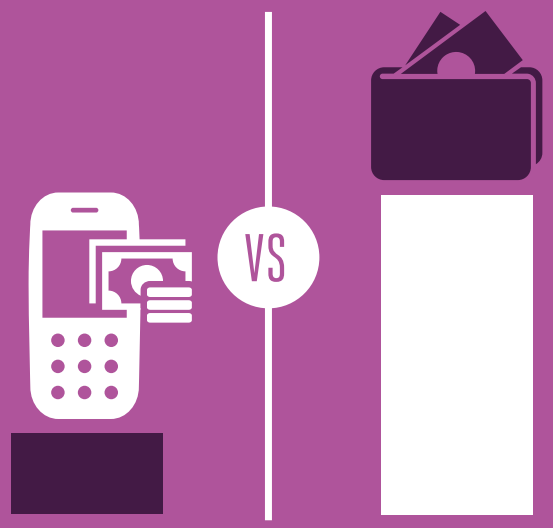
GDP versus spend



Uganda has a low Gross Domestic Product (GDP) per capita, ranking lowest across the modelled nutrition countries. However, it has the third highest percentage of GDP spent on mobile services across the comparative countries. This is indicative of a Business to Consumer (B2C) opportunity.

Obstacle to mHealth

Spend versus income



Spend on mobile relative to available income is lower than the normative range for the 10 modelled nutrition initiative countries at USD$8 per month. However Average Revenue per User (ARPU) ranks within the 45th percentile.

Advantageous for mHealth

Government support of health services

Uganda has the second lowest spend by government on health initiatives.

Indicative of B2C opportunity when combined with high mobile spend

General market conditions

Mobile banking is well established in Uganda and there is an opportunity to combine this motivation with mobile health services around health insurance. Uganda ranks second highest for subscribers (42%[6]) using mobile payments. This acceptance of mobile financial services and payments creates several distinct opportunities, including remittances for health worker support, potential mobile health insurance tie-ins, the use of mobile as a payment device at health facilities and saving for medical emergencies using mobile.

The Ugandan government launched a strategy for financial literacy in late 2013 which included guidelines and strategies for increasing the financial knowledge of the country's population. Key challenges, identified in regard to scaling mobile money, were the lack of financial inclusion within the country and the need to incorporate financial services with other popular and/or user desired services. Mobile could fill this role in Uganda. When combined with mobile payment and banking infrastructure, mHealth can accelerate the development of each while increasing the penetration of these services into the Base of Pyramid (BoP) segment. This combined approach creates the potential for revenue and a viable business model that may be developed into something which is sustainable and scalable.

Uganda has a relatively young population. Seventy eight percent of the population is under 30 and nearly half are under 15 years old. The general level of literacy is also quite high and primary education ranks in the high 90 percent for both boys and girls. These figures indicate a population that is potentially open to new ideas and new service approaches.

The Ugandan Nutrition Action Plan is primarily focussed on providing quality nutrition related information. The initiative is unusual in that not only are women of childbearing age targeted, but also those within the 10-14-year-old segment. This targeting of future mothers is designed to ensure that experience is embedded at the so called 'grass-roots level'. The adoption of mobile by youth segments, and its acceptance as the norm, is an important feature which can be leveraged to create mobile health opportunities which are sustainable and ultimately scalable. Targeting youth segments with mobile nutritional health messaging will ensure that the message is accessed and will normalise mobile as a health knowledge platform. User acceptance of mobile in this role will create a new revenue opportunity for operators, creating the sustainability missing in many other mHealth pilot schemes.

6. Ugandans who used a mobile in previous 12 months – Sprint Spring 2014 Global Attitudes Survey

The Ugandan government has instigated a Community Health Information System (CHIS) which will be rolled out to all CHW's in-country. The CHW's have been provided with mobile devices to facilitate the real-time transmission of data and support to frontline workers. The system exploits RapidSMS (an open source data collection platform) and currently gathers pregnancy, birth, maternal death and other indicators related to MNCH at a community level. It is recognised that the system can be developed to include more indicators, acting as a basis for effective community health programme monitoring with mobile as the preferred data collection and dissemination device.

A lack of health personnel in Uganda is an ongoing problem. Health services in the country are decentralised with districts and health sub-districts delivering health services. The system is based around referrals through National Referral Hospitals and health centres. These health centres are segmented into types, health centre (HC) I, II and III and village health teams. According to the Ugandan HSSP II, the largest number of vacancies is in HC II (67%) and these are predominantly located in rural communities. These communities suffer from some of the greatest need in respect of health burdens and nutritional deficiency. Mobile can provide assistance in these communities by providing education and decision support tools to over-extended health workers. Mobile can also offer support at the edge of health systems in rural and remote regions. Promoting nutritional messaging to these communities can also reduce the burden on health workers by educating people to good nutrition practice.

Opportunity

Figure 1

Uganda General Market View SWOT

WEAKNESSES

Uganda has the second lowest smartphone penetration of the modelled mHealth countries, placing it in the lowest 11th percentile overall. This weakness will impact on the development and complexity of the mHealth services which can be offered in Uganda and may reduce the speed with which commercially sustainable services may be launched.

Although there is evidence of strong partnership between mHealth providers and Ministry of Health/Global Health Security (MoH/GHS) in Uganda, only 20% of tracked mHealth services include cross-sector partnerships (government, academic, Mobile Network Operators (MNO's) and funding parties). Cross sector partnerships enable greater breadth, reach and quality of service delivered whilst improving the efficiency of processes involved in provisioning mHealth.

STRENGTHS

The targeting of younger users (girls of 10-14 years) is an inspired tactic as children are generally more susceptible to learning and behaviour change. Consequently mobile health innovations are more likely to be accepted and acted upon. This creates the potential for mobile health to become normalised and elevates the operator to the role of preferred health partner. In this situation, the operator can begin to develop a sustainable business model which targets suitable customers to motivate them to spend more on mobile Value Added Services (VAS).

The country exhibits a strong acceptance of mobile banking. It is the second highest in respect of users who make recurring mobile payments amongst the 10 modelled countries. Mobile financial services are a strong partnering opportunity for mHealth and one that works well in combined offerings e.g. mobile insurance, payments and health

Uganda has very high literacy rates and a youthful population. These features combine to create a potential audience which is more accepting of new services and willing to experiment. If mobile health is well positioned, it can grow with this audience and, as they mature, could create a sustainable business model which becomes self-perpetuating.

OPPORTUNITIES

Uganda will attain a population of 47 million[7] by 2020 and has a population growth rate of 2.7% (1990-2010[8]). It currently ranks as the world's third fastest growing urban populations. The impact of nutritional practices on health is increasing exponentially as populations grow, escalating pressure on the limited health facilities of Uganda. There is an opportunity for mobile health to provide cost-effective health messaging, bridging gaps in nutrition and MNCH knowledge focussed on improving this situation.

Health services are strongly regulated with respect to the rights of the individual around privacy and consent. Uganda has begun the process of defining these rights and regulations in the context of the electronic world, where an additional set of hurdles must be approached with the need for consent when service users are remote from the health service personnel. The fact that there is a legal system (known as e-laws) in Uganda which tackles consent in remote transactions means mHealth is in a better position to develop, unencumbered by any potential legal confusion and legislative challenges.

MHealth service coverage in Uganda is not always deployed in regions which have the largest health burden. For example, Karamoja District sees a large health burden but the lowest mHealth service deployments (4). Conversely Kampala has 9 services tracked but has one of the lowest health burdens of GSMA mHealth service regions monitored. Consequently, there is an opportunity to target these deficiencies with an increase in mobile health services, based on demand and the relative ease with which they can be extended to overlooked regions e.g. rural areas.

While the mHealth moratorium can be seen as a threat to the development of new initiatives in Uganda, the fact that the government has sought to coordinate and harmonise initiatives is also an opportunity. Mobile health services will only reach scale if coordination and partnering across stakeholders can be successfully implemented. Initiatives like this show that the Ugandan government is keen to take steps towards reaching a solution.

THREATS

The moratorium on all E-health and mobile health initiatives was designed to reduce duplication and eliminate unnecessary pilots. However, moratoriums are a reactive mechanism to deal with problems. They have the potential to stifle innovation and there have been reports that implementation of the moratorium and the technical working groups assigned to it have created substantial delays in project take-up. This has the potential for creating delays and even cancellation of projects with tight deadlines and commercial orientations where timelines are critical in achieving sustainability. Achieving sustainability is the first stage in attaining scalability and as such it is important for the development of mHealth.

The growth in mobile services and payments within Uganda has seen a corresponding increase in taxation. Tax regimes should be fair but not stifle innovation. If regimes are too strict, then they dissuade customers from experimenting with new services. There is a risk of extinguishing the opportunity of mHealth if the service it facilitates, the net feedback and its own success i.e. mobile, money, are excessively taxed.

Source: GSMA M4D mHealth 2015

7. http://populationpyramid.net/uganda/2020/
8. UNICEF 2012

General market conditions

Population growth is an important feature of Uganda which affects the health and economic landscape of the country. Uganda's population growth rate of 3.2% is the highest of the mNutrition countries and the 5th highest in the world. This results in a considerable strain on health resources catering to the 6.2 children born per woman in Uganda. The impact of poor nutritional practices on health is compounded by the growing population, placing pressure on the limited health resources available to the MoH. This creates a compelling argument for the use of mobile health messaging to bridge the gaps in nutrition and MNCH knowledge.

The Uganda opportunity to scale mHealth services

As part of the GSMA mNutrition comparison country feasibility research, we set out to identify the health, mobile and economic indicators and datasets in 10 modelled countries across SSA. These indicators are represented in figure 2.

Uganda shows a moderate-to-strong potential to scale mHealth, as indicated by its top five positioning in 43% of the selected indicators.

In terms of ranking, Uganda sees a broad spread of indicator ranks including 20% in the topmost position (rank 1) - the fourth highest across the modelled mNutrition countries. The average for top ranked indicators when compared across all nutrition initiative countries is 10% placing Uganda considerably higher than the norm for this indicator.

Uganda's number one ranking in 3 mHealth feasibility indicators places it in the 75th percentile compared across the 10 modelled mNutrition countries.

Figure 2

General market indicator metrics – top 5 country ranking

INDICATOR METRICS*	1	2	3	4	5
Maternal mortality	Nigeria 6.3	Mozambique 4.9	Tanzania 4.6	Malawi 4.6	Zambia 4.4
Infant mortality	Nigeria 77.8	Cote D'Ivoire 76.2	Mozambique 63.1	Zambia 56.4	Kenya 48.7
Child mortality <5	Nigeria 123.7	Cote D'Ivoire 107.6	Mozambique 89.7	Zambia 88.5	Kenya 72.9
Children aged <5 stunted	Malawi 48%	Zambia 46%	Rwanda 44%	Mozambique 43%	Tanzania 43%
No. of pregnant mothers	Nigeria 5.7	Tanzania 1.5	Uganda 1.3	Kenya 1.2	Mozambique 0.8
No. of mothers with children <5y	Nigeria 17.7	Tanzania 5.3	Kenya 4.1	Uganda 3.8	Mozambique 2.8
Penetration + growth + coverage	Rwanda 1.29	Malawi 1.16	Ghana 1.14	Uganda 1.11	Zambia 0.90
Unique mobile subscriber penetration	Ghana 50%	Cote D'Ivoire 45%	Zambia 40%	Kenya 32%	Rwanda 30%
Mobile subscriber penetration 5 year growth	Rwanda 25%	Zambia 15%	Malawi 15%	Mozambique 14%	Ghana 10%
Mobile geographical coverage	Malawi 79%	Uganda 76%	Rwanda 74%	Ghana 54%	Tanzania 41%
Overall literacy rate >15y	Uganda 73%	Kenya 72%	Ghana 71%	Tanzania 68%	Rwanda 66%
Female literacy rate <15y	Kenya 67%	Ghana 65%	Uganda 65%	Rwanda 62%	Tanzania 61%
Per capita GDP	Ghana 1605	Nigeria 1555	Zambia 1469	Cote D'Ivoire 1244	Rwanda 1244
Health expenditure	Zambia 87	Nigeria 80	Cote D'Ivoire 79	Rwanda 79	Ghana 75
% above poverty line	Uganda 74%	Cote D'Ivoire 73%	Rwanda 73%	Nigeria 63%	Tanzania 60%
% out-of-pocket spend on health	Nigeria 95%	Cote D'Ivoire 88%	Rwanda 88%	Kenya 77%	Zambia 67%
Spend on mobile (ARPU/month)	Nigeria 16	Cote D'Ivoire 13	Rwanda 13	Kenya 12	Zambia 12
% of GDP spent per month on mobile	Mozambique 1.77%	Malawi 1.49%	Uganda 1.46%	Kenya 1.27%	Cote D'Ivoire 1.05%
% of GDP spent per month on mobile over 12 months	Mozambique 21%	Malawi 18%	Uganda 18%	Kenya 15%	Cote D'Ivoire 13%
Gini co-efficient	Kenya 67.21%	Zambia 54.63%	Ghana 51.84%	Rwanda 50.82%	Nigeria 48.83%
Income share held by top 10% of the population	Tanzania 29.61%	Cote D'Ivoire 31.75%	Malawi 31.85%	Ghana 32.75%	Uganda 36.10%
% government funding on health	Malawi 73%	Zambia 60%	Ghana 56%	Mozambique 42%	Kenya 40%
% donor funding on health	Mozambique 70%	Malawi 52%	Tanzania 41%	Kenya 39%	Zambia 27%

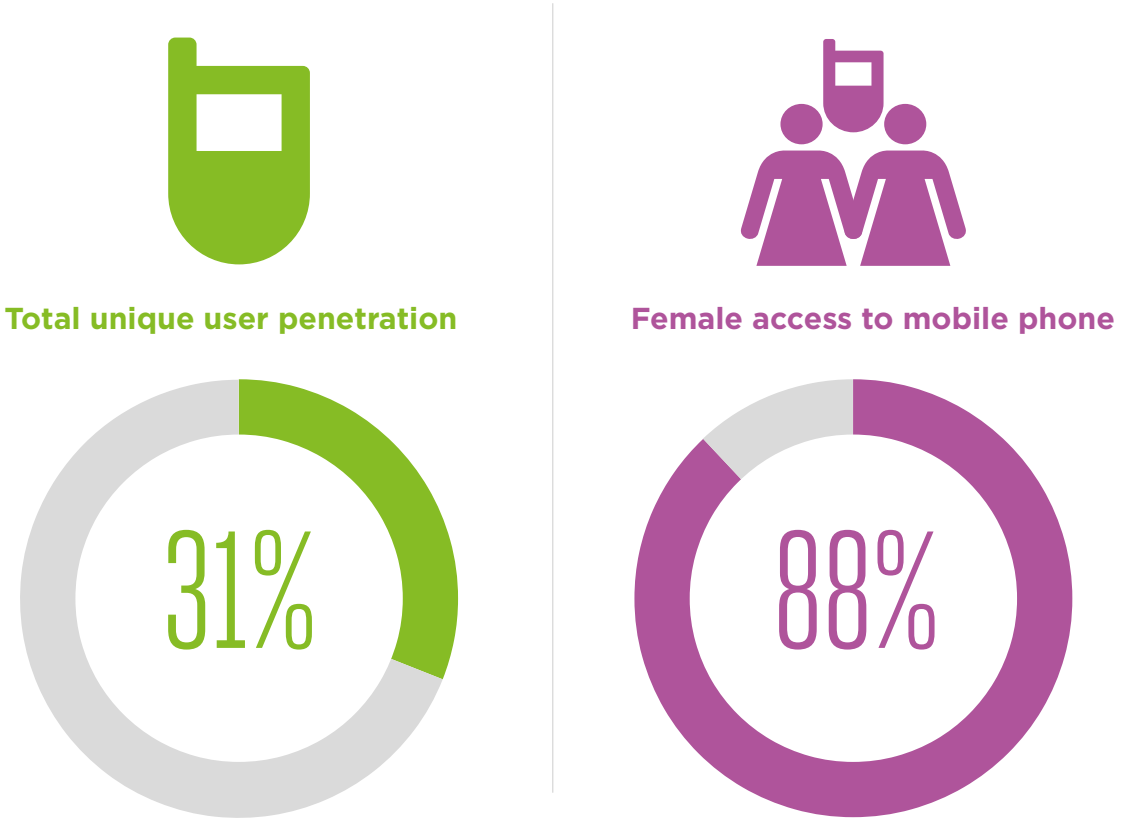
Source: WHO, World Bank, GSMA Intelligence, M4D Impact 2014
Country attainment of applicable MDG 1,4 and 5

Ugandan Market Indicators

Phone penetration is one indication of phone usage but the incidence of phone sharing (access) in Uganda shows there is a greater market in terms of potential users of mHealth than penetration alone would indicate.

Figure 3

Mobile phone use – Unique User penetration[9] versus total access to mobile



Source GSMAi Q3 2015, NCBI http://www.ncbi.nlm.nih.gov/pubmed/25059242 and MercyCorps Agri-Fin Mobile baseline survey

Mobile ownership is approximately 77% of the male population and 54%[10] of the female. When gender balance is considered (there is a female bias of approximately 3% in Uganda) this split reduces to 57% male and 43% female ownership respectively.

As part of the quantitative evaluation process, the 10 GSMA mNutrition comparison countries were evaluated, scored against a set of comparable indicators and placed in a ranked scale. The outputs from this process are analysed in the following sections.

The exact methodology, justifications for metrics chosen and source material used are available separately in the GSMA Uganda mHealth Country Feasibility Report Methodology. It is highly recommended that this methodology is read in conjunction with this section of the report.

9. Unique users are specific mobile users not take into account multiple SIM ownership. Penetration rates reported by regulators are generally higher as they do not consider multiple SIM ownership.
10. PEW research Centre 2014 - global attitudes survey Q68 & Q69 combined.

Figure 4

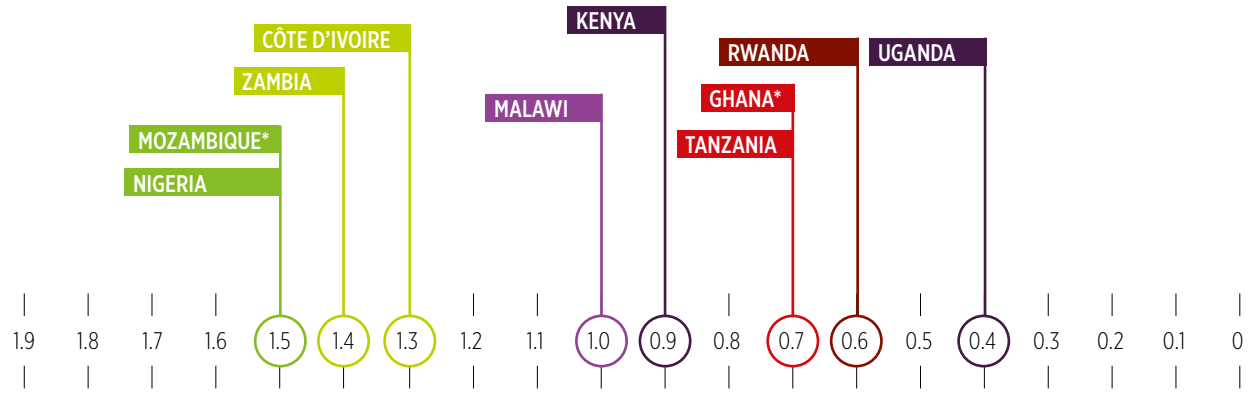
Criteria considered for opportunity matrix indicator

The opportunity matrix shown has a scale range centred on a score above or below 1. A score of 1 is ideal, a score above 1 is better than ideal and a score below 1 is less than ideal. The gradation of scoring is shown by the proximity of the score above or below 1.

It is important to consider the proxy indicators which are included in the category and the output drivers of the opportunity matrix scale as these dictate the output score; seemingly counterintuitive assumptions relating to countries can be clarified by considering these proxy indicators and their influence on the outputs.

Figure 5

Uganda health burden opportunity matrix



* Denotes rounding of figure

Uganda's comparative index of 0.41 indicates a lower health burden opportunity compared to the other modelled countries. This is due to the comparatively low infant and child under 5 mortality rates (ranked 8th across the modelled countries) and the lowest female mortality rate of all the modelled countries. Antenatal care through access to skilled antenatal care ranks at 95% (accessing skilled antenatal care at least once) and is well above the SSA average of 78%. However this falls off substantially for repeat access, falling to 47% (at least four uses of skilled antenatal care) which is around average for SSA[11].

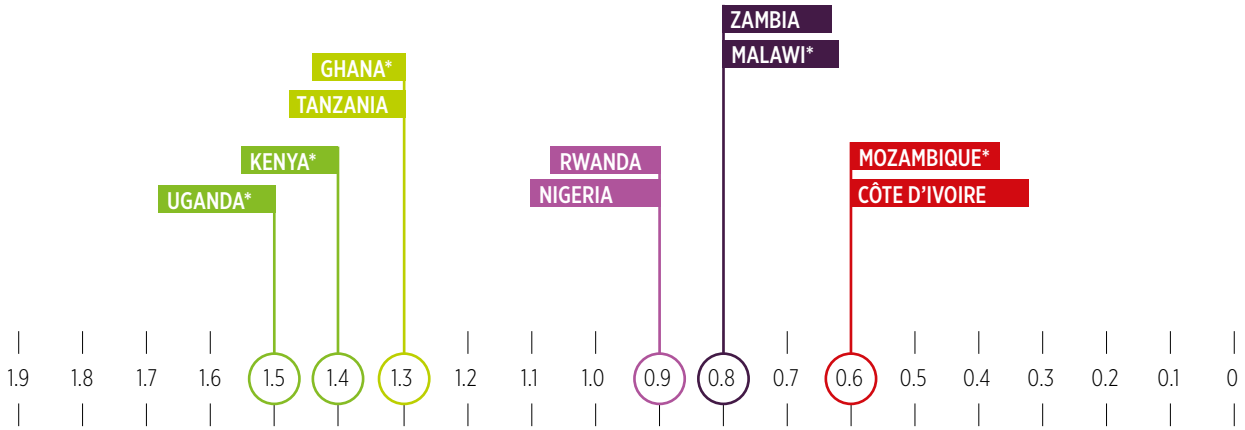
Nutritional deficiencies within the country mean stunting is a problem with 34% of children under 5 stunted but remains a lower indicator than the other countries considered within the model.

A lack of basic knowledge around nutrition has been identified as an underlying reason for stunting and mobile has an important role in bringing basic nutrition, cooking and food preparation knowledge to Ugandans.

11. UNICEF Uganda fast facts 2012

Figure 6

Uganda addressable market opportunity matrix



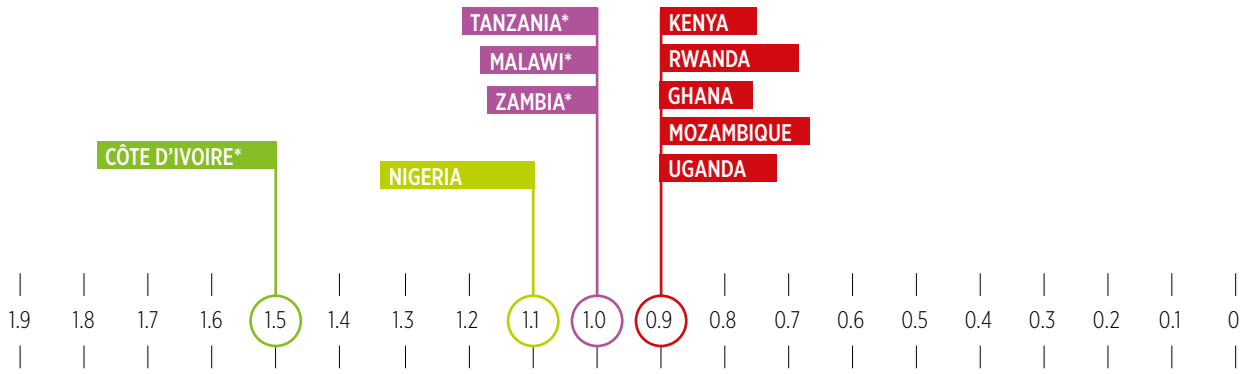
* Denotes rounding of figure

Uganda has a fast growing addressable population with the highest fertility rate of the modelled countries and a growing youth population (55.3% of the total population are under 18). These growth indicators mean Uganda will be likely to increase its overall score within this indicator over the midterm as youth segments mature and reproduce. Currently it ranks well above ideal for this indicator with a 1.45 score on the opportunity matrix.

Adoption and take-up of mobile services for Uganda ranks 4th highest across the modelled countries while cellular coverage is the second highest of the modelled countries. The sophistication of the Ugandan mobile market is also relatively high with percentage growth in broadband connections ranking 4th across the modelled countries.

Figure 7

Uganda ability to pay opportunity matrix



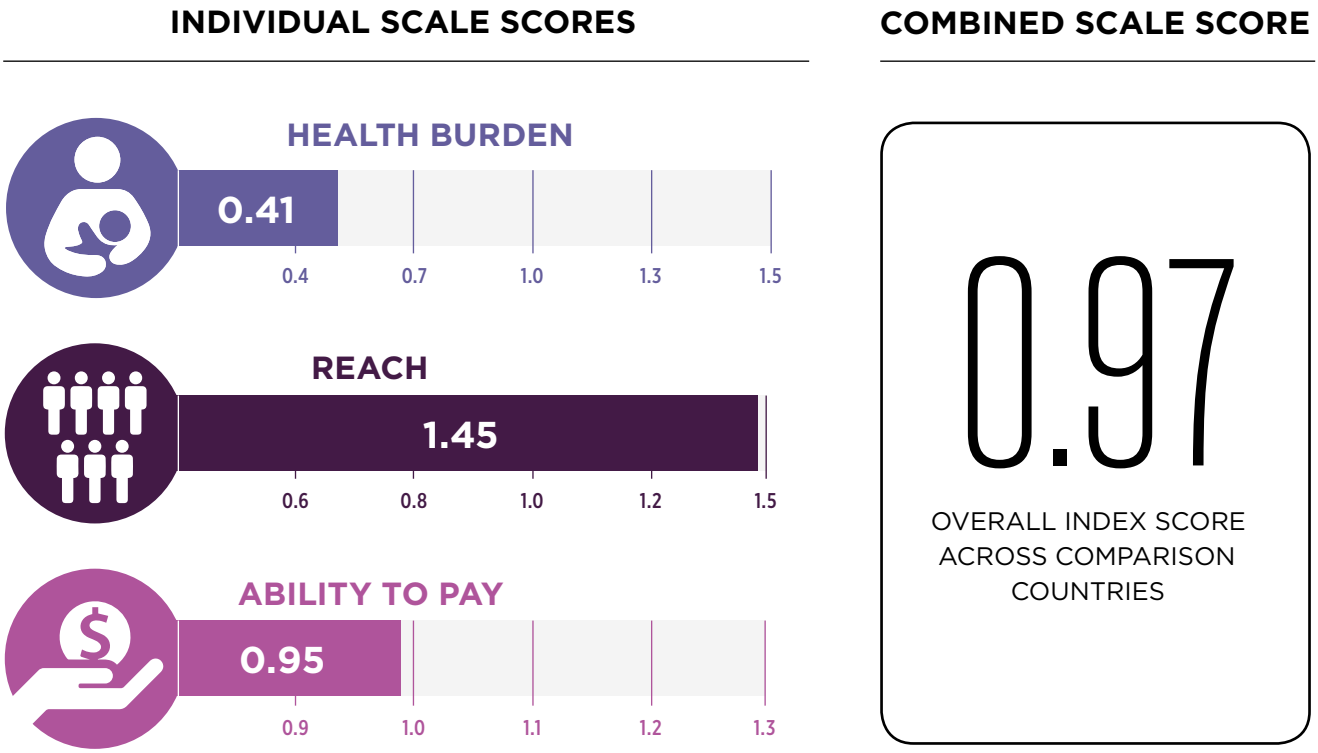
* Denotes rounding of figure

Uganda sits within the main group of the modelled mNutrition countries for opportunity to pay indicators exhibiting a score of 0.95, just below the ideal scoring zone. The country ranks 1st for number above the poverty line and exhibits good distribution of wealth indicators with the share of wealth held by the top 10% of society within the top five for this indicator. The country has relatively low GDP per capita (9#) comparative with the other modelled countries, but shows a strong percentage (3#) of this GDP being spent on mobile (average mobile spend over 12 months as a percentage of GDP).

The market opportunity, in respect of ability to pay, is made up of both the B2B and B2C market opportunities. Overall Uganda has an index score of 0.95, which represents good feasibility for payment capacity. B2C indicators are considerably higher than B2B, at 1.11 vs 0.67 (ranking 3rd and 9th respectively for these indicators). This indicates a good opportunity to exploit Out of Pocket (OoP) spend while better serving health beneficiaries, using mobile. The percentage of GDP spent on mobile is also an indicator of B2C customer willingness to purchase mobile services. Uganda also exhibits the fourth highest growth rate in broadband mobile users and sixth highest number of broadband users (Q4 2014) which are indicators that the market is conducive to innovative interventions and technologies like mHealth.

Figure 8

Uganda opportunity to scale services*

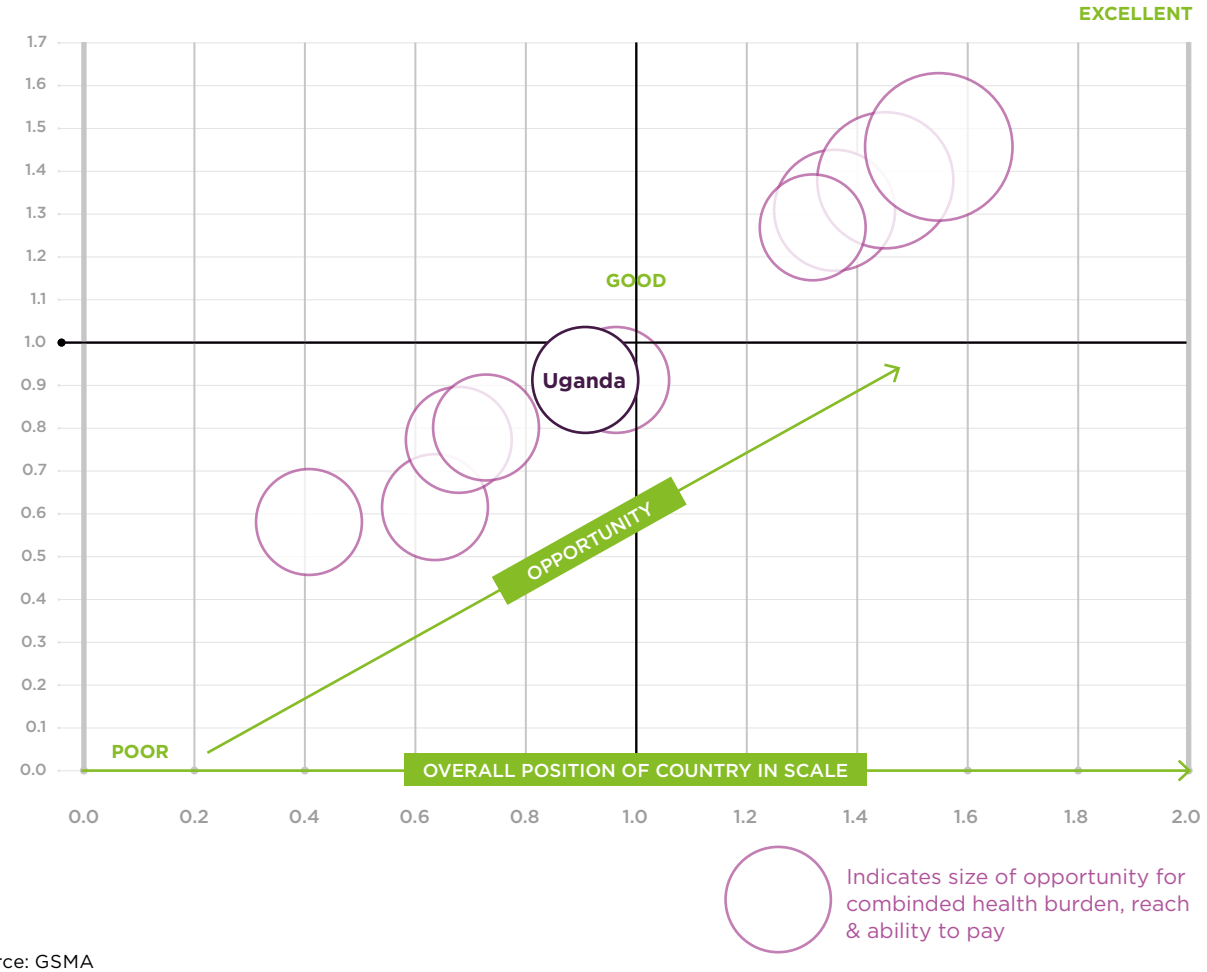


Source: GSMA. *Please see GSMA methodological framework for additional clarification on quantitative scoring

When the aggregate mHealth driver indicators are considered as a combined output (Figure 8) the opportunity index score for Uganda shows a respectable combined figure (0.97) well within ideal feasibility score parameters. The GSMA through its stakeholder partners is committed to providing support to facilitate and streamline this opportunity.

Figure 9

Ugandan combined indicator rank and comparative size of market opportunity



Source: GSMA

* Purple circles denote other GSMA nutrition initiatives countries.

** Data shows overall ranking and size of market opportunity denoted by size of sphere.

*** Please see GSMA methodological framework for additional clarification on quantitative scoring

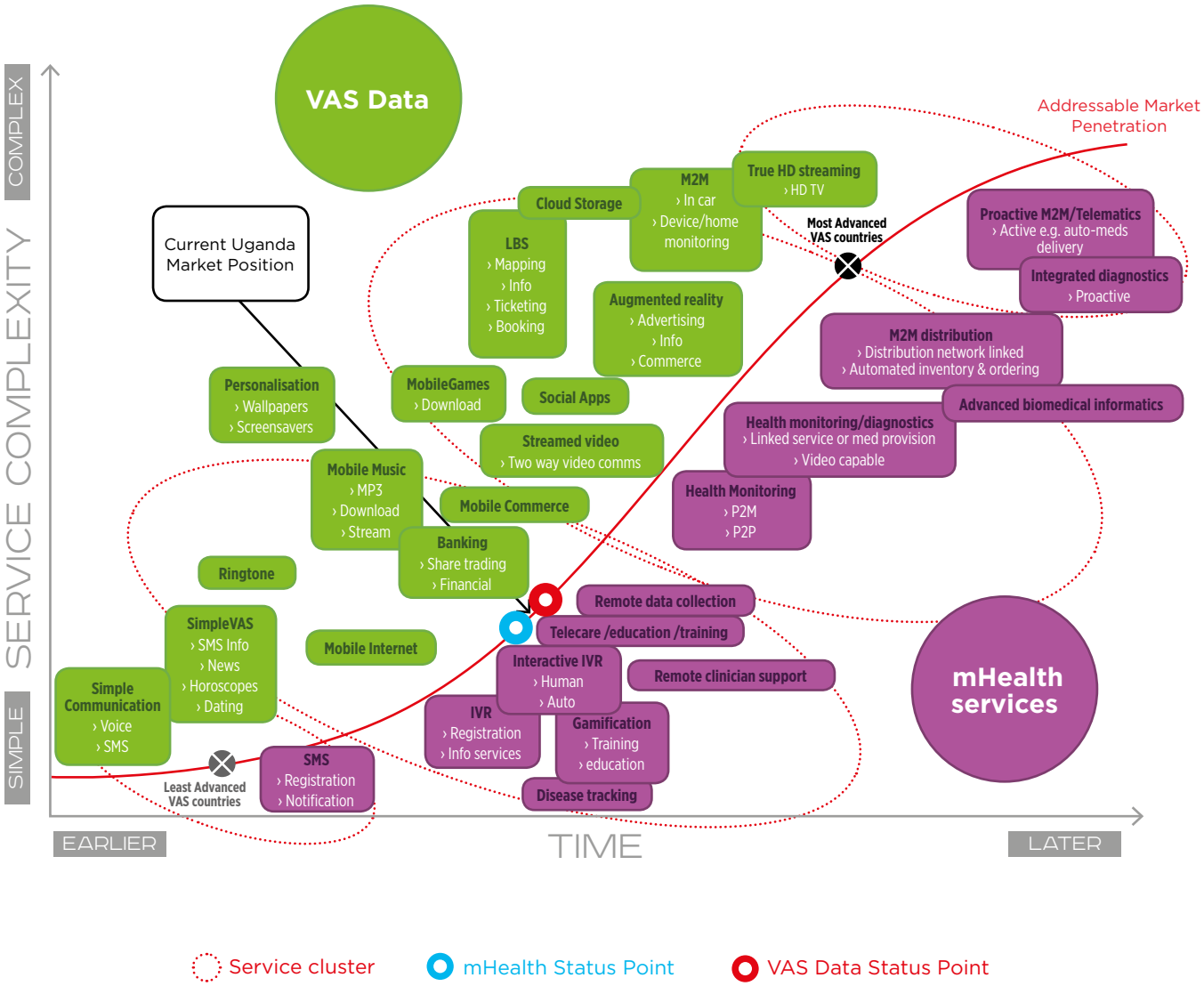
Figure 9 compares overall ranking of GSMA nutrition initiative countries and combines this data with the overall size of the opportunity when all indicators combined. The combined opportunity is an indication of the capacity (size of opportunity) and the position on the scale gives an indication of the ease with which mHealth services might be launched. This output is defined as the degree of challenge divided by the degree of opportunity.

The opportunity status in Uganda is such that the country sits almost exactly in a middle of the scale with moderate-to-good service indicators and a good potential defined by the combined opportunity size. Launch and service development challenges are moderate, with none considered insurmountable nor identified as critical to the successful launch of mHealth services.

Mobile service development

Figure 10

Ugandan mobile Value Added Services evolution



Source: GSMA

The dotted service clusters in Figure 10 denote four evolutionary points within the Value Added Service (VAS) and mHealth service development environments. The evolution of mHealth services corresponds with VAS evolution and are indicated where the dotted circles overlap mHealth and VAS services.

Uganda's VAS and mHealth service development are shown with a red and blue indicator circle respectively. The distance between the most and the least developed service markets denotes overall maturity. For comparison, a country such as the USA would be further up the scale towards most advanced VAS, based on a number of advanced mHealth service functionalities and offerings e.g. automatic prescription ordering, machine-to-machine, reimbursement and decision support.

The position of Uganda on this maturity scale was evaluated by considering overall market maturity data. This took into account a number of usage metrics including the total number of VAS and mHealth services offered, complex versus simple offering ratio, data ARPU levels and data ARPU increase over defined periods amongst others. (Full criteria for scoring are available in the GSMA mHealth Country Feasibility Report Uganda Methodology). This process was replicated across all of the 10 comparison countries in order to generate a scale of service maturity. The distance between the mHealth and VAS status points indicates the state of mHealth service development (the further apart the larger the service gap and greater requirement for development).

Uganda is well provisioned for mHealth services, having the most MNCH services tracked by the GSMA of the mHealth considered countries. The country makes up 18% of the MNCH services tracked by the GSMA and sees moderate-to-good indicators across other VAS indicating metrics including mobile broadband growth, subscriber penetration ARPU and percentage of income spent on mobile services.

Subscriber growth was 83% (2008-2013) which places Uganda in the 44th percentile for this indicator compared with the other modelled mHealth countries.

Mobile broadband encourages sophisticated use of mobile by improving the experience of data VAS and, when combined with competitive data pricing, encourages use. Mobile health services can benefit from this increased sophistication as the complexity and potential usefulness of what they can provide increases. In Uganda, there were approximately 2.3m broadband users placing Uganda in seventh place for this indicator, comparative with the other mNutrition modelled countries. However, if growth in broadband subscribers is considered, Uganda moves up to fourth place compared to the other countries with growth of 13% (Q4 2104).

Smartphones provide a richer, more sophisticated environment to provide health services and along with competitive data pricing encourage the use of VAS. In Uganda, smartphone adoption was 8.6% (Q4 2014), placing the country second lowest in comparative rankings for this indicator and well below the average across SSA.

The lack of smart phone penetration is unlikely to impact early stage mHealth service development, which will concentrate upon SMS and IVR nutritional messaging. However, commercial opportunities for these types of service are limited, particularly with freemium models. As mHealth services develop, more sophisticated variants are likely to be in demand leading to upsell opportunities. The lack of devices able to provide a platform for these services may delay mHealth service development, affecting long-term scaling and sustainable opportunities.

Whilst smart phone penetration is low, sophistication of mobile service use is relatively high. Uganda ranks in the 83rd percentile for use of mobile devices for mobile payments and receiving health information[12].

12. Cell Phones in Africa: Communication Lifeline – Pew Research Centre

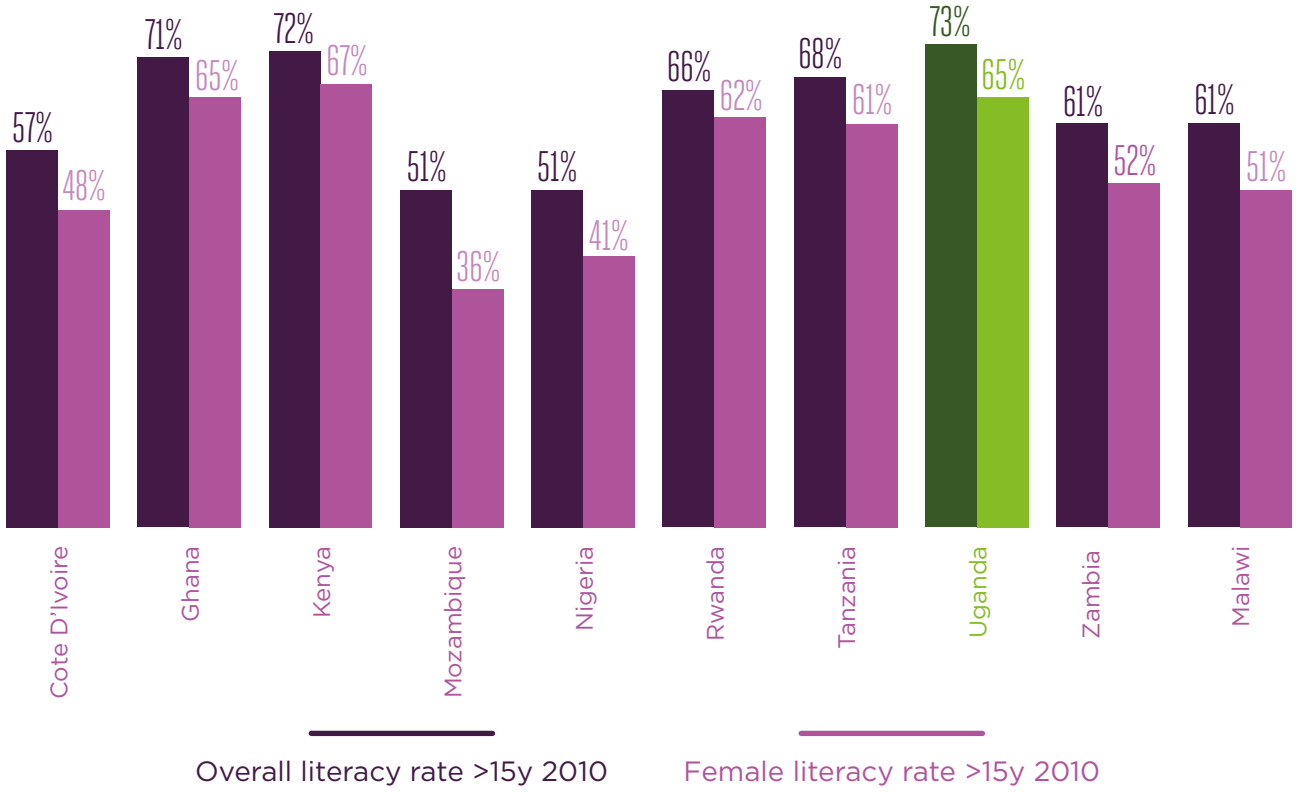
Features of Ugandan VAS ecosystem

There are a number of advantages in providing SMS health and nutritional information and the format is conducive to both funded (B2B) and premium SMS commercial (B2C) models. As a service platform, SMS is highly inclusive based on penetration in country and the almost universal ability to receive SMS overall mobile device types in Uganda.

Part of the GSMA mHealth product concept includes a freemium stage-based SMS messaging service which is geared to MNCH in its content design.

Figure 11

Ugandan total literacy and female literacy rates



In Uganda there is a very high level of literacy (73%) compared to the other GSMA priority countries and well above the average of 63%. Female literacy is even healthier at 65% which is 10 percentage points above the average for female literacy in the modelled priority countries. This creates an opportunity for knowledge improvement and retention, leading to behaviour change around nutritional data delivered over SMS.

The capacity to provide reliable mobile services will be improved in Uganda, through the provision of the countries National Backbone Infrastructure (NBI) project. This is part of the country's eGovernment initiative to connect all major towns onto a fibre-optic network which includes central government ministries and departments. In the country's 2015/16 budget, it was announced that additional provisioning for SMS and data services would be incorporated into this roll-out to be concluded by December 2015. This support will further encourage mobile health initiatives and ensure coverage and access issues are minimised.

Mobile and VAS sector alignment to mHealth

The mobile and VAS sector within Uganda is complemented by multiple competing operators who create a competitive innovation driven market. However, the multiple competing players do have the potential to dilute the impact of mHealth, based on a lack of co-operation between operators and the differing commercial priorities of each.

The mobile market in Uganda is defined by a drive for subscriber acquisition, avoidance of churn and increasing customer stickiness. MHealth is beneficial for all of these features as it is a service which provides market differentiation and hence increase the potential for customer lock-in (stickiness of service offering).

Mobile health innovation, coming from operators, has been moderately strong in Uganda. It contains the most mHealth initiatives tracked by the GSMA of the 10 modelled mNutrition countries but, despite multiple service launches, limited numbers have actually scaled. The consensus of opinion is that there have been rather too many pilots in the country.

One of the larger initiatives which has taken place was aligned to the government's wider e-health roadmap and involved MTN and Airtel. The MNCH project was tasked with improving the efficiency and effectiveness of health data management using Timed & Targeted Counselling (ttC), Integrated Community Case Management (ICCM), and Growth Monitoring and Community Led Behaviour Change.

Other types of stakeholder partnerships have also developed in Uganda. Google SMS was an initiative launched in 2009 between Google, MTN and the Grameen foundation. The service incorporated several information and assistance options, two of which were directly related to mHealth, namely sexual and reproductive health tips and a clinic finder application. This combined partner approach is indicative of the type of innovation and cross sector stakeholder partnering which will lead to success with mHealth in Uganda.

Another successful, scaled enterprise was the mTrac initiative. This was designed as an auditing and data collection tool, focusing on the collection, verification, accountability and analysis of data generated at community and health facility levels. The initiative is discussed in greater depth in the case study below.

The future of mHealth service development in Uganda will be defined by the historical impact of mHealth pilots. By 2010, there had been over 50 pilots in the country leading to a moratorium, banning pilots without official recognition by the government. To launch services, technical specifications had to be defined which ensured applicability and tie-in with the country's existing health requirements and government ICT integration plans. This moratorium was initiated to deal with what the government called a 'chaotic mushrooming' of mHealth projects across the country.

The B2B vs B2C sectors

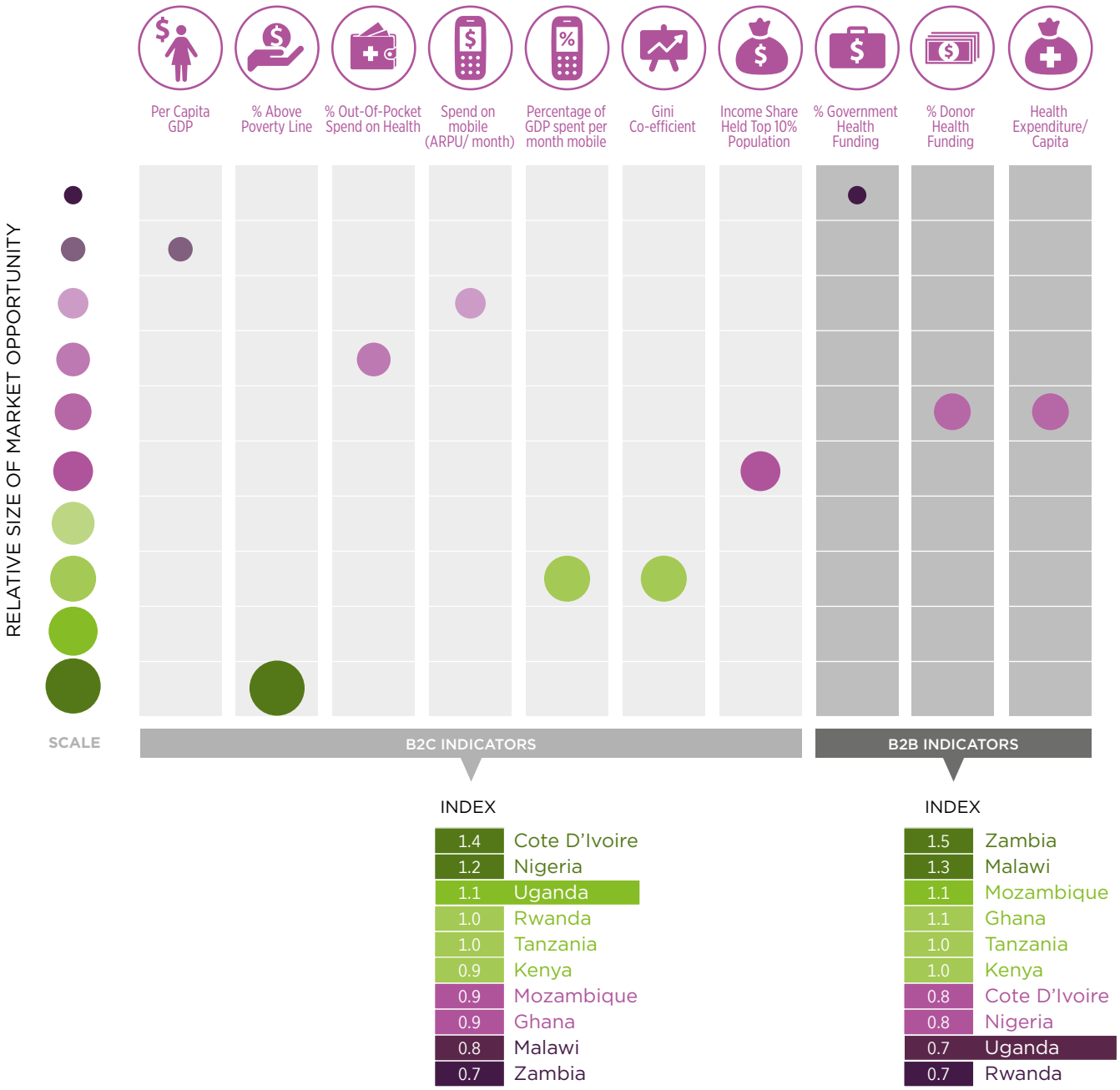
The mHealth opportunity in Uganda is made up of both a B2C and a B2B opportunities. Figure 12 considers a number of the feasibility metrics considered for these particular user segments.

The B2C and B2B market opportunity indicators are represented in figure 12 below by the size of the circle. The larger the circle, the greater the opportunity for that particular indicator compared with the others shown. The combined B2C and B2B opportunity for Uganda is indicated by the highlighted index score beneath the main chart.

The data shown is a set of reference points and provides a normalised and averaged view of these opportunities. They are not specific to any particular stakeholder such as a mobile operator, NGO or health service provider.

Figure 12

Relative B2B and B2C indicators



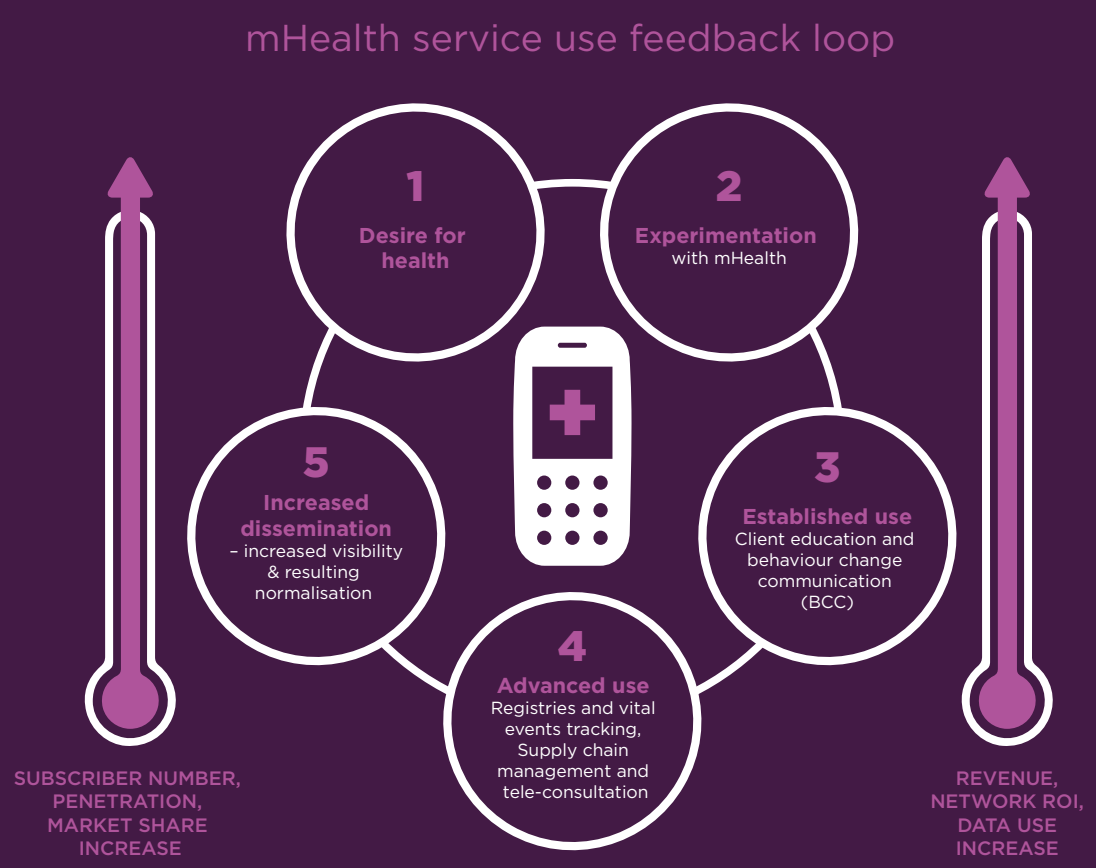
Source: WHO/World Bank/GSMA extracted data

Mobile market view

The mHealth opportunity has two distinct pathways for operator stakeholders. In one aspect, it provides a valuable mechanism to grow operator subscriber numbers, market share and overall penetration. On the other, it is a strong driver for take-up of data VAS services, with a service proposition built around providing and gathering health information (push and pull) and health monitoring (tracking disease and health indicators). From the customer perspective, there is a strong inbuilt impetus to consume services which can improve or ensure health. These features combine to create the potential for mHealth services to become self-perpetuating.

Figure 13

mHealth normalisation process and the impact on mobile operators



Source: WHO/World Bank/GSMA extracted data

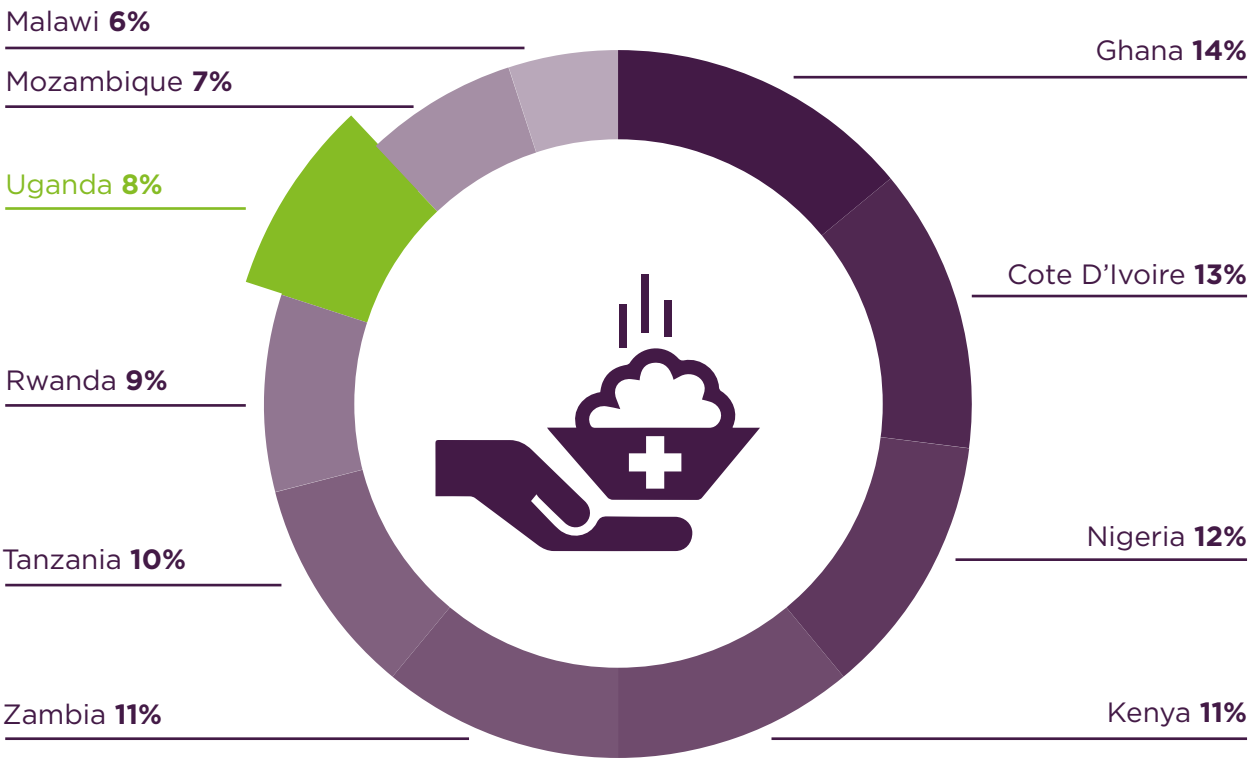
The Ugandan mobile market

Uganda had a unique user penetration rate of 31% Q4 2014[13]. This places the country 8th amongst the GSMA target mNutrition countries and below the average penetration rate for Africa of 40% (Q4 2014).

Reported ARPU figures from GSMAi[14] show an average ARPU of USD$7.48 per month (GSMAi ARPU per subscriber full year average 2013 reported figures). This positions Uganda in 7th place across the modelled mNutrition countries, marginally behind Ghana and well below the African average of $10.52. Uganda's position improves when ARPU is compared with GDP per capita. Considering this metric Uganda sees approximately 18% of its GDP per capita spent on mobile services (over 12 months) placing the country third in the GSMA comparison countries for this metric.

Figure 14

Comparative mobile penetration rates of GSMA nutrition initiative countries – Uganda extracted



Source: GSMAi

13. Latest confirmed GSMAi data
14. GSMAi: Data used in feasibility evaluation are not those reported here. Data reported in the mobile view

General mobile market indicators

Uganda is a market defined by growth. Over the 2010-2014 period total connections (excluding M2M) reached just over 25 million with a growth rate of 83% over the period. This growth is likely to continue in the mid-term based on the unique penetration rates in country (potential for growth).

While subscriber growth is increasing and will, no doubt, continue for some time ARPU rates are falling. This is an Africa-wide phenomenon and saw Ugandan ARPU falling by 7% over the 2008-2013 period. In order to tackle ARPU decreases, compelling new services like mHealth need to be developed which stimulate increased use and migration toward high-value data VAS.

MHealth service innovation can also open up new markets in the B2B sector. Governments aim to improve provision of healthcare, to increase efficiency and reach and reduce costs associated with providing it. Mobile has much to recommend it in this area. As partnerships progress, government and NGO demand will create a more commercial flavour potentially involving models beyond subsidisation, including micro insurance or mobile savings.

Figure 15

Operator subscriptions Q4 2010 to Q4 2014

	2010	2011	2012	2013	2014
Airtel *(Bharti Airtel)*	2,881,963	3,700,165	4,432,068	7,795,000	8,496,550
Africell *(Lintel)*	609,000	622,000	507,891	618,000	1,000,0000
iTel	30,000	65,000	98,063	128,018	154,810
MTN	6,463,000	7,629,000	7,702,000	8,808,000	10,396,000
Smart					116,713
Smile			1,600	6,000	13,000
Mobile UT *(Uganda Telecom)*	1,850,000	1,996,875	2,159,375	2,937,109	5,169,313
Warid Telecom	2,050,000	2,400,357	2,724,524		
Total	**13,883,963**	**16,413,397**	**17,625,521**	**20,292,127**	**25,346,386**

Source: GSMAi

The Ugandan mobile market is extremely frenetic. This has led to some dilution in service offerings but overall the competitive environment has helped spread innovative approaches and a competitive market ethos. MTN remains the market leader with a 41% market share but has had its dominance eroded primarily via churn to its second-place rival, Airtel. Airtel accelerated its subscriber take-up by the acquisition of Warid Telecom's customers in 2013. The country's incumbent, Uganda Telecom, has also proved a viable player growing its market share from 13% to 20% over the period.

Tax revenues generated from mobile in Uganda have grown steadily over the 2009-2014 period, increasing by 60% despite overall minutes of use decreasing slightly (1.3% overall and 5% for on-net calling) over the forecast period. This tax demand has been dripped down to customers in both direct (VAT) and indirect taxations (increased per minute charges).

Whilst growth in mobile service use is an opportunity to generate income which benefits social causes, some caution is advisable in order to avoid dissuading experimentation in service use (high charges on new services discourages use). There are short-term advantages in increased taxation, but the potential long-term economic impact could be greater with a healthier population leading to greater economic growth.

Mapping mHealth service penetration and reach in Uganda

As part of the qualitative review of Uganda's feasibility as an mHealth target country, service mapping was undertaken with a mix of survey, interview and desk research. The following sections highlight some of the insights from this activity.

Aligning Uganda mHealth initiatives to desired health outcomes

- Currently tracking 25 live mHealth services deployed with partnerships from over 50 different organizations representing multiple stakeholder groups
- Currently 4 mHealth services are nationally accessible over basic mobile phones

Overall mHealth coverage in Uganda

Graphical representation of total health services and regional breakdown[15]

Figure 16

mHealth services: regional distribution

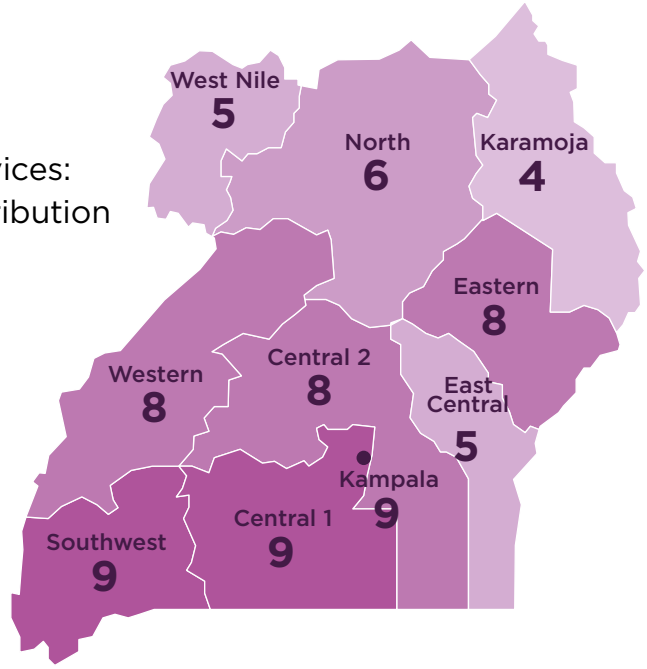


Figure 17

Stunting in children under 5 (height for ages, % below -2SD): regional distribution

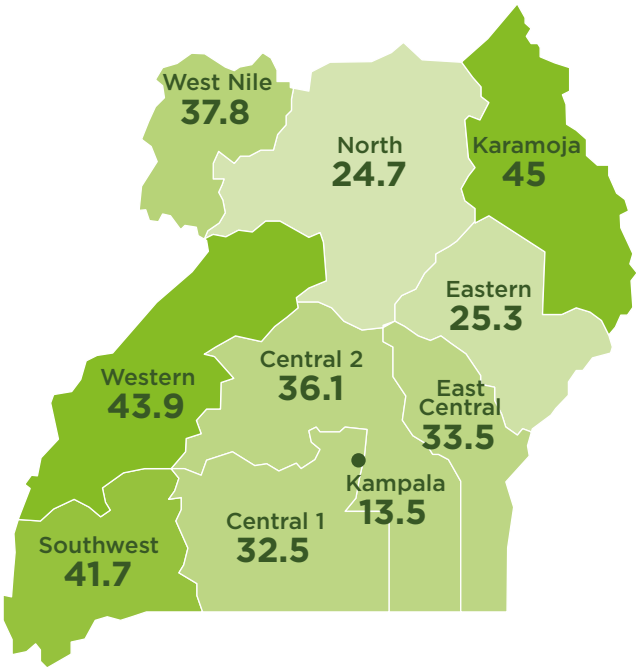
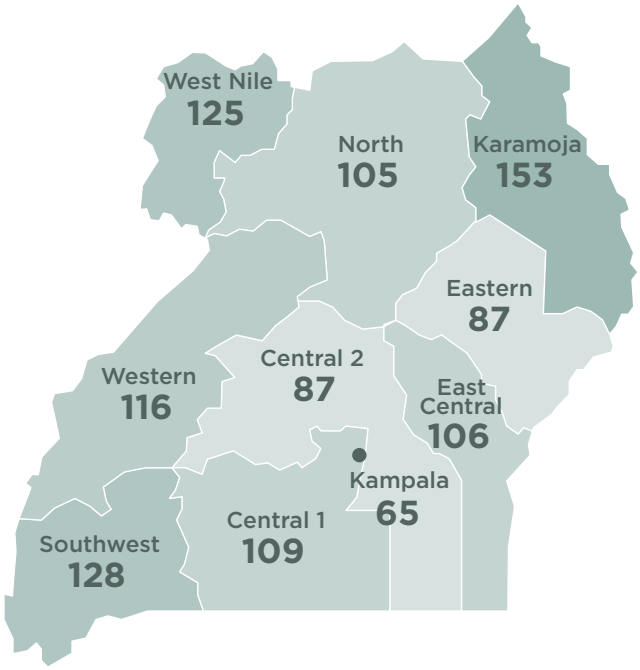


Figure 18

Children under 5 mortality: rates per 1,000 births: regional distribution



15. 15 of the 25 services provided geographic distribution data

Health burden indicators

Table 1

Comparison of health burden indicators relating to maternal and newborn child health and nutrition from Karamoja and Kampala

	Karamoja		Kampala	
	Number	Rank[16]	Number	Rank
Under-five mortality	153	10	65	1
% Receiving antenatal care from a skilled professional	87.8	10	98	2
% Delivery at health facility	27.1	10	92.9	1
% Delivered by a skilled provider	30.8	10	93	1
Height for ages - % below -2SD	45	10	13.5	1
Number of mHealth service deployments	4		9	

RANKING

GOOD	1
	2
	3
	4
	5
	6
	7
	8
	9
BAD	10

This section seeks to understand the health disparities between the Karamoja District Health Service (DHS) cluster and Kampala. Various health burden indicators exhibited in Table 1 show that there is a significantly larger health burden in the Karamoja cluster than in Kampala. The Karamoja DHS cluster happens to be the worst performing of all the DHS clusters for the indicators listed above (consistently ranked in 10th place), yet it is also the cluster with the fewest mHealth service deployments with only 4 currently available in the region. Kampala currently has 9 mHealth services but ranks low for health burden across the listed indicators. This lack of implementation of mHealth services in heavily burdened regions raises some concerns.

The percentage of stunted children in the Karamoja cluster is 45%, whilst in Kampala it is significantly lower at 13.5%. This indicates a need for distribution of nutrition services in Karamoja, but there are currently only 2 mHealth services in Karamoja which have a nutrition component embedded within the service. It is unclear as to how many people are currently being reached by these services in this region.

16. Rank indicates performance out of all 10 DHS clusters where 1 indicates best performance and 10 indicates the worst performance

The health burden indicator which raises the most concern is the percentage of deliveries which take place at a health facility. For Karamoja, this is only 27.1% which corresponds to the equally low percentage of deliveries assisted by skilled providers for this region (30.8%). Efforts aimed at increasing the number of babies delivered under the supervision of health professionals and ensuring proper medical attention and hygienic conditions during delivery are crucial in reducing the health risks to mothers and children[17]. Mobile can make a valuable contribution to these efforts by driving the demand for delivery at health facilities by enlightening mothers through mobile. When looking at the rural vs. urban burden (Table 2) it can be seen that the percentage of babies delivered at a health facility in rural areas is 52% compared to 89.5% in urban areas – a sizeable difference. There are currently 4 services which are aimed at educating mothers on the preferred practice of delivering their babies at health facilities. It's not clear whether these services are being implemented in rural or urban areas and, as such, emphasis needs to be placed on extending the reach of these services to rural communities where these interventions are most needed.

Table 2

Rural vs. urban burden

	Rural	Urban
Under-five mortality	111	77
% Receiving antenatal care from a skilled professional	94.4	97.4
% Delivery at health facility	52	89.5
% Delivered by a skilled provider	52.8	89.1
Height for ages - % below -2SD	35.6	18.6
Mobile telephone ownership	53.1	86.8

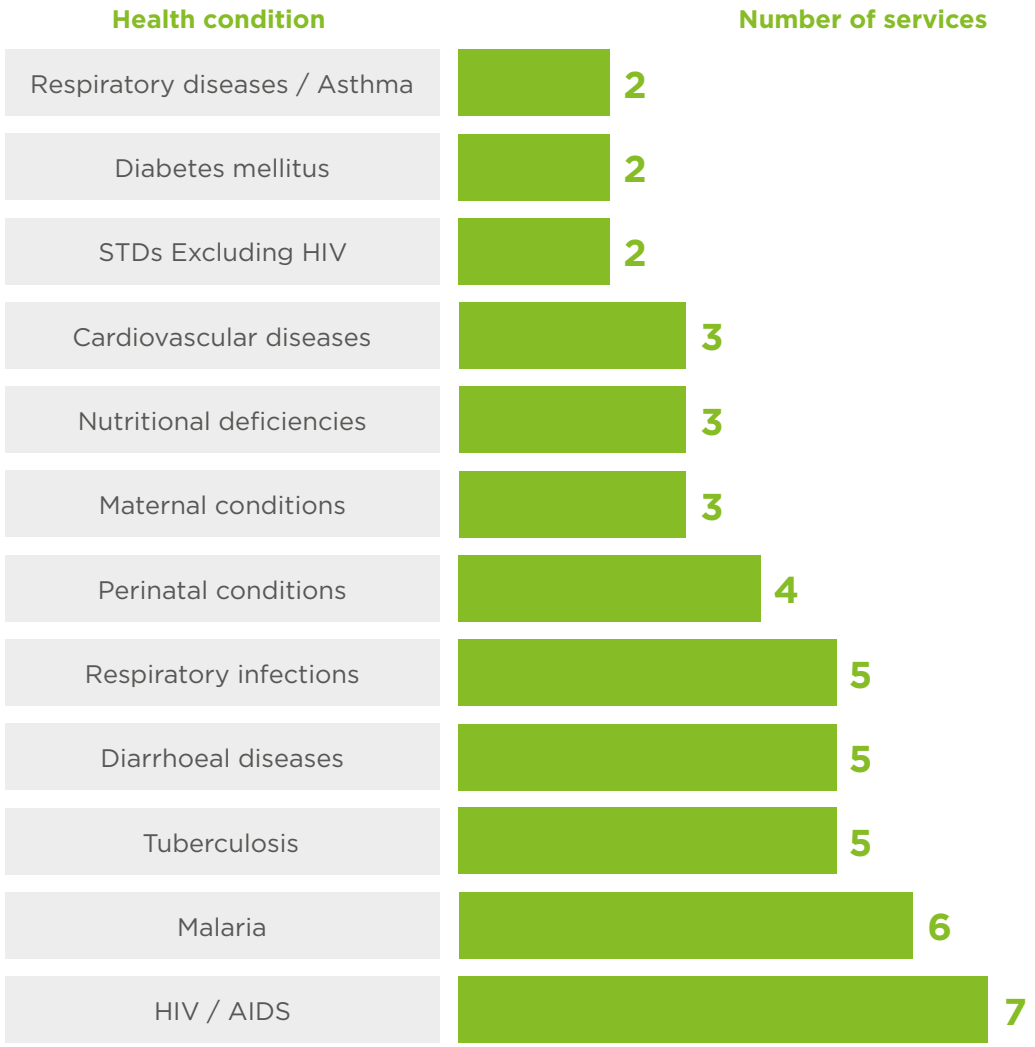
Other rural vs. urban disparities highlighted in Table 2 once again illustrate the potential for mobile as a mechanism for change. Mobile has the potential to reach communities where the health system might be inadequately resourced to do so, as is typically the case in rural areas. This is supported by the mobile phone ownership statistics which indicate that roughly 53.1% of households own a mobile phone[18].

17. Uganda Demographic and Health Survey, 2011
18. Uganda Demographic and Health Survey, 2011

Health conditions addressed by mHealth services

Figure 19

Health conditions addressed by mHealth services



HIV/AIDS is the disease addressed by the most mHealth services – a total of 7 services currently address HIV/AIDS within their service offering. Of the health conditions currently being addressed by mHealth services, 6 are amongst the top 10 causes of premature death[19]: HIV/AIDS, malaria, tuberculosis, diarrhoeal diseases, cardiovascular diseases and respiratory diseases or infections. Of the top 5 causes of premature death in Uganda, 4 are already being addressed by mHealth services. This show good initial alignment of mHealth services in meeting the health burden.

19. http://www.cdc.gov/globalhealth/countries/uganda/

Health interventions

Figure 20

Health interventions covered by mHealth services

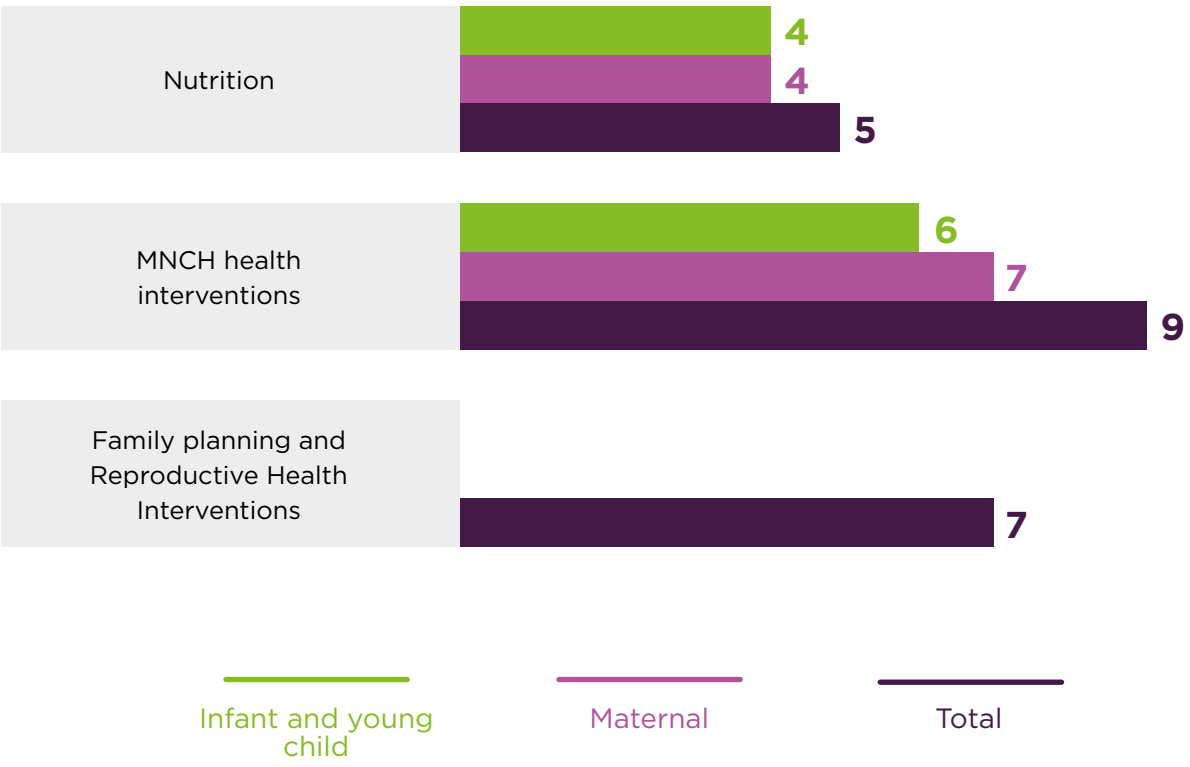


Figure 20 shows that 9 out of the 25 services being implemented in Uganda focus on maternal and newborn child health interventions. Of these 9, 7 focus on maternal health and 6 address infant and young child health. Family planning and reproductive health interventions are currently being implemented by 7 mHealth services. Only 5 of the 25 services have a nutrition component. Of these 5, 4 deliver maternal nutrition interventions and 4 focus on infant and young child nutrition.

Nutrition interventions

These nutrition services are essential, as the Uganda Demographic and Health Survey (2011) indicates that nationally, 33 percent of children under age 5 are stunted, and 14 percent are severely stunted. The breakdown of various nutrition topics addressed by these mHealth services is given in Table 3.

Table 3

Nutrition topics addressed by mHealth services

Maternal nutrition interventions		Infant and young child nutrition interventions	
Nutrition topic		**Nutrition topic**	
Improved use of locally available foods to ensure increased intake of important nutrients	4	Exclusive breastfeeding	4
Food fortification with folic acid, iron, vitamin A, zinc and iodine	3	Timely, adequate, safe and appropriate complementary feeding	4
Iron and folic acid supplements and deworming	3	Zinc treatment for diarrhoea	4
Hand washing with soap	3	Initiation of breastfeeding within 1 hour (including colostrum feeding)	3
Multi-micronutrient supplementation	2	Continued breastfeeding	3
Iodized salt consumed as table salt and/or as food-grade salt (used in food processing)	2	Vitamin A supplementation and deworming	3
Treatment of night blindness in pregnancy	2	Management of severe acute malnutrition	3
Fortified food supplements (e.g., corn-soya blends, lipid-based nutrient supplements) for undernourished women	2	Management of moderate acute malnutrition	3
Vitamin A supplement in first 8 weeks after delivery	2	Hand washing with soap	3
		Appropriate feeding of HIV-exposed infants	2
		Iodized salt consumed as table salt and/or as food-grade salt (used in food processing)	2

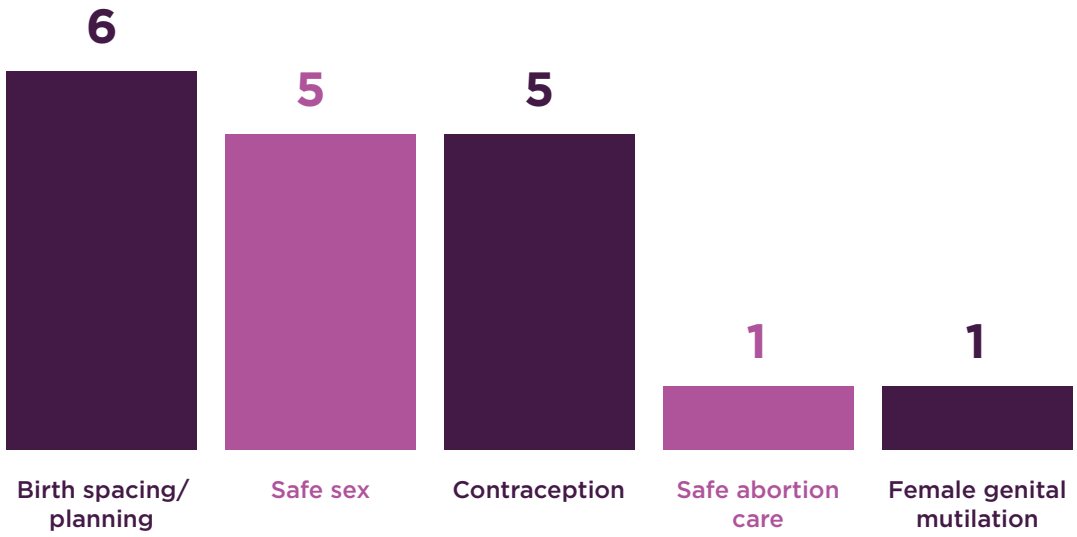
Family planning and reproductive health interventions

Data indicates that there is an inverse relationship between the length of the preceding birth interval and the proportion of children who are stunted[20]. The longer the interval, the less likely it is that the child will be stunted. Similarly, short birth intervals substantially reduce children's chances of survival. For example, the infant mortality rate is 95 deaths per 1,000 live births for children born less than two years following a preceding birth compared with 46 to 49 deaths per 1,000 live births for children born after longer intervals. This demonstrates the need for family planning interventions to educate mothers around appropriate birth spacing to ensure adequate nutrition for the child. From Figure 21 it can be seen that mHealth family planning interventions are already prioritising this need for education around birth spacing and planning with 6 services indicating that they are addressing this issue within their service offering.

Figure 21

Topics covered by mHealth family planning and reproductive health interventions

Number of mHealth services



The disparity in stunting prevalence between rural and urban children in Uganda is substantial, where children in rural areas are almost twice as likely to be stunted as those in urban areas (36 percent versus 19 percent)[21]. This improves the case for introducing the use of mobile which has the potential to increase reach to vulnerable populations in rural areas.

20. Uganda Demographic and Health Survey, 2011
21. Uganda Demographic and Health Survey, 2011

Maternal and child health interventions

Within the 9 services offering maternal and newborn child health interventions, the various topics listed in Table 4 were covered.

Table 4

Services offering maternal and newborn child health interventions

Maternal health interventions		Infant and young child health interventions	
Health topic	**Number of services**	**Health topic**	**Number of services**
Pregnancy	7	Newborn care	5
Antenatal care	6	Growth and development	4
Pregnancy complications	6	Vaccines / immunizations	4
Pregnancy danger signs	6	Prevention of Mother-to-Child Transmissions (PMTCT)	3
Labour	6		
Emergency preparedness	5		
Post-partum care	5		

There are 6 services currently addressing infant and young child health. Data shows that of the children in Uganda who survive to their first birthday, 38 out of 1,000 would die before reaching their fifth birthday[22]. Meaning that one in 11 children dies before their fifth birthday. There is an obvious need for using innovations such as mHealth to reduce the number of child deaths in Uganda.

22. Uganda Demographic and Health Survey, 2011

Quantifying users

Figure 22

Number of mHealth services targeting different beneficiary groups

Beneficiary data provided by 8 of the 25 mHealth services being implemented in Uganda indicates that a total amount of 1,163,543 beneficiaries have been reached through these services to date.

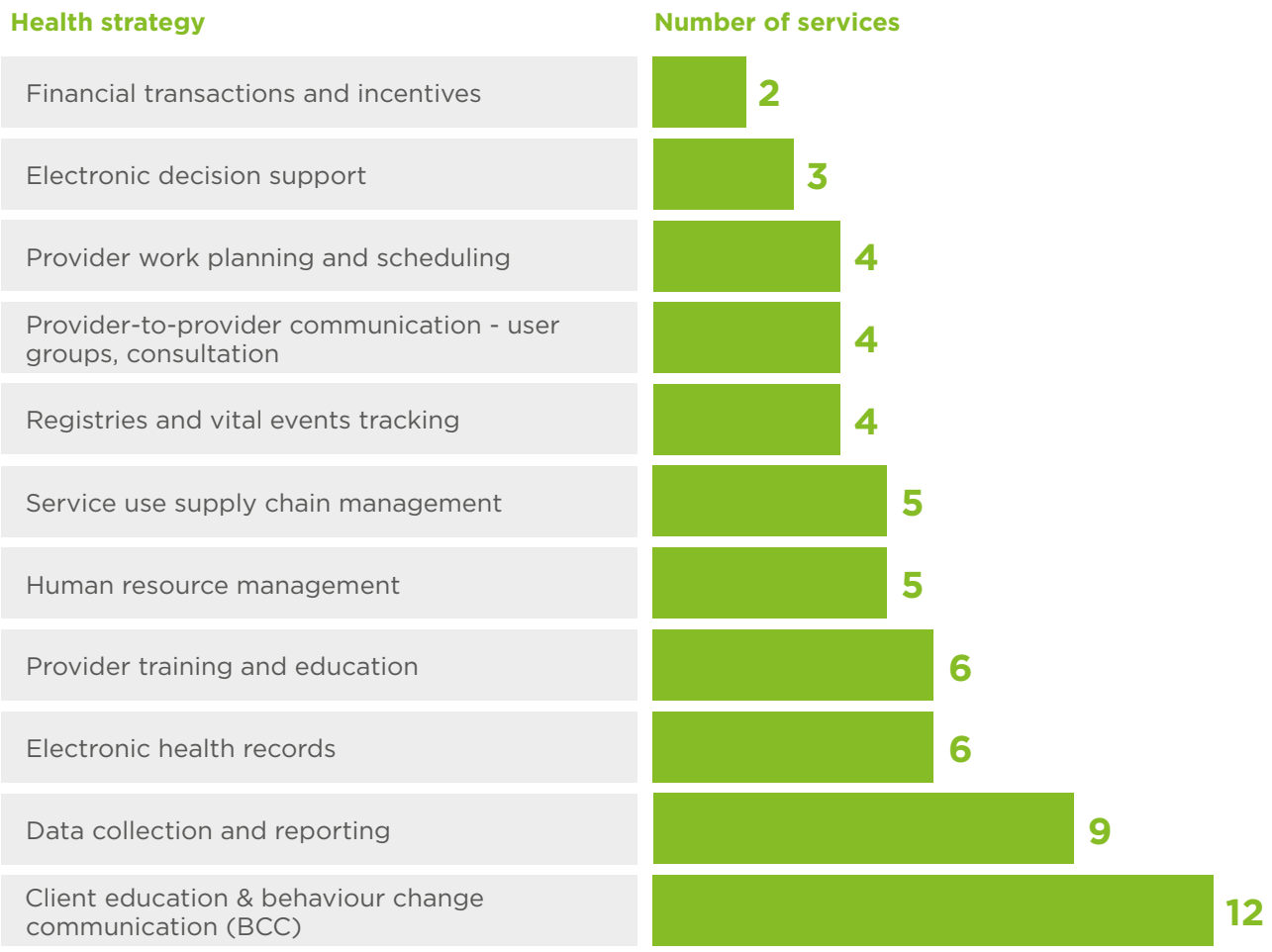
Similarly, 154,091 health workers are currently interacting with mHealth services, the majority of these being frontline health workers (CHW's, community volunteers etc.).

5 services are exclusively targeting women and children.

mHealth strategies

Figure 23

Health strategies addressed by mHealth services



Of the 13 mHealth strategies identified within mobile health, 11 are currently being provided by mHealth services in Uganda. The only strategies which are not currently being implemented are the use of sensors and point-of-care diagnostics (and monitoring) and tele-consultation.

Research shows that there were minor improvements in the nutritional status of children in Uganda over the five year period between 2006 and 2011 with the percentage of stunted children falling from 38 percent to 32 percent[23].

One aspect shown to be an important influence in stunting prevalence was the mother's level of education which generally has an inverse relationship with stunting levels[24]. For example, children of mothers with secondary or higher education are the least likely to be stunted (25 %), while children whose mothers have no education are the most likely to be stunted (42 %). Similarly, child mortality among children born to mothers with no education (59 deaths per 1,000 live births) is more than double that of children born

23. Uganda Demographic and Health Survey, 2011
24. Uganda Demographic and Health Survey, 2011

to mothers with secondary or higher education (23 deaths per 1,000 live births)[25]. This illustrates the need for services which can inform educated and uneducated mothers alike about better nutrition practices for both themselves and their children. BCC messaging services delivered via mobile can make valuable contributions towards stimulating positive behaviour change and adoption of better nutrition practices. The use of IVR and voice services can even overcome the barrier of illiteracy amongst uneducated mothers. Of the 15 BCC services currently being implemented in Uganda, 4 are covering nutrition within in their service. Although these services are mostly being implemented in the Central region and in Kampala where malnutrition is not endemic. Only one of these services are nationally available.

Partnerships and business models

Only 7 out of the 25 services have managed to secure a partnership with the Ministry of Health. In Uganda only 4 services are nationally deployed and each of these services has established a partnership with the MoH. This indicates that partnership with the MoH in Uganda may have a big influence on the geographic reach of a service and also illustrates the importance of forming such a partnership.

Only 8 services have secured cross-sector partnerships and there is varied representation of mHealth stakeholders, including: government, academic institutions, technology providers, mobile operators, donors and NGOs.

There has been relatively little involvement from the mobile operators in mHealth. MTN and Airtel appear to have invested the most in mHealth, each collaborating with 4 mHealth services. There are 2 mHealth services which have established partnership with both MTN and Airtel, resulting in the service being made accessible on both networks.

Apart from 4 services which are either part- or fully funded by the MOH, the majority are still funded by donors. There are 2 services which are partly paid for by the consumer and partly funded by either a donor or mobile operator. Living Goods is a service which operates on a 'pay per transaction' revenue model (supplemented by donor funding) and Airtel's health insurance product operates on a subscription model (supplemented by investment from Airtel).

25. Uganda Demographic and Health Survey, 2011

Technology

Figure 24

Terminal devices used in mHealth services

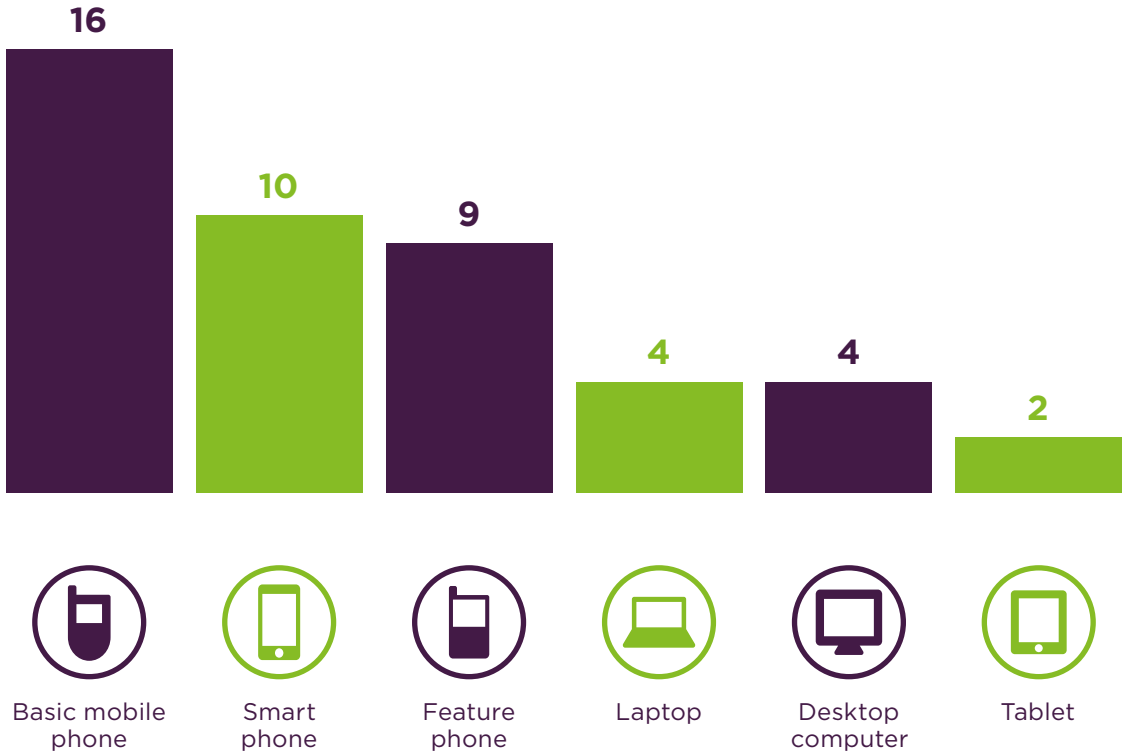


Figure 24 shows that basic mobile phones are still the preferred devices for use within mHealth services, with over 16 services being accessible using a basic mobile phone. The largest and most successful mHealth services in Uganda (including the 4 nationally deployed services) are implemented over basic mobile phones.

mHealth case studies

Uganda

NGO-led Case Study: Living Goods

mHealth use case

Living Goods harnesses the power of micro-entrepreneurs to reinvent rural trade and dramatically scale access to a wide range of life-saving and life-changing products. The organisation operates networks of independent agents who make a margin on their sales going to door-to-door offering affordable and effective solutions designed to improve the health, wealth, and productivity of the world's poor. To improve performance, Living Goods is expanding its mobile offering.

Mobile features include[26]:

- Increase treatment accuracy and improve quality: Living Goods smartphones offer menu-guided iCCM assessment, dosage guidelines, automated treatment and pregnancy follow-up reminders, and household registration. It also flags acute cases and spots high-risk pregnancies.
- Ensuring Healthy Pregnancies: Agents use SMS to register every pregnant woman and newborn child in their community. Once enrolled, expectant mothers receive automated stage and age appropriate SMS messages to promote a healthy pregnancy and safe delivery.
- Mobile dashboards improve performance and monitoring: Automated dashboards show field staff how agents are performing in real time. This performance management system enables branch managers and central staff to understand how they and their agents are doing, in real time, as well as track instances of illnesses, identify struggling agents, and eliminate paperwork.
- Help on Call: All our agents post their mobile number in every client home. Clients can call their agent any time of day or night when a child is ill to get immediate advice or request a house call.

Delivery channels

SMS, voice, IVR and internet services

Technology device

Smartphone

26. http://livinggoods.org/what-we-do/mobile-technology-2/

Health focus

- Infectious diseases, including diarrhea, pneumonia and malaria,
- Nutrition deficiencies, including a focus on: protein-energy deficiency, iron deficiency and Vitamin deficiency (focusing on maternal and child nutrition).
- Reproductive and maternal health interventions.

Living Goods includes the following nutrition-related components:

- Educational SMS messages are sent to all registered pregnant women throughout their pregnancy to drive key behaviours during pregnancy including taking iron folate and breastfeeding information

Several new strategies are being developed in order to encourage health and nutrition for mothers and infants:

- Development of a growth monitoring app for 0-24 months to identify when growth falters and link with education and behaviour change.
- Additional educational SMS messages throughout the 0-24 month period to drive breastfeeding in 0-6 months, and proper complementary feeding in 6-24 months.
- Further development of the pregnancy app which would allow tracking of maternal nutrition and pregnancy interventions. This would include delivery tracking of iron folate, deworming tablets, IPTp, with flags for when CHP should follow up with pregnant woman, including possibly tracking birth weight of new baby.

Target audience / beneficiaries

Infants, children and women

Agents, called Community Health Promoters (CHPs), benefit by dramatically lower costs to market and monitor their goods, enabling real-time sales force management.

Geographical focus

This initiative has been rolled out in several districts:

Kampala;

Wakiso, Masaka and Mpigi
(Central 1 DHS cluster),

Mukono
(Central 2 DHS cluster),

Jinja
(Eastern DHS cluster) and

Lira
(North DHS cluster).

Implementation experience

The mobile platform was trialed and rolled out last summer (2014) in the Mafubira (Jinja) branch. 30 community health promoters tested a set of Android apps to help them better register, diagnose and treat children and pregnant mothers. Problems with implementation:

- Access to a power source.
- Availability of mobile phones: many agents did not own a phone or shared them with family members.
- Apps were often not user-friendly.

Several issues were resolved:

Living Goods helped to finance the purchase of agent's smartphones and sourced in-expensive solar chargers for agents. Apps have been adjusted continuously to address user experience feedback.

Living Goods teamed with Medic Mobile to create more user-friendly apps for agents to be able to navigate more efficiently.

Today 100% of Living Goods' CHPs in Uganda are now on the Android platform.

Partner coverage

BRAC Uganda is piloting the apps with its agents, and planning to roll out to 3,000 agents.

Funding

Consumer funding

Donor

Scale

600 CHPs are actively using the apps, with plans to scale to 6,000 CHPs covering 5 million Ugandans over the next four years.

Successes

Living Goods has received fair amounts of positive media attention over the last few years, which has compared this initiative to the Avon business model. Living Goods was also one of the winners of the 2014 GSK/Save the Children Health Innovation Award for its breakthrough technology.

The organization is well developed with a clear focus on sustainable training and progression to utilizing mobile technology for further growth. There are currently more than 600 agents involved in the scheme, who have successfully driven down the price of medications, and reduced the counterfeit market. A report last year by researchers at Harvard's Kennedy School of Government[27] found that the arrival of Living Goods distributors caused the incidence of fake drugs in local shops to fall by half. Prices dropped nearly 20%. Critically, the study found that the presence of Living Goods CHP in a village increased the use of ACT medicines by children thought to be sick with malaria by almost 40%[28].

A five-year randomised control trial was carried out to look at the health outcomes for clients using the Living Good services and those who were not. Although the study has not yet been published, there is data to suggest that the program caused a 27% reduction in under-5 mortality and up to 72% increase in likelihood of home visits in the first seven days post natal compared to control areas.

27. http://www.hks.harvard.edu/fs/dyanagi/Research/FakeDrugs.pdf
28. http://www.theguardian.com/social-enterprise-network/2013/may/03/social-enterprise-leading-fight-malaria

mHealth case studies
Uganda

MoH-Led Case Study: mTrac[29]

mHealth use case

mTrac is a government led initiative to digitize the transfer of Health Management Information System (HMIS) data via mobile phones. The initial focus of mTrac is to speed up the transfer of HMIS Weekly Surveillance Reports (covering disease outbreaks and medicines) and to provide a mechanism for community members to report on service delivery challenges and empower District Health Teams by providing timely information for action[30].

Features include:

- Disease outbreak surveillance
- Stock tracking, particularly in regard to the anti-malarial drug ACT[31]
- Citizen led accountability and health services monitoring
- Data aggregation and presentation

Delivery channels

SMS, using RapidSMS technology

Data is sent by health workers and community members via a toll-free SMS to the District Health Office for verification and approval. The results are then automatically interpreted by a computer in the capital, Kampala, providing the Ministry of Health with accurate figures with which to plan and monitor programmes.

Health teams have been trained to manage an online dashboard which aggregates weekly reports from the Ministry of Health[32].

Technology device

Basic phone owned by staff members

Health focus

Infection and parasitic disease monitoring, with a particular focus on malaria, maternal and peri-natal conditions. The system also facilitates monitoring and tracking of resources.

Target audience/ beneficiaries

Healthcare workers (community based and facility based)

Village health teams

Community members

District health offices

Implementation experience

In early 2010, NGO FIND Diagnostics initiated an SMS-based monitoring system in over 140 Health Facilities in two Districts in Uganda. mTrac was launched as a result of this in December 2011 and in March 2013, it was scaled to all districts.

UNICEF have implemented mTrac

29. All information captured in this case study is as of Q1 2015 and may not represent current state
30. http://www.mtrac.ug/
31. http://www.unicef.org/uganda/9903.html
32. http://www.finddiagnostics.org/resource-centre/news/120530.html

Geographical focus

The mTrac Project is being implemented across all regions and districts in Uganda.

Partner coverage

- **Uganda Ministry of Health**
- **UNICEF**
- **WHO**
- **DFID UK Aid**
- **Medicines and Health Service Delivery Monitoring Unit**

Mobile operator partner

MTN

Funding

Government funding

DFID UK Aid through WHO

Scale

mTrac has been rolled out countrywide by the Ugandan Ministry of Health to all health facilities. With the recently concluded revision of all the Health Management Information Systems tools in Uganda, the mTrac system has been broadened to track stock data on six TRACER drugs and ARV's in addition to surveillance data.

As of March 2015, the system currently has 12,013 district health officials, 18,690 health workers and 7,381 village health team members registered. In addition, the health services complaints hotline has continued to grow with over 400 actionable health reports received every month[33]. Overall it is reported that 36,000,000 people have interacted with the mTrac program since its launch. Since launch, over 3,000,000 cases of malaria have been reported.

Successes

There has been a steady increase in reporting rates in the districts where mTrac is being implemented, providing disaggregated, real-time data which was previously unavailable at the national level. There has also been a noticeable, steady decline in stock-out rates of ACTs from active facilities.

mTrac appears to have seen considerable success since its launch in December 2011. In the early phases of the programme, its efforts were recognized in a speech on the priorities for UK Aid by the Development Secretary, Justine Greening. She highlighted mTrac as an example of the successful application of mobile technology for monitoring medicine stock levels. The initiative continued to receive praise, including recognition by the Ministry of Health, who cited mTrac as 'among the table-top 10 e-health projects of 2013' and it was granted full recognition by the African Development Bank (AfDB)[5].

After the completion of sustainable training programmes in all districts in March 2013, true testament to the effectiveness of this initiative was demonstrated during the Ugandan Typhoid outbreak in 2015. Collaborating with U-report, mTrac was utilized to assist in the response, monitoring and alerting of typhoid cases. With the new system of reporting, 271 new suspected cases were documented4. This previously would have been documented and collaborated using paper records, a timely and costly alternative.

33. http://www.unicef.org/esaro/5440_uga2015_avert-typhoid.html

mHealth case studies
Uganda

MoH-Led Case Study: Mother Reminder[34]

mHealth use case

The 'Mother reminder system' uses SMS messaging to send reminders to pregnant and new mothers, these are relevant to the stage of their pregnancy or age of their child. These may include reminders to go for antenatal check-ups or to be tested for HIV. If a woman is living with HIV, the system could provide information on exactly what she needs to do and when to do it, to prevent mother-to-child transmission of the virus. Messages are continued after birth to alert mothers to necessary immunizations and local Child Health Days, as well as other events which they could attend to improve their child's health[35].

Features include:

- Client education and behaviour change communication (BCC) reminder messages
- Sensors and point-of-care diagnostics (and monitoring)
- Registries and vital events tracking
- Data collection and reporting
- Electronic health records
- Electronic decision support
- Provider-to-provider communication - user groups, consultation

Delivery channels

SMS: free for the user

Mother Reminder paired with Text to Change uses SMS to encourage behavioural change. Text to Change's service has proved that this approach is a highly effective communication channel for health education, encouraging testing and drug compliance and informing people of the choices available to them concerning their wellbeing[1].

Technology device

Basic mobile phone

34. All information captured in this case study is as of Q1 2015 and may not represent current state
35. http://rsr.akvo.org/project/542/

Health focus

Family planning and reproductive health interventions

Maternal health and nutrition interventions:

- Food fortification with folic acid, iron, vitamin A, zinc and iodine
- Iron and folic acid supplements and deworming
- Multi-micronutrient supplementation
- Iodized salt consumed as table salt and/or as food-grade salt
- Treatment of night blindness in pregnancy
- Improved use of locally available foods to ensure increased intake of important nutrients
- Fortified food supplements (e.g., corn-soya blends, lipid-based nutrient supplements) for undernourished women
- Vitamin A supplement in first 8 weeks after delivery

Infant and child health and nutrition topics covered by this services include:

- Initiation of breastfeeding within 1 hour (including colostrum feeding)
- Exclusive breastfeeding
- Appropriate feeding of HIV-exposed infants
- Timely, adequate, safe and appropriate complementary feeding
- Continued breastfeeding
- Zinc treatment for diarrhoea
- Iodized salt consumed as table salt and/or as food-grade salt (used in food processing)
- Vitamin A supplementation and deworming
- Management of severe acute malnutrition
- Management of moderate acute malnutrition

Target audience/ beneficiaries

Expectant and new mothers

Children

Infants

Geographical focus

After the testing period, the project was rolled out in nine districts by October 2011

It has since been scaled to be implemented in all 112 districts

Partner coverage

- **USAID**
- **Ministry of Health**
- **Text to Change**
- **UNICEF**

Funding

Donor funding: UNICEF is the funding partner for the programme

Scale

The project has reached 80,000 beneficiaries to date. .

The opportunity for mHealth to support nutrition, maternal and child health

Total addressable maternal mHealth market 2015

Total Addressable Market
0.79M

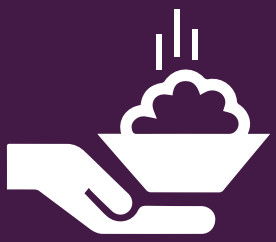
Total Addressable Market
1.19M

Total addressable maternal mHealth market 2020

Total Addressable Market
1.25M

Total Addressable Market
1.82M

Ranking of overall mHealth opportunity



Scale of maternal and child health/ nutrition problem

LOW

Size of addressable population

HIGH

Ability to pay or fund mHealth

MEDIUM-LOW

Ability to deliver

mHealth service providers

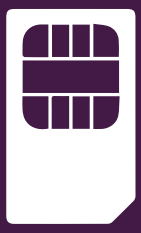
HIGH-MEDIUM

Strength of supporting programmes

MEDIUM

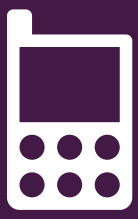
Interest from commercial aggregators

MEDIUM



Interest from mobile operators

MEDIUM



Supporting mobile / health regulation

MEDIUM

Willingness to partner

MEDIUM-HIGH

Improving efficiency in health

Uganda's economy is reliant upon agriculture with close to 20% of GDP generated by it and 70% of the population employed in agriculture related activities. However, agricultural yield and post-harvest losses are high. In close partnership with external funders including the USAID Feed the Future initiative, the government is looking to improve nutritional outcomes and tackle these challenges. In particular, it aims to reduce stunting and child mortality. Mobile has a critical role to play in this initiative, providing a scalable channel to deliver culturally sensitive and region specific nutritional information which supports the targeted health outcomes. The delivery of this content can be more pervasive over the cellular network based on the current unique user penetration in the region (31%) and its forecast increase (penetration is expected to reach 50%)[36] by 2020.

Another initiative through which mobile could improve stunting and child mortality is The Ugandan Nutrition Action Plan (UNAP). This plan has a clear set of aims directed towards improving nutrition and health outcomes with special emphasis placed on women of a reproductive age and children within the first thousand days of life. This is identified as the primary window of opportunity before permanent damage occurs as a result of substandard nutrition. The GSMA's work around stage-based messaging is directly concerned with this critical period. The GSMA are working to introduce the operational efficiencies of mobile to ensure scale and coverage are reached in communicating the key messages during this period.

Bridging gaps in Ugandan health strategies

The Ugandan government projects to promote maternal, infant and young child feeding and nutrition practices are key aims in improving awareness and increasing healthy feeding behaviour. Support to households and communities to own their food production, programmes to reduce post-harvest loss and spoilage and provision for acute malnutrition with reporting via community based monitoring are all highlighted in the country's various health action plans. However, the use of mobile, as a tool for disseminating complementary nutritional data, health data to improve nutrition and the impact on economic indicators, is conspicuous by its absence from many of the country's planning documents. For example, the data around the need to provide appropriate complementary feeding during weaning, dietary diversification and increased coverage of micronutrient supplementation, as defined in the Ugandan Nutrition Action Plan, could easily be delivered through a stage-based messaging service provided by mobile.

36. GSMAi - Q3 2015. This data is unique subscribers derived by dividing the average number of SIMs owned per person in Uganda. Penetration rates using SIM ownership alone sees penetration of 49% and 94% in Q4 2014 and Q4 2020 respectively.

Regulatory position in Uganda

The most important legal/regulatory feature relating to mHealth in Uganda was the implementation of the country's moratorium on mHealth pilots in 2012. While the moratorium has not been fully lifted, it is possible to launch services if prior approval has been granted by the ministry. The validation process itself has come under attack with detractors decrying the length of time required to obtain permissions.

There are valid points from both sides on the applicability of the ban but what is crucial here is that partners can successfully work together. Key to the success of mHealth service launches are broad partnering arrangements across stakeholder groups and government has a pivotal role in this process. To avoid the pitfalls which initially led to the moratorium in Uganda, service providers should try wherever possible to consider the underlying health strategies of MoH's and to consider how their services integrate with them and how they will scale and sustain. Proof-of-concept mHealth projects which are not integrated to the wider strategies of governments, including specific strategies or wider country level Information and Communications Technology (ICT) plans are not likely to be looked on favourably.

The legal position regarding health in Uganda is framed by the requirement for implied and actual consent. Consent management is, therefore, a critical consideration in mHealth. Early stage health services are less likely to come up against these issues but as usage becomes more sophisticated e.g. remote diagnosis involving health personnel, they are more likely to. Contractual relations, which are defined under the same auspices as questions of consent and are likely to be undertaken 'at a distance' when using mobile, have been tackled by the Uganda Law Reform Commission. Laws governing such relations were enshrined in the Ugandan Electronic Transactions Act 8 of 2011, the Computer Misuse Act of 2011 and the Electronic Signatures Act of 2011.

Figure 25

Existing applicable mHealth legal frameworks

mHealth road map/strategy	
National eHealth (mHealth) strategy, policy or framework in place	Yes
Year adopted	2012/2013
eHealth (mHealth) policy 'embedded' in a larger e-government policy or as a part of a broader health or teleHealth policy	Stand-alone policy
Implementation	Partially
Regulatory body that deals specifically with eHealth (mHealth) issues/initiatives	Yes
Governance and policy mechanisms in place at a national, regional and/or local level to ensure implementation, support and monitoring of the strategy	Yes
Any failed or stalled attempts to develop an eHealth policy and legislation	None known
Medical codes of conduct	Yes

Existing legal framework	
Recognition and protection of an individuals right to healthcare	Yes
Recognition and protection of an individuals right to privacy	Yes
Recognition and protection of the right of individuals to access information held by the government/state	Yes
Member of	EAC (East African Community)
Member of the African Union	Yes
Policies or laws that regulate medical research National Guidelines for Research Involving Humans as Research Participants (2007) with regard to research participants and the collection of data.	Yes

Mobile financial services, specifically mobile payments, insurance and savings, are important facilitators of mHealth. These services have a somewhat symbiotic relationship which sees both benefit when they are combined as part of a suite of health and insurance offerings. In Uganda, there is a particular opportunity based on the well-established use of mobile financial services consequently any regulation impacting mobile money has the potential to impact mobile health.

As transaction revenue has grown in Uganda, the Revenue Authority (URA) has taken notice. In 2013, it imposed a 10% tax on money transfers in Uganda, including mobile money transfers. Later that year it began registering mobile money agent businesses to enforce collection of income taxes and shortly thereafter this cost was passed on to customers as part of transfer fees. Any form of penalisation passed on to customers is likely to have a negative impact on uptake and use.

Conclusions

- Nationally 33% of children under-five are stunted in Uganda and 14% suffer severe stunting. Only 16% of those mHealth services tracked by the GSMA focus on infant and young child nutrition. Mobile is uniquely positioned to tackle and improve on this health feature through its capacity and coverage features. In this way, it can provide timely and accurate data surveillance and better engagement with patients. The combined result of this is a reduction in the burden on overstretched health facilities.

- The potential market for literate maternal segments in Uganda is 0.79 million and is forecast to rise to 1.82 million by 2020 for combined IVR and SMS users.

- Ongoing partner opportunities in Uganda have led to some success in the mHealth sector. Approximately 32% of service providers have secured cross-sector partnerships while 16% are available nationally. Of the nationally representative services, 100% are partnered with the MoH. This feature indicates the importance of working with governments to achieve scalable mHealth outcomes. Where possible mHealth service providers should attempt to align their offerings as closely as possible to the specific needs and most prevalent heath burdens defined by government partners.

- Of the total mHealth initiatives tracked by the GSMA, 60% are concerned with behaviour change and communication (BCC). However only 16% include nutritional education and advice which is targeted at mothers, infants and children under-5. There is a unique opportunity to reach those lacking basic education using mobile and IVR, with a strong potential social impact. Data from Uganda shows that women with little or no education are more likely to be undernourished (42%) comparative with those who have a secondary education (25%). Mobile provides the means to tackle an historical inequity and improve aggregate benefits to the wider Ugandan society through a healthier, more productive and nutritionally healthy population.

- mHealth service coverage in Uganda is not always deployed in regions which have the largest health burden. For example, the Karamoja District sees high health burdens but a significantly low number of mHealth service deployments (4) whereas Kampala, which has one of the lowest health burdens, has 9 active mHealth deployments. Mobile must be used in an efficient manner and to its respective strengths. One of these strengths lies in its ability to reach underserved regions.

- Burgeoning business is a potential tax opportunity and one that feeds back into society through reinvestment in public spending. However taxation of new and developing business models must be fair and proportional. If it is not there is a risk that tax policies will stifle commercial developments which could have long-term beneficial effects for the whole of society.

Overall feasibility assessment

The feasibility of mHealth to address nutrition and maternal and child health in Uganda is high to moderate.

Demand-side requirements are there, in terms of addressable market, but there remains some work to do in popularising the concept of mHealth with mobile users and MNO stakeholders. In the medium term, it is the GSMA's assertion that Uganda has the potential to develop into a sustainable mobile health opportunity.

The GSMA will continue to address the challenges facing the market and optimise partnerships between mHealth service providers and the public and private sectors.

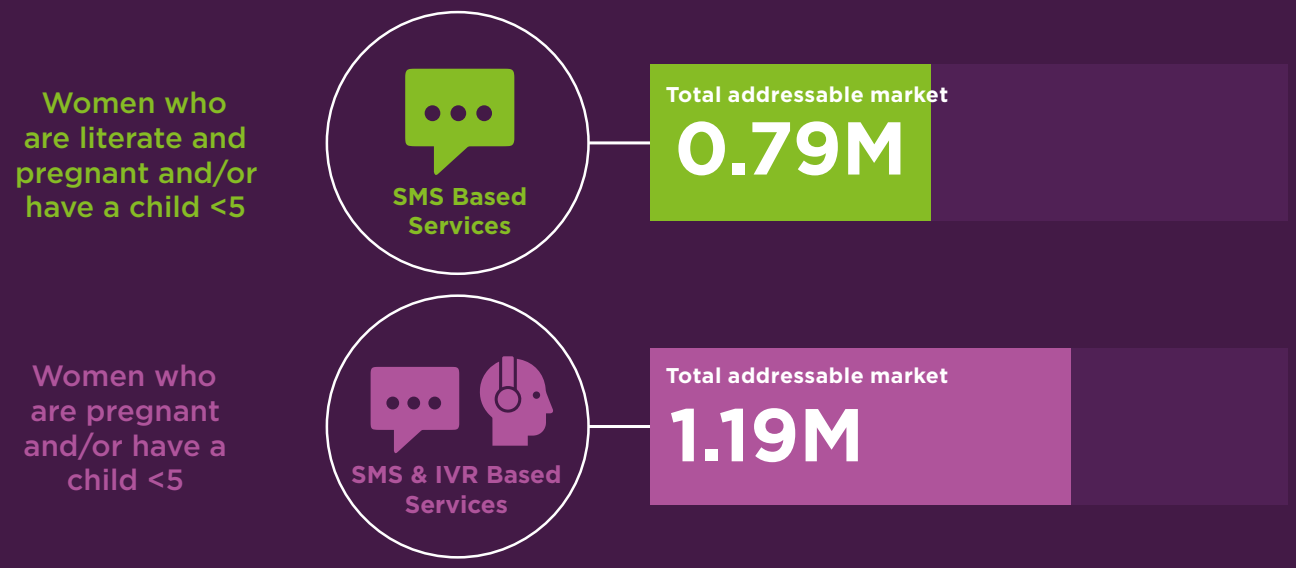
Opportunity size

The rapidly growing population and evolution of the Ugandan mobile health industry suggests that services should concentrate on the simplest formats of delivery in the initial stages of development. As such there is an opportunity to target literate women with children under-five using SMS to deliver nutrition and maternal health information services. This segment is forecast to grow by 58% over the 2015-2020 period.

In order to avoid research bias and exploit cumulative knowledge features, the GSMA opted for a conservative forecast in the analysis below. Only women who are pregnant or have a child under -5 are considered as addressable units. Moreover, women who are pregnant and have a child are counted only once despite different services being offered to these users (effectively two separate service streams). The addressable market is likely to be larger when women of a child bearing age and those who have a child and are pregnant are included in the calculation.

Figure 26

Total addressable maternal mHealth market 2015

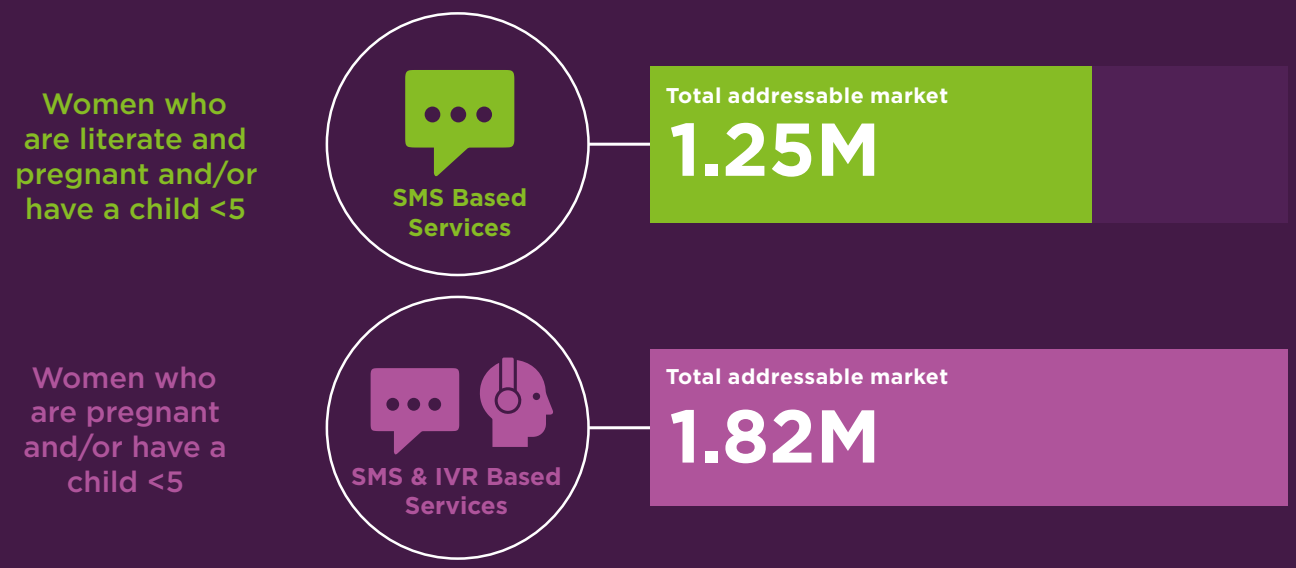


Source: GSMA Mobile for Development mHealth model, GSMAi data

When both literate and illiterate maternal segments are targeted using SMS and IVR, this opportunity increases to an addressable market size of 1.82m by 2020, growing by 53% over the 2015-2020 period.

Figure 27

Total addressable maternal mHealth market 2020



Source: GSMA M4D health model, GSMAi data

Ranking of overall opportunity

Ranking of overall opportunity is a combination of both quantitative and qualitative inputs
Scale of maternal and child health/nutrition problem – **LOW**
Size of addressable population – **HIGH**
Ability to pay or fund mHealth – **MEDIUM-LOW**
mHealth service providers – **HIGH-MEDIUM**

Ability to deliver

Ranking of ability to deliver is a combination of both quantitative and qualitative inputs.
mHealth service providers – **HIGH**-medium
Strength of supporting programmes – **MEDIUM**
Interest from commercial aggregators – **MEDIUM**
Interest from mobile operators – **MEDIUM**
Supporting mobile/health regulation – **MEDIUM**
Willingness to partner – **MEDIUM-HIGH**

Abbreviations and terminology

AfDB- African Development Bank
ARPU - Average Revenue per User
ARV - Antiretrovirals
BoP – Base of Pyramid
B2B - Business to Business
B2C - Business to Consumer
BCC – Behaviour Change Communication
CHIS – Community Health Information system
CHP – Community Health Project
CHW - Community Health Worker
DFID – Department for International Development
DHS – District Health Service
GDP - Gross Domestic Product
GHS – Global Health Security
HC – Health Centre
HIS – Health Information System
HMIS – Health Management Information System
HSSP – Health Sector Strategic Plan
ICCM – Integrated Community Care Management
ICT - Information and Communications Technology
IPTP – Intermittent Preventative Treatment in Pregnancy
IVR - Interactive Voice Response
MNCH - Maternal Newborn and Child Health
MNO – Mobile Network Operators
M2M –Machine to Machine
MoH - Ministry of Health
M&E - Monitoring & Evaluation
NGO - Non-Governmental Organization
NBI – National Backbone Infrastructure
OoP – Out of Pocket
PMTCT – Prevention of Mother to Child Transmission
SMS - Short Message Service
SSA - Sub-Saharan Africa
Ttc – Timed and targeted counselling
UN – United Nations
UNAP – Ugandan Nutrition Action Plan
URA – Ugandan Revenue Authority
VAS - Value Added Services
WHO – World Health Organization

For more information on GSMA Mobile for Development mHealth,
please visit **www.gsma.com/mobilefordevelopment/programmes/mHealth**