Mobile for Development

mHealth Country Feasibility
Report: Zambia

The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and Internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

For more information, please visit the GSMA corporate website at www.gsma.com

Follow the GSMA on Twitter: @GSMA

Mobile for Development

GSMA Mobile for Development brings together our mobile operator members, the wider mobile industry and the development community to drive commercial mobile services for underserved people in emerging markets. We identify opportunities for social, economic and environmental impact and stimulate the development of scalable, life-enhancing mobile services.

Mobile is the predominant infrastructure in emerging markets. We believe it is the transformative technology that enables us to put relevant, impactful services into the hands of underserved people. Since the creation of GSMA Mobile for Development we have partnered with 50 mobile operators, rolling out 104 initiatives, impacting tens of millions of people across 49 countries.

For more information, please visit the GSMA Mobile for Development website at www.gsma.com/mobilefordevelopment or email m4d@gsma.com

Follow GSMA Mobile for Development on Twitter: @GSMAm4d

CONTENTS

Background

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

In June 2012, the GSMA mHealth programme launched the Pan-African mHealth Initiative (PAMI). PAMI has been funded by UK aid from the Department for International Development (DFID), to support the scale-up of mHealth in nutrition and maternal and child health, in support of the Millennium Development Goals 4, 5 and 6. PAMI 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
or visit www.gsma.com/mobilefordevelopment/programmes/ mHealth

Craig Friderichs
Paul Merry
Kim Viljoen
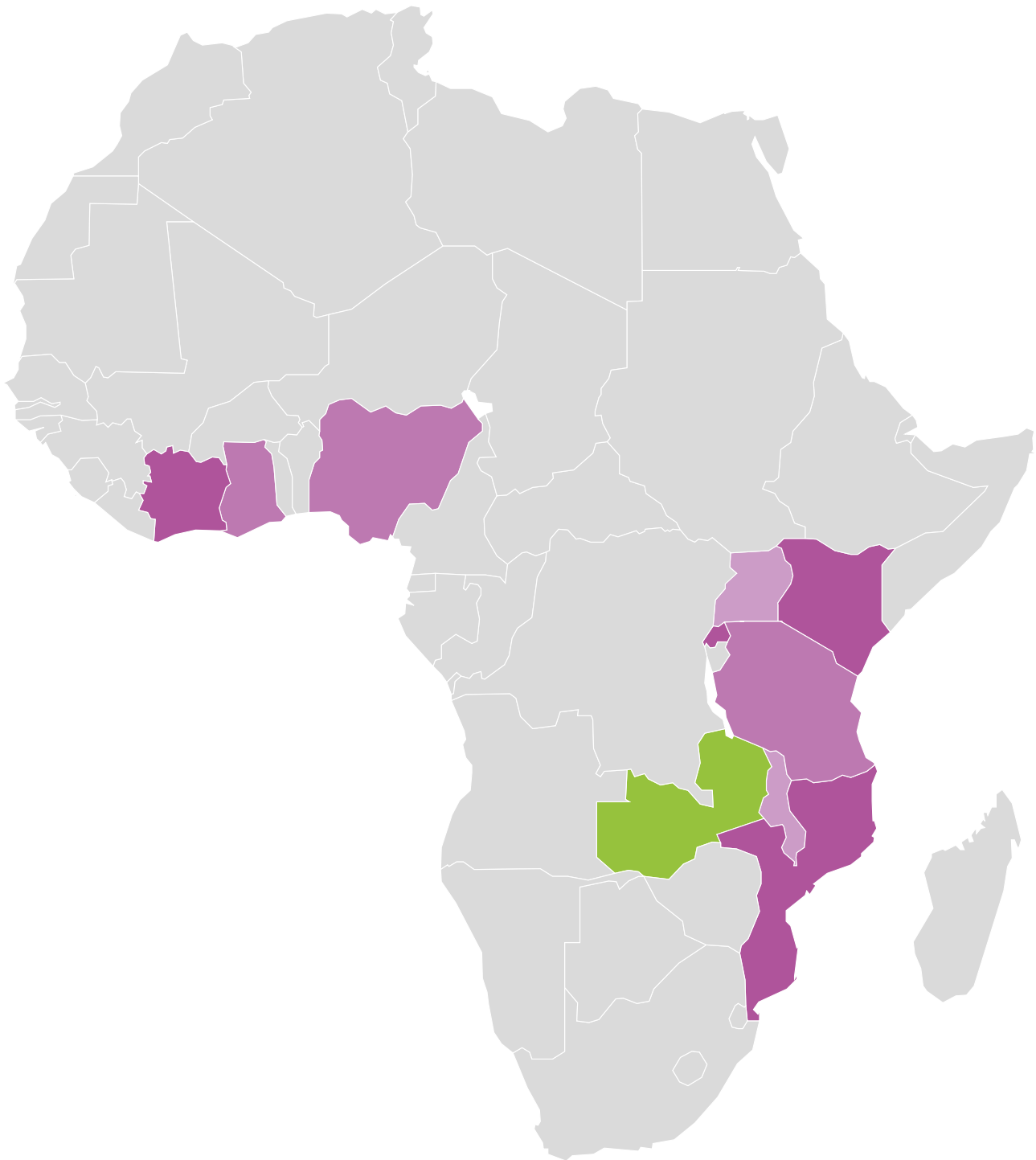
3-year 10-country nutrition initiative which aims to develop mHealth services in the area of maternal and child health in Sub-Saharan Africa.

Zambia has been selected as a GSMA priority country.

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

Executive summary

This report aims to carry out a comprehensive analysis of the current state of mHealth in Zambia. Information has been gathered and presented in the context of the GSMA Pan-African mHealth Initiative and more specifically is aligned to the aim of the 10-country GSMA nutrition initiative - to develop commercially sustainable mHealth services that meet public health needs, in the areas of demand generation, registration and data surveillance.

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

What problems can mHealth solve?

- Infant mortality rates are approximately 56 deaths per 1000 births and children under-five mortality rates have reached approximately 89 deaths per 1000 births, placing Zambia as the second highest country for these indicators across the 10 GSMA nutrition countries. Of the infant and young child mHealth interventions tracked by the GSMA in Zambia, 14% are related to reducing infant mortality. Whilst this is the largest direct health intervention (data collection and reporting rank higher but are not defined as direct interventions), mobile is well positioned to do more. In Ghana, for comparison, the same indicator reaches 70%, despite ranking 6# for infant mortality. Mobile in Zambia is uniquely positioned to tackle and improve on this health feature

through its unique coverage and capacity to reach the largest possible audience.

- It is recognised that there is a critical shortage of community health workers (CHW) in Zambia (approximately 1.6 CHW/1000). The National Community Health Worker Strategy seeks to tackle this imbalance by formalising and standardising the role of CHWs in the health sector. The mHealth services tracked by the GSMA and targeting health workers have reached 7,298 front line personnel and 734 facilities (Q4 2014). Scaling up and integrating mobile services with CHW resources will greatly assist the National CHW Strategy initiative, particularly in the areas of training and retention.

- Malnutrition is the primary cause of under-five deaths in Zambia, attributable to 52%. Forty-five percent (45%) of children under-five are stunted, 5% are acutely malnourished (wasted) and 15% are underweight. Micronutrient deficiencies are also an issue, with 53% of children having a vitamin A deficiency, 4% of school-age children having an iodine deficiency disorder, and 46% of children with iron deficiency anaemia (MOH 2011). Mobile is a powerful tool in the education of efficient nutrient intake, that can be disseminated countrywide and in difficult to reach rural districts.

- There are only five mHealth services offering maternal health interventions in Zambia, despite a recognised problem with underweight women in rural areas (approximately 11%), specifically in the North-Western and Western provinces (14% each). Mobile has the capacity to reach rural women, via pushed and adapted information related to the nutritional requirements of users and the available food sources in-country.

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

What is conducive to mHealth success in a country?

- The potential addressable market for maternal segments is 1.89 million. This estimate is forecast to rise to 2.13 million by 2020.

- There is a lack of mHealth initiatives, tracked by the GSMA, directly concerned with education and advice targeting maternal, infant and children under-five nutrition. This is so despite data showing that 45% are stunted and 21% severely stunted. Data from Zambia also shows that women with no education are more likely to be undernourished (12% comparative with those who have a secondary education (6%)). This presents a unique opportunity for mHealth service providers to bridge a gap in the Zambian health service, by utilising messaging and IVR-based nutritional info services.

- There is a striking differential in the level of assistance provided during childbirth across urban and rural regions in Zambia. Approximately 80% of births to urban women are attended by a skilled health provider, compared with 30% to women in rural areas. Distribution of skilled providers in rural areas is unlikely to improve in the short to mid-term, despite the existence of a number of initiatives. Mobile can be used to improve the skills of the existing health workers in rural areas, particularly through the utilisation of applications focused around electronic decision support, training and education.

3. The readiness of stakeholders to support mHealth in Zambia

What position are stakeholders in to facilitate mHealth?

- The Zambian government position in respect of ICT, and its role in facilitating the ongoing development of the country, is advanced. The country has instigated multiple strategies towards integrating ICT into everyday life, including the rollout of a national government financed backbone network, the defined output of which is the improvement of countrywide health indicators. Regulation designed to create universal access in rural and other underserved regions using mobile creates the opportunity to drive mHealth services into these regions by fixing costs at a level that is within OoP parameters. However, the commercial proposition around such a strategy remains undefined.

- The Zambian SmartCare National Health Insurance service will facilitate the improvement of overall registration and data surveillance health indicators. Adding access across all radio access network (RAN) options (SmartCare is currently only available as a 3G add-on) would increase the impact of this initiative exponentially, as there is almost universal access to mobile devices in Zambia (73% of the population have at least access to a phone, rising to 83% in urban areas).

- The Zambian government has instituted a number of initiatives to tackle the lack of in-country health personnel and the National CHW Strategy is closely aligned to the work being undertaken by the GSMA and mobile stakeholders. Specifically, mobile provides an easy route to connect CHWs in regions where health needs are under-serviced, providing access to standardized health content and allowing data to be pushed to beneficiaries in the field. Capacity can also be increased on-the-fly, due to the inbuilt scalability of mobile.

- The challenge of filling the gap in CHW training in Zambia is well understood and the remedies have multi-sector/partner support. Mobile, as highlighted, can provide several methods to improve the situation. The UK Government, through the DFID funded Human Resources for Health Program has provided financial support to the Zambian Ministry of Health to implement national CHW strategy in the areas of recruitment, training and deployment. This creates a revenue opportunity, and a business model, for mobile operator partners to support CHW training initiatives. A viable business model can be developed into a sustainable and consequently scalable mHealth initiative.

Market conditions in Zambia

mHealth indicators

Zambia shows a moderate-to-strong potential to scale mHealth, as indicated by its top five positioning in 57% of selected indicators compared against the other ten target countries.
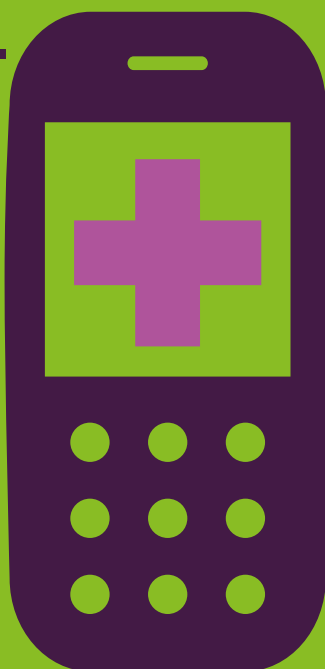
57%

This is the joint highest combined ranking for these indicators across the GSMA nutrition initiative countries.

Current state of Zambia Health

HEALTH BURDEN — HIGH

REACH — MEDIUM-LOW

ABILITY TO PAY — LOW

Penetration versus access

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

42.2%
Unique User Penetration

VS

73%
Access to Mobile Phone
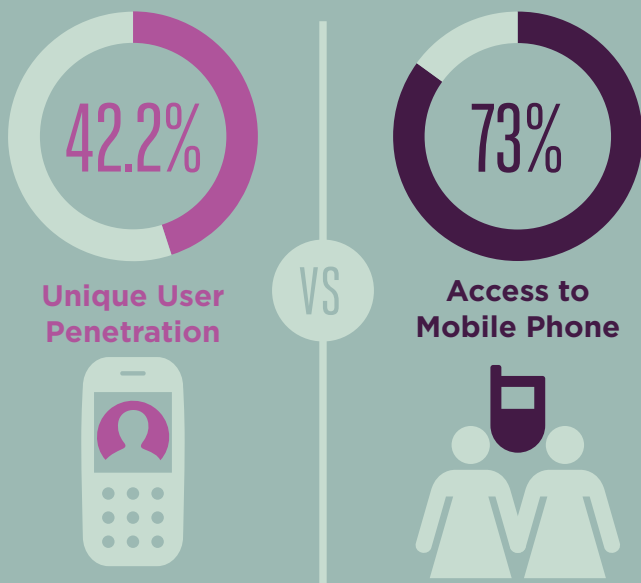
Advantageous for mHealth

GDP versus spend

VS

LOW GDP PER CAPITA

LOW SPEND
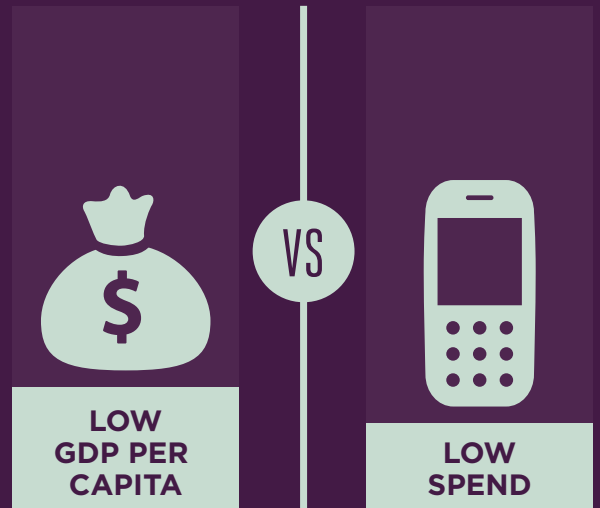
Zambia has a relatively low GDP per capita, ranking third lowest against comparator countries and has a correspondingly low percentage of GDP spent on mobile, ranking second lowest.

Advantageous for mHealth

Spend versus income

VS
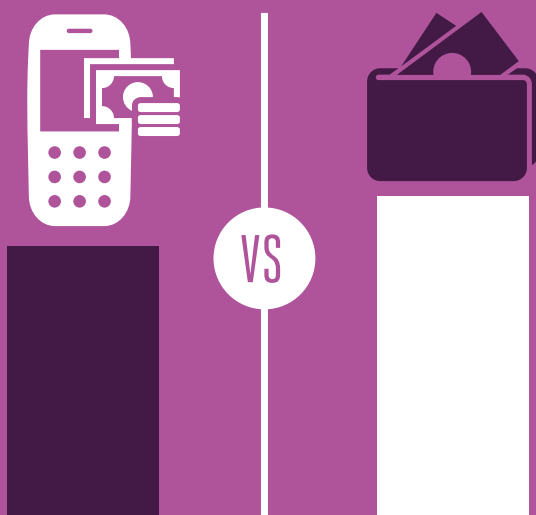
Spend on mobile relative to available income is higher than the normative range for the 10 nutrition initiative countries at

USD$12 per month

Advantageous for mHealth

Government support of health services

Zambia has the second highest spend by government on health initiatives.
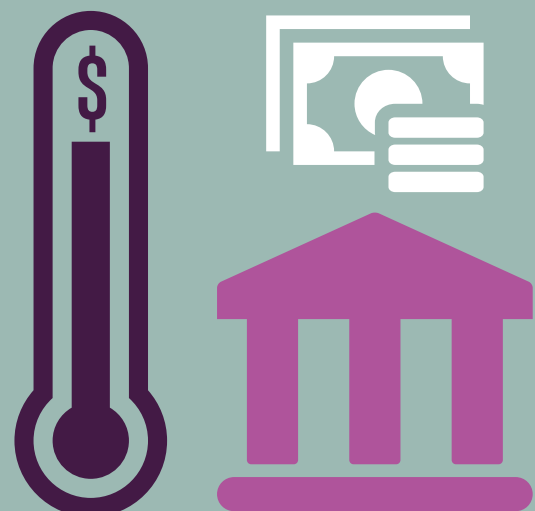
Advantageous for mHealth and B2B models specifically

General market conditions

Figure 1 highlights some of the features of the Zambian market in relation to mHealth

Figure 1
Zambia General Market View SWOT

➕ STRENGTHS

There is a need for health registration and medical records collation in Zambia and a number of initiatives have sought to tackle this, e.g. the Zambian Smart Care initiative. The mHealth sector is also tackling this challenge in Zambia - 41% of GSMA tracked mHealth initiatives are involved with data collection and reporting of some sort. The second most prevalent initiative (education & behaviour change) makes up 22% of mHealth initiatives. This market feature illustrates the important role mobile plays in tackling the critical issues facing the Zambian health sector.

Four of the total health conditions currently addressed by mHealth and tracked by the GSMA are amongst the top 10 causes of death in all ages in Zambia: HIV, malaria, diarrhoeal diseases, and respiratory infections (cumulatively contributing to 43% of deaths in all ages). These same health conditions are amongst the top 10 causes of death for children under-five (cumulatively contributing to 46% of deaths).

➖ WEAKNESSES

While Zambia is tackling the lack of skilled health personnel, it has only increased what it defines as other health workers, which includes CHWs and midwives, by 13% and 18% over the 2005-2010 period. This is both the lowest and second lowest increase across all health personnel cadre indicators for this period, despite such staff being the front-line health personnel in rural and underserved regions.

Only 4 services report to be reaching something approaching national scale and only one reports the number of districts reached (74 out of 89 districts), despite in-country mobile coverage reaching 73% (Q4 09), with almost 38% coverage of 3G (people that live in areas served by a mobile cellular signal).

➕ OPPORTUNITIES

There are currently only 2 mHealth services addressing maternal or infant and young child nutrition tracked by the GSMA in Zambia. This is concerning as data shows that 45% of children under-five are stunted and 21% are severely stunted. Moreover, in Zambia women with no education are more likely to be undernourished (12%) than those with more than secondary education (6%). End-user education towards good nutritional intake is a particularly effective method to tackle these issues and mobile with its wide area coverage and ability to deliver both text and IVR-based information (base of pyramid/illiterate) is well-placed to tackle this deficiency.

The Zambian regulator is open to stakeholder input when adapting regulation in order to fulfil requirements. The regulator is actively seeking input on its universal access regulation and the two largest MNOs in Zambia (MTN and Airtel) are involved in defining standards for mHealth. This provides the opportunity to adapt these standards in a way that benefits patients and the commercial mHealth sector equally.

Analysis of mHealth service coverage in Zambia indicates that services are not being deployed in regions that have the biggest health burden, e.g. there is a greater overall health burden in the Northern Provinces of Zambia but only 9% of mHealth services have been launched there, compared with 32% in Lusaka which has a considerably lower health burden. Consequently, there is an opportunity to target these deficiencies with mHealth services, based on demand-side metrics.

➖ THREATS

Although there is evidence of partnerships between mHealth providers and the MoH in Zambia, only 18% of tracked services include cross-sector partnerships (government, academic, MNOs and funding parties). Cross sector partnerships enable greater breadth, reach and quality of service delivered, while improving the efficiency of processes involved in provisioning mHealth.

The Zambian government is aware of the high in-country health personnel attrition rate and has begun a number of initiatives to tackle this. In many cases these initiatives benefit from the use of mobile connectivity. However, there is a general feeling that they lack cohesion or any form of collaboration in approach. The result is that health burdens are not being tackled in the most efficient manner. There is a risk that this lack of cohesion and co-operation will become engrained as MNOs in the region attempt to differentiate their mHealth service offerings . This is a particular risk in Zambia due to the highly competitive operator environment.

Source: GSMA M4D mHealth 2015

Zambia is tackling the dual challenges of a growing population and a lack of human resources, to effectively care for this population.

Figure 2

Selected Zambian health personnel data; actual and recommendation shortfall - 2010

Type	Available	Recommended	Shortfall	Increase 2005-2010
Doctors	911	2,391	1,480	41%
Nurses	7,669	16,732	9,063	26%
Midwives	2,671	5,600	2,929	18%
Nutritionist	139	209	70	114%
Other Health Workers	320	6,000	5,680	13%
Admin	14,457	12,054	-2,403	
Total			**16,819**	

*Total shortfall shown is for all 13 health personnel cadre in 2010
Source: 2010 MoH Zambia, MoH HRIS database

Taking into account all health personnel indicators (13 cadre types in 2010) there was an average shortfall of 1,609 healthcare individuals across Zambia[1].

The shortfall in staff is compounded by the dissemination of these health assets.

1.   MoH Zambia, MoHHRIS database 2010 'gap to establishment number'

Figure 3

Zambia population distribution and heath personnel/1000 population of specified region
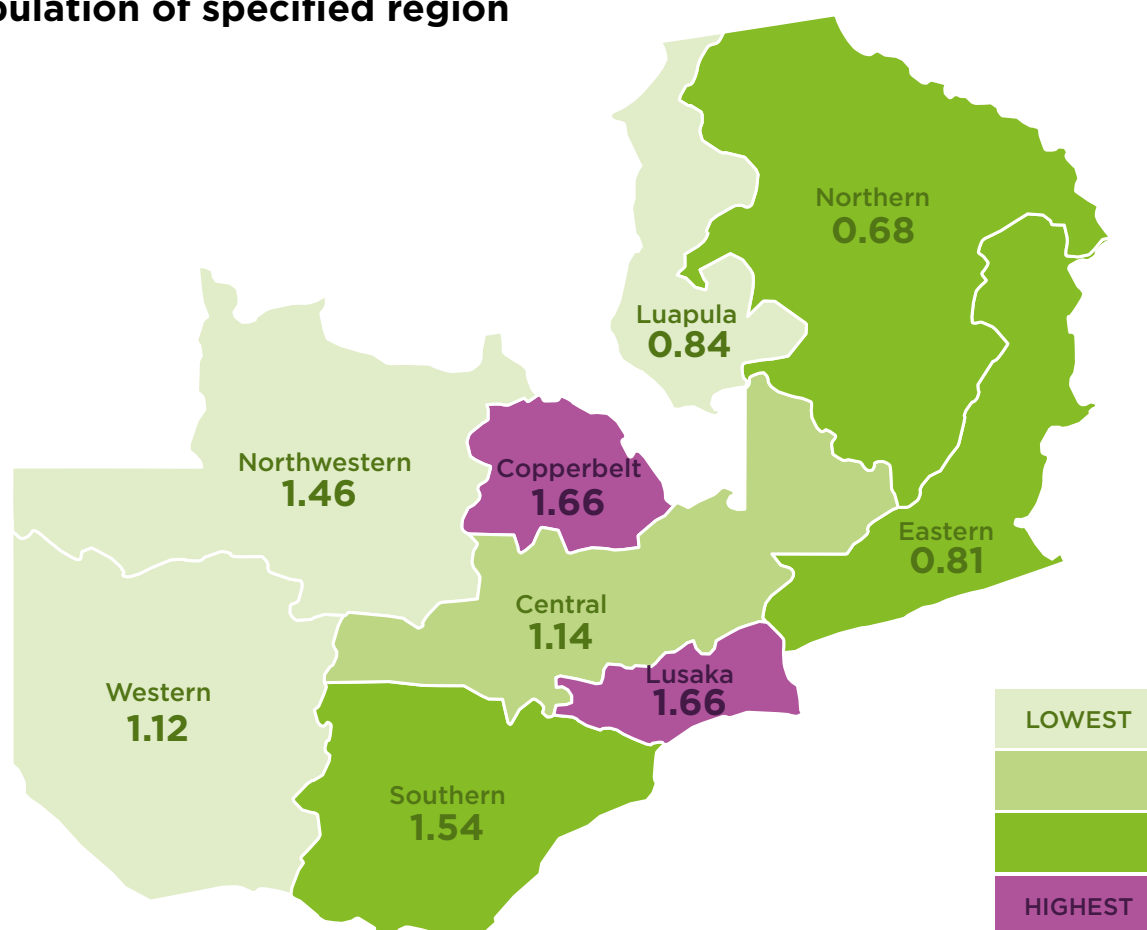
REGION	POPULATION	HEALTH PERSONNEL/1000
Northern	1,759,600	0.68
Luapula	958,976	0.84
Eastern	1,707,731	0.81
Western	881,524	1.12
Central	1,267,803	1.14
Southern	1,606,793	1.54
Northwestern	706,462	1.46
Copperbelt	1,958,623	1.66
Lusaka	2,198,996	1.66

Source: National Human Resources for Health Strategic Plan 2011 – 2015

The lack of health personnel in Zambia can be put into context when considering that the Millennium Development Goals (MDG) attainment requirement is a proxy ratio of two medical doctors and 14.3 nurses per 1000 of the population. Compounding this problem is the urban rural population imbalance and the attrition rate of health personnel.

Figure 4

Urban-rural distribution of clinical healthcare workers per/1000 population
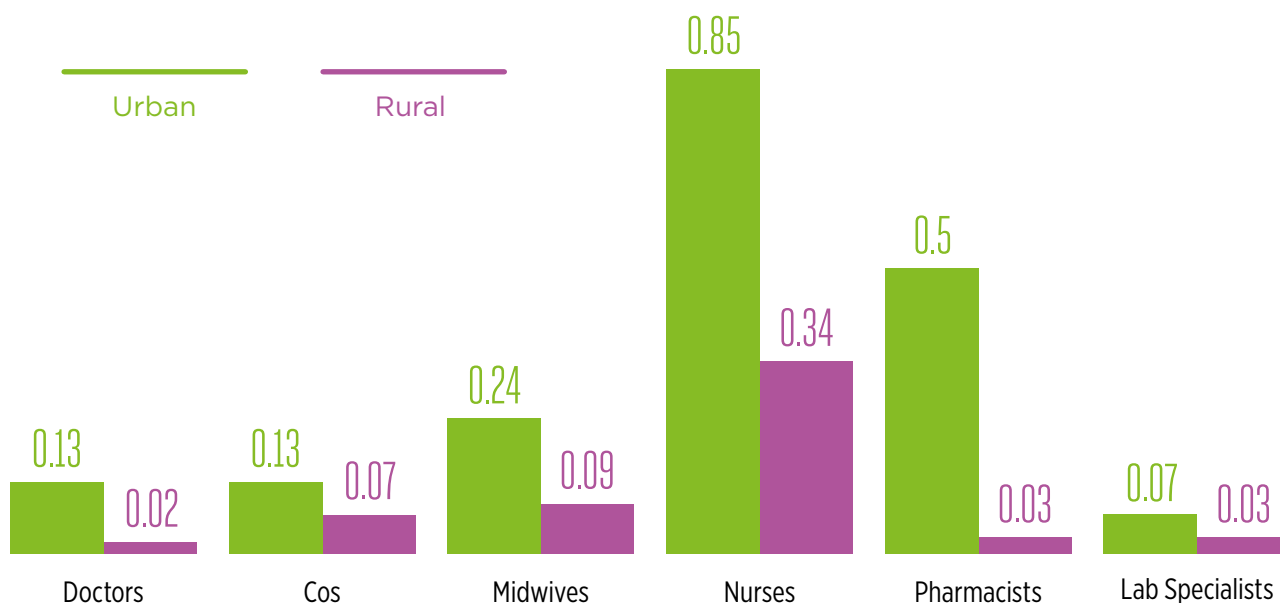
Source: Global Health Workforce Alliance

The second of these problems is of particular concern, with almost 19,000 health personnel churning from the Zambian health sector during 2011 alone. The Zambian MoH Workforce Review[2] suggests that enlarging training programmes and extending the scope of training would provide possible solutions, but this strategy faces a number of challenges in Zambia, not least of which is the distribution of CHWs.

Mobile acts as a knowledge multiplier and in Zambia it has the opportunity to improve the expertise of primary care providers, by increasing ICT-enabled health that can then be disseminated to a wider audience to overcome some of those problems highlighted.

Mobile enables knowledge to be shared across boundaries without the need to be facility-based, while a two-way mobile device means that data can be pushed and pulled, which is more conducive to education (question and answer). There are multiple CHW training programmes active in Zambia that use mobile devices, including initiatives from Dimagi (CommCare), the Grameen Foundation (MOTECH) and D-tree. These trailblazing initiatives can be developed to incorporate more complex multimedia capabilities (video, visuals, immersive multi-media, augmented reality, gamification, etc.) that have the potential to enrich approaches to education.

2. Ministry of Health. Health Workforce Review. Government of Zambia: Lusaka. 2010.

While mobile has the potential to extend and make CHW training more inclusive, it is also important to consider its impact on influencing CHW behaviour and improving patient care. A Zambian study carried out in 2011 showed that CommCare, an open-source mHealth platform designed for decision support, behaviour change communication, data collection and client management, helped improve linkages between community and clinic, improving follow up rates with "the system widely penetrated into the ...communities" and showed "functioning linkages between community and clinic"[3]. In Zambia's neighbouring country Tanzania a randomized control study found that feedback generated from data collected by mHealth applications increased CHW visit frequency[4] and that SMS reminders that were escalated to a supervisor in the case of missed appointments improved CHW visit timeliness by 86%. Finally, a 2012 study in India[5] showed that CHW knowledge retention (after four months) was positively influenced, with recognition of danger signs in all health categories increasing from a baseline of 48% to 70%.

As such there is a growing evidence base of the efficacy of mHealth applications in CHW training, decision support and procedure efficiency improvement.

3. Schuttner 2011; Use of mobile phone guided community outreach for integrated primary health care and HIV services in Zambia. Poster TUPE444, Sixth IAS Conference on HIV Pathogenesis, Treatment and Prevention, Rome, Italy
4. DeRenzi 2012:; Improving community health worker performance through automated SMS
5. IntraHealth2012; Putting Information into the Hands of Community Health Workers

Health personnel attrition and churn rates in Zambia

Zambia suffers the dual challenges of a lack of skilled medical staff and a high churn rate of that staff. Analysis by the Public Library of Science (PLOS) undertaken in 2002 and followed up in 2011 demonstrated that this is a continent-wide problem. Medical staff migration to North America alone had grown annually and reached 38% (approximately 18,819) and was set to continue to grow (data beyond 2011 was not available). To put this into perspective this figure equated to more than the aggregate number of doctors working in Ethiopia, Ghana, Liberia, Tanzania, Uganda, Zambia and Zimbabwe during 2013. In Zambia approximately 38% of the total population of nurses had filled out the paperwork required to work abroad, according to data from the Zambian Nursing Council during the 1995-2005 period. It is not known how many actually left the country.

There have been a number of attempts to tackle this issue in Zambia. The UK Government, through the DFID funded Human Resources for Health Program, is providing support to the Government of Zambia to increase the public training capacity for healthcare personnel and improve retention, aiming for the government to be able to train an additional 3,100 community health assistants, 360 skilled birth attendants and 40 biomedical engineers over the 2013-2018 period. The 5-year initiative includes retention strategies based on bonding and career planning/incentive schemes. The sustainability of this initiative is secured, as the Government of Zambia has already taken full responsibility for the additional training capacity that was created and has committed to recruit and put on pay roll all community health assistants that are being trained.

Combining mobile with incentives like the Human Resources for Health Programme can assist in the retention of personnel and the efficiency and impact of existing personnel. These advantages include but are not limited to:

- Training, incentives and career growth through use of mobile job-aids, pushed training and health apps

- Increased impact of existing CHWs through the multiplying features of mobile, including remote access to health personnel and connections to patients and enhanced access incorporating voice, visual and text aids. Improved and cost-effective access and communication, to bring information and knowledge to geographically remote regions

- Improved speed and less labour intensive data gathering for health personnel, that can be linked to centralised data depositories e.g. tracking registries and epidemiological databases

In order for Zambian mobile service providers to buy in to mHealth in the long-term, commercial viability must be proven. Combining the various stakeholders in the way described can provide this viability through a shared value proposition. This proposition depicts the tangible (health impact, cost, ROI, market share, other) and intangible (quality of service delivery, brand loyalty, other) aspects, creating a value proposition that speaks to both public and private stakeholders.

Zambian initiatives to tackle specific countrywide health challenges

As stated, the Zambian government is aware of the challenges it faces in the area of health service provisioning and has undertaken a number of initiatives to tackle them. One of the most ambitious was the Zambian National Community Health Worker Strategy. This nationwide project began in 2010 and was designed to formalise and standardise the CHW role in Zambia. Specific aims included defining and clarifying the role of the estimated 23,500 community health volunteers in Zambia, improving management capabilities (formalising and creating structure), improving CHW motivation, ensuring cost efficiencies and improving training opportunities. It was originally envisaged that the project would run until 2015.

Mobile has played an important role in the attainment of these aims by improving access to logistically remote and overstretched CHW resources, providing motivation through training and ensuring CHWs are recognised, verified, better managed and communicated with on an ongoing basis. The UK has directly assisted in this endeavour, by providing mobile community-based monitoring systems that strengthen the supervision and retention of CHWs. The DFID funded Human Resources for

Health in Zambia Programme has used mobile to input a wide range of health indicators into the DHIS2 (District Health Information System), a web/cloud-based community level data system designed to record community health activities, as well as providing mobile phones and talk time to CHWs in Zambia involved in the programme.

The government of Zambia has led and funded the implementation of its National CHW Strategy, 2010 from the start, with initial support from the UK Government.

A mechanism to sustain impetus behind CHW funded training initiatives that involve mobile is the incorporation of premium aspects to any mobile offering. CHWs might be incentivised by being provided premium data services as part of the incentive for providing services and using mobile. Such an approach can create a self-sustaining revenue stream, as CHWs experiment with data services and latterly begin to purchase them.

---

6. Preparing the next generation of community health workers: the Power of technology for training – Dalberg 2012

Creating a self-sustaining and scalable proposition is part of the solution required for improving CHW resources in Zambia. The other feature is understanding the individuals involved; what inspires them, stimulates them and incentivises them to continue to provide best-in-class care.

The Zambian government is working with a number of partners to define and clarify best practice. In collaboration with USAID a national field experiment was set up to look at broad strategies for the compensation of CHWs. The outcomes were designed to identify how framed opportunities influence field representatives.

Figure 5

USAID/Zambian Government national CHW field experiment strategic aims

STRATEGY TYPE	INCENTIVE TYPE INPUTS	MOTIVATION AND PERFORMANCE IMPACT OUTPUTS
Strategy 1 Recruitment 'message' geared toward "community" benefits of becoming a CHW, such as serving and being a leader in one's community.	Monetary and 'in-kind' incentives Professional feedback (career advancement) Social recognition (community standing)	TO BE ASCERTAINED AT DATA EVALUATION STAGE
Strategy 2 Recruitment 'message' geared toward "career" benefits of becoming a CHW, such as opportunities for promotion or further professional development	**Testing recruitment methods and incentives schemes**	

Source: USAID, Zambian Community Health Worker Strategy, GSMA

The strategies that are being tested combine social and monetary benefits-in-kind approaches. Ultimately the project should ensure that practical approaches and strategies can be identified and enacted in the Zambian National CHW Strategy.

Mobile will play an important role in facilitating both types of strategy. An example is the provision of monetary incentives, knowledge and training that is required to advance a career in medical care. There are a number of approaches that can be exploited to ensure CHWs are performing to the best of their abilities using mobile and ensuring that they are sustained in their positions.

Figure 6

Examples of retention and efficiency features applicable to CHWs in Zambia enriched by the use of mobile

RETENTION FEATURE	EFFICIENCY FEATURE	HOW MOBILE FACILITATES
Financial Remuneration; loyalty and impetus to perform particularly when results based.		Mobile money: In many cases the only mechanism for remunerating the unbanked/base of pyramid CHW. Alternate payment incentives include call credit and or access to VAS – this also benefits MNOs by encouraging data use through experimentation with data.
	Equipment/instructions; access to appropriate information creates a sense of confidence in the CHW and patient.	The mobile device provides direct access to information and is instantly updatable; 'right tools for the right job'. The equipment also increases CHW motivation and enhances credibility within the communities with mobile multimedia being seen as cutting edge tech.
Supervision: Support and assistance increasing confidence and skillset mix.	Increase in effectiveness and long-term potential for improvement in number and complexity of medical procedures undertaken.	Mobile provides remote access that is two-way (call & connect) and can actively 'chase' for assistance (calling). Advanced mobile usage models allow for multiple formats of support including information and data augmented or multimedia real-time support. It also creates the opportunity to refer when serious medical situations occur, reducing trepidation and obstacles to learning and improving medical skill sets.
Career & development: Sense of opportunity from self development and advancement opportunities creating sense of engagement and activity.		Remote certification & sequential development: the mobile device empowers CHWs to train at their own pace using training tools and tests while gamification can be leveraged to improve the retention and enjoyment factor of learning building toward accreditation and self-improvement.
Integration with national health systems: Creates a sense of involvement and improved knowledge dissemination creating a better working environment.	Centralisation is inherently efficient. Providing a single system creates interrelation and efficiency savings while increasing the speed of process implementation.	Mobile as a networking device provides the capability to centralise and integrate while ensuring connection to centralised sites i.e. clinics, health centres and the medical professionals within these. It can also provide a single channel from which centralised messaging and procedures can be disseminated.

Figure 6 demonstrates some of these capabilities while identifying if the approach is a retention feature, an efficiency feature (and so a cost benefit) or a combination of both.
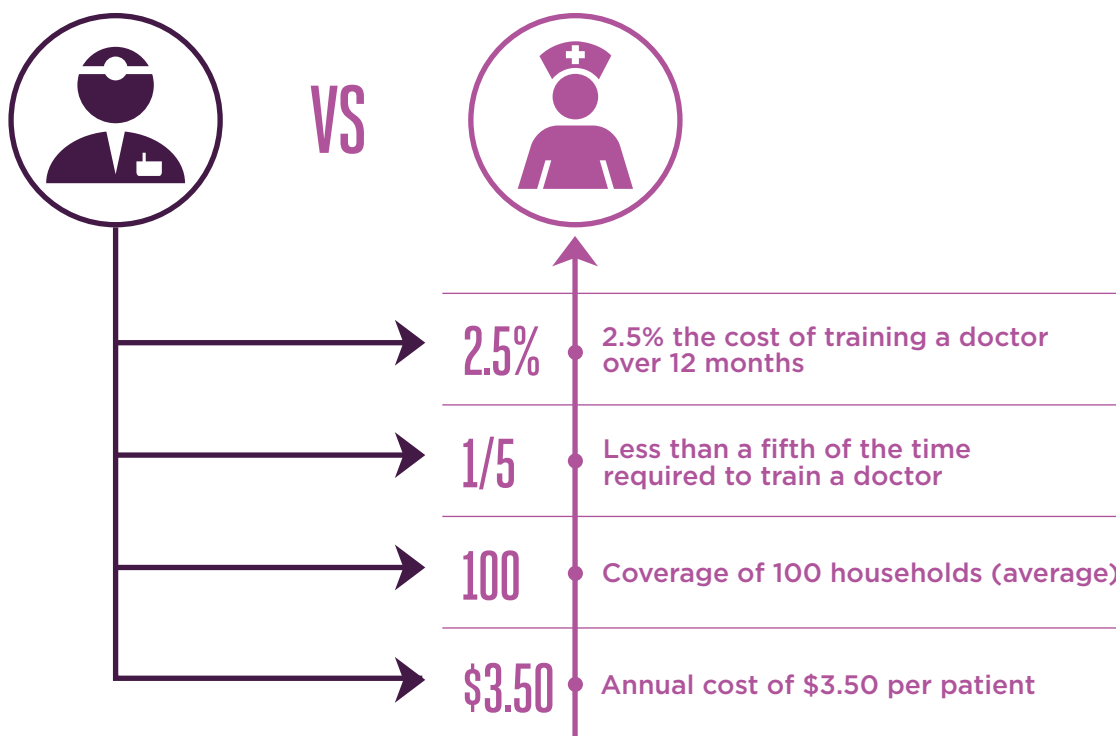
Cost effectiveness analysis

In Europe approximately 170,000 doctors are trained annually in comparison to just over 5,000 or 3% of this number, in SSA. In order to bridge the gap in health personnel it is estimated that an additional 3.5 million CHWs[7] are required to achieve MDG's 4, 5 and 6.

Whilst CHWs are not as experienced as other trained health personnel they have a critical role to play in filling the health worker deficit. With limited resources available to train and remunerate health personnel in Zambia CHWs provide an excellent return both in financial and quick-to-train terms.

Figure 7

CHW costs versus other health personnel in SSA

VS

2.5% 2.5% the cost of training a doctor over 12 months

1/5 Less than a fifth of the time required to train a doctor

100 Coverage of 100 households (average)

$3.50 Annual cost of $3.50 per patient

Source: McKinsey Quarterly, Earth Institute, WHO Human Resources for Health

The efficiency improvements of utilising mobile to train and assist CHWs in decision support in Zambia have been highlighted, but there are also cost efficiencies in this strategy. Digital training materials are easier and significantly cheaper to transfer and localize than conventional training materials. An estimated saving of 77%[8] (USD$65 vs USD$15) can be realised when the upfront costs of developing this content are subsumed. The GSMA is committed to creating such content as part of its nutrition initiative by removing this cost obstacle. These cost savings are particularly pertinent to Zambia due to the high attrition rate, dissemination of health personnel and low number of health personnel per-patient.

---

7. High Level Taskforce on Innovative International Financing for Health Systems
8. Preparing the next generation of community health workers: The power of technology for training - Dalberg 2012

The Zambian opportunity to scale mHealth services

As part of the GSMA nutrition initiative country feasibility research, we set out to identify the most comparable health, mobile and economic indicators and datasets within each of the 10 priority countries. These indicators are represented in figure 8.

Zambia shows a moderate-to-strong potential to scale mHealth, as indicated by its top five positioning in 57% of selected indicators. This is the joint highest combined ranking for these indicators across the GSMA nutrition initiative countries. In terms of top five positioning, Zambia sees the majority of indicators ranked fifth (38%) compared with approximately 8% in the topmost position (rank 1). The average for rank 1 indicators when compared across all 10 GSMA nutrition initiative countries is 10%, placing Zambia slightly lower than the norm for this indicator.

Figure 8
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	Rwanda 5.82%	Tanzania 37.58%	Malawi 39.02%	Uganda 44.30%	Mozambique 45.66%
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, WorldBank, GSMA Intelligence, M4D Impact

*Indicator metrics in table have been left in original format. Data in market indicator analysis normalised for cross indicator comparison.

Market indicators in Zambia

Figure 9

Mobile phone use: penetration versus access to mobile

Unique user penetration

Access to mobile phone

42.2%

73%
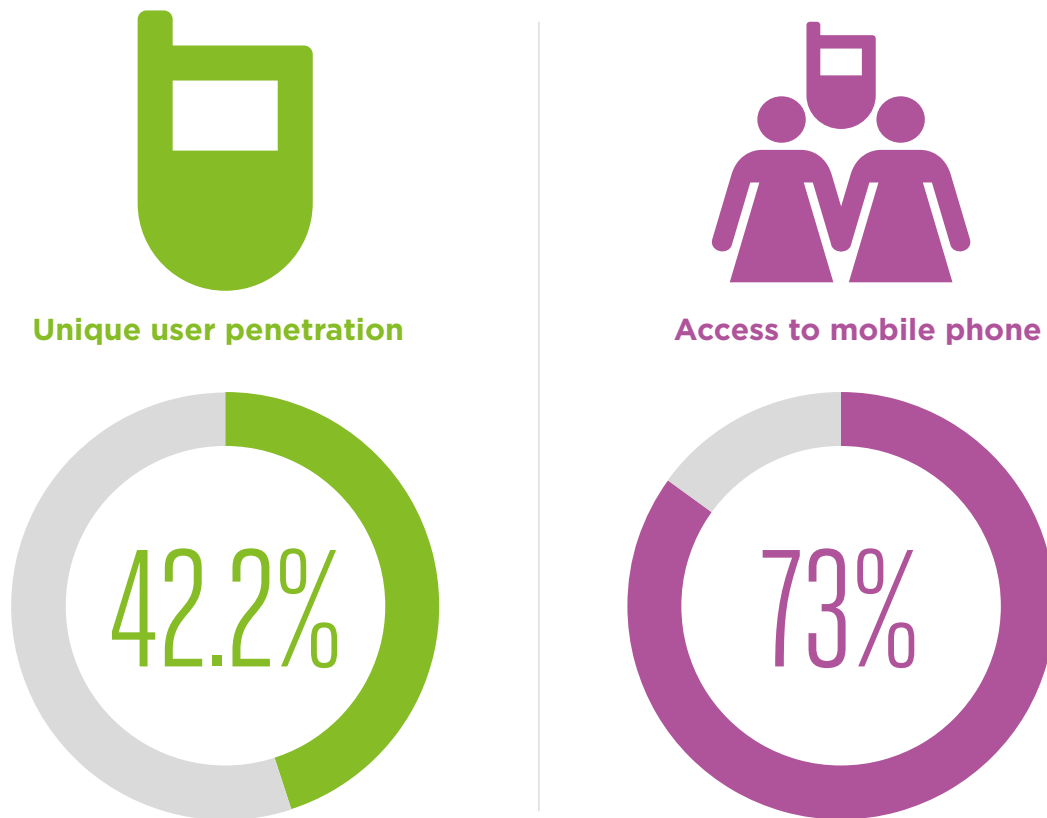
Source: GSMAi Q42014, Audience Scape National survey Zambia April 2010 N=179 adults (15+) who use a mobile phone at least weekly, but do not own mobile. Adapted by GSMA (revised urban rural percentages to correct weighted average).

The indicator shown in figure 9 combines urban and rural average. This feature is more pronounced when considering urban access alone, which in Zambia reaches 83%. This is an important consideration, as low rural mobile phone usage is likely to distort weighted average calculations when using urban rural population splits as used in figure 9.

Figure 10

Zambian regional population density and health personnel coverage per 1000 persons compared with access to a mobile device

Region	Population	Health Personnel/1000	Access to mobile*
Northern	1,759,600	0.68	61%
Luapula	958,976	0.84	34%
Eastern	1,707,731	0.81	65%
Western	881,524	1.12	44%
Central	1,267,803	1.14	62%
Southern	1,606,793	1.54	53%
Northwestern	706,462	1.46	52%
Copperbelt	1,958,623	1.66	71%
Lusaka	2,198,996	1.66	86%

Source: National Human Resources for Health Strategic Plan 2011 – 2015, AudienceScapes national survey of adults (15+) n=2000, Central n=191, Copperbelt n=334, Eastern n=264, Luapula n=157, Lusaka n=293, Northern n=243, Northwestern n=118, Southern n=245, Western n=155.

*persons who have access to a phone at least once per month.

Figure 10 quantifies the opportunity for providing mHealth services as personnel multipliers in those regions that have health personnel deficits in Zambia. While some regions show greater potential in the accessibility of mobile devices, all regions exhibit some potential. In no region is less than a third of the population able to access a mobile device, while the weighted average across the regions is 63%, based on population densities.

The Northern and Eastern regions in Zambia exhibit particular potential to develop mHealth services, presenting a high population density, low health personnel penetration and good access to mobile devices.

As part of the quantitative evaluation process, the 10 GSMA nutrition initiative target countries were evaluated, scored against a set of comparable indicators and placed in a ranked scale.

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

Figure 11
Criteria considered for opportunity matrix indicator

PROXY INDICATORS

CATEGORIES

DRIVERS

- Maternal mortality rates
- Infant mortality rates
- Child <5 mortality rates
- Child <5 stunted rates

Maternal Mortality
Child Mortality
Incidence of Stunting

Health Burden

- No. pregnant mothers
- No. mothers with children <5

Target Audiences

Available Market

- Unique mobile subscriber penetration
- Mobile sub penetration 5-year growth rates
- Mobile geographical coverage

Market Growth Indicators

- Per capita income
- Percentage above poverty line
- Percentage of out-of-pocket spending on healthcare
- ARPU divided by per capita income (12mnth period)
- GINI coefficient (negative)
- Income held by top 10% of population (negative)

Business to Consumer Potential

Market Potential to Pay

- Percentage of government health spending per capita
- Percentage of health services funded by NGO

Business to Business Potential

It is important to consider the proxy indicators that 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.

The opportunity matrix 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.

In figure 12 below the comparative health opportunity of Zambia is compared across the 10 GSMA nutrition initiative countries. The health burden opportunity in Zambia is high, at a comparative index of 1.4, indicating a higher health burden opportunity compared to other priority countries. This is predominantly due to high child stunting rates in the country, the second highest of the GSMA nutrition initiative countries, combined with high infant and child mortality rates. These indicators occupy the fourth highest spot on the 10 country point scale, with Zambian child mortality indicators at almost 16 percentage points higher than the next highest country for this indicator.

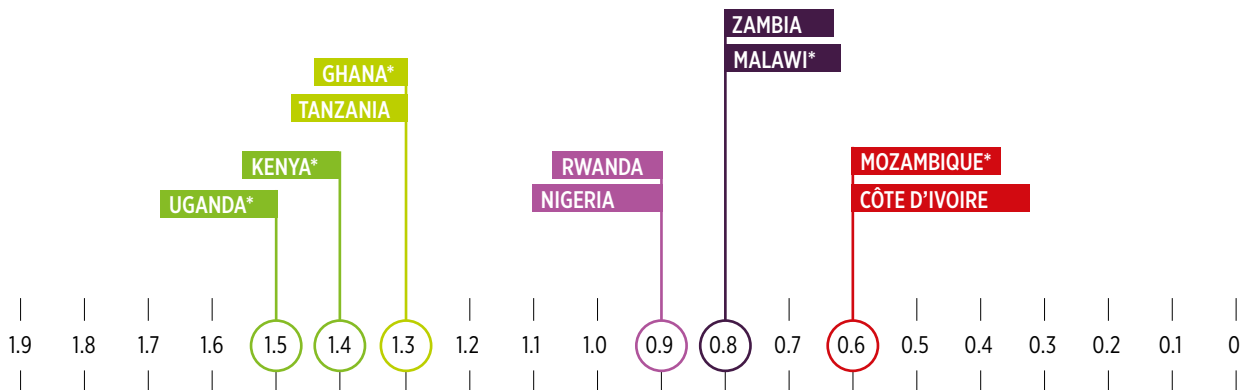**Figure 12**
Zambia health burden opportunity matrix
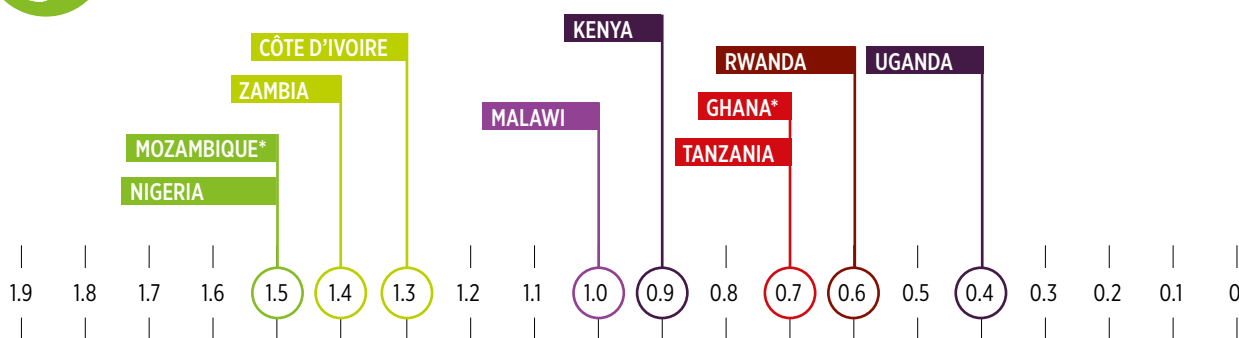
* Denotes rounding of figure

The addressable market in Zambia is defined by two halves. On the one side, Zambia exhibits high mobile usage indicators, with the second highest mobile subscription rate and third highest unique mobile subscriber penetration rate. Allied to this, Zambia exhibits the second strongest growth rate over the 2008-2013 period at 139% and the second highest penetration rate increase of 15%, comparative with the 10 consideration countries over the same period. On the other side Zambia does not feature in the top five for indicators relating to pregnant women or women, with children under-5 ranking in the bottom three for both these indicators across the comparative 10 countries. The result, when these indicators are combined, is that the Zambian addressable market opportunity is slightly below ideal at 0.8, while still in proximity to the ideal score of 1.

While health burden opportunity matrix indicators show Zambia to be below the ideal, it should be emphasised that the information considered is a current snapshot. The opportunities surrounding mHealth are also in the future. If growth trend analysis is considered, the potential for Zambia begins to improve. The country exhibits the second highest growth rate for population (17% over 2008-2013 period) and the second highest rate in increase in mothers with children under-five (28% over 2008-2013 period), comparative with the 10 GSMA nutrition consideration countries. As such, Zambia exhibits a strong potential to improve its opportunity indicators for pregnant women and women with children under-five, in the mid to long-term.

Figure 13

Zambia addressable market opportunity matrix

* Denotes rounding of figure

The Zambian market opportunity related to ability to pay for mHealth services is characterised by a number of features applicable to the B2C and B2B segment opportunity and in the longer-term market features and trends that are developing.

Overall the country occupies an index of 0.96, representing good feasibility for the payment capability of mHealth users within the B2B and B2C sectors. The burden of out-of-pocket (OoP) expenditure on health placed on the patient should be reduced where possible and in Zambia the indicators for public health system support are higher than their comparative B2C indicators. The percentage of government funding is the second highest and reliance on NGO funding is the fifth highest of the comparison countries. While B2C segment indicators are less dominant than B2B indicators in Zambia they remain within the top five; the percentage of OoP spend on health and overall spend on mobile (ARPU) both lying fifth in the scale. This apparent willingness to consume services should drive the adoption

and active use of mHealth by providing a proxy for the willingness of patients to seek out medical care beyond that which is provided for free.

In Africa ARPU is falling across the board. Zambia's decrease is relatively low, reaching CAGR 9%[9] over the 2008-2013 period, compared with 23% for the worst performing country of the 10 comparison countries. The percentage of overall income spent on mobile services has also fallen across Africa over a five year period but paradoxically, this is actually an indication of a healthy market. As subscriber penetration increases, mobile migrates into lower socioeconomic segments which do not have as much disposable income. Zambia has seen a marked increase in subscribers, by growing 139%, but has resisted the drop-off in mobile spend, falling 44% (the fifth lowest fall of the 10 countries) comparative with the largest fall of 74%. These trends add credibility to the argument about willingness to seek out medical care and demonstrate a resilience to wider African regional trends in Zambia.

---

9.   CAGR is used to smooth anomalies from year to year over reported period.

Figure 14
Zambia ability to pay opportunity matrix

1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
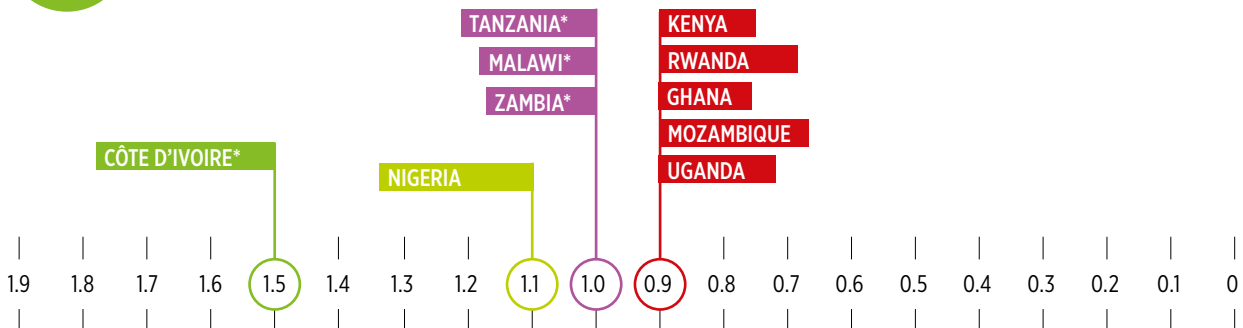
* Denotes rounding of figure

When the aggregate mHealth driver indicators are considered as a combined output (Figure 14 above) the opportunity index score for Zambia shows an ideal potential which is within positive index score indicators.

Figure 15
Zambia opportunity to scale services*

INDIVIDUAL SCALE SCORES

HEALTH BURDEN

1.36

| 0.4 | 0.7 | 1.0 | 1.3 | 1.5 |

REACH

0.8

| 0.6 | 0.8 | 1.0 | 1.2 | 1.5 |

ABILITY TO PAY

0.96

| 0.9 | 1.0 | 1.1 | 1.2 | 1.3 |

COMBINED SCALE SCORE

1.00

OVERALL INDEX SCORE
ACROSS COMPARISON
COUNTRIES
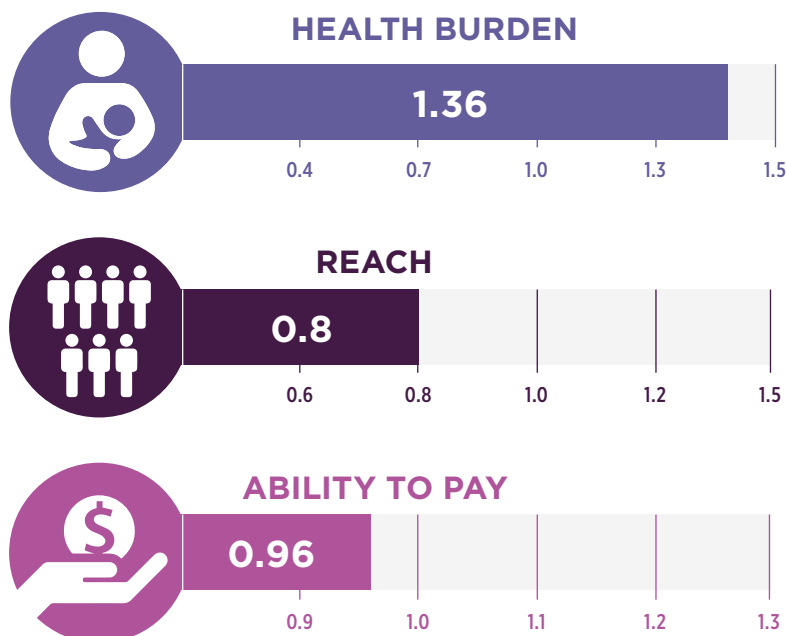
Source: GSMA. *Please see GSMA methodological framework for additional clarification on quantitative scoring

Figure 16 below compares overall ranking of the GSMA nutrition initiative countries and combines this data with the overall size of the opportunity with all indicators combined. The relative combined opportunity is an indication of the capacity (size of opportunity) of Zambia to be developed, while position on the scale gives an indication of ease with which mHealth services might be launched (degree of obstacle vs opportunity).

Figure 16

Zambian combined indicator rank and comparative size of market opportunity
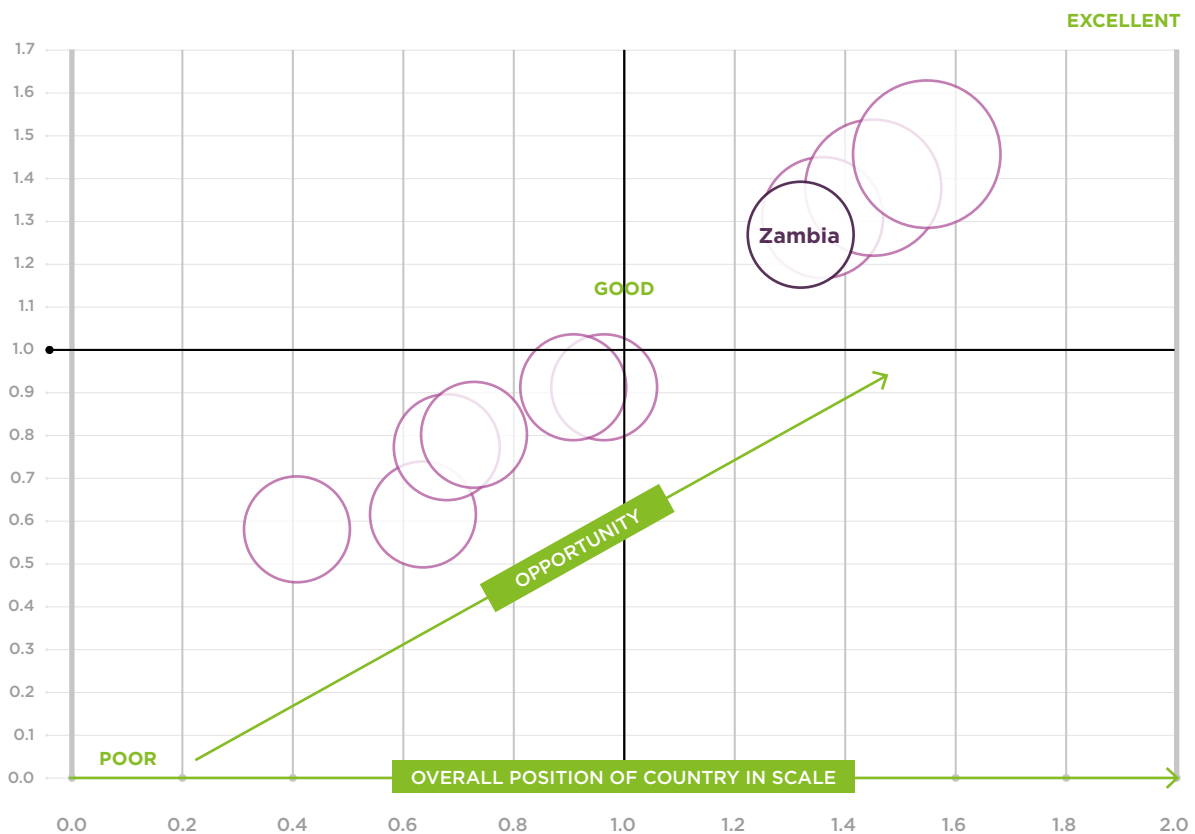
Indicates size of opportunity for combined health burden, reach & ability to pay

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

Mobile service development

Figure 17

Zambia mobile VAS evolution

SERVICE COMPLEXITY

COMPLEX

SIMPLE

VAS Data

Current Zambia Market Position

Addressable Market Penetration

M2M
› In car
› Device/home monitoring

True HD streaming
› HD TV

Cloud Storage

Most Advanced VAS countries

Proactive M2M/Telematics
› Active e.g. auto-meds delivery

LBS
› Mapping
› Info
› Ticketing
› Booking

Augmented reality
› Advertising
› Info
› Commerce

Integrated diagnostics
› Proactive

M2M distribution
› Distribution network linked
› Automated inventory & ordering

MobileGames
› Download

Social Apps

Personalisation
› Wallpapers
› Screensavers

Advanced biomedical informatics

Streamed video
› Two way video comms

Health monitoring/diagnostics
› Linked service or med provision
› Video capable

Mobilemusic
› MP3
› Download
› Stream

Mobile Commerce

Health Monitoring
› P2M
› P2P

Ringtone

Banking
› Share trading
› Financial

SimpleVAS
› SMS Info
› News
› Horoscopes
› Dating

Mobile Internet

Remote data collection

Telecare /education /training

Interactive IVR
› Human
› Au...

Remote clinician support

mHealth services

Simple Communication
› Voice
› SMS

IVR
› Registration
› Info services

Gamification
› Training
› education

SMS
› Registration
› Notification

Least Advanced VAS countries

Disease tracking

EARLIER

TIME

LATER

⬭ Service cluster ⬤ mHealth Status Point ⬤ VAS Data Status Point

Source: GSMA M4D mHealth

The dotted service clusters in Figure 17 denote four evolutionary points within the Value Added Service (VAS) and mHealth service environments. The evolution of mHealth services corresponds with the VAS evolution points as depicted above.

Zambia's VAS and mHealth service development are shown with a blue and red indicator circle. The distance between most developed service markets and least developed service markets denotes overall maturity. For comparison, a country such as the USA would be further up the scale toward 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 Zambia on this maturity scale was evaluated by considering overall market maturity. Data was considered across a number of usage metrics, including total number of VAS and mHealth services offered, complex versus simple service offering ratios, data ARPU and data ARPU increase over defined periods amongst others (full criteria for scoring is available in the GSMA mHealth Country Feasibility Report Zambia and Mozambique Methodology). This process was replicated across all of the 10 country feasibility report countries in order to generate a scale of service maturity.

Smartphone adoption was 15% (Q4 2014), placing Zambia 6th in the comparative country rankings for this indicator and just less than Nigeria, by 1 percentage point. Smartphone ownership is a strong impetus for increased VAS. Data from Q4 2014[10] showed smartphones accounted for 66% of the total mobile phone market and in the majority of markets a comparable increase in data use was seen. Smartphones provide a richer and more sophisticated environment to provide health services.

Spend on mobile relative to available income is above the normative range of the comparison countries, at USD$12 per month in Zambia. Zambia also sees lower decreases in ARPU (9%) comparative with the other nutrition countries, resisting the general trend in Africa of free-falling ARPU figures. This is despite substantial increases in subscriber numbers that can artificially accelerate falls in service revenue (penetration into base of pyramid lower spending segments). However, caution is advisable; Zambia has the second lowest percentage of GDP spent on mobile, which might indicate that mobile VAS is less of a priority than in other African countries.

Only two GSMA mHealth tracked service provider reports user figures reaching an estimated 254,690 beneficiaries (Q4 2014) in Zambia. The comparative use of feature phone versus smartphone devices to access these services is 24% vs 18%, with the majority of services (41%) accessed over basic mobile devices.

10. Source Ericsson, Gartner

Pricing mHealth services

In Zambia the existing infrastructure, billing systems and customer acceptance toward SMS make it an attractive platform to provide mHealth services. However feedback from in-country VAS and aggregator sources have identified a number of challenges for new entrants or those players who are not intimately involved with mobile operators.

Delivering the volume of services is a particular challenge for new entrants, when average cost of premium SMS is around 2 kwacha (USD$0.31) before aggregators take their cut of between 60-70% after tax. Developers can negotiate directly with mobile operators and in so doing reduce revenue shares but this has additional complexities and costs associated. Larger volumes reduce the costs but are prohibitive in size, particularly when considering that mHealth services are as yet an unproven revenue generator and that end-consumers do not perceive them as a premium service. Commercial players must also pay an upfront SMS licence per short code although aggregators can provide short codes on a pro-rata basis to reduce the costs. As such it is advisable for any commercial player launching an mHealth initiative to develop a close working relationship with an aggregator or mobile operator in Zambia.

## Features of the Zambian VAS ecosystem

The advantages of premium SMS for providing simple and inclusive access (accessed by the widest audience) to mHealth services, whether funded OoP or subsidised via NGOs, have been highlighted, but an important feature of the Zambian market is the regulator's attitude to non-profit premium SMS offerings. If a service is not-for-profit or NGO funded then the licensing fee is waivered. This provides the incentive for developers to test mHealth services and develop adaptations around freemium models.

One of the simplest mHealth services to provision is SMS delivered information. Such services can be launched relatively quickly through existing infrastructure, are inexpensive to launch (as opposed to data VAS), have a low infrastructure demand and are simple for customers to use.

Figure 18

Zambian total literacy and female literacy rates

Overall literacy rate
>15y 2010

Female literacy rate
>15y 2010
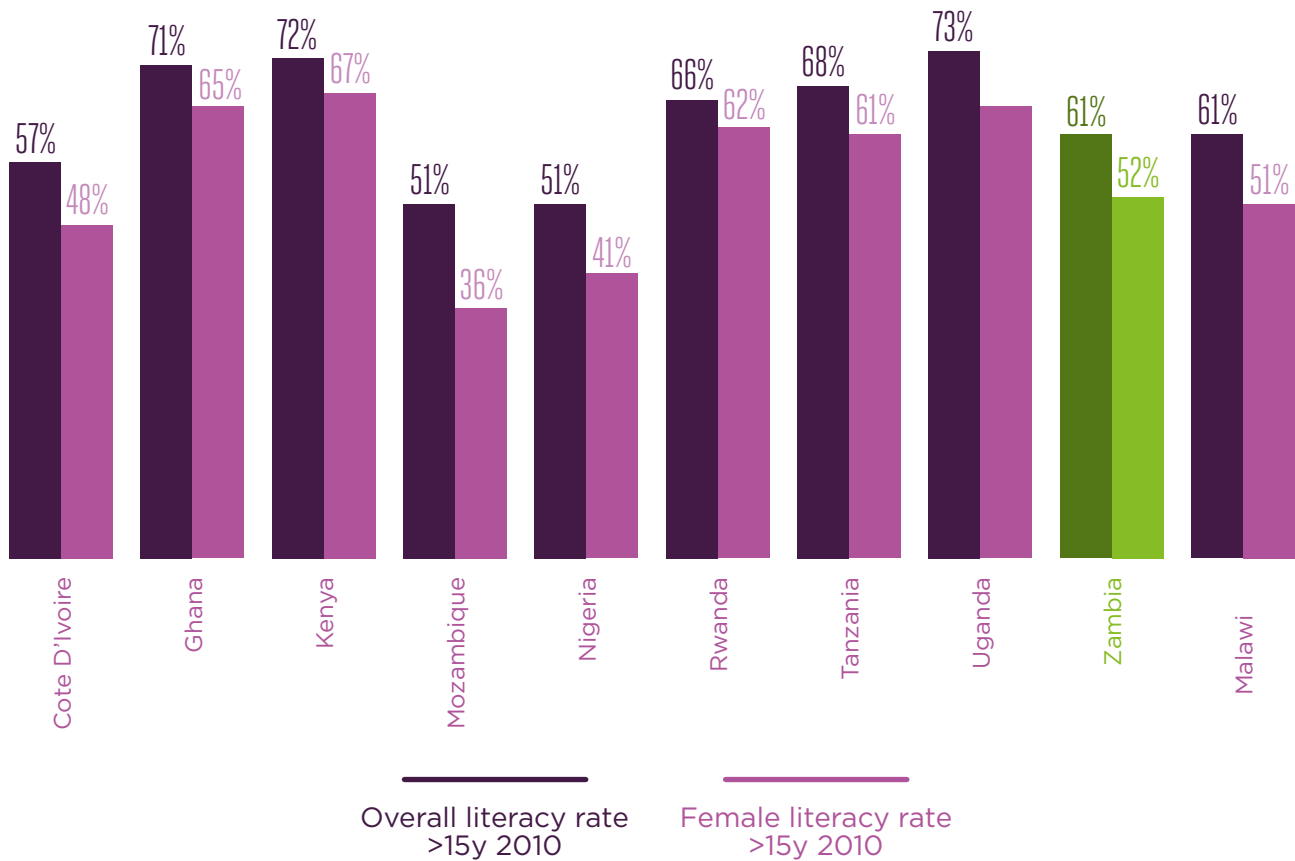
In order to reach a target audience content must be in a format that the target audience can consume. In Zambia there is a moderate level of literacy amongst the population, ranking 6th amongst the 10 GSMA nutrition initiative countries for this indicator.

The potential impact of SMS as an information platform can be seen by considering the degree of usage made by those who own or have access to a mobile phone.

Figure 19

Percentage of Zambian mobile users who receive SMS news or information on a recurring basis*
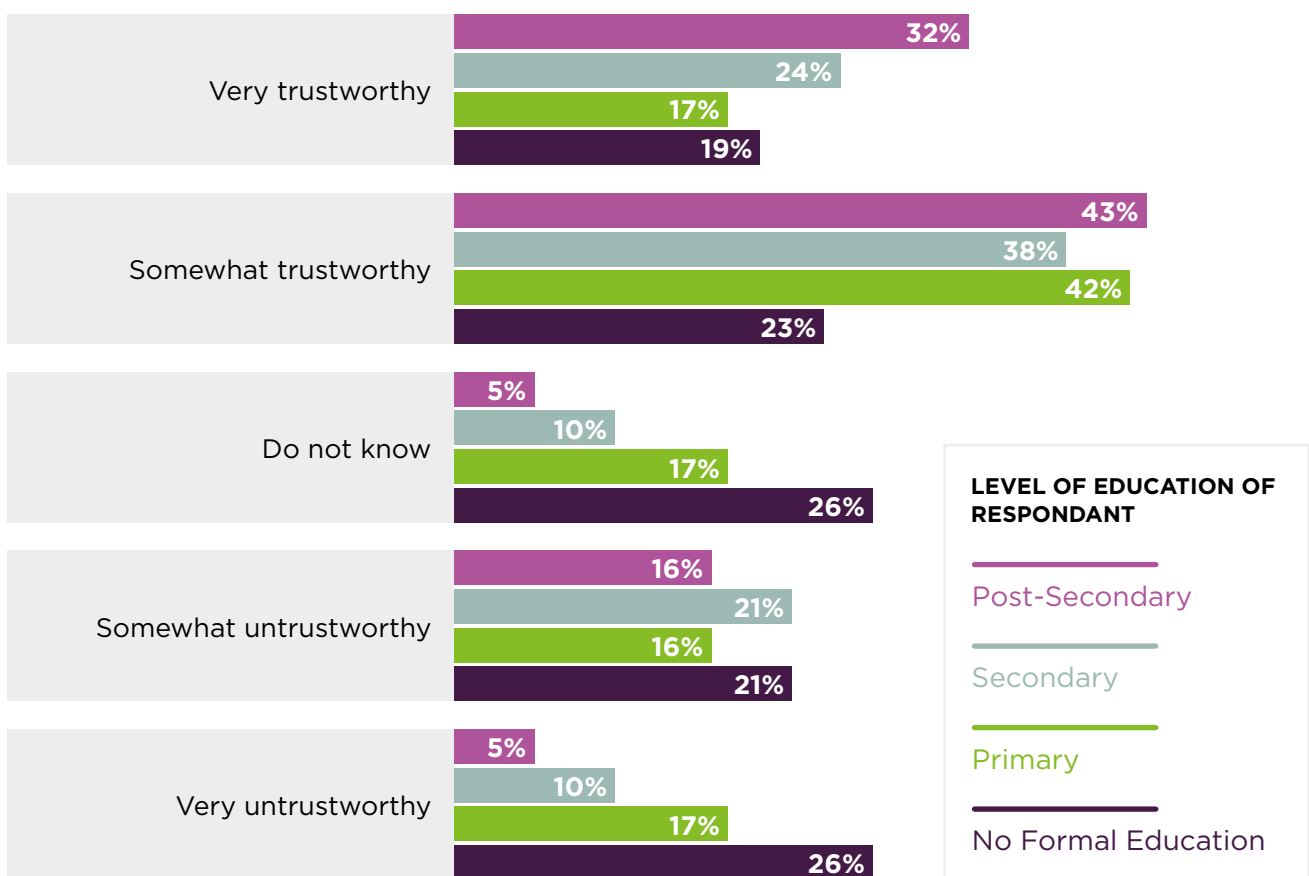

Mobile phone owner   Mobile phone borrower
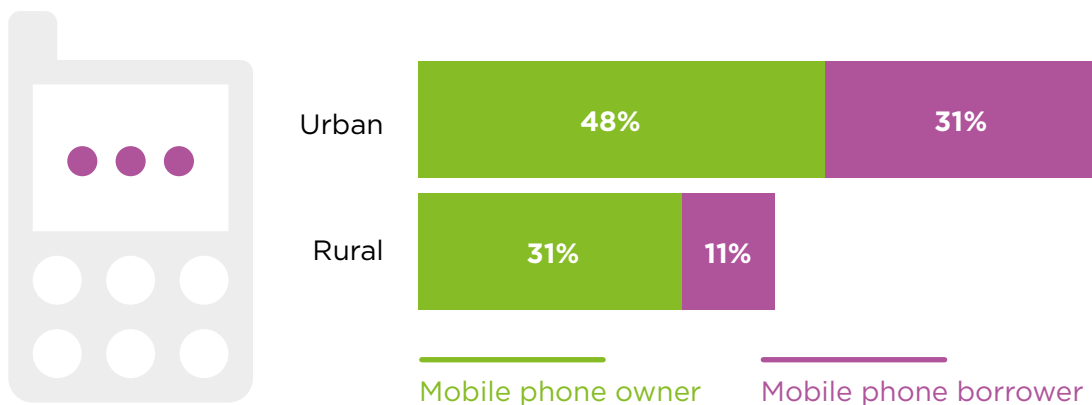
*Recurring defined as use at least once a week.
 Source: AudienceScape national survey of Zambia 2010: Adults (15+) who use a mobile phone at least once a week n-1010.

While literacy rates are moderate, mobile operators in Zambia have highlighted the problem of reaching mass markets and particularly those in rural areas, where literacy rates are considerably lower. Potential evidence of this feature can be seen by the considerably lower consumption of SMS information and content within the rural regions seen in figure 20.

An additional challenge around SMS information services in Zambia is the level of trust regarding any data that cannot be directly verified. This issue has evolved as scams and other criminal activities have begun to proliferate in-country, in many cases instigated over SMS.

Figure 20

Level of trust in relation SMS information services

Very trustworthy
- 32%
- 24%
- 17%
- 19%

Somewhat trustworthy
- 43%
- 38%
- 42%
- 23%

Do not know
- 5%
- 10%
- 17%
- 26%

Somewhat untrustworthy
- 16%
- 21%
- 16%
- 21%

Very untrustworthy
- 5%
- 10%
- 17%
- 26%

LEVEL OF EDUCATION OF RESPONDANT

Post-Secondary

Secondary

Primary

No Formal Education

Source: AudienceScape Survey response to question of trustworthiness of SMS as a news and information source 2010 (15+) n=1226 who use SMS information services

SMS, as a user remote information source, faces some challenges in this area. Despite this fact there is a moderate-to-good level of confidence in SMS information in the majority of user segments in Zambia, outside of the least educated groups (figure 20 above).
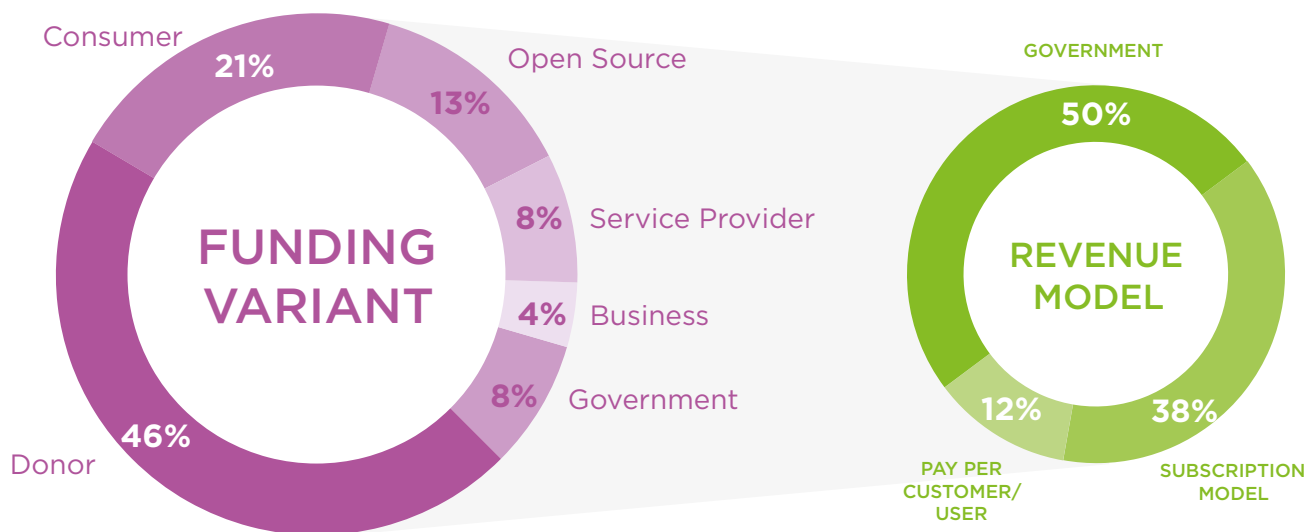
Mobile and VAS sector alignment to mHealth

The market opportunity in Zambia has been defined, but a full picture of the market is not possible without considering the value chain players who facilitate the mHealth process from a service perspective.

The mobile and VAS sector within Zambia is highly competitive and benefits from a number of large players and two dominating mobile operators, with a combined 84.4% market share. The proximity of lead operators MTN and Airtel, with 43.59% and 40.79% market shares respectively, creates a highly competitive service environment that is encouraging to service innovation and differentiation.

Stakeholders involved in the development of this report identified Airtel as one of the major movers in the mHealth space in Zambia, gaining good traction with its newly launched health micro-insurance service, Airtel Insurance. The operator has also sought to grow subscribers by forming an in-house team tasked with increasing mHealth service usage.

Figure 21

GSMA tracked mHealth service business models and revenue generation

FUNDING VARIANT

- Consumer 21%
- Open Source 13%
- Service Provider 8%
- Business 4%
- Government 8%
- Donor 46%

REVENUE MODEL

- GOVERNMENT 50%
- SUBSCRIPTION MODEL 38%
- PAY PER CUSTOMER/ USER 12%

Source: GSMA

Donor funding remains the dominant model for funding mHealth services in Zambia. Of those mHealth services that have a revenue generating model the split is relatively even (favouring B2B) across B2C and B2B (government funded). The high percentage of revenue generated through government is likely to be related to the high sponsor features of the Zambian mHealth market.

Registration, secured data interchange, privacy and the role of mobile

One of the challenges facing the Zambian health sector is the need for data service user registration, data interchange and secured patient health data.

The SmartCare Centre for Disease Control Patient smart-card system, dating from 2004, is one attempt to tackle this challenge. A number of partners including Dimagi and the Center for Disease Control and Prevention (CDC) worked with the Zambian Ministry of Health, to roll out a patient smart-card system. The system was designed to enable patients to carry with them their own medical records when visiting public hospitals and clinics. These records were then to be read by smart-card readers in facility. In its basic format the system does not connect to any central service, and data is collected by manual transfer of memory sticks. Adding mobile connectivity to this service adds additional advantages, including better records management, real-time patient updating capabilities and improved illness/disease epidemiology but is only available as a 3G option when coverage is available. This requirement for a 3G radio access network (RAN) limits the usefulness of SmartCare for base-of-pyramid and rural users or those relying on legacy connectivity (2G etc.). Mobile operators and their technical service partners are in a strong position to improve this process, offering mobile as a platform ready-made for the interoperable exchange of data that can be provided instantly, securely and across a wide area networked community.

The B2B vs B2C sectors

The mHealth opportunity in Zambia is made up of both a B2C and a B2B opportunity. Figure 22 considers a number of the feasibility metrics for these particular user segments.

Figure 22 illustrates the relative data point indicators for the B2C and B2B market opportunity in Zambia, denoted by the size of the circle. The larger the circle the greater the opportunity for that particular indicator compared with the other indicators shown. The aggregated B2C and B2B opportunities for Zambia, relative to the other nutrition initiative target countries, are indicated by the index score beneath the main chart.
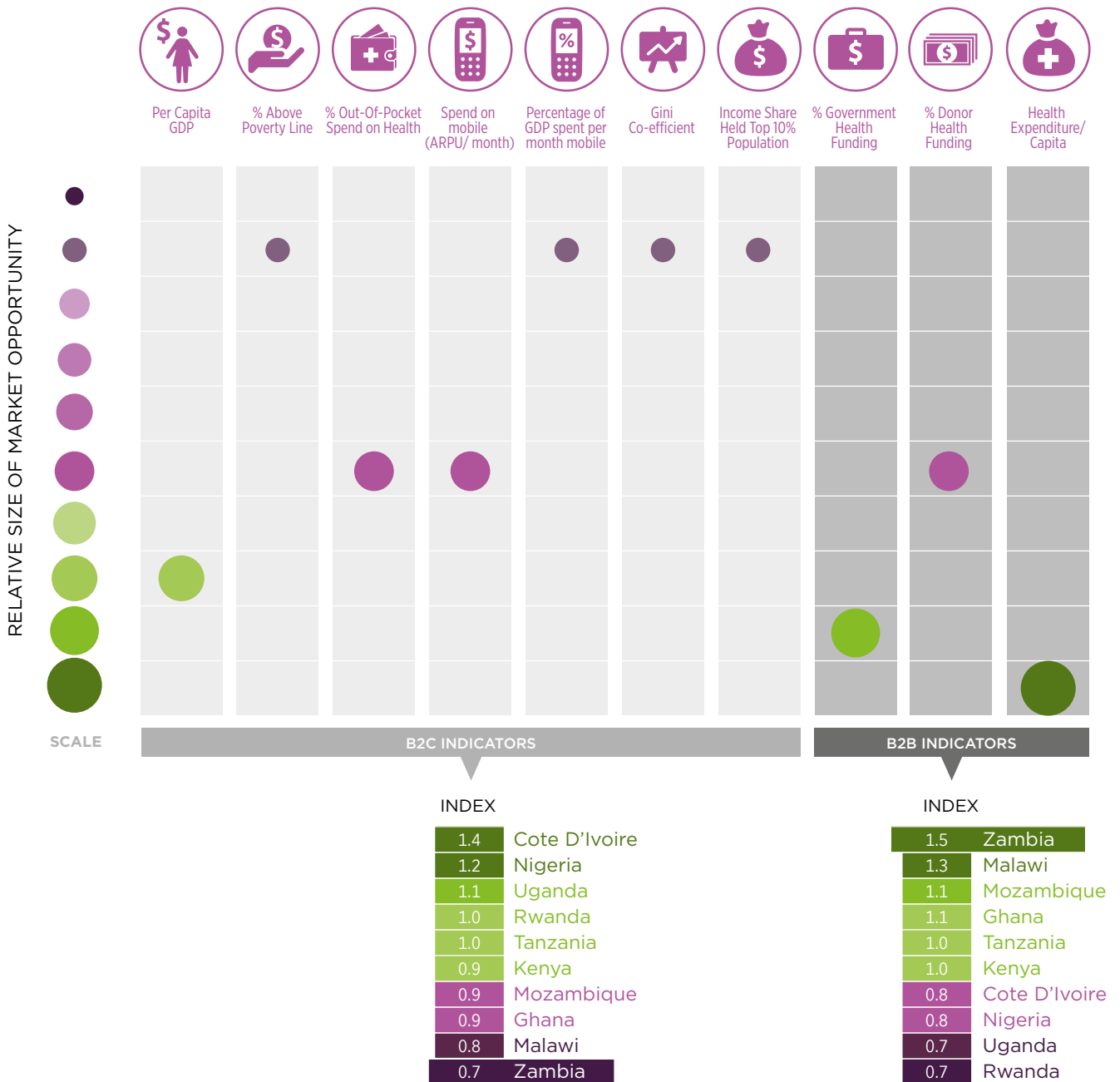
The data shown is a single set of reference points and provides a normalised and averaged view of the market. Additional insight would be attained using other qualitative indicators pertinent to specific audiences of this data e.g. a mobile operator vs an NGO. Such user-specific cross-referencing cannot be undertaken here but is encouraged to better focus market entry and market development strategy.

At this point in the development of mHealth within Zambia it is expected that the government will guide overall strategy. The opportunity indicators in figure 22 strongly support such a strategy, with Zambia occupying the topmost and bottommost position amongst the 10 nutrition countries for B2B and B2C indicators respectfully. Favouring a B2B or government/NGO funded approach will prove successful in the short term but in order to open up the commercial sector a robust multi-sectorial partnership approach is desirable. Currently only four services tracked by the GSMA have secured-cross sector partnerships.

The main features driving down the overall feasibility for B2C in Zambia are the high concentration of wealth in a small sub segments of the population and a rather lack-lustre OoP spend on health and overall spend on mobile as a reflection of GDP (5th and 9th place respectively of the 10 nutrition focus countries). It is arguable that the influence of access to wealth may not be a wholly fair representation of feasibility indicators. Access to expendable income may not dictate how health spend develops, but when combined with qualitative feedback from in-country stakeholders, on the difficulties in popularising commercial health services and the challenges surrounding premium SMS, weight is added to the assertion that the B2C sector will be challenging in Zambia.

Figure 22

Relative B2B and B2C indicators

| | Per Capita GDP | % Above Poverty Line | % Out-Of-Pocket Spend on Health | Spend on mobile (ARPU/ month) | Percentage of GDP spent per month mobile | Gini Co-efficient | Income Share Held Top 10% Population | % Government Health Funding | % Donor Health Funding | Health Expenditure/ Capita |

RELATIVE SIZE OF MARKET OPPORTUNITY

SCALE — B2C INDICATORS — B2B INDICATORS

INDEX

1.4	Cote D'Ivoire
1.2	Nigeria
1.1	Uganda
1.0	Rwanda
1.0	Tanzania
0.9	Kenya
0.9	Mozambique
0.9	Ghana
0.8	Malawi
0.7	Zambia

INDEX

1.5	Zambia
1.3	Malawi
1.1	Mozambique
1.1	Ghana
1.0	Tanzania
1.0	Kenya
0.8	Cote D'Ivoire
0.8	Nigeria
0.7	Uganda
0.7	Rwanda

Source: WHO, WorldBank, GSMA extracted data

Mobile market view
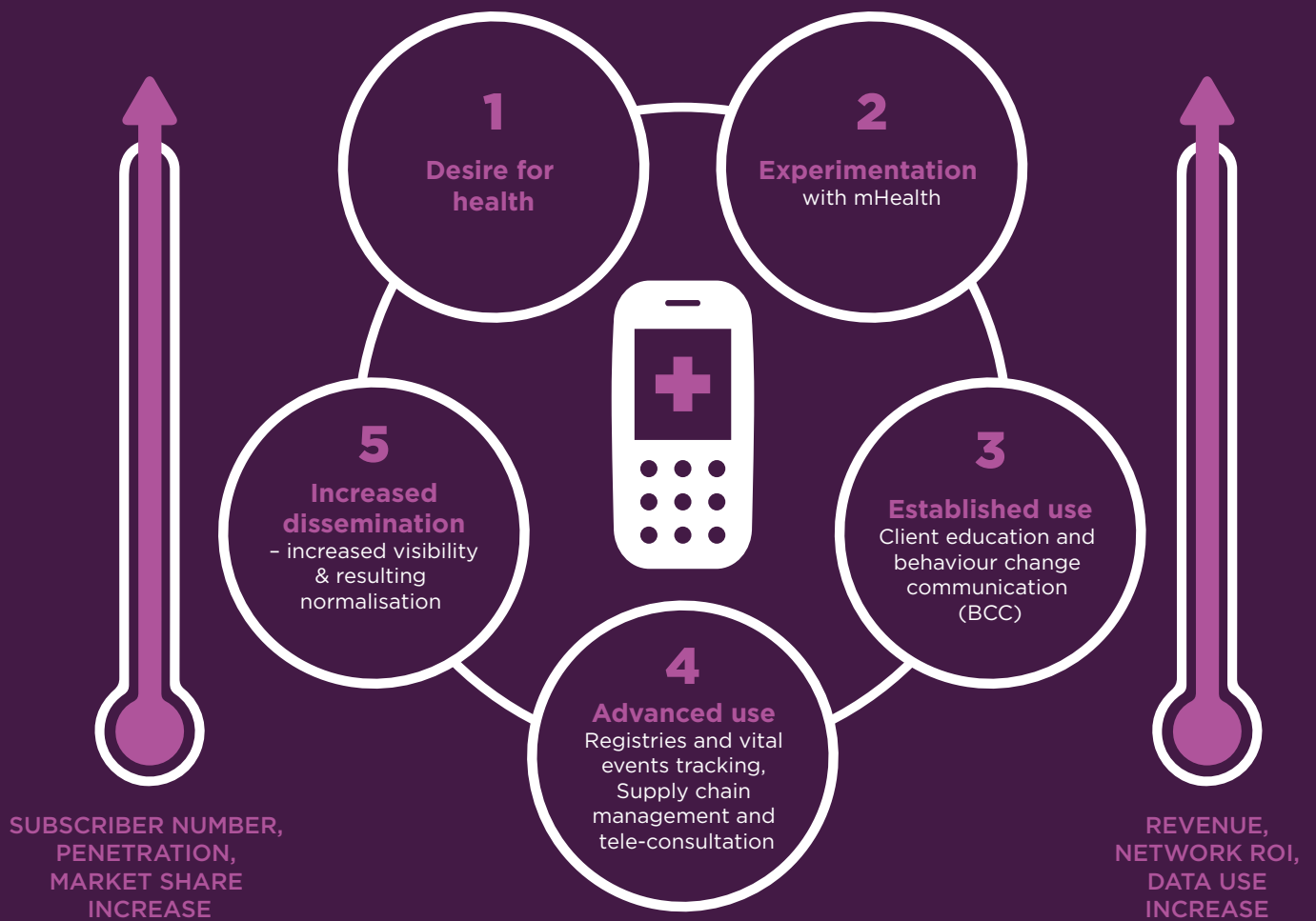
The mHealth opportunity has two distinct pathways. On the one side it provides a valuable mechanism to grow operator subscriber numbers, market share and overall penetration. On the other it is a strong driver for take-up of data VAS services, with the proposition built around providing and gathering health information (push and pull) and health monitoring (tracking disease and health indicators). There is a strong inbuilt impetus to consume services that can improve or ensure health. These features create the potential for mHealth services to become self-perpetuating. Mobile operators providing mHealth services have the opportunity to occupy a place within markets lacking an established health infrastructure, positioning them as preferred health service providers. In this way they become normalised (i.e. they are identified as the go-to option for such services). In such a position mobile operators can create a sustainable service offering.

Figure 23

mHealth normalisation process and the impact on mobile operators

mHealth service use feedback loop

1 Desire for health

2 Experimentation with mHealth

3 Established use Client education and behaviour change communication (BCC)

4 Advanced use Registries and vital events tracking, Supply chain management and tele-consultation

5 Increased dissemination – increased visibility & resulting normalisation

SUBSCRIBER NUMBER, PENETRATION, MARKET SHARE INCREASE

REVENUE, NETWORK ROI, DATA USE INCREASE
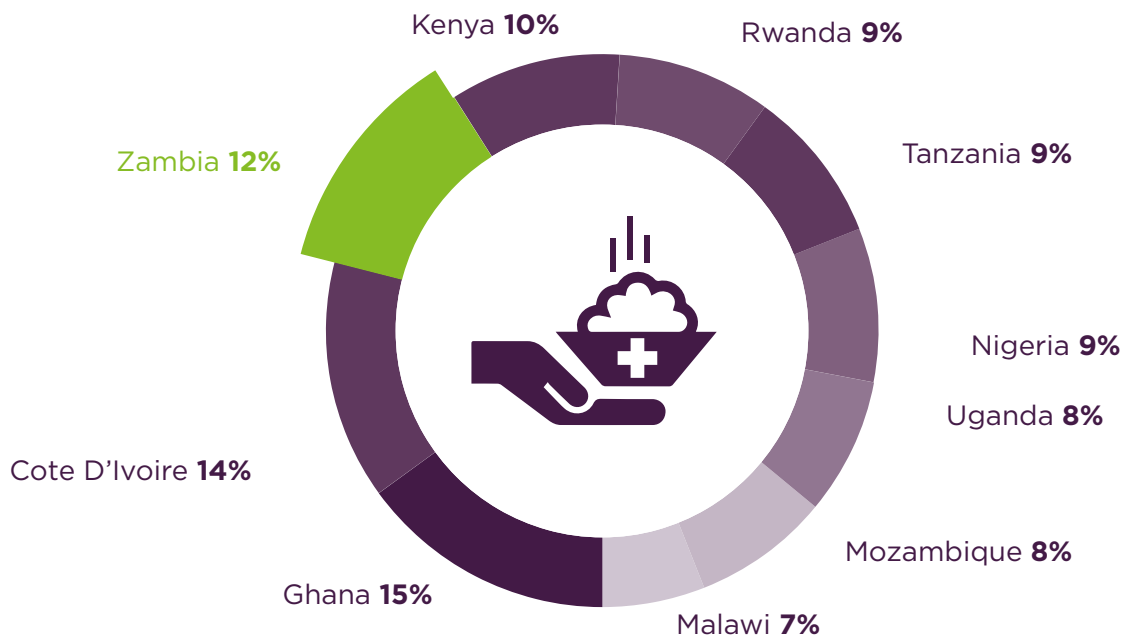
Source: WHO/World Bank/GSMA extracted data

The Zambian mobile market – market specifics

Zambia has the third highest mobile penetration rate across the comparison countries. Its average ARPU spend of USD$12 per month is also above the average of the GSMA nutrition focus countries and 5th highest for this indicator overall (comparator countries only). The country is also blessed with a lower fall-off rate in ARPU than comparable countries in SSA (see above). These positive indicators combine with strong growth trend indicators; Zambia has the second greatest population growth rate overall over the period 2008-2013 and is forecast to attain the second highest growth rate for women with children under-five by 2020.

Figure 24

Comparative mobile penetration rates of GSMA nutrition initiative countries - Zambia extracted

Kenya **10%** · Rwanda **9%** · Tanzania **9%** · Zambia **12%** · Nigeria **9%** · Uganda **8%** · Cote D'Ivoire **14%** · Mozambique **8%** · Ghana **15%** · Malawi **7%**

Source: GSMAi

Not all indicators, however, are positive. Zambia has the second lowest spend on mobile services (10%) when compared with GDP over a twelve month period (2012 data). This may indicate a user base that is difficult to reach, along with an aversion to significant spend on VAS. In these circumstances, developing new mHealth services that capture the imagination of the average Zambian mobile user will be challenging.

Figure 24 above shows the anomaly of high unique penetration versus low overall spend on mobile services. Despite Zambia placing third overall against the comparative countries for penetration it ranks 9th for ARPU as a reflection of GDP. However this metric is potentially misleading. A high penetration rate allied to steep growth in subscribers can indicate a market in an early stage of VAS development. This stage is characterised by subscriber VAS experimentation and has a low

average spend per user as a result. The rates of growth in penetration and subscribers, at 119% and 87% respectively over the previous 5 years, lends support to this theory. The advantage of a market characterised by early stage VAS development is that experimenting customers become established users over time and increase their VAS spend. A strong opportunity for mHealth can be created from the development of an attractive service proposition by service developers and mobile operators.

One mechanism to provide an attractive service proposition is to bundle services. A number of mobile operators have taken an innovative approach to this option in Zambia. For example, Airtel has launched 'Airtel Insurance' in partnership with Africa Life insurance and MicroEnsure (a Zambian privately owned wealth management company and philanthropic micro loans organisation respectively), providing ongoing life-ensure for approximately 10 ZMW ($1.55). Airtel's bundled innovation was to link the level of insurance cover provided to the amount of airtime used so any 10 ZMW top up equates to free life cover of 1500 ZMW ($232).

Figure 25
Airtel insurance top up values and attendant life insurance coverage

| Top up value	Insurance cover
KMZ 10-24.99 ($1.55-3.86)	KMZ 1,500 ($125)
KMZ 25-49.99 ($3.86-7.73)	KMZ 2,500 ($386)
KMZ 50-99.99 ($7.73-15.45)	KMZ 5,00 ($773)
KMZ 100+ ($15.46)	KMZ 10,000 ($1,546)

Source: Airtel

Additional cover can be gathered by increasing top up value (figure 25 above) at defined levels. This strategy has the potential to have a direct impact on ARPU, as relatively small increases in top up value produce an exponential increase in coverage. This is potentially one way to overcome the challenges of reaching the discerning Zambian consumer with mHealth related services.

General mobile market indicators

Mobile market indicators in Zambia show a strong growth period followed by a market correction (likely related to SIM-card registration requirements from the regulator) and a gradual slowing in overall growth. Despite this, the country saw growth of 91% of the reported period and a 7% increase over the previous twelve months.

Figure 26

## Total mobile subscriptions and operator subscriptions Q4 2010 to Q4 2014
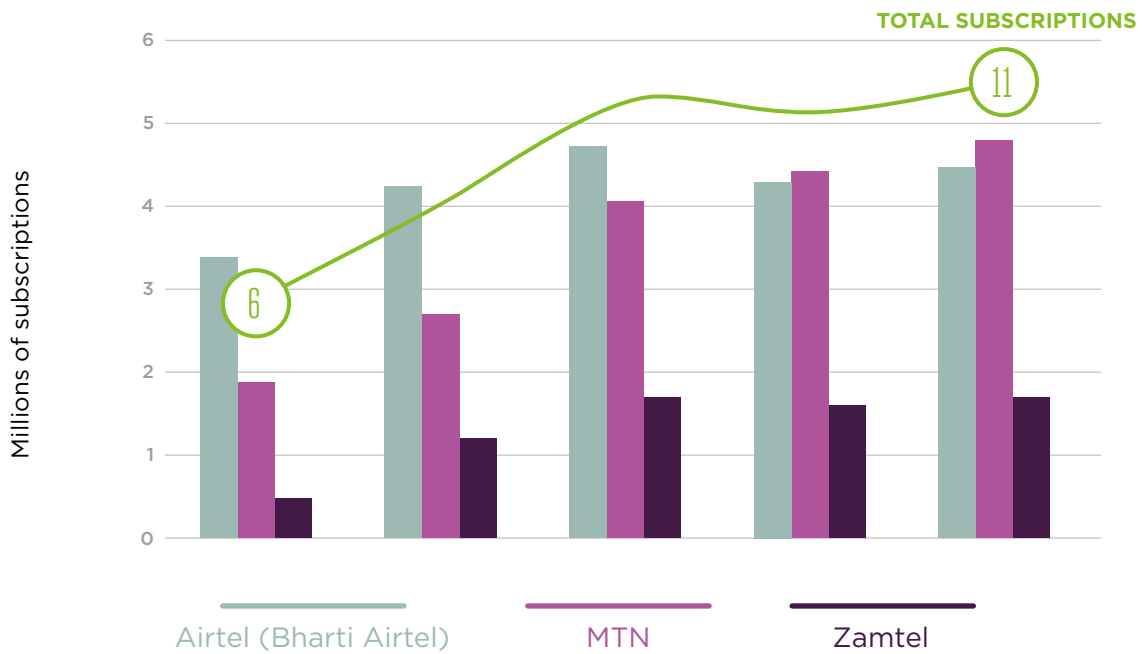
Source: GSMAi

Zambia is a highly competitive mobile market that has experienced a dynamic period of growth as well as a relatively recent change in the market leader position, with MTN challenging and overtaking the market leader Airtel. This competitive environment will encourage service development, as operators seek to differentiate their service offering. Providing mHealth services potentially bundled with other capabilities, including insurance, mobile payments and VAS data services are ways in which mobile operators might differentiate themselves in Zambia.

The Zambian market is defined by domination between two regional operator superpowers and an incumbent third player. The jostling for the top operator position has seen MTN edging ahead but not to a position where it could be said to be dominating the market. With just under three percentage points of market share at issue the Zambian mobile market is particularly competitive.

Figure 27
Mobile operator market share

Airtel (Bharti Airtel)
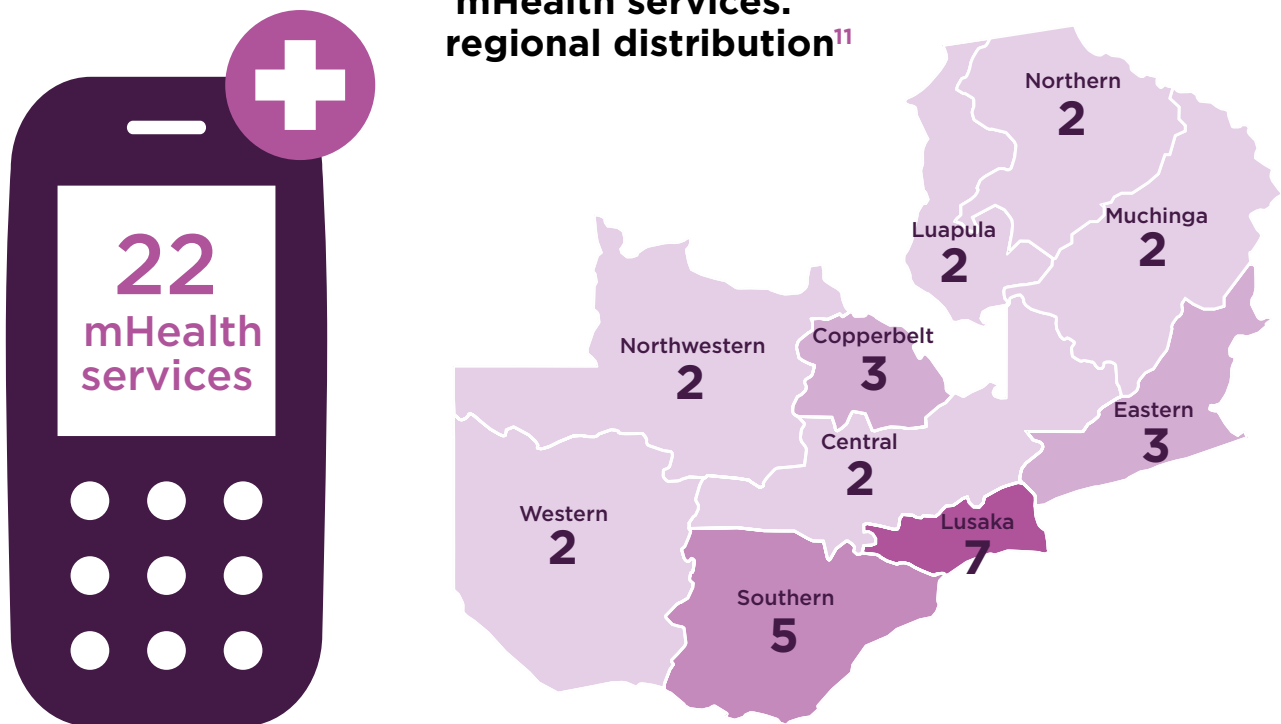40.79%

MTN
43.59%

ZamTel
15.62%
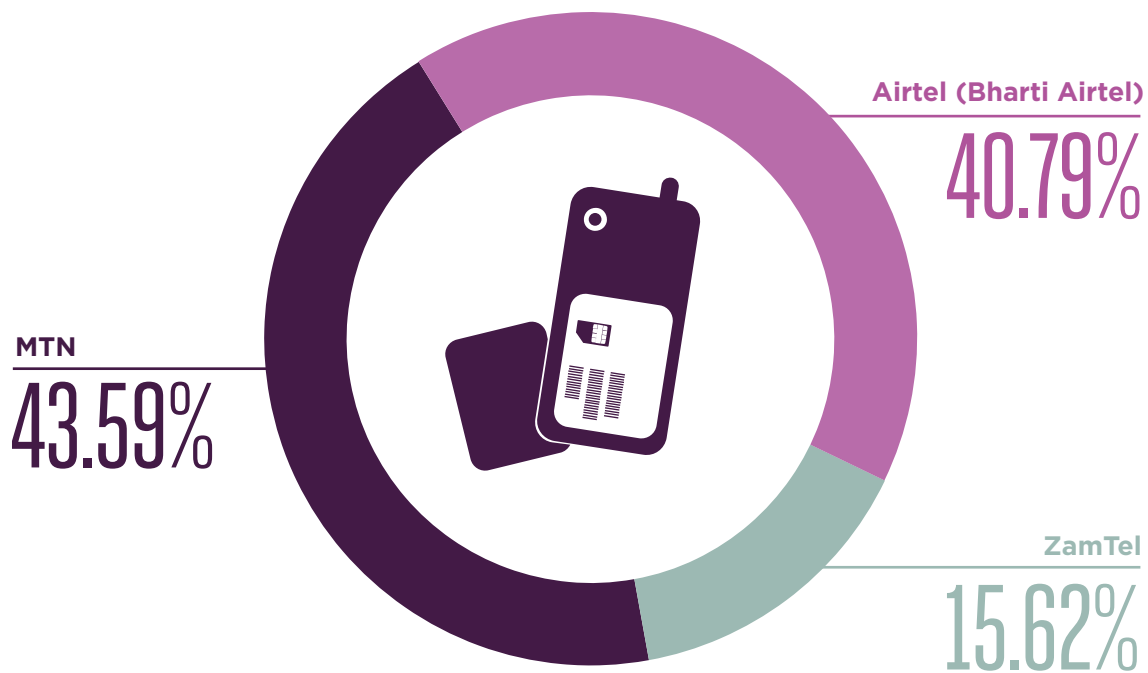
Source: GSMAi

Mapping mHealth service penetration and reach in Zambia

As part of the qualitative review of Zambia'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 Zambian mHealth initiatives to desired health outcomes

- Currently tracking 22 live mHealth services deployed with partnerships from over 35 different organizations representing multiple stakeholder groups

- There are at least 4 services that are nationally available, 2 of which are implemented at facilities across Zambia

- There are 2 mHealth services being implemented in each province with the most serviced region having up to 7 different mHealth services

Figure 28

mHealth services: regional distribution[11]

22 mHealth services

Northern **2**

Luapula **2**

Muchinga **2**

Northwestern **2**

Copperbelt **3**

Eastern **3**

Central **2**

Western **2**

Lusaka **7**

Southern **5**

11. An mHealth service may be deployed in more than one province

Figure 29

Under-five mortality rates per 1000: regional distribution[12]

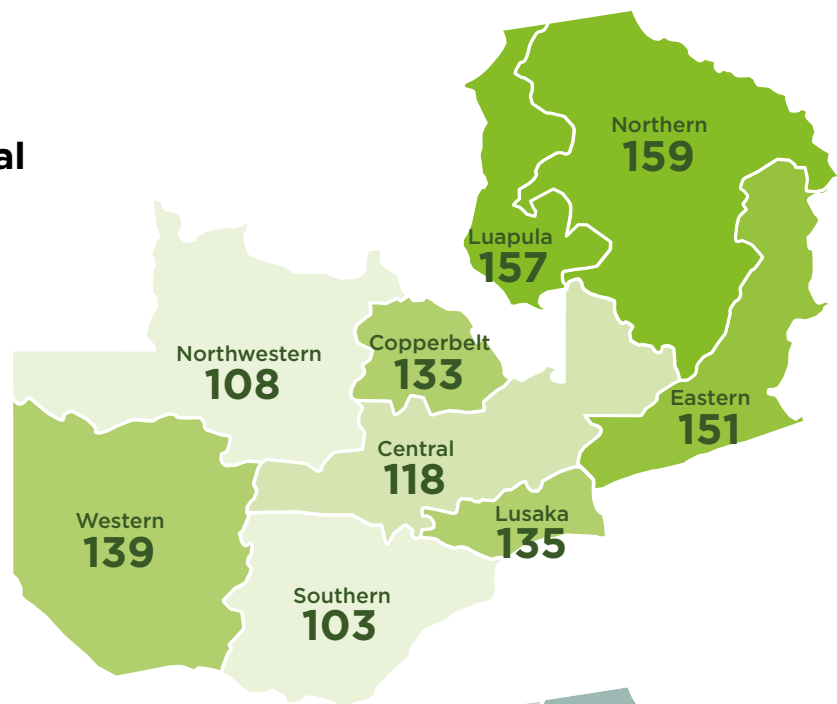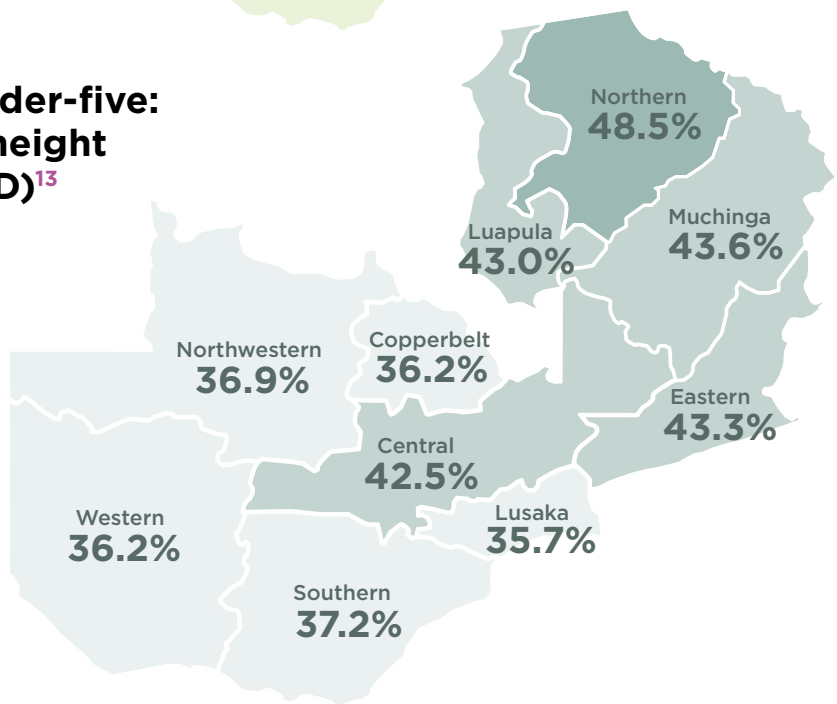

Northern
159

Luapula
157

Northwestern
108

Copperbelt
133

Eastern
151

Central
118

Western
139

Lusaka
135

Southern
103

Figure 30

Stunting in children under-five: regional distribution (height for ages - % below -2SD)[13]

Northern
48.5%

Luapula
43.0%

Muchinga
43.6%

Northwestern
36.9%

Copperbelt
36.2%

Eastern
43.3%

Central
42.5%

Western
36.2%

Lusaka
35.7%

Southern
37.2%

Existing research shows that the mother's age at birth is a key child survival determinant. The data show that the lower the mother's age, the higher the likelihood that her child will die before the age of five. The Zambia demographic and health survey (2007) revealed that the infant mortality rate for children born to mothers younger than 20 is 100 per 1,000 live births, compared with 78 per 1000 live births for children born to mothers between the ages of 20-29. The report also revealed that childhood mortality rates are higher among first-borns than other children - 105 per 1,000 live births in first-borns and 75 per 1,000 live births for children who are second- or third-order.[14] This substantiates the need for mHealth services such as behaviour change communication services (e.g. educational messaging services) to educate young mothers in Zambia about their pregnancies.

12. Source: Zambia Demographic and Health Survey 2007 (Muchinga province was only separated from Northern province in 2011 and there is no data for under-five mortality rates for this province)
13. Source: Zambia Demographic and Health Survey 2013-14
14. Source: Zambia Demographic and health survey 2007

Health burden indicators

Table 1

Comparison of health burden indicators relating to maternal and newborn child health and nutrition from the Northern Province and Lusaka Province

	Northern		Lusaka		RANKING
	Number	Rank	Number	Rank	
Under-five mortality	159	9	135	5	GOOD 1
%receiving antenatal care from a nurse/ midwife	82.2	7	94.5	2	2
Delivery at health facility	48	9	89.9	1	3 / 4 / 5
% delivered by a skilled provider	45.3	10	88.9	1	6 / 7
Height for ages - % below -2SD	48.5	10	35.7	1	8
Number of mHealth service deployments	2		7		BAD 9 / 10

Source (for under-five mortality and % receiving antenatal care from a nurse/ midwife) : Zambia Demographic and Health Survey 2007. Source (for all other health indicators): Zambia Demographic and Health Survey 2013-14

Table 1 compares various health burden indicators relating to maternal and newborn child health and nutrition from the Northern Province and Lusaka Province. This data demonstrates a greater overall health burden in the Northern Province.

Only two mHealth services are reported to be deployed in the Northern Province and surrounding provinces, whilst the Lusaka Province has 7 mHealth services. Although there is not extensive data about the distribution of services in Zambia, there is an initial trend indicating that mHealth services are not being deployed in regions that have the biggest health burden.

One of the biggest maternal health disparities between the Northern Province and Lusaka Province is in deliveries at health facilities (only 31% in Northern Province and 78.1% in Lusaka Province) and deliveries assisted by skilled providers (only 29.4% in the Northern Province and 77.5% in Lusaka Province)[15]. This improves the feasibility of mobile-based health services such as behaviour change communication services (e.g. educational messaging services) to drive the demand for increased deliveries at facilities in the Northern Province.
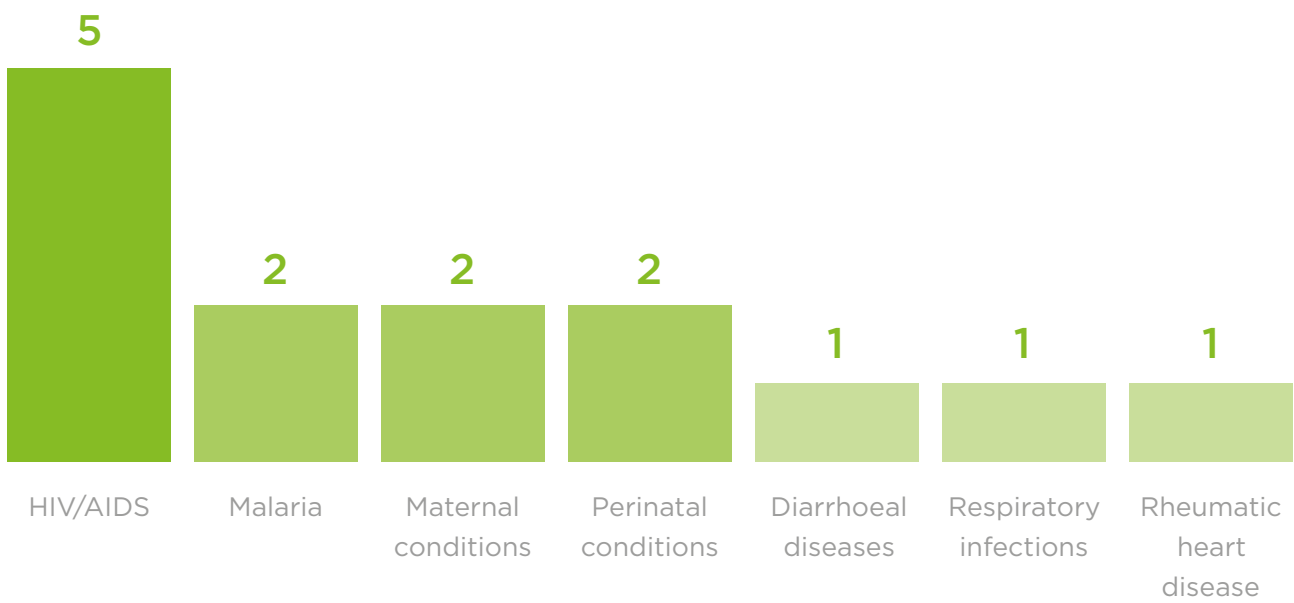
One of the most striking differentials in assistance during childbirth is due to urban-rural residence. About eight in ten births to urban women are attended by a skilled provider, compared with three in ten births to women in rural areas. Where the distribution of skilled providers in rural areas is unlikely to improve, mHealth can be used to improve the skills of the existing health workers. There are many mHealth applications focused on meeting this need, for example, electronic decision support, provider training and education, provider work planning and scheduling, etc.

15. Source: Zambia Demographic and health survey 2007

Health conditions addressed by mHealth services

Figure 31
Health conditions addressed by mHealth services

HIV/AIDS	Malaria	Maternal conditions	Perinatal conditions	Diarrhoeal diseases	Respiratory infections	Rheumatic heart disease
5	2	2	2	1	1	1

In Zambia the most addressed health condition for mHealth is HIV / AIDS (5 services), followed by antimalarial initiatives, maternal conditions, and perinatal conditions (each addressed by 2 services).

Four of the health conditions currently addressed by mHealth are amongst the top 10 causes of death in all ages in Zambia: HIV, malaria, diarrhoeal diseases, and respiratory infections (cumulatively contributing to 43% of deaths in all ages)[16]. These same health conditions are amongst the top 10 causes of death for children under-five (cumulatively contributing to 46 % of deaths in children under-five years of age)[17].
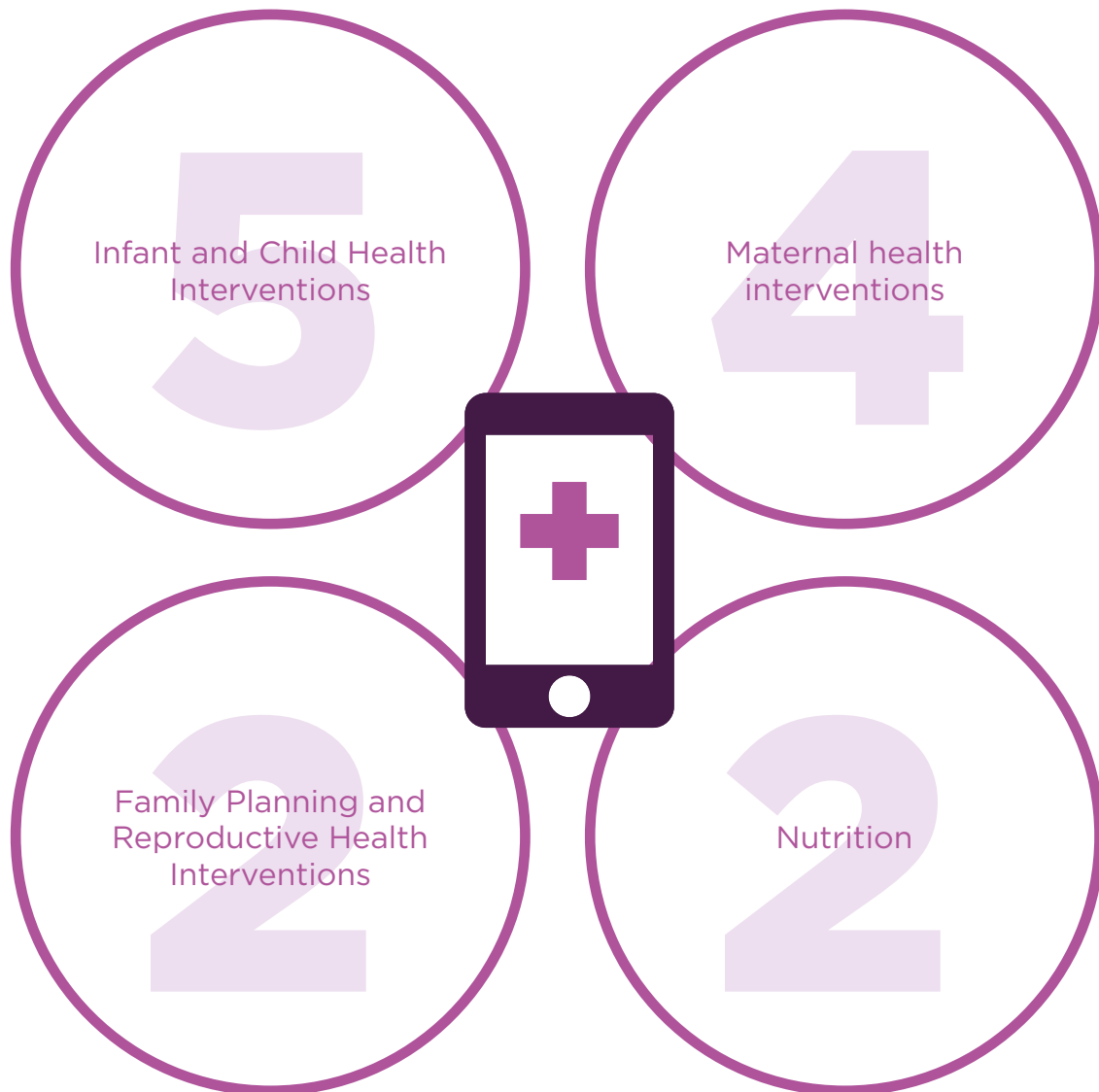
16. Source: GBD Compare (http://viz.healthmetricsandevaluation.org/gbd-compare/), 2010
17. Source: Zambia: Health Profile (WHO)

Health interventions

Figure 32
Health interventions addressed by mHealth services

Infant and Child Health Interventions

Maternal health interventions

Family Planning and Reproductive Health Interventions

Nutrition

Maternal health interventions is the most prevalent health intervention, addressed by 5 mHealth services, closely followed by infant and child health interventions which is currently addressed by 3 mHealth services. There are only 2 mHealth services addressing maternal or infant and young child nutrition. This is concerning as data shows that 45 percent of children under-five are stunted and 21 percent are severely stunted.[18]

18.   Source: Zambia Demographic and health survey 2007

Maternal and child health interventions

There are 5 services offering maternal health interventions. Figure 33 illustrates which maternal health topics are amongst the most addressed by mHealth services.

Maternal health topics addressed by mHealth services

4	Pregnancy	**3**	Post partum care
3	Antenatal care	**1**	Pregnancy danger signs
3	Pregnancy complications	**1**	Labour
3	Emergency preparedness		

The 4 mHealth services offering infant and child health interventions focus on education around the Prevention of Mother To Child Transmission of HIV (PMTCT) and newborn care.

Quantifying users

Figure 34

Number of mHealth services reaching different beneficiaries

12 Children   **12** Women   **7** Men

TARGET GROUP

Only 4 of the mHealth services reported the number of beneficiaries reached by the service (256,597 beneficiaries).

7,298 frontline health workers and 789 healthcare facilities are reported to have been reached by 3 mHealth services.[19]
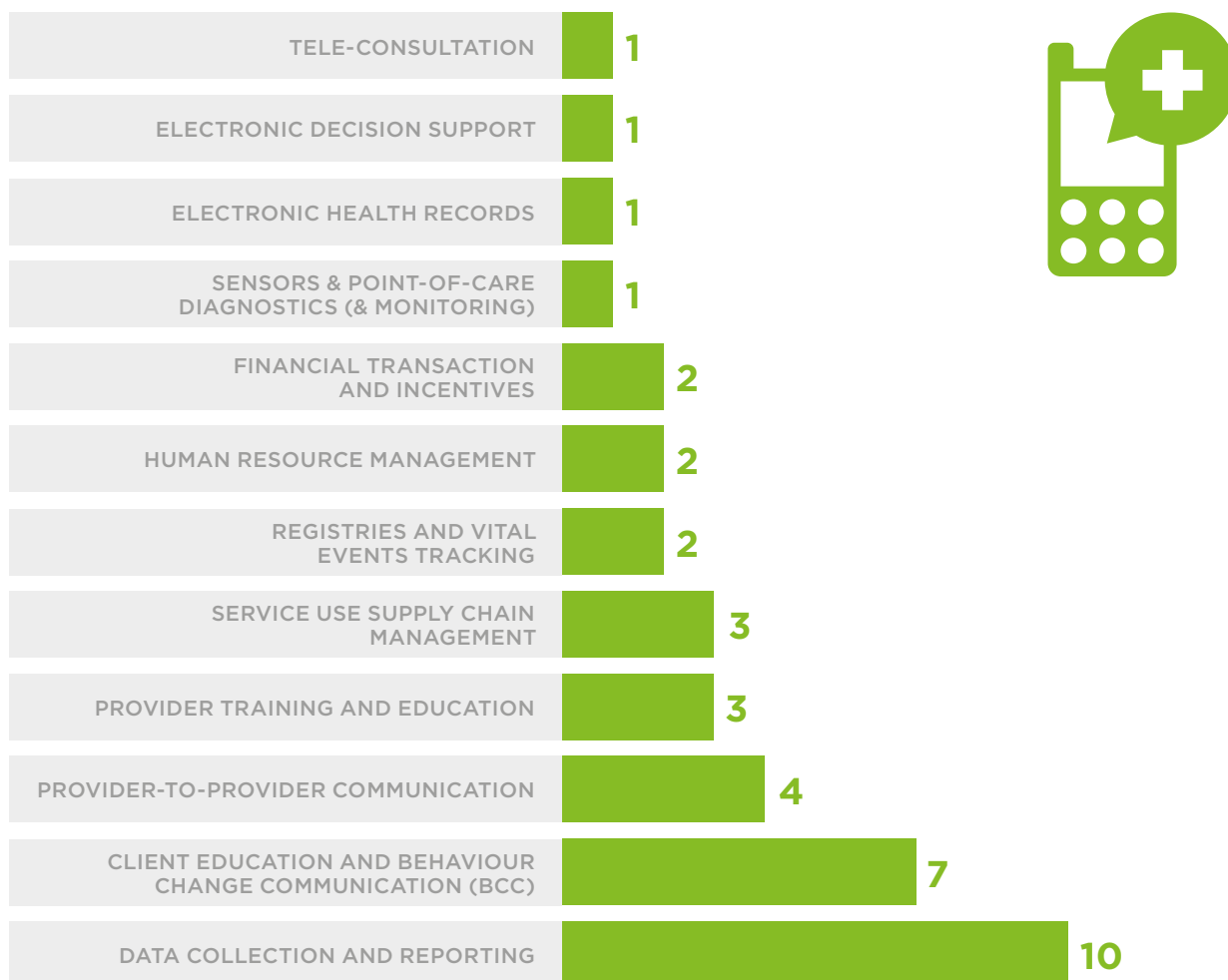
3 services are exclusively targeting women and children.

---

19. Only 3 services reported these indicators

mHealth applications

Figure 35

mHealth applications offered by mHealth services

Application	Value
TELE-CONSULTATION	1
ELECTRONIC DECISION SUPPORT	1
ELECTRONIC HEALTH RECORDS	1
SENSORS & POINT-OF-CARE DIAGNOSTICS (& MONITORING)	1
FINANCIAL TRANSACTION AND INCENTIVES	2
HUMAN RESOURCE MANAGEMENT	2
REGISTRIES AND VITAL EVENTS TRACKING	2
SERVICE USE SUPPLY CHAIN MANAGEMENT	3
PROVIDER TRAINING AND EDUCATION	3
PROVIDER-TO-PROVIDER COMMUNICATION	4
CLIENT EDUCATION AND BEHAVIOUR CHANGE COMMUNICATION (BCC)	7
DATA COLLECTION AND REPORTING	10

12 out of the 13 mHealth applications are currently being provided by mHealth services in Zambia. Applications that are currently only covered by 1 mHealth service include:

- Sensors and point-of-care diagnostics (& monitoring)
- Electronic health records
- Electronic decision support
- Tele-consultation

These applications, as well as providing work planning and scheduling (which is not covered by any mHealth services), could have a positive impact in Zambia, where women in urban areas are more likely (75%) to be assisted by a nurse or midwife, while a traditional birth attendant is more likely (31%) to assist women in rural areas. There should be more emphasis and efforts to deploy mHealth services that can help improve the skills of healthcare workers in rural areas and ultimately the quality of healthcare provided to women in rural areas.

Partnerships

8 out of the 22 services have managed to secure a partnership with the Ministry of Health. Ideally there should be a greater number of partnerships between the Ministry of Health and mHealth services. mHealth is currently falling under the Ministry of ICT within the Zambian Ministry of Health. The Ministry of ICT extends to the broader use of Information and Communication Technology (ICT) within health and as such, the department is fairly under resourced to take full ownership of mHealth. There is a need for other departments (such as the Ministry of Community Development and Maternal and Child Health and other departments within the Ministry of Health) to take ownership of mHealth projects falling in their specific health domain. Although this shift of ownership is already in progress, there is much room for improvement. This may be an influencing factor in the low partnership between the Ministry of Health and mHealth services in Zambia.

Whilst only 4 services have secured cross-sector partnerships, there is a varied representation of mHealth stakeholders including: government, academic institutions, technology, aggregators, mobile operators, donors and NGOs.

Operator involvement

Airtel is the mobile operator with the most engagement in mHealth. Airtel is currently partnering with 5 mHealth services and is reported to have formulated an in-house mHealth team to effectively address increasing usage of mHealth systems within Zambia. MTN has 2 internal mHealth services and has also partnered with another mHealth service.

Business models and revenue generation

Figure 36

mHealth service business models

BUSINESS	1
SERVICE PROVIDER	1
GOVERNMENT	2
OPEN SOURCE	3
CONSUMER	5
DONOR	11
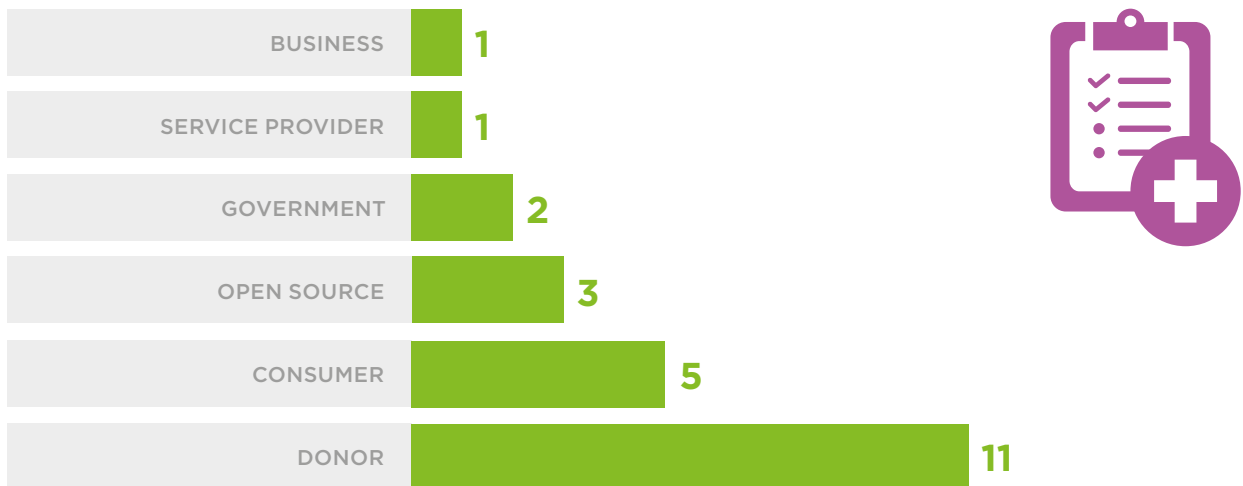
11 out of the 22 services are donor funded. 5 are reported to be funded by the consumer.

Figure 37

Types of revenue generation in mHealth services

1
Pay per customer/user

3
Subscription model

4
Government

Technology

Figure 38

Types of technology devices used in mHealth services

Device	Value
TELEMEDICINE DEVICE	1
TABLET	1
LAPTOP	1
EMBEDDED DEVICE	1
DESKTOP COMPUTER	1
SMART PHONE	6
FEATURE PHONE	8
BASIC MOBILE PHONE	14
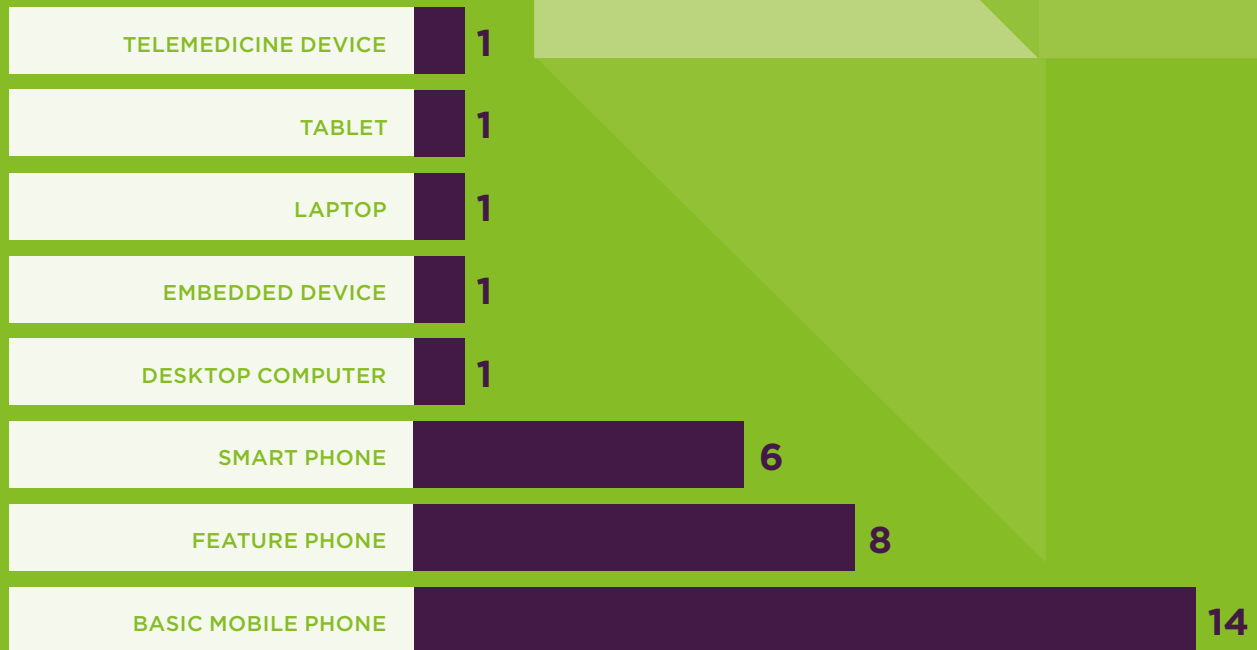
Figure 38 displays data for different technology devices used within mHealth services. This figure shows that 14 mHealth services can be accessed by basic mobile phone, making this the most popular technology device used in mHealth services in Zambia.

mHealth case studies
Zambia

mHealth use case

Program Mwana uses RapidSMS mobile technology to improve early infant diagnosis of human immunodeficiency virus (HIV) and client-provider communication in hard-to-reach geographical locations. The project has two applications, focused on enabling efficient results delivery and strengthening patient-provider communication, respectively.

The first technology application 'Results160', uses RapidSMS technology to delivery test results for diagnosis of HIV in infants in real time to rural clinics. Once test results have reached the rural clinic, CHWs inform mothers that results are ready for collection; this system thereby enables timely and efficient communication of diagnosis.

The second application 'RemindMi' improves the rate of postnatal follow-up by distributing reminders to mothers to return for their regular postnatal visits according to the immunization schedule.

Registered clinic workers and CHWs also benefit from free-text chat groups, to strengthen provider-provider communication and patient tracing.

Delivery channels

SMS

SMS allows for rapid delivery of information, and in this case enables timely delivery of results to health workers and mothers. Quantitative data from the pilot study reported that on average 30% more diagnosis results arrived by SMS than by hardcopy. Turnaround for SMS results was also consistently lower than that of hardcopy results. Additionally, the percentage difference in the turnaround time with SMS as compared to hardcopy is higher in rural areas than in urban areas.

Technology device

Basic phone

Results are formatted to be legible on different screen sizes of basic phones. For the pilot study, basic phones containing the Results160 application were provided to all registered facilities. During the pilot study, health workers used their personal phones in the instance of a lost donated embedded phone.

Health focus

HIV/AIDS, infant and child health – vaccines, PMTCT

Target audience / beneficiaries

Women and children (Postnatal babies, infants) exclusively

ZCHARD/BU, with the assistance of UNICEF, completed extensive quantitative and qualitative evaluations of the Program Mwana pilot, in 2011. The service continues to undergo monitoring and evaluation, as evidenced by the service's website which features up to date data on service distribution. Most notably, Results160 has reduced the time required for the return of diagnosis results from approximately 30 days to seconds. Additionally, the total turnaround time of diagnosis results, from initial diagnosis by the laboratory to receiving of results by the patient, has been reduced by fifty percent, from approximately 66 days to 33 days.

Target actors

Frontline health workers: community health workers, community volunteers, facility-based health workers,

Supervisor: nurses

National Health System

Patient/beneficiary

All service actors are given initial training on the use of the Results160 and RemindMi applications. Service actors must be familiar with the role they play in the complex workflow of the of the Results160 application. At the rural clinic level, health workers take the infant's dry blood spot (DBS) sample and subsequently pack and log the DBS sample. Workers at this clinic must then send a message to the lab, along with the sample's identification number. The lab then processes results and the lab workers are responsible for sending the results via SMS back to the rural clinic. Once received, the health worker at the rural clinic can contact the mother and communicate the results. Service actors reported the DBS tracking service as easy to use, and data showed almost 100% satisfaction at the pilot stage. In a less complex workflow, the RemindMi application is used only by the patient (mother) and the service provider; this application requires the health worker to utilize the immunization schedule specific to the infant to communicate with the mother at specific time points about her postnatal appointments.

Geographical focus

Presence in 734 health facilities in 74/89 districts across all 10 provinces:

Central Province

Copperbelt Province
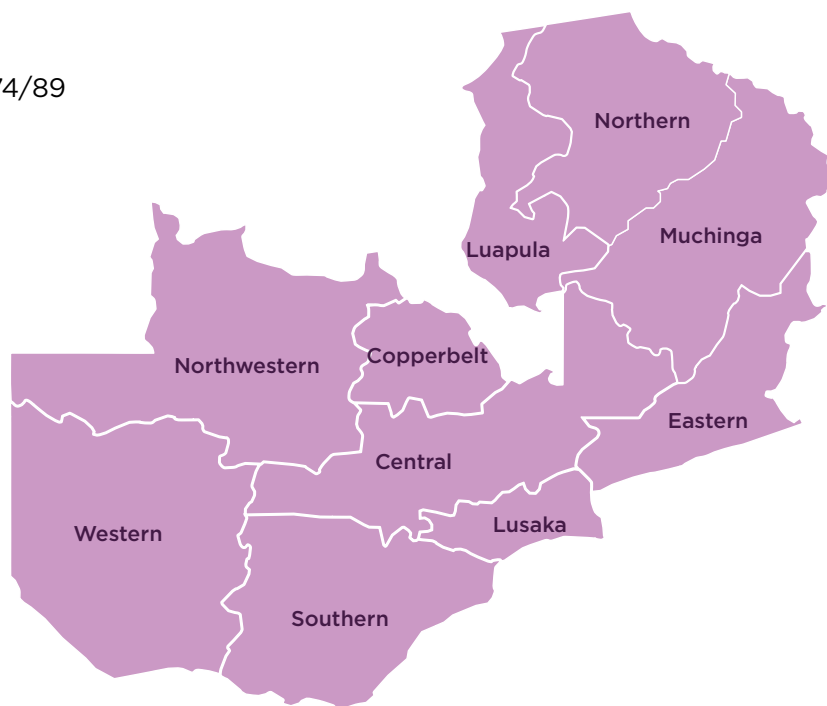
Eastern Province

Luapula Province

Lusaka Province

Muchinga Province

North-Western Province

Northern Province

Southern Province

Western Province

Source of content

There is no static content within this service (no educational messaging)

Content covers: SMS messages

As SMS inherently allows for almost instantaneous content sharing, the Results160 system includes specific design features to ensure patient confidentiality and meticulous data collection. Once results are ready, the central SMS system sends a message alerting the clinic workers that the results are ready. Results can only be accessed using a previously assigned Personal Identification Number (PIN). Messages are then exchanged between clinicians in order to securely retrieve the test results. A follow up message is then sent to remind the clinician to record results in the register and to subsequently delete them, for security purposes. Results can also be sent to printers via SMS. Sending the SMS message "CHECK" will allow a user to see if they have any outstanding results; sending "RESULT" with a lab requisition number will send the result for that number; sending "HELP" will

alert support staff to call the user who sent the message, in order to troubleshoot and resolve any potential issues. All messages are free to the clinic staff who are receiving them.

Source: Local Zambian software developers, UNICEF, frog™

Localization: The service is localized in regards to the geographical distribution of clinics and laboratories that make up the workflow network. Rural clinics are connected with the closest laboratory facilities in order to maximize the number of patients included in the system and the geographic reach of the service. Additionally, 2 laboratories containing PCR technology are included in the Program Mwana system. The scalability of the project is centred on recruiting new health facilities and clinic through provision of software. Due to the geography-based nature of the system, clusters of health facilities may be introduced at one time, rather than individual facilities registering at varying time intervals.

Implementation experience

Program Mwana was first piloted at 31 clinics within six provinces in June 2010. 30 additional facilities were added to the system in November 2011. While the goal of national scale by 2013 was not achieved, the project is continuing to expand due to a three-year national scale-up plan developed in 2011.

The project has been closely monitored throughout the scale-up process. Reliance on power and mobile network availability, respectively, were major reported challenges to service usage. 22 of the 31 pilot sites commented on poor mobile network coverage; mobile operator partnerships have since developed. Stock-outs of the DBS kits were occasionally a problem, in addition to delays at various points in the workflow (i.e. PCR facilities). Additionally, the system management tool used to troubleshoot and support facility staff was slow to be adopted early on.

Partner coverage

- **Ministry of Community Development Mother and Child Health & Ministry of Health:** resource partner, implementation partner, standards partner, teaching partner, distribution partner, technical assistance, advocacy partner

- **Boston University/Zambia Centre for Applied Health Research and Development (ZCHARD):** research partner – pilot testing, monitoring and evaluation

- **UNICEF:** implementation partner, technical support, capacity development – technology development, expansion support

- **frog™:** technical support

- **RapidSMS:** technology partner – technology platform

- **CIDRZ:** implementation partner, technical assistance, distribution partner, teaching partner

- **FHI 360 / ZPCTII**: implementation partner, teaching partner, distribution partner, technical assistance

- **Airtel:** standards

- **MTN:** standards

Funding

UNICEF

Business model

Donor

Government funding

Open source

Scale

A total of 56,176 HIV results have been delivered using Results160 and a total of 97,096 births have been registered using RemindMi. There are over 4,690 patients/beneficiaries actively interacting with this service. The predicted annual growth in number of registered frontline health workers is 500 health workers and 1,800 CHWs each year; this prediction is based on new sites that are in the process of being added to the system. Finally, the predicted annual growth in number of healthcare facilities utilizing this service system is approximately 120 facilities each year.

mHealth case studies
Zambia

NGO-led case study: **Project mUbumi**

mHealth use case

Project mUbumi is an mHealth initiative focused on improving communication between pregnant women and members of the volunteer community support group known as Safe Motherhood Action Groups (SMAG). This is a subproject of the Saving Mothers Giving Life (SMGL), a global initiative launched by the Zambian government and its partners to reduce maternal mortality and to address MDG 5. A RapidSMS platform allows two-way automated, personalized communication via SMS messages, through which mUbumi features three key applications: (1) personalized reminders, (2) vital events reporting, and (3) hospital/facility referrals.

The 'reminder' feature consists of reminders sent based on follow-up dates assigned to women by health workers and targeted SMAG volunteers working in the geographic area in which the patient resides. The 'vital events reporting' feature consists of a basic communication system whereby SMAG volunteers report births and/or deaths via SMS, which are received and recorded by clinic workers. The 'referrals' feature is for obstetric emergencies and consists of a linear communication chain between community, facility and hospitals.

By instituting these communication systems mUbumi aims to: enhance antenatal care (ANC) and postnatal care (PNC) attendance, increase the proportion of facility deliveries, and improve emergency referral linkages between the communities, health facilities and hospitals in order to support emergency obstetric and neonatal care (EmONC).

Delivery channels

SMS

SMS is the channel through which mUbumi enables communication between pregnant women and SMAGs. SMS allows for exchange across several actors in different locations. In this case, SMS delivery allows for: the SMAG to receive notifications regarding ANC and PNC appointments, the SMAG to send referrals to the health facility, the health facility staff to respond to referrals and subsequently anticipate patient arrivals, the hospital staff to receive referrals from the health facility, and the ambulance drivers along with hospital staff to respond to referral and dispatch transportation.

Technology device

Basic phone

Basic phones equipped with the RapidSMS application allow for the various and many service actors to easily communicate in non-emergency as well as emergency settings. While the chain of communication and relevant SMS text accord with the respective mUbumi server feature, the basic phone can be used for all its applications.

Health focus

HIV/AIDS, maternal conditions – maternal haemorrhage, maternal sepsis, hypertensive disorders, obstructed labour, perinatal conditions – prematurity and low birth weight, birth asphyxia and birth trauma, neonatal infections and other conditions, maternal health interventions – pregnancy, antenatal care, pregnancy complications, emergency preparedness, postpartum care, Infant and Child Health – newborn care

Target audience / beneficiaries

Postnatal newborn, children, women and children exclusively

As mUbumi is in its early stages, there is no current data available on the effects of the mUbumi program on neonatal and infant survival, or uptake of facility-based services for EmONC. An integral feature of the mUbumi service is the pairing of the patient/beneficiary with the service actor: the pregnant woman must first be assigned to a local SMAG, who essentially acts as a surrogate service actor for the patient. Qualitative data shows that pregnant women find the mUbumi-enabled communication with SMAG volunteers to be informative, supportive, and useful. The personalized feature of mUbumi's automated SMS system enables individualized care; for example, the basis for the content of the 'reminder' feature is the specific sequence of follow-up appointment dates assigned to the patient by a health worker.

Geographical focus

9 pilot healthcare facilities
Kalomo District, Southern Province

Target actors

Frontline health workers: community-based health workers, nurses, midwives, doctors/physicians, other skilled health workers, facility-based health workers

Other actor: data clerks and SMGL project staff in Southern Province

All service actors are trained to use their respective feature of the mUbumi application. Service actors have different roles in the workflow depending on the specific feature, their geographical location, and the individual case details. For the ANC/PNC reminders feature, the primary service actors are the data clerk, SMAG and mother. For the vital events tracking and registration feature, the primary service actors are the SMAG who registers the birth or death, and the health clinic worker who receives and records this data. For the EmONC referral communication feature, there are actors at the community, facility and hospital level; the primary service actors are the SMAG, health facility staff, hospital staff, and ambulance drivers in some instances.

Content covers

SMS messages

The content of the SMS messages depends on which of the three mUbumi features the service actor is using.

For the 'reminder' feature, the data clerk registers a birth at the health facility and subsequently sends an SMS message to the mUbumi server; the SMAG receives notifications and reminders for the ANC follow-ups of the mothers in her community; once the SMAG has successfully contacted the mother she must confirm the reminder through the system; the mother must then attend ANC follow-ups on time; the data clerk records visit information in the system.

For the 'vital events reporting' feature, the SMAG communicates the vital event (birth, death) to the mUbumi server, and the clinic worker subsequently receives the information via SMS.

For the 'EmONC referral communication' feature, the SMAG sends referral SMS to health facility; the health facility staff responds to referral and anticipates patient arrivals; the health facility staff sends a referral outcome and patient is treated, and SMAG receives the outcome notification; then, the health centre staff send a referral SMS to the hospital; the hospital staff and ambulance driver respond to the referral, resulting in an ambulance being dispatched in some cases; finally, hospital staff sends a referral outcome once patient is treated and health facility staff receives outcome notification.

There is a web-based dashboard that enables visualization of all the data collected through the mUbumi system. This enables export for downstream analysis as well as system monitoring to ensure SMAG continued compliance. The system outputs also illuminate key MCH indicators at both the district and facility levels, showing statistical breakdowns of ANC and PNC attendance rates, delivery information, common pregnancy complications, and SMAG activity levels.

Source

RapidSMS

Localization: The service is localized in regards to the geographical distribution of SMAGs, health facilities, and hospitals that make up the service actor network. There does not need to be a previously established relationship between the patient and the hospital. However, as the service seeks to improve access to services, communication is localized to the nearest hospitals or health facilities. SMAGs are local volunteers, located in the villages and thus familiar with the pregnant women and the health facilities, and act as a liaison between the patient and the health facility. The web dashboard also features a visualization of geographic visualization.

Implementation experience

Qualitative and quantitative data collected on the pilot and early stages of mUbumi report generally positive feedback with regards to implementation. According to the SMGL endline evaluation in May 2013, there was a 35% decrease in institutional maternal mortality ratio (MMR) in the 4 implementing districts of the SMGL initiative – these include Kalomo, the mUbumi pilot site, Mansa, Nyimba and Lundazi. As demand for MCH services in Zambia has increased in recent years, with 73% of deliveries recorded in health facilities, project researchers foresee a growing role for mUbumi services.

Partner coverage

Ministry of Community Development Mother and Child Health & Ministry of Health: resource partner, implementation partner, standards partner, teaching partner, distribution partner, technical assistance, advocacy partner

Boston University Center for Global Health and Development/Zambia Centre for Applied Health Research and Development (ZCAHRD): research partner – pilot testing, monitoring and evaluation

Saving Mothers Giving Life (SMGL) Consortium – implementation partner

RapidSMS: technology partner – tech platform

Airtel: standards partner, other MNO capability - mHealth research

Funding

Ministry of Health

Business model

Open source

Scale

In the 9 pilot sites, a total of 40 frontline healthcare workers used the mUbumi server. Phase two of the project will continue implementation in Kalomo District as well as a scale-up of similar activities in Choma District. As of February 2014, over 7,000 pregnant women had been registered in the mUbumi system. The 'reminder' feature, implemented in April 2013, and has since generated 5,376 reminders with a 42% response rate from SMAG volunteers.
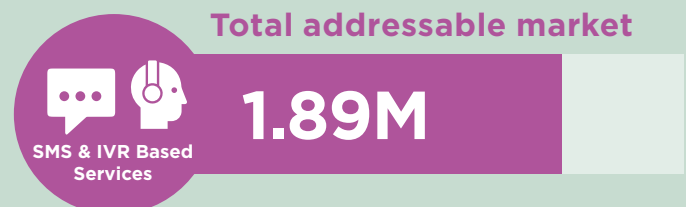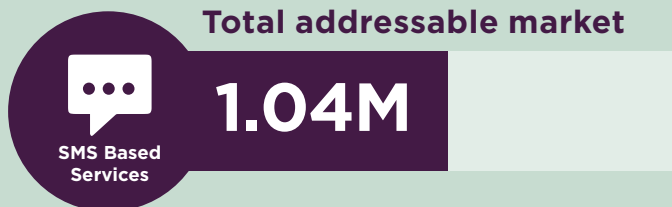
The opportunity for mHealth to support nutrition, maternal and child health

Growth rate indicator

2015

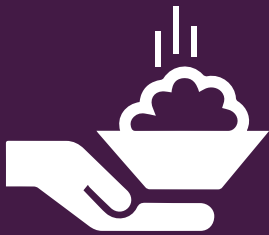Total addressable maternal mHealth market 2015

Total addressable market

SMS Based Services — **1.04M**

Total addressable market

SMS & IVR Based Services — **1.89M**

2020

Total addressable maternal mHealth market 2020

Total addressable market

SMS Based Services — **1.21M**

Total addressable market

SMS & IVR Based Services — **2.13M**

Ranking of overall mHealth opportunity

Size of nutritional MNCH problem

MEDIUM-HIGH

Size of addressable population

MEDIUM-LOW

Ability to pay or fund mHealth

HIGH-MEDIUM

Ability to deliver

mHealth service providers

MEDIUM-LOW

Strength of supporting programmes

LOW-MEDIUM

Interest from commercial aggregators

MEDIUM-LOW

Interest from mobile operators

MEDIUM

Supporting mobile / health regulation

MEDIUM

Willingness to partner

MEDIUM

Regulatory position in Zambia

There are a number of regulatory obstacles that indirectly affect the mHealth sector. One of the more serious is the levying of VAT and regulatory taxes on premium SMS. The Zambian Information Communication Technology Authority (ZICTA), requires all commercial providers to pay a premium SMS license for each short code. The charge is $3,000 for a new short code and $2,000 for annual renewal. SMS aggregators can reduce this cost by providing short codes on a pro-rata basis but this is generally assigned to short-term periods e.g. while SMS competitions are running. As mentioned, these charges are waivered for service providers offering not-for-profit or NGO funded initiatives which provides the scope and capacity for testing of services, but lacks the foundation to develop services that provide health solutions that can sustain and scale.

Analysis of the regulatory situation in Zambia by the Centre for the Study of African Economics' identified the requirement to strengthen policy and regulatory environments across the country in the area of ICT. The dominant criticism was that there was a lack of specificity in regulatory guidelines leading to an ad-hoc interpretation of these guidelines with particular problems around data security and legal and ethical issues relating to ICT. The results of this ambiguity have led to a lack of standards in both the ICT and health sectors.

Figure 39 summarises some of the regulation that has been developed to tackle these particular challenges.

Figure 39
Regulation developments

| Specific legislation	Description and major applicable features
The Information and Communication Technologies Act 2009	Provides for the economic and technical regulation of information and communications technology to "protects the rights and interest of services providers and consumers". The act includes provisioning for the Universal Access and Service Fund used for the financing of ICT in rural and un-served areas of the country using public funds. The act also tackles SLA issues including the historical problem of extremely high complaint levels for telecomms. It allows the regulator to define QoS and punish transgressions with a fine of up to $150.00, $15.00 per day and possible revocation of license.
The Electronic Communications and Transactions (ECT) Act No. 21 of 20.	The act is designed to regulate communications, dissemination and processing of electronic data and commination while ensuring the security and SLA of financial and other electronic transactions.

Source: Zambia ICT Sector Performance Review 2009/2010

Of particular interest is the mandate of the regulator specifically, and its role to promote universal access, in particular in rural and underserved regions, and its authority to regulate tariffs (pricing and costs). The combination of these features creates potential for the regulator to facilitate the movement of mHealth services into those regions where they are most needed, while creating a potentially scalable and sustainable business proposition by fixing costs at a level contingent on OoP spend in these regions.

The majority of regulation that impacts mHealth service development has been indirect, concerning itself with the wider ICT environment. There is a decided lack of impetus to provide regulation, which in turn directly influences mHealth, and creates a challenge from a market feasibility standpoint in two ways. On the one hand, service providers will need to consider how their offerings comply or will comply with regulation that is not yet defined. On the other, potential customers are unlikely to take up services without the protection afforded by strictly enforced regulation. In both instances the solution is the concentration of resource on regulatory development and clarification.

Similar to other SSA countries, Zambia has regulation restricting cross-border dissemination of personal information. This impacts the flow of patient registration, along with tracking and medical record information. In particular, regulation stipulates that no personal data can be processed automatically or manually. The method for processing/gathering such data requires consent to be sought and confirmed in writing by the data owner (patient). In those instances where personal data is being processed it must be undertaken in-country and/or through a Zambia-based agency agreement. In Zambia this is of particular concern for those operators with regional footprints i.e. the main operators in Zambia, who have multiple office sites. There are multiple occasions when this type of regulation might be contravened, for example, by simply forwarding mobile records gathered data to a remotely held data centre/hosting site outside of the country. The potential for these types of contravention will increase as big data analytics, requiring remote hosting and access of information, become more mainstream in multinational mobile operators.

The solution for the majority of these regulatory challenges is the creation of specific regulation developed around the unique requirements of mHealth services. Ideally patient data should be protected and the rights of the individual ensured as sacrosanct, but a healthy dose of practicality, common sense and awareness of the needs of the wider industry should pervade the development of this regulation.
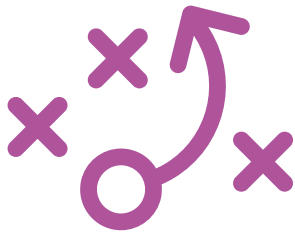
Conclusions

- It is recognised that there is a critical shortage of CHWs in Zambia and the National CHW Strategy seeks to tackle this imbalance. The mHealth services tracked by the GSMA and targeting health workers have reached 7,298 frontline health workers and 734 facilities. As such there is a clear benefit to attempting a coordinated scaling up of CHW initiatives that incorporates mobile services to better achieve the strategic aims of the CHW projects aims.

- While Zambia is tackling the lack of skilled health personnel, the supply of other health workers (CHWs and midwives) has only increased by a relatively small amount. This frontline worker group, found mostly in rural and under-penetrated regions, is critical to tackling health burdens in Zambia. The requirement for additional support that can be provided by mobile, becomes even more significant in this scenario.

- The potential market for maternal segments is 1.04 million and is forecast to rise to 1.89 million by 2020.

- In 2011 16%[20] of Zambia's total government budget was spent on health. The Zambian Ministry of Health is being forced to do more with less. The availability of development aid has fallen from 37% of projects in 2002 to 6% in 2012. mHealth should be leveraged to address critical resourcing constraints more effectively, provide timely and accurate data surveillance and engage better with patients. The combined result would be the reduction of the burden on overstretched health facilities.

- Successful initiatives and ongoing opportunities in Zambia have led to some success in the mHealth sector. Approximately 36% of mHealth service providers tracked by the GSMA have secured MoH partnerships. However, ongoing support is required across the service provisioning ecosystem and cross-sector arrangements are critical to this endeavour. Slightly less (18%) have attained this ideal in Zambia. New entrants and the remaining mHealth service providers are encouraged to improve their situation and partner with multiple stakeholders.

---

20. WHO Country Corporation Strategy - http://www.who.int/countryfocus/cooperation_strategy/ccsbrief_zmb_en.pdf

- There is a lack mHealth initiatives tracked by the GSMA that are directly concerned with nutritional education and advice, targeted at maternal, infant and child nutrition, there is a unique opportunity to reach those lacking in basic education segments of society using mobile. Indeed in many ways mobile is one of the few platforms in which nutritional and health information can be imparted to illiterate base of pyramid individuals based in the rural regions of Zambia. The practicality of such an approach is confirmed by other data that shows women with little or no education in Zambia are more likely to be undernourished (12%), comparative to those who have a secondary education (6%). mHealth and nutritional information services delivered via IVR provide the means to tackle an historical inequity and improve aggregate benefits to the wider Zambian society through a healthier, more productive and nutritionally balanced populace.

- mHealth service coverage in Zambia is not always deployed in regions that have the largest health burden. There is evidence of a marked north-south bias. Consequently, there is an opportunity to target these deficiencies with mHealth services, based on demand-side metrics.

Overall feasibility assessment

The feasibility of mHealth to address nutrition and maternal and child health in Zambia is moderate-to-good. Demand-side requirements are in place in terms of addressable market and audience, but there remains some work to be done to provide the infrastructure to enable mHealth and popularise the concept with mobile users. In the medium term, it is the GSMA's assertion that Zambia has the potential to develop into a strong mHealth market opportunity. The GSMA will assist in this process by working with the public sector to address common challenges, optimising the chances of success for partnerships between industry stakeholders.
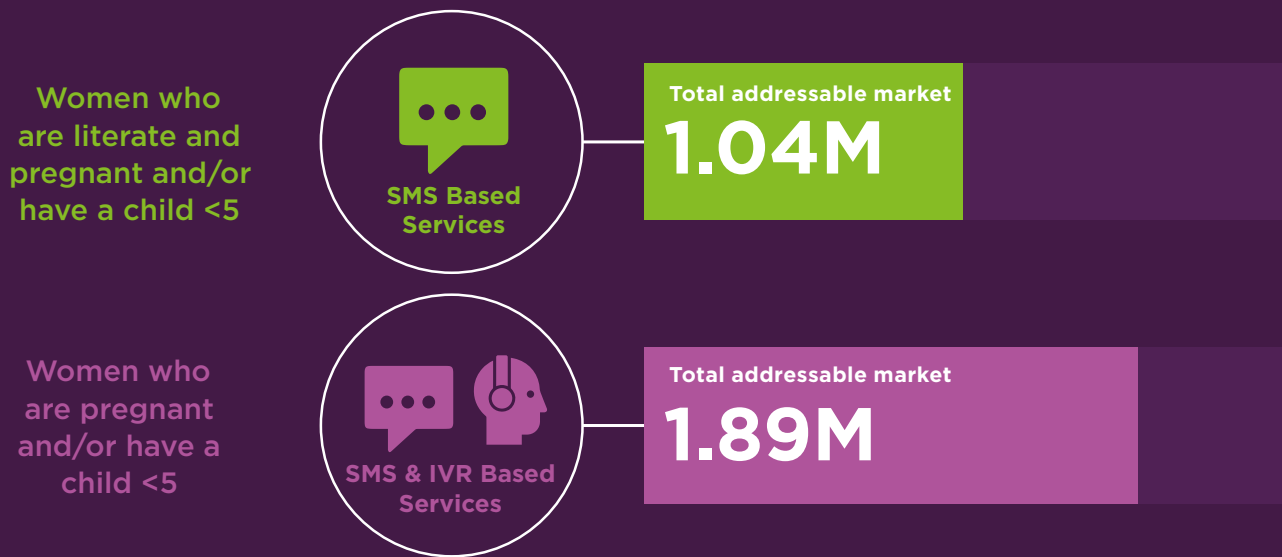
Opportunity size

The evolving nature of the Zambian mHealth industry suggests that services should concentrate on the simplest formats of delivery in the initial stages of market 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 17% over the 2015-2020 period.

Figure 40

Total addressable maternal mHealth market 2015

Women who are literate and pregnant and/or have a child <5

SMS Based Services

Total addressable market
1.04M

Women who are pregnant and/or have a child <5

SMS & IVR Based Services

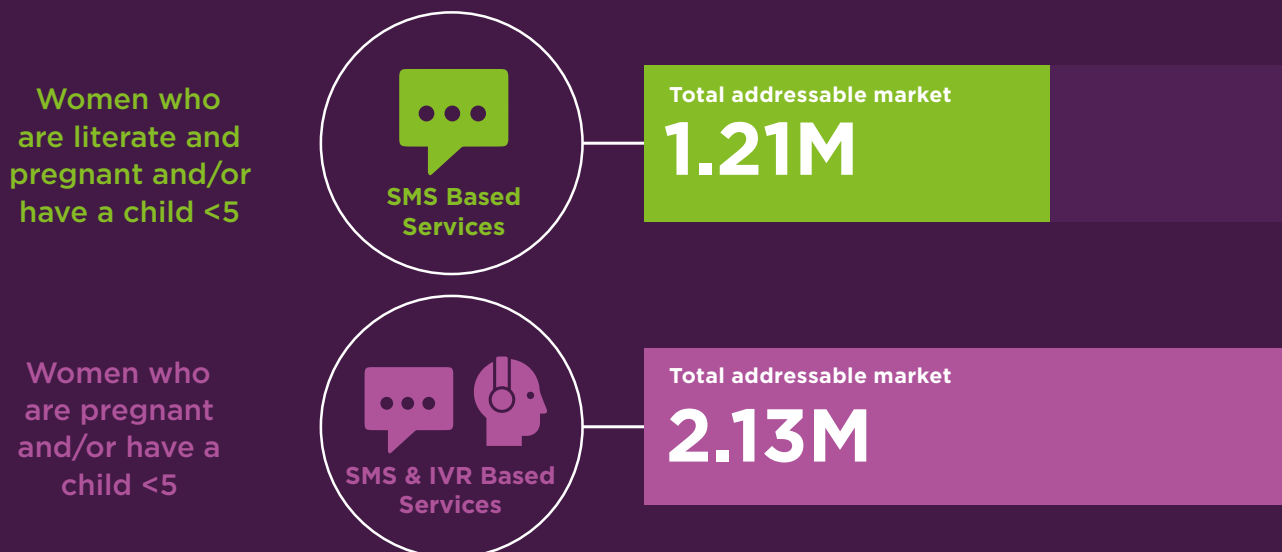Total addressable market
1.89M

Source: GSMA Mobile for Development mHealth model, GSMAi data

When both literate and illiterate maternal segments are targeted using IVR services this opportunity increases further, demonstrating an addressable market of almost 2.1 million by 2020, growing by 13% over the period 2015-2020.

Figure 41

Total addressable maternal mHealth market 2020

Women who are literate and pregnant and/or have a child <5

SMS Based Services

Total addressable market
1.21M

Women who are pregnant and/or have a child <5

SMS & IVR Based Services

Total addressable market
2.13M

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 – **MEDIUM**-**HIGH**
Size of addressable population – **MEDIUM**-**LOW**
Ability to pay or fund mHealth – **HIGH**-**MEDIUM**
Ability to deliver – **MEDIUM**

Ability to deliver

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

Abbreviations and terminology

ANC - Antenatal Care

ARPU - Average Revenue per User

B2B - Business to Business

B2C - Business to Consumer

CAGR - Compound Annual Growth Rate

CHW - Community Health Worker

DBS - Dry Blood Spot

DoH - Department of Health

EmONC - Emergency Obstetric and Neonatal Care

ICT - Information and Communications Technology

IVR - Interactive Voice Response

MDG - Millennium Development Goals

MCH - Maternal and Child Health

MNO - Mobile Network Operator

MoH - Ministry of Health

NGO - Non-Governmental Organisation

OoP - Out of Pocket

PAMI - Pan-African mHealth Initiative

PMTCT - Prevention of Mother to Child Transmission

PNC - Postnatal Care

ROI - Return on Investment

SMAG - Safe Motherhood Action Group

SMGL - Saving Mothers Giving Life

SMS - Short Message Service

SSA - Sub-Saharan Africa

SUN - Scaling Up Nutrition

VAS - Value Added Services