



**TECHNOLOGY SOLUTIONS
TRANSFORMING GLOBAL HEALTH**

Global **m**Health REPORT

NOVEMBER 2015

FIG. 1

CURRENT STATUS OF WORLD VISION mHEALTH PROJECTS



PROJECT STAGES

- START UP
- ONGOING
- PHASING OUT

WORLD VISION PROJECT MODELS

- NUTRITION**
 - GMP
 - PD HEARTH
 - CMAM
- MNCH**
 - ttc
 - iccm
- MoTECH**



▲ Martha Newsome and Jean-Baptiste Kamaté, Partnership Leader – Global Field Operations, observe a Sierra Leonean Community Health Worker as he demonstrates application functionality.

Foreword

World Vision is a proven partner with Ministries of Health and others who share a vision to end preventable deaths and malnutrition of vulnerable women and children by leveraging digital health, or mHealth.

We believe that mobile technology in the hands of frontline and community health workers is a game changer for global health: a critical tool to realise the new Sustainable Development Goals for health and nutrition. I'm particularly proud of this summary of World Vision's mHealth projects in 16 countries.

I want to thank our donors, partners and supporters for working with us to ensure that children survive, thrive and become the leaders of tomorrow.

Martha Newsome,
Partnership Leader – Sustainable Health,
World Vision International

Global Reach

For over eight years World Vision has advanced mHealth¹ as a health and community systems strengthening tool with the intent to boost health and nutrition outcomes for pregnant women, mothers and children under 5. Presently, the World Vision mHealth portfolio has active deployments supporting community health workers (CHWs) and health facility staff in 16 countries in Africa, South Asia and Southeast Asia. The technology supports 21 evidence-based health and nutrition projects. The programmatic focus of each deployment is summarised in this report along with its stage of development. Growth in this portfolio is expected to continue with several new country projects currently in the design stage and not yet included in this report.

To support many of these 21 projects, World Vision has invested in the development of a common set of applications built within the mHealth solution, MoTECH Suite. This has been made possible through a partnership with solution providers Dimagi and Grameen Foundation supported by the Bill & Melinda Gates Foundation. The common platform offers an open-source software solution tailored to meet the needs of five World Vision health and nutrition project models or approaches. Using these five global applications as the starting point, the solution application is contextualised in close consultation with Ministry of Health (MoH) counterparts and users at the national and field levels.

The common MoTECH Suite applications align with key elements of programme design, reduce ramp-up time and cost, and allow access to experienced and specialised technical support to contextualise and launch mHealth projects in many of the most remote and disadvantaged World Vision area development programmes (ADPs).³ The configured solution aligns with government strategy/policy on CHW programming as well as field-level processes that are fundamental to each programme.

Currently, the majority of World Vision's mHealth deployments are moderately scaled and represent proof-of-concept experiences (see Figure 2). However, negotiations are under way in several countries to scale up to achieve wider population coverage based on positive results. Furthermore, several deployments – including those in Uganda, Niger, Mozambique, India, Rwanda and Tanzania – have each reported already having reached in excess of 9,000 beneficiaries, who typically are mothers or caregivers of children under 5. Existing national mHealth projects are also being supported by World Vision in Rwanda and Kenya.⁴

WORLD VISION'S GLOBAL mHEALTH INITIATIVE AT A GLANCE

- 16 COUNTRIES
- 21 PROJECTS
- 6,235 ACTIVE CHW² USERS
- 453,300 BENEFICIARY COMMUNITY MEMBERS REACHED

¹ The term *mHealth* or *mobile health* refers to the use of mobile devices equipped with tailored software as well as data storage, reporting and sharing systems that support it. The broader term *digital health* goes beyond mHealth projects to include, for example, strengthened interoperability among systems or improved policy and standards pertaining to health management information systems (HMIS).

² For the purposes of this report, *community health worker* is used to describe a broad range of frontline health workers or health extension workers. In all cases this is taken to mean personnel who have a primary focus on delivering promotive, preventive and sometimes curative health services outside of the health facility, in the homes or gathering places that exist in the communities where they work.

³ World Vision operates in area development programmes (ADPs) for its project implementation. An ADP is a distinct geographical area where we partner with local stakeholders and communities to improve the health and well-being of children and caretakers through multiple-sector projects aimed at root causes of issues that negatively affect children. These geographic areas where beneficiaries live and work can vary in size, context and population structure. Each ADP has its own staff and design, but they all seek to support families and communities to address child well-being.

⁴ In countries where World Vision supports government mHealth services, we collaborate with the MoH, government and local ADP to help facilitate efficient and effective project implementation. Specific activities of focus are often funding, monitoring and evaluation, training, and partner acquisition for these projects. Here, World Vision contributes significantly less to start-up and scaling costs as these are paid by the government.

World Vision is committed to working with MoHs, investing in sustainable, scalable technologies and bolstering the global evidence base emerging from field deployments while simultaneously increasing opportunities for future growth. Support for innovative mHealth projects continues to grow and will undoubtedly lead to increasing numbers of CHWs and the families they serve benefitting from technology-enabled community health services.

FIVE PROGRAMMATIC APPROACHES SUPPORTED BY mHEALTH

TIMED AND TARGETED COUNSELLING (ttC) deploys CHWs trained in a behaviour-change communication method to encourage families to improve their understanding of health and nutrition. Visits are targeted to times in pregnancy and early childhood when the desired health behaviours are most relevant.

INTEGRATED COMMUNITY CASE MANAGEMENT (iCCM) is a widespread WHO-endorsed and standard approach intended to deliver basic medical care for ill children outside of the health facility. CHWs are equipped to diagnose and treat the most common and life threatening conditions – fever, diarrhoea and acute respiratory infection.

POSITIVE DEVIANCE (PD) HEARTH programme teams start by studying the families who, despite economic or other hardships, manage successfully to rear well-nourished children. Using this information and an understanding of locally available nutritious foods, groups of mothers of malnourished children together learn and prepare these menus to support a change in household-based habits.

COMMUNITY MANAGEMENT OF ACUTE MALNUTRITION (CMAM) is used in emergencies or in settings where there are high levels of acute malnutrition. CMAM uses case-finding and triage to match malnourished children with treatment suited to their medical and nutritional needs and achieve their rehabilitation.

GROWTH MONITORING AND PROMOTION (GMP) is a longstanding public health approach whereby children under 5 are weighed and measured periodically to detect varying degrees of compromised nutritional status. GMP programmes are the entry point to refer children and their families to more focused programmes like PD Hearth or CMAM.

Building a Multifunctional Platform

World Vision's mHealth initiative has a strong focus on behaviour-change communication, registries and vital-events tracking, electronic health records, electronic decision support, and provider-to-provider communication as mapped against an industry standard categorisation of mHealth functionalities in Figure 3 (see pages 4–5). As functionality bundling in mHealth projects progresses, preserving the focus on community-systems strengthening with emphasis on CHWs is key, with potential areas of growth in provider training and education, human-resource management, supply chain management and financial

incentives. Multifunctional technology platforms are central to the value proposition of mHealth, but the longer-term utility of these systems is contingent on their ability to exchange data with other systems and improve business-intelligence processes. World Vision's mHealth projects are making progress towards, but have not yet achieved, integration with existing national HMIS. There is growing awareness that these projects must, from their inception, envision and build a road map to achieve the goal of interoperability or risk losing momentum. In keeping with this idea, World Vision is gaining experience in leveraging or seeking integration points with several other technologies with broad uptake in the health sector, such as GIS,⁵ RapidSMS,⁶ DHIS2⁷ and OpenHIE,⁸ which have been used to implement scalable and sustainable solutions.

WORLD VISION'S GOAL IS FOR DIGITAL HEALTH TO TOUCH THE LIVES OF 700,000 COMMUNITY MEMBERS BY THE END OF 2016

FIG. 2

TRAINING USERS AND BENEFICIARIES

COUNTRY	PROJECT	NUMBER OF USER TRAININGS IMPLEMENTED	CURRENT NUMBER OF USERS	CURRENT ESTIMATED NUMBER OF BENEFICIARIES REACHED
Afghanistan	MUNCH	4	52	3,355
Burundi	Rural Integrated Nutrition	2	24	3,302
Cambodia	Sahakkom Koun Laor	0	59	215
Chad	Saving Children's Lives	1	13	NA
India	Starting Strong	17	72	2,490
India	Starting Strong	13	104	3,700
Indonesia	Posyandu Mobile Health	8	78	1,140
Kenya	Jamii Smart	1	NA	NA
Mali	Saving Children's Lives	2	21	349
Mozambique	Muecate MNCH – CommCare	3	60	5,000
Mozambique	Muecate MNCH – SMAP	3	300	27,700
Niger	Saving Children's Lives	4	100	139,210
Niger	RAcE/NICe	1	16	5,840
Rwanda	EKN Nutrition	NA	1,777	53,827
Rwanda	EAMNeCH	NA	1,942	68,610
Sierra Leone	Community mHealth	4	145	2,046
Sri Lanka	BEACEN	1	23	3,000
Tanzania	SUSTAIN MNCH	1	32	30,100
Uganda	mHealth for AIM	29	896	88,416
Zambia	mHealth for Malaria	NA	521	15,000
	TOTAL	94	6,235	453,300

NOTE: EboVAC Salone in Sierra Leone started in October 2015 and therefore is not included in this table.

5 A GIS is a geographic information system designed to capture, store, manipulate, analyse, manage and present all types of spatial or geographical data.

6 See www.RapidSMS.org.

7 See www.DHIS2.org.

8 See www.ohie.org.



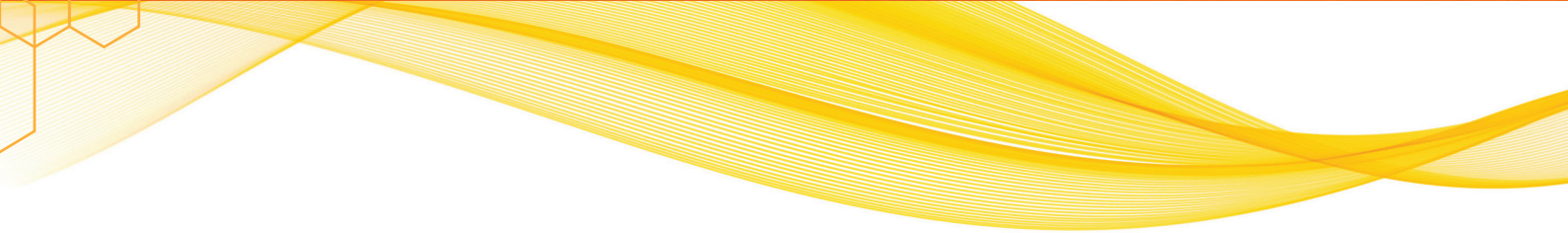
FIG. 3

AREAS OF PROGRAMMATIC SUPPORT & INTEROPERABILITY OFFERED BY WORLD VISION mHEALTH PROJECTS

		Behaviour-change communication or message	Sensors & point-of-care diagnostics*	Registries/vital events tracking	Data collection & reporting
Afghanistan	MUNCH	•		•	•
Burundi	Rural integrated nutrition	•			•
Cambodia	Sahakkom Koun Laor	•			
Chad	Saving Children's Lives	•		•	•
India	Starting Strong	•		•	•
Indonesia	Posyandu Mobile Health	•		•	•
Kenya	Jamii Smart	•		•	•
Mali	Saving Children's Lives	•		•	•
Mozambique	Muecate MNCH – CommCare				•
Mozambique	Muecate MNCH – SMAP				•
Niger	Saving Children's Lives	•		•	•
Niger	RacE/NiCe	•			•
Rwanda	EKN Nutrition	•		•	•
Rwanda	EAMNeCH			•	•
Sierra Leone	Community mHealth	•		•	•
Sierra Leone	EboVAC Salone	•		•	•
Sri Lanka	BEACEN	•		•	•
Tanzania	SUSTAIN MNCH	•		•	•
Uganda	mHealth for AIM	•		•	•
Zambia	mHealth for Malaria	•		•	•

Adapted from A.B. Labrique, L.Vasudevan, E. Kochi, R. Fabricant, G. Mehl. 'mHealth innovations as health system strengthening tools: 12 common applications and a visual framework'. *Glob Health Sci Pract.* 2013;1(2):160–171.

* Currently World Vision does not have projects that offer these two areas of functionality; however, requirements are being prepared to include CHW training and education into some MoTECH Suite projects, and recently funded project designs have incorporated sensors and/or point-of-care diagnostics.



	Electronic health records	Electronic decision support	Provider-to-provider communication	Provider work-planning & schedule	Provider training & education*	Human resource management	Supply chain management	Financial incentives	Interoperability
	•	•	•						
	•	•							
	•	•		•			•		•
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Strategic Positioning for Scalability

TEAMS MUST INITIATE
SUBSTANTIVE
DISCUSSIONS WITH
GOVERNMENTS TO
PERMIT A PROJECT
DESIGN THAT ALIGNS
WITH THEIR FUTURE
DIGITAL HEALTH GOALS,
OFFERS FUNCTIONALITIES
THAT STRENGTHEN
COMMUNITY HEALTH
SYSTEMS AND WILL
BE INTEROPERABLE
WITH A MATURING HMIS

World Vision mHealth projects are all working towards transitioning into a scale-up phase once consensus and shared commitment to a solution or a package of solutions is reached among key national stakeholders – governments, local mobile network operators (MNOs) and MoHs chief among them. World Vision is well positioned in various countries to partner with governments to build this consensus and policy alignment.

World Vision's experience has shown clearly the need to study the mHealth 'ecosystem' to understand the potential entry points for World Vision and clarify whether to offer a technology solution that can be brought to scale in a consortium scenario or to support an existing solution that has already proved its value. Several projects in the process of transitioning to scale-up have experienced setbacks due to misalignment with government desires/abilities or due to a midstream change in government policy.⁹ In these cases, teams are working to align with government priorities or adjust and reaffirm agreements.

Early stage mHealth deployments must offer sufficiently robust evidence of their value to substantiate a considerable investment from participating governments and other key national stakeholders. World Vision's current work, and continual improvement, provides the foundation for scalable programmes that feature engaged, motivated and effective CHWs as well as harmonised monitoring and evaluation systems where data is shared appropriately and used quickly by the partners who need it.

Constructing Sustainable Cost Models

According to recent estimates, during FY15 World Vision mobilised upwards of US\$2.5 million for technology-specific components of health and nutrition projects. For most projects, this component is embedded within a larger health or nutrition-focused grant. Cumulatively over the past several years, World Vision estimates that more than US\$26 million overall has been allocated to these projects.

One of the major cost components for mHealth deployments is the communications costs for data, voice and text transmission. Preferential communication rates and favourable pricing for devices have been negotiated in Uganda, Zambia, India and Sri Lanka, with other country projects initiating similar negotiations. When numbers of users increase as projects mature, experience shows that favourable rates can be negotiated once a foundational

⁹ World Vision, mHealth Information Mapping Survey, 2015.

relationship with mobile network operators (MNOs) has been established. Discussions with national telecommunication regulators in Sierra Leone, Uganda, Zambia and elsewhere have helped build this foundation and ensure that all key stakeholders are working together towards a sustainable business model.

The magnitude and scope of investment in this technology clearly holds great promise to expand CHW capabilities and reach in the communities they serve, leading to an integrated community-based primary health-care system and enhanced impact on maternal and child health and nutrition. Transitioning from proof of concept to projects that achieve broad population coverage is the challenge facing many current World Vision deployments. Positioning the projects to achieve a sustainable cost model for scalability is a critical success factor.

Lessons for Implementation

Building Partnering Acumen

World Vision national office and field teams have gained considerable expertise and confidence in the partnering processes necessary for project development and long-term viability of mHealth solutions. Several national offices have successfully furthered this process to the stage where memorandums of understanding (MoUs) between World Vision and the MoH and/or supporting government entities have established an intent to construct jointly a scalable and interoperable solution as part of a coherent vision for strengthening national health systems (see the Sierra Leone example below). In some cases MoUs with MNOs have set forth favourable pricing structures. The key element in these successful partnering endeavours has been the capability of our national office teams to engage in productive negotiations for technology projects, in some cases with support from regional office, support office and Global Centre resource persons.

Insights into Training Effectiveness and Efficiency

In its role of strengthening community health systems, World Vision is frequently the primary sponsor of CHW trainings. Training CHWs to use mobile devices and applications is crucial to successful project implementation. When used properly, the technology can reduce time for form completion, increase data accuracy and completeness, provide optimal home-visit scheduling options and/or facilitate prompt referrals for urgent medical care and appropriate follow up. Ideally, CHWs should see the phone as a beneficial tool that will make these tasks easier. But sometimes, especially for older CHWs, the initial reaction can be negative due to perceived difficulties with technology or notions of 'extra work'. As described by the project

OUR NATIONAL OFFICE AND FIELD TEAMS HAVE GAINED EXPERTISE AND CONFIDENCE IN PARTNERING PROCESSES NECESSARY FOR PROJECT DEVELOPMENT AND LONG-TERM VIABILITY OF mHEALTH SOLUTIONS

**IN NIGER,
CHWs ARE PROUD
TO OWN A TECHNICAL
TOOL AND BECOME
PROFICIENT IN AN
'ADVANCED
TECHNOLOGY'**

▼ *A CHW in Indonesia uses mobile application to counsel a mother during a growth monitoring session.*



lead for the EKN Nutrition programme in Rwanda, 'For older people it takes time to become familiar with the use of RapidSMS.'¹⁰ To promote easy transition from paper-based systems to electronic coordination, CHWs require initial training and refresher sessions or supportive supervision, depending upon post-training skills assessment and field competency.

World Vision supports initial and refresher trainings in all projects with the exception of those supporting government deployments. In these instances, the MoH has often already conducted initial trainings, and World Vision's primary role is to conduct refresher trainings. Field-experienced technology partners, such as Dimagi, have also greatly contributed to the calibre of user-training curricula and competency assessments. Reports from our field programmes (data not shown) suggest that documenting and sharing ways to improve the training cost-benefit picture is a priority.

Information Technology Support

To support CHWs, it is also necessary to resolve information technology (IT) issues that arise on a daily basis. Challenges to ensure smooth operation of the mHealth platform may be related to user competency, device reliability, mobile network connectivity issues

and application malfunctions, to name a few. In particular, for initial deployments of the application or for system upgrades, support to identify and resolve configuration issues together with the technology partner is a priority. Longer-term systems-architecture considerations come to the fore as plans to improve interoperability are put in place. This progression from user-related to system-related technology issues corresponds with levels 1, 2 and 3 of IT support.

Although data on specific levels of IT technical support are not available for all World Vision projects, a clear indication of inadequate support from those projects reporting was evident.¹¹ While a few projects such as

¹⁰ World Vision, *mHealth Information Mapping Survey*, 2015.
¹¹ *Ibid.*

those in Sierra Leone demonstrate more fully functioning support mechanisms with five designated IT staff, many projects operate with only one IT technical advisor and rely more heavily on support from their technology partner. Most countries are operating with only level 1 technical support, and still others have indicated that they have no IT technical staff available.¹² In several cases troubleshooting system configuration issues was covered by health technical staff supporting the project on an intermittent basis. The most crucial area for sustainable IT capacity building is from higher level 2 through level 3 technical skills.

User Satisfaction and Data Utilisation

Favourable reviews of mHealth initiatives highlight their potential to assist frontline health workers and increase utilisation of monitoring data for local-level decision making. Under the Saving Children's Lives project in Niger, CHWs were proud to own a technical tool and become proficient in an 'advanced technology'. This has also had a profound effect on community perception of CHWs. The same project in Niger reported that CHWs experienced increased reputation, belief in their ability to perform their job and respect from using mHealth devices. In Zambia, the project leader reported that 'CHWs like the technology because it has made their work easier. They refer beneficiaries quickly, and the time they spend during home visits has [been] reduced'. Higher-level supervisors in Sri Lanka have also noticed positive effects of mHealth, commenting that data are easier to analyse with automated features, high-quality and easily accessible patient records and/or medication use, and fewer data errors. However, managers reported that slow connection speeds due to inadequate throughput of cellular or internet coverage can cause delays in data collection, and if errors are made they are often difficult to correct once submitted. Overall, CHWs and supervisors tend to like the technology, especially with proper training and good connection quality. In future, World Vision deployments are expected to provide more rigorous evidence of these patterns based on a common monitoring and evaluation framework currently being finalised.



▲ *Ugandan health workers use their World Vision-issued phones to help manage child illnesses and to stay connected with health staff and patients alike.*

12. IT support is broken up into three tiers: Level 1 support is the most basic level of support, where simple problems like software malfunctions that arise with technology are resolved. Level 2 support handles more complicated issues, such as server installation or virus removal, and is often necessary for more technical and larger projects. Level 3 support includes all highly technical backend system failures that can arise with software or hardware/network issues.

India

Overview and Context

Starting Strong is a World Vision India project currently funded by World Vision Canada to address the nutritional needs of mothers and children under 5. Specific focus is given to the 1,000-day period between the start of a woman’s pregnancy and a child’s second birthday because studies have shown that early nutrition intervention has a tremendous impact on a child’s long-term physical and mental growth. Starting Strong aims to contribute to solving the malnutrition problem in Narsinghpur, a city in India’s second largest state, where an estimated 21 per cent of children under 5 are stunted, 42 per cent are wasted, and 39 per cent are underweight.¹³

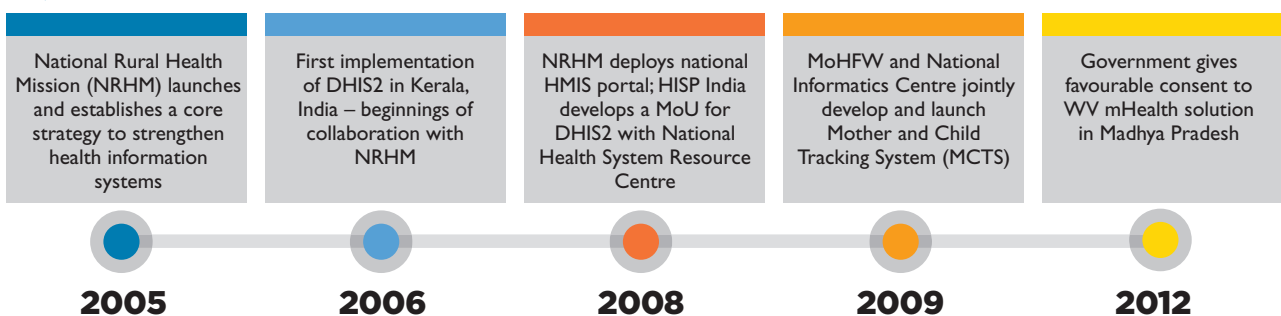
Starting Strong is implementing a bundle of three models: timed and targeted counselling (ttC), growth monitoring and promotion (GMP), and positive deviance hearth (PD Hearth). The project utilises a ttC-based mobile application provided by the MoTECH Suite that allows community health workers (CHWs) to track pregnant women and children under 2 and augment personalised counselling with appropriate multimedia messages on caring and feeding practices, immunisation and health-seeking behaviours. The application further assists CHWs by automatically scheduling the next visit in an established visit schedule and by

providing referrals to nearby health facilities if urgent care is needed based on the presence of danger signs regarding pregnancy, newborns or infants. A GMP mobile application has also been implemented to help CHWs register and collect anthropometric data. This allows CHWs to readily screen and enrol vulnerable children into PD Hearth services. The enabling environment for national eHealth integration in India is still evolving towards more institutionalised health management information systems (HMIS). The massive and complex nature of the Indian context has slowed the process to achieve smooth interoperability. However, there are key steps in the timeline of movement towards integration that will allow for future mHealth projects to achieve scale more successfully (see Figure 4).

Intervention Quality Enhancements

Use of the MoTECH application by CHWs has helped improve health-care quality by ensuring protocol adherence. While time per visit has increased from 10 minutes to 30 minutes, this can be attributed to messaging support that the mobile application can provide. Project monitoring will track time per visit and allow trainers and supervisors to better understand the messaging learning curve for CHWs. Prior to the implementation of the MoTECH software, CHWs

FIG. 4 INDIA EHEALTH SYSTEM INTEGRATION AND INTEROPERABILITY TIMELINE



¹³ World Vision, *Starting Strong Baseline Report*, April 2013. Sources for timeline: 2005, <http://www.minsa.gov.pe/oge/conferenciaops/Recursos/43.pdf>; 2006, <http://www.uio.no/studier/emner/matnat/ifi/INF5750/h13/lecture-presentations/presentationkopen-source-kurs.pdf>; 2008, <https://nrhm-mis.nic.in/SitePages/HMIS-AboutUS.aspx>; <http://www.minsa.gov.pe/oge/conferenciaops/Recursos/43.pdf>; <http://www.hispindia.org/index.php/our-projects/national>; 2009, <http://www.uio.no/studier/emner/matnat/ifi/INF5750/h13/lecture-presentations/presentationkopen-source-kurs.pdf>

FIG. 5

MOBILE NETWORK OPERATOR PROFILE

IDEA CELLULAR

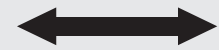


165 MILLION IDEA SUBSCRIBERS
OF THE 941 MILLION CELLULAR CONNECTIONS IN INDIA



149,196 SITES OF OPERATION

2G | 3G



primarily collected data. Mobile technology reduces errors that occur in manual data entry while also adding value to the routine CHW visit. ‘The MoTECH application is able to assist the CHW in providing counselling according to the data being input,’ says Jeba Priya, project manager of Starting Strong. ‘Community health workers are able to pull up multi-media such as pictures and videos that can be shared with mothers and caregivers.’

New Approaches to Support and Solution Design

Mobile applications such as MoTECH often require information technology (IT) support to quickly fix

issues that may impede the operability of the tool. While outside support can be acquired at a cost, Starting Strong has integrated IT support within the rest of the programme, reducing potential expense and turnaround time. ‘Staff members and workers were initially trained on health and nutrition, then later trained on the use of MoTECH Suite,’ states Jeba Priya. ‘This allowed them more ease in understanding the application.’

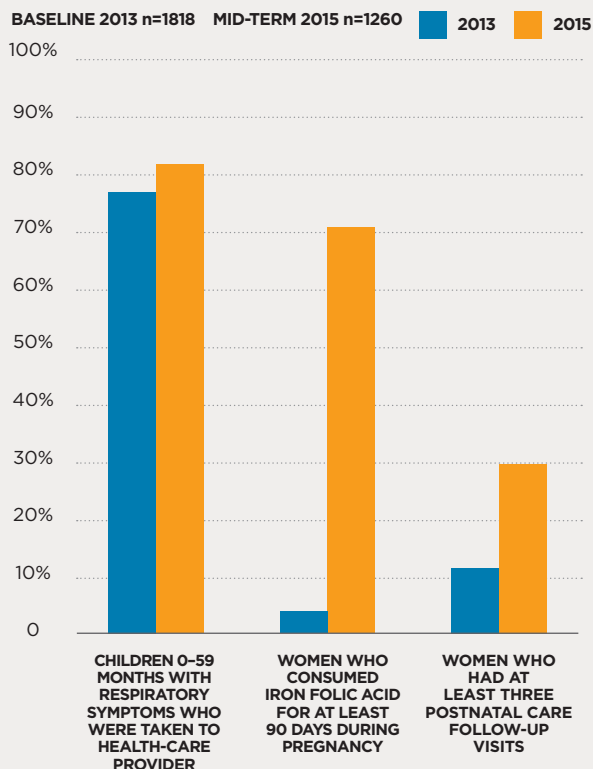
This capability has enabled Starting Strong to better diagnose the mHealth ‘ecosystem’ at the local level, where staff learned that in some programme areas the solutions are often incompatible with the technology that underlies the MoTECH Suite and so adjusted their approach to better match the needs of the local area. ‘We studied their process, and we provided them an exact solution per their process,’ comments Lindon Johnson, the national ICT4D coordinator for India. ‘We were even able to fill in the gaps of their solution using our processes. This is an example of us coming together with the local government and creating the best solution.’

Early Results

In March 2013, prior to the implementation of the project, a cross-sectional baseline survey in mHealth project areas was undertaken throughout villages in the Narsinghpur District of Madhya Pradesh to assess the prevalence of malnutrition in children under 5 (including wasting, stunting and underweight) and to measure the frequency of health-care access by pregnant women. The Sai Kheda block within the Narsinghpur district was identified as a comparison group which will be used for analysis of the final evaluation in 2017. In both sites cluster sampling was used and yielded a final sample size of 2,895 randomly selected households (45 clusters per site and margin of error ±4 per cent wide).

FIG. 6

COMPARISON* OF BASELINE AND MID-TERM RESULTS IN MHEALTH-SUPPORTED PROGRAMME AREAS, STARTING STRONG, INDIA APRIL 2013 AND MAY 2015



* Differences between prevalences at baseline and mid-term for the IFA and postnatal care indicators are statistically significant at least at the p<.05 level.



◀ Women and children of Melghat ADP also benefit from World Vision India's mHealth initiative.

In May 2015, a mid-term survey was conducted to monitor progress of the mHealth project, focusing on assessment of capacity building for frontline workers and system networks. Using the same sampling method specified for the baseline, a final sample of 1,260 households was recruited in the programme area only.

Pre-publication results from the mid-term survey, conducted two years into the project implementation, showed positive results among programme beneficiaries for a few key indicators. The proportion of children aged 0 to 59 months who were taken to a health-care provider to address a recent acute respiratory infection episode was 82 per cent in 2015; although the trend is positive, this was not a significant increase from 77 per cent in 2013. Similarly, the survey showed an increase of 18 percentage points in the proportion of women with children aged 0 to 23 months who had completed at least three postnatal care visits (from 12 per cent to 30 per cent). There also was a dramatic 68 percentage point increase in the proportion of women who reported having consumed iron folic acid (IFA) for at least 90 days during their most recent pregnancy (from 4 per cent to 71 per cent). For the latter two indicators, these differences reached statistical significance. There were no significant differences observed for any anthropometric measure among children. ●

Indonesia

Overview and Context

Childhood malnutrition is a priority health issue in Indonesia. World Vision's mHealth project supports the Posyandu, a community-based and government-led growth monitoring and promotion (GMP) programme to address child malnutrition. Posyandu hosts monthly community-based weighing and

immunisation for children under 5 and pregnant women and offers nutrition counselling and supplementation. Through a grant from World Vision Canada, UNICEF and the Institute of Development Studies of the Canadian Department for International Development, World Vision has added an mHealth component to improve the

FIG.
7MOBILE NETWORK
OPERATOR PROFILE

TELKOMSEL

**122 MILLION**
SUBSCRIBERS
OF THE 318.5 MILLION CELLULAR
CONNECTIONS IN INDONESIA

ESTIMATED POPULATION COVERAGE

95% > 2G
60% > 3G**2G | 3G | 4G****MORE THAN ONE IN THREE INDONESIAN CHILDREN ARE STUNTED.**THIS IS EQUAL TO OVER 9.5 MILLION MALNOURISHED CHILDREN UNDER 5.¹⁴

quality of Posyandu services for malnourished children and their caregivers in two districts in Jakarta and Sikka.

Taking advantage of the global GMP application in the MoTECH Suite, World Vision partnered with Dimagi to customise the solution for this project. The application addresses the needs of government and other partners acting in a supervisory role and enhances the daily activity of the community volunteers that they support. The application, called mPosyandu, uses Android smartphones to register the child, collect anthropometric measurements, calculate z-scores and classify the child's nutritional and growth velocities. From within the application, summary reports can be generated from the data along with aggregate single records using various criteria. The implementation of mobile phone technology is increasingly popular with international agencies and non-government organisations (NGOs) because of its potential to improve access, quality and timeliness of service. Challenges such as error rates in paper-based records hinder the true potential of programmes such as Posyandu.

Partnering for Evidence Building

The evaluation component of the Posyandu project has benefitted greatly from a partnership with Institute of Development Studies UK. The research team established a framework for assessing the value of the mHealth solution and conducted a baseline survey in January 2015. The most recent milestone in this partnership has been the completion of a mid-term review exercise in August 2015 with a focus on acceptability of the application among community health

workers (CHWs), which in Indonesia's context are community volunteers, and the impact of mPosyandu on growth monitoring activities. Early results are summarised below.

Results to date

Findings from the mid-term review suggest that the mPosyandu application helped to improve accuracy of nutritional status calculations. These validity checks identified that 11 per cent of calculations to detect underweight children using the previous paper-based system were inaccurate. Furthermore, document review found that 34 per cent of paper records showed incorrect values for child age, a variable that strongly affects estimates of several nutritional status measures, further emphasising the data-quality issues for the programme that can be addressed with the use of mPosyandu.

Mid-term review findings also documented that both CHW cadres and caregivers perceived the use of mPosyandu as improving service quality of the nutrition programme. With the mPosyandu application, CHWs more often provide immediate feedback after each growth monitoring session (57 per cent) than those who do not use mobile phones (7 per cent). mPosyandu also provides CHWs with an array of tools to help them improve their nutrition counselling by identifying the cause of a child's malnutrition and provide automated tailored advice for caregivers, with supporting pictures and videos. These tools also can encourage CHWs to give immediate and appropriate counselling to caregivers, and we have found that the level of acceptance of the solution is nearly universal (91 per cent), indicating that caregivers believed they had received high-quality service, in part because of the use of mPosyandu. ●

Sierra Leone

Overview and Context

Sierra Leone is emerging from the Ebola crisis with a renewed commitment to contribute to strengthening the health systems that have been decimated by the epidemic. The broad spectrum of concerns related to maternal, newborn and child health and nutritional status has only increased against the backdrop of the Ebola epidemic in the region.

While supporting Ebola control efforts nationwide through the safe and dignified burial programme, World Vision has maintained an mHealth deployment using the MoTECH Suite with the user interface CommCare (the component of the software most visible to the user operating the handset) to support timed and targeted counselling (ttC) in Bonthe District for the past three years. This project has been supported by a grant from Irish AID and UKAid to World Vision's Ireland and UK-based offices.

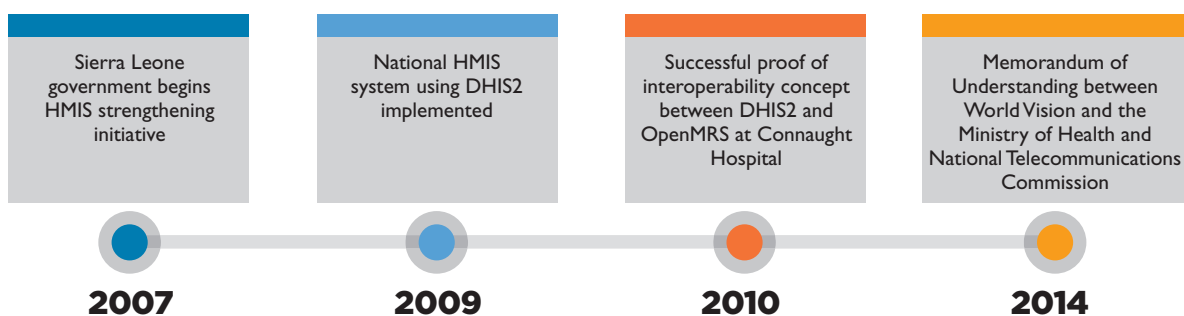
During the peak of the Ebola epidemic in November and December of 2014, community health worker (CHW) activity was shifted to emphasise infection control measures. Household visits decreased, but the mHealth-supported ttC programme has persisted, and is expected to expand in the coming year.

Building Robust Partnerships for Scalability

Strategic collaborations and partnerships have always been driving factors in determining the potential to scale up mHealth deployments. Engagement and partnership with government agencies need to be focused on sustainability. Our project in Sierra Leone exemplifies this approach. The network of collaborations and partnerships among NGOs, the government, technology providers, funders and mobile network operators (MNOs) cultivated by World Vision has set the stage for project expansion.

Beginning in early 2012 and building on prior collaborations, the World Vision team worked with counterparts at the Sierra Leone Ministry of Health (MoH) to establish mHealth as a strategic investment to be integrated into the national health system and to offer the promise of improved service delivery and community-level data in support of maternal and child health programmes. The Sierra Leone mHealth project supporting the World Vision team continues to deepen its understanding of other mHealth projects being undertaken in the country. By current estimates there are 40 active mHealth projects in Sierra Leone. Yet of these projects, only three support maternal, newborn and child health (MNCH)

FIG. 8 DIGITAL HEALTH SYSTEMS INTEGRATION AND INTEROPERABILITY TIMELINE IN SIERRA LEONE



Sources for timeline: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3041283/>.

FIG.
9MOBILE NETWORK
OPERATOR PROFILE

AIRTEL SL



1.5 MILLION
SUBSCRIBERS
OF THE 4.1 MILLION CELLULAR
CONNECTIONS IN SIERRA LEONE



295
SITES OF OPERATION

2G | 3G | 3G+



interventions, and no other projects exist in the Bonthe District where World Vision currently works. Further organisational partnering based on a mutual understanding of shared needs and strategic intent is constantly being explored.

Partnering with key ministries

From the outset, the World Vision team anticipated the challenge of working within an evolving digital health framework on the part of government (see Figure 10). World Vision and the Sierra Leone MoH worked closely with the Ministry of Information and Communications, which develops telecommunications policy, and the National Telecommunications Commission, which regulates and ensures policy compliance, to ensure the mobile solution was aligned with governmental strategy, policy and vision for mHealth. In addition, World Vision shared with them the performance characteristics of the mobile solution in support of CHW programming to explain its promise for improving health outcomes. This effort culminated in a decision by the government formally to recognize the MoTECH Suite as the preferred mobile solution of the Sierra Leone government at the local community level.

To enable the MoH to lead in the implementation of the mobile solution and ultimately take over the project after scale up, World Vision is providing it with equipment, helping the MoH identify gaps in policy and technical support, and working with ministry staff to fill those gaps.

Building a Sustainable Cost Model

To foster the creation of a sustainable cost model, World Vision supported the MoH in its negotiations with Airtel, one of the nation's main mobile network operators (MNOs) (see Figure 9). During these negotiations the MoH explained that

the project was part of a government health and development project. The ministry then proposed that Airtel become a partner in this project under its corporate social responsibility programme by offering reduced data, voice and SMS rates for the initiative when it is time to expand to population-level scale. The scale of CHW programmes in Sierra Leone offers the promise for Airtel to gain a large number of consistent subscribers as well as improved signal coverage for communities as Airtel increases its sites of operation. This public-private partnership will help assure the long-term viability of the project expansion and will enable the government to afford the cost of the mHealth programme as external funding diminishes over the coming years.

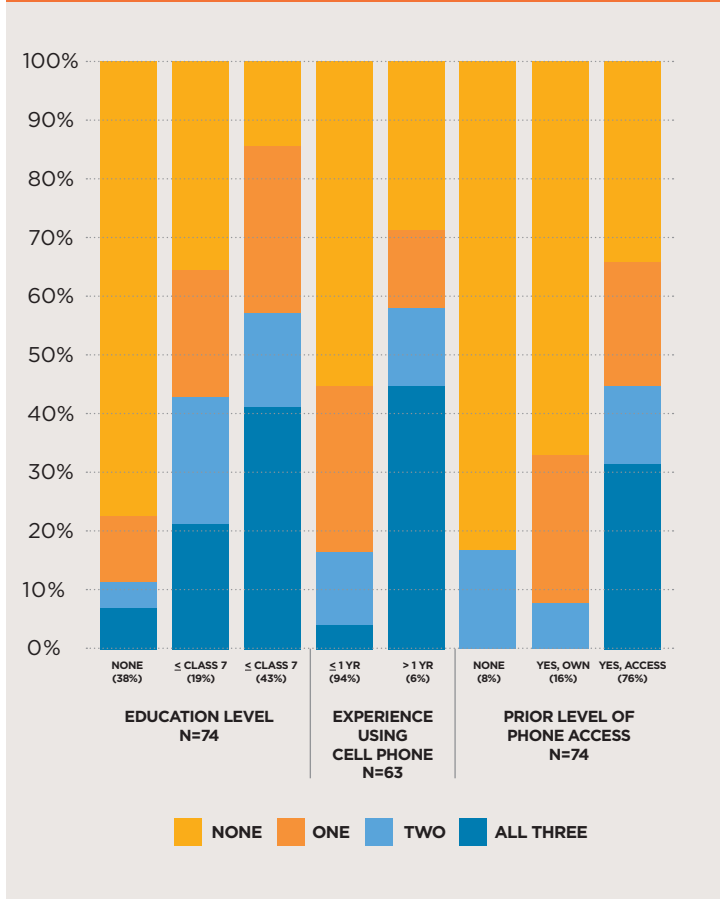
Understanding the Needs of Trainees

User trainings conducted between 2012 and 2014 reveal key insights into the type of user that is able to master the mobile device and application. Trainers were asked to observe three categories of skills related to effective use of the mHealth solution: navigation skills needed to open and use the application, skills needed to enter information into the application, and the ability to transmit information from the device to the server.

Skills attainment information was available from a total of 75 trainees. The information was combined to reflect whether one, two or all three of these skill categories were observed immediately after they were trained to use project-provided handsets. Figure 10 summarises key results, showing that higher levels of education were strongly related to the highest level of skills acquisition during the training (41 per cent in the highest education category, 21 per cent with lower level of education and 7 per cent with no education; $p < 0.001$). Among the 63 trainees who



FIG. 10 FACTORS ASSOCIATED WITH NUMBER OF OBSERVED SKILLS ACQUIRED POST-TRAINING, SIERRA LEONE, 2012-2014



reported their level of prior experience using a cell phone, having more than one year of cell phone experience was related to more complete skills acquisition (45 per cent for those with more than one year of experience vs. 4 per cent for those with less; $p < 0.005$). Finally, there was a trend towards improved skills acquisition for trainees who had better access to a cell phone in the past. Most trainees (76 per cent) did not own a phone yet had some level of access to one. Trainees in this group more often acquired two or three skills (45 per cent) than did either those who own a phone (8 per cent) or those who had no access (17 per cent; $p = 0.06$). Further analysis of these results for trainees who own their phone is in process. Although multivariate analysis was not performed due to the small sample size (so we cannot determine which of these characteristics plays a stronger role), these results clearly indicate that those trainees with less education and less prior experience with or access to a cell phone will need additional support to master the mHealth application. ●



Uganda

Overview and Context

According to the Ugandan Demographic and Health Survey in 2011, about 6,000 women die every year due to pregnancy-related causes. Similarly, 1 in every 19 Ugandan children dies before his or her first birthday, and 1 in every 11 dies before his or her fifth birthday.

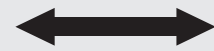
The AIM Health project is funded by For Every Child, a World Vision US-based campaign, and by Irish AID. The project uses the timed and targeted counseling (ttC) project model as part of a community systems strengthening approach to improving maternal, newborn and child health. This programme is aligned to Uganda's National Health Strategy,

FIG.
11MOBILE NETWORK
OPERATOR PROFILE

| MTN

**10.8 MILLION MTN
SUBSCRIBERS**
OF THE 25.3 MILLION CELLULAR
CONNECTIONS IN UGANDA**52** DISTRICT
CAPITALS
AND OVER
150 TOWNS

2G | 3G | 4G



which has prioritised filling the gaps in health-care accessibility. Project implementation has proceeded in close partnership with the Ministry of Health (MoH) to tailor the design and training of community health workers (CHWs). The mHealth project has outfitted CHWs with devices enabled with the MoTECH Suite ttC application to address MNCH issues in Uganda. In this context the application is better known as CommCare, which is the component of the software most visible to the user operating the handset.

Ease of Use

The introduction of new technology to an existing project can be cumbersome. A lack of familiarity, together with technical issues, can cause an otherwise promising programme to falter. The AIM Health project encountered these issues, yet it was able to overcome the difficulties with positive results. 'We had trouble synchronising the data once it was captured, which affected the ability of the village health team to provide feedback,' describes Joel Nsumba, the reporting and documentation coordinator of AIM Health. 'Once the technical issue was fixed, the comfort level of the health workers in terms of using the CommCare application was greatly elevated.'

The capabilities of the MoTECH Suite were key to the comfort level of the CHWs and their village health team supervisors as they discovered that data could be collected and aggregated by region, office and age group. 'Everyone was so involved with the findings that they expected greater results from the project from the use of the CommCare application,' continued Nsumba. As users gain an understanding of key processes in the mHealth approach, the need for

technical support to solve emerging issues decreases, thus leading to more streamlined operations.

Move to Mobile

The scale of the Ugandan mHealth deployment is one of the largest in the World Vision portfolio, with 896 CHW users delivering the ttC service with the assistance of the MoTECH Suite and CommCare. Results describing the potential impact of the solution as an efficiency gain and quality improvement resource within the AIM Health project are still forthcoming, but the AIM Health team believes that it will soon be more common for CHWs in their project areas to be using the mHealth tool than relying on paper-based systems.

A Ministry of Health Partnership Moving towards Sustainability

The use of the CommCare application within the AIM Health project has bolstered World Vision's partnership with the MoH. World Vision has also worked together with the MoH to understand the effect of mHealth technology and the impact of AIM Health as a whole.

An appreciation of the value of the solution is growing, and there is active discussion between World Vision and the MoH to enable data sharing on the path to interoperability. 'The Ministry of Health plans to use a comprehensive CommCare interface so that health-metrics information can be directly shared between this project and other Ministry of Health information systems,' states James Muhumuza, the project manager of AIM Health. 'We hope that the Ministry of Health will be able to continue the work when our project phases out.' ●

World Vision is a Christian relief, development and advocacy organisation dedicated to working with children, families and communities to overcome poverty and injustice. Inspired by our Christian values, World Vision is dedicated to working with the world's most vulnerable people. World Vision serves all people regardless of religion, race, ethnicity or gender.

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For more information on individual
country projects, including points of contact,
see <http://www.wvi.org/mHealth>.

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