Innovation for capturing and tracking temporal changes in health and nutrition indicators of households: Samburu pilot

Watson Lepariyo, Vincent Alulu and Nathaniel Jensen

Background

Globally, malnutrition of all forms affects one in three people directly (WHO 2018). In 2018, 149 million children under five years of age were stunted, 49 million were wasted and 40 million were overweight globally (WHO 2019). The prevalence of stunting in Africa is 40% and Asia has the largest number (112 million) of stunted children under five (Dewey and Begum 2011). Malnutrition at an early age has been shown to have direct consequences on child health, long term cognitive and physical development, and subsequently resulting in decreased productivity in adulthood (Alderman, Hoddinott and Kinsey 2006).

The Global Nutrition Targets 2025 and Sustainable Development Goal Target 2.2 reflect a commitment to reducing malnutrition, but a lack of timely and reliable data continues to hamper related efforts (Development Initiatives 2018). Reliable methods for tracking acute indicators, such as wasting, that change rapidly and frequently over time are lacking especially in sub-Saharan Africa and, when available, are not reliable (Development Initiatives 2017). These unreliable methods can lead to a misjudging of the situation by program implementors who are keen to track and eliminate all forms of malnutrition. Data utilized to formulate joint global and regional child malnutrition estimates, are often obtained from a nation-level dataset that are a point-in-time estimates of malnutrition that are collected at intervals of three to five years in most countries (WHO 2019). These infrequent and low-resolution estimates pose a number of issues for those working to understand nutrition and health dynamics. Aggregating nutrition data and using national-level datasets masks the

sub-national variation in levels and the causes of these indicators (Akombi et al. 2017). Therefore, there is a need to increase data collection at the subnational level to better understand the priorities and help in designing effective action. Data to track seasonal variation in malnutrition rates, for example during dry seasons, is mostly non-existent, because the current data collection methods are too costly to deploy frequently. In addition, conventional data collection norms rarely integrate processes such as household benchmarking and related education, which could generate value for the surveyed households.

Project summary

A research team made up of scientists from the International Livestock Research Institute (ILRI) and the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), proposed to tackle this information gap by developing, deploying and building capacity around an information and communications technology (ICT)-based platform for collecting and disseminating high-frequency, high-resolution food consumption data and young child health data directly from and to households. High-resolution data in this case includes images that can be run through a trained algorithm to differentiate types of foods consumed.

> The key innovation of this platform is combining the accuracy and frequency of recording events in near-real-time with the low-cost, ease and support of ICT.

The research team developed a system by which households can record and submit food consumption and child health data at their convenience, the platform is aimed at reducing cost and improving the timeliness of the data by avoiding reliance on third-party enumerators. The mobile-based platform does not require user literacy or numeracy, and offers an opportunity to capture indicators that would otherwise be too complex or expensive to capture using conventional methods. The tool interface is based on icons and audio that can be easily interpreted by those with limited training. Children's clinical signs and symptoms are collected to assess morbidity levels that can have implications on nutritional status. Analytic tools and image processing algorithms can also be used to ensure that related high-quality images provide additional information on data accuracy.

These processes are aimed at reducing the time taken to administer conventional surveys (e.g. paper-based consumption journals, socio-economic profiling) to households and reduce recall error, while improving the data available for tracking and improving interventions. Furthermore, the mobile-based platform is programmed to provide households with dashboards of information on their children's nutrition status with reference to international standard. Access to information that was otherwise not available, is expected to stimulate households to improve their health and nutrition-related behaviour and eventually improve their nutrition status.
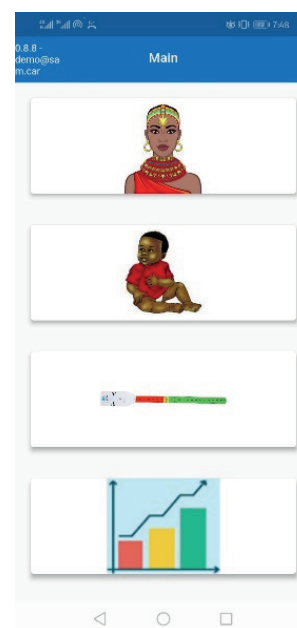

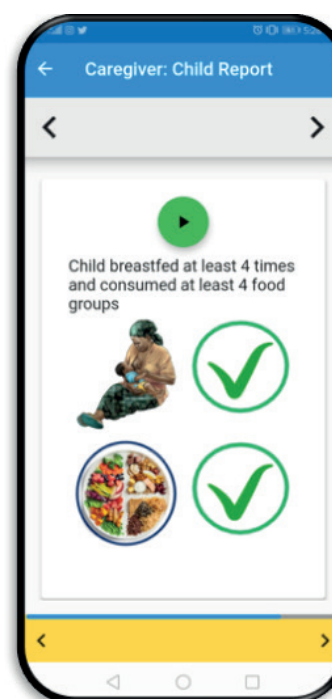*Figure 1: The caregiver 'Mbiotisho' app home page*

Figure 2: Age-conditional feedback on the number of times that the child breastfed and the number of food groups that the child consumed.

Study design

Tools

The caregiver's tool, which is known as 'Mbiotisho'[1], uses pictorials, illustration and audio to elicit information on child morbidity, dietary patterns, coping strategies and children's Mid-Upper Arm Circumference (MUAC) and provides households with individualized feedback on key health and nutrition indicators. The tool does not require literacy or numeracy and it was developed using the Logiak platform.

Logiak is a code-free environment that provides a flexible application development environment, with customizable features, which was important to ensuring that the application would be intuitive and simple to use even for those that were unfamiliar with smartphones and/or were illiterate. The tool is programmed with easy-to-use-features; for instance, the tool opens to a simple landing page with limited and obvious options (Figure 1) and always returns to the same landing screen when tasks are completed.

Apart from being a data submission tool, the application also provides individualized feedback instantly on several indicators in response to a caregiver's input. This feature does not require communication with the server, so that the feedback is in real time irrespective of connectivity. The feedback is presented in a way that can be visualized easily by caregivers, with support from pre-recorded audio that better explains the message to the caregivers (Figure 2).

Figure 3: Community health volunteers Mbiotisho household dashboard

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1. 'Mbiotisho' is a Samburu word which loosely translates to health and nutrition.

The research team also developed a second tool targeting community health volunteers (CHVs). This tool is intended to help CHVs collect the same data as those collected by caregivers, on the same caregivers and their index children[2], thereby providing a comparison dataset with which to assess the accuracy and value of the data collected by the caregivers. The CHV tool also provides the CHVs with basic demographic information on each of the caregivers (Figure 3) and summary statistics on recent submissions, which the CHV could use to assess the participants' progress while intervening whenever they are lagging.

In addition to the tools, there is a web-based dashboard for developing and deploying the data collection tools and downloading data by the research team.

Sampling and implementation

In June 2019, the research team launched an iterative process of tool development and pretesting with eight caregivers and four community health volunteers (CHVs). The goals of this process were to (i) ensure that caregivers were able to correctly understand and respond to the questions in the tool and (ii) improve the caregivers' user experience when doing so. To achieve this, the team went through two cycles of caregiver training and many days of unsupervised data collection, feedback and updating the tool. See Alulu (2019) for more details on the pilot activities.

After successfully pre-piloting the tools, the research team launched a one-year pilot in October 2019, in Samburu County, one of the arid and semi-arid lands (ASAL) of northern Kenya. The county was selected purposefully to test the tool in a region characterized by limited inaccessibility, low literacy rates and low ICT coveareg In addition, the county has a well-established community health strategy system (CHSS) and CHV network, which would play critical in collecting and assessing the nutritional data quality.

Four community health units (CHU)[3] were purposefully selected to provide variation in remoteness and infrastructure, which we expect to provide variation in participants' literacy rates, smartphone coverage and experience. Within each CHU, five CHVs were selected by the community health extension workers (CHEWs) from the subset of CHVs that had been active for the past six months and had been submitting monthly reports on their

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2. Index child refers to a child that is selected to participate in the study aged between 6–47months at the time of enrolment.
3. Community Health Unit (CHU) is a health service delivery structure within a defined geographic area covering a population of approximately 5,000 people.

clients during that period. The CHVs were then requested to develop a roster of all the caregivers' reproductive age (15–49 years) with at least one child between five and 47 months from their catchment area.[4] The sample was then selected after stratifying the rosters by child age and location within each CHU. Our original intention was to randomly select from the age- and location-stratified lists but we fully saturated many of the CHVs' strata and then needed to reallocate across strata. Part way through the training we added an additional two CHVs and 10 caregivers to mitigate the risk that CHV attrition presented for the original study design. The final sample size for the project pilot is 189 caregivers and 22 CHVs.

> As a group, the 22 CHVs participating in the project were trained for three days on CHV technical modules specific to the indicators, on the features and survey content in the Mbiotisho app, and how to provide technical support to the caregivers.[5]

The 189 participating caregivers were then trained in their respective CHUs for seven days, three of which were in unsupervised, but CHV-supported, app testing. The training included modules on phone use and care, training on the basic application features and training on the survey questions. Both the CHVs and caregivers were provided with smartphones and solar chargers to be used throughout the pilot.

The pilot will be active for 11 months. During this time, the caregivers can submit information as often as once every 24 hours or as seldom as they like. During training, the caregivers were informed that the team's intention was to collect information on most of the health and consumption indicators about three times a week. At the same time, CHVs would visit each caregiver monthly, providing technical support and checking up on the same indicators.

At the end of the 11 months of piloting, we hope to have approximately 50,000 submissions from the caregivers on caregiver and child morbidity, dietary patterns and coping strategies; 8,000 submissions on children MUAC measurements from caregivers; and 4,000 submissions of caregivers and children checkup from CHVs on the same indicators.

Discussion

Training caregivers to submit their children's nutrition and health data is a promising way to address a critical information gap around health and nutrition—information that is invaluable both to the decision-makers and the contributors. The Mbiotisho app also offers an exciting way to learn how the provision of tracking information to contributors could stimulate nutrition-related behaviour change and/or influence the quality and frequency of submissions by caregivers. A mobile health (mHealth) application like Mbiotisho could be viewed both as a data collection tool and most importantly a critical component of the nutrition care process[6] . Studies show that mobile-based applications can be used to deliver health services to underserved communities and have had a positive impact on health and have been useful tools in health behaviour change interventions (Garcia-Gomez et al. 2014; McKay et al. 2018).

From the training, we found that caregivers are eager to learn and contribute. While they were excited to use the application, they also showed a keen interest in growing their knowledge and capacity around nutrition and smartphone use. Having access to, and learning to use, smartphones can be viewed as a way of developing self-efficacy among women that would not otherwise have access to such devices and opportunities. While these experiences have been promising, the value of this solution will ultimately be determined by the quality of the data recorded and submitted by the caregivers.

Acknowledgements

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4. Irrespective of this project, CHVs perform and record monthly checkups from pregnant women and women with children under five years of age within their catchment area.
5. In theory, all the CHVs were already trained and experience at collecting the indicators and were actively collecting most of the indicators during their monthly check-ups with caregivers.

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6. The nutrition care process includes nutrition assessment, nutrition diagnosis, nutrition education and counselling, and nutrition monitoring and evaluation.

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Watson Lepariyo, Vincent Alulu and Nathaniel Jensen work for the International Livestock Research Institute (ILRI).

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Contact

Nathaniel Jensen
ILRI, Kenya
n.jensen@cgiar.org

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ilri.org