Effective Use of Near Real-time Monitoring System for Stunting Reduction in Zimbabwe

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Abstract: Background: In Zimbabwe, 26.2 percent of children under five are stunted. Evidence has shown that multi-sector interventions are key to addressing stunting. Yet, practical implementation is difficult, often occurring through separate disjointed and uncoordinated sector actions with limited access to real time information for decision-making. Objective: To describe the design, implementation, successes, challenges and lessons learned from using a near-real time monitoring (NRTM) system as a monitoring tool for multi-sectoral community based model for stunting reduction in Zimbabwe. Methods: An open source technology was used to obtain the information needed on the multi-sectoral coordination process, provide a common platform to capture and present data on situational factors, community conditions and practices to be acted upon and thus contribute to reducing stunting. Results: Significant improvements in community data flows were noted; the system brought together several types of data, concepts, stakeholders and multi-sector energies into focused programming. Several challenges including conceptual issues, initial coordination, financial resources and missed partnership opportunities were documented. The introduction of the NRTM system resulted in improved data flows for programme monitoring and facilitated multi-sector collaboration. Conclusion: NRTM is an effective monitoring tool for the multi-sectoral community based model to reduce stunting in Zimbabwe.

Key words: Near real-time monitoring (NRTM), stunting, decision-making, UNICEF, Zimbabwe.

1. Introduction

Stunting or chronic undernutrition, defined as below minus two standard deviations from median height-for-age of reference population, is one of the leading causes of infant and child mortality worldwide [1]. Stunting is more prevalent in low- and middle-income countries [2]. Globally, roughly 156 million children are stunted with the highest rates being in Sub-Saharan Africa and Asia [3]. The rates in Africa have remained high at around 40% for more than a decade [4] and the decline has been too small to achieve global targets for stunting reduction [5]. In Zimbabwe, 26.2% of children under five are currently stunted [6]. Stunting among under-fives in Zimbabwe has consistently decreased from 33.8% in 2010 [7] to 27.6% in 2014 [8] and 26.2% in 2018 [6]. However, the progress during that period of time was uneven. For example, some districts in 2014 were still home to large proportion of stunted children. Among them were Mwenezi (32.5%) and Chiredzi (27.4%) in Masvingo Province as well as Chipinge (43.8%) and Mutasa (29.9%) in Manicaland Province [9].

Besides its major contribution to mortality, stunting has been increasingly associated with reduced physical capacity, school performance and economic productivity [10]. Stunted children also have a lower intelligence quotient [1] and are at greater risk of poor health and developing cardio-metabolic diseases later in life [11].

The UNICEF conceptual framework illustrates that causes of stunting can be grouped as basic, underlying and immediate [12]. Since the causes of stunting are multi-faceted, the approaches to addressing it should
also be multi-sectoral [13]. In this regard, it is increasingly recognized that community and household level actions are critical for stunting reduction [14].

To effectively address the high rates of chronic undernutrition, stunting prevention from conception to two years of age (the first 1,000 days of life) has emerged as one of the most critical national priority for Zimbabwe as reflected in the country’s Agenda for Sustainable Socio-Economic Transformation (ZimAsset), the government’s economic turnaround blue-print. In addition, in 2015, the country adopted a Food and Nutrition Policy that calls for a multi-sectorial approach to the reduction of stunting and established coordination mechanisms from national level to community (village) level in the form of Food and Nutrition Security Committees (FNSC). The Food and Nutrition Security structure, which is under the Office of the President and Cabinet, includes different sectors such as local government, agriculture, health, social services, community development, environment and water, sanitation and hygiene. Consequently, a multi-sectoral community based model for stunting reduction was designed to contribute towards revitalizing the coordination structures at the different levels, building the capacity and resilience of communities in the event of shocks threatening nutrition security; assisting them to develop and implement micro-plans for solving their own problems and promoting the ownership and accountability for results.

This multi-sectoral model sought to answer questions around what is being done to tackle undernutrition, whether it is sufficient, and how it can be accelerated to empower communities in ways that address and prevent stunting in the short and long run. Responding to these questions required a multi-purpose monitoring system capable of capturing the unique intervention needs of specific localities, the performance of the sectors in relation to the needs, the effectiveness of the interventions, and the extent to which communities were being empowered to address stunting at present and into the future. Furthermore, to serve as an effective decision support system, it was agreed that the monitoring system would need to provide frequent, complete, standard and accurate data on a regular and timely basis; hence the Near Real Time Monitoring (NRTM) system. The anticipated outcome of NRTM system was to provide rapid multi-sectorial data that would enhance decentralised level decision making capacities of stakeholders and contribute to improved community actions directed at influencing nutrition behaviours. The system aimed to achieve this through four strategic pillars, namely: NRTM System Design and Development, Citizen Engagement and Social Accountability, Performance Reviews and Data Use, and Knowledge Exchange.

UNICEF in Zimbabwe is currently supporting the government to implement the multi-sectoral community based model to reduce stunting in 19 districts. The NRTM system model was launched in June 2015 in the first 4 districts (Chipinge, Chiredzi, Mwenezi, and Mutasa) and has been fully operational since January 2016. The 4 districts were prioritized based on the high levels of chronic malnutrition as described above, food insecurity, high numbers of children under five and poverty rates over the past 10 years. The purpose of this paper is to describe the design, implementation, successes, challenges and lessons learned of using the near-real time monitoring system as a monitoring tool for the multi-sectoral community based model for stunting reduction in those 4 districts.

2. Methods

2.1 The System and Its Implementation

UNICEF, with financial support from the Bill & Melinda Gates Foundation, developed an Information and Communication Technology (ICT)-based near real-time monitoring system using open source technology called open-data kit (ODK). ODK is a free and open-source set of tools that can assist in creating,
authoring and managing mobile data collection processes. It was selected for this project because it allowed the project team to build a customized data collection form specific to the needs of the intervention; collect data on mobile devices (smart phones or tablets) and send it to a server. It is also a novel solution for aggregating data from a server and extracting it for predefined uses.

The system took into account the need for vertical coordination (access and visibility of performance among various actors at different levels of programme coordination), horizontal coordination (access to information on actions of peers at each administrative level), effects of interventions on drivers of stunting (practices in relation to pregnant women and children under 2 years of age), community empowerment (assessed by the extent to which sectors support community actions) and community feedback on service quality (addresses the citizen engagement and social accountability component of the model). The purpose of the programme was to provide relevant information at predetermined time intervals to foster regular dialogue and drive hitherto neglected response and coordination. Fig. 1 shows the schematic data flows, which in a way replicate the implementation structure of the country’s food and nutrition security policy. The left panel of the Figure shows the established structure of food and nutrition security committees in the country. The right panel shows the management structure of the NTRM system for stunting reduction. The data flow structure emphasizes the fact that the project aimed to utilize existing structures without creating any new and separate ones of its own. This strategy to overlay a new monitoring

Fig. 1 Zimbabwe’s food and nutrition security policy implementation structure, and utilization of NRTM data for planning by FNSCs at the various governance levels.
KEY: NRTM → Near Real-Time Monitoring; ODK → Open Data Kit; FNSC → Food and Nutrition Security Committee.
system on existing protocols was meant to build on existing systems and avoid possible conflict and compatibility shocks.

The data collection component, conducted in 110 wards and 1,236 villages, was designed to combine paper-based data gathering at village level and electronic entry into tablets at the ward level (a higher administrative level). The near-real time nature of the project was embedded in the design concept since delays were inevitable at the first tier of paper-based data recording. As such, the implementation of the project was designed strategically to take a phased approach with the first 4 months prioritizing system build-up, testing for viability, training of project personnel and preparing for implementation.

As shown in Fig. 2, the ODK system feeds data into MySQL (Food and Nutrition Council (FNC) System) database for storage and processing. In instances where there is need to send short-message services (SMSs), the FNC System sends the information to RapidPro which in turn sends SMSs to interested stakeholders to take action. In addition, RapidPro receives feedback on the sent SMSs and feeds it into the FNC System. Thus, data flow up the hierarchy to the national level and reports flow downwards to the ward level. At the ward level, members of the ward FNSC assist village FNSC members to interpret the information that concerns their village in very simple terms. At that lowest level, village FNSC members propose solutions to address any noted challenges and categorize them into what they can do themselves and what they need help on from higher levels.

While all the components of data are self-contained in one system, visualization dashboards were developed to reflect different types of data summaries.
from different modules. Dashboard summaries (Figs. 3 and 4) show the status of practices in relation to pregnant women and children under 2 years of age; functionality of coordination structures at each level; community demands and satisfaction with service providers; system-generated alerts for outliers or trends requiring further investigation or immediate attention; and changes in general conditions with the potential to negate sector actions (drought, markets, price movements, disease outbreaks, etc.).

As shown in Fig. 3, the system has been constructed in such a way that the landing page shows the status of key indicators from each module. A visitor to the site can choose to view data summaries by preferred level: national, provincial, district or ward. Each level gives detailed summaries for similar indicators. Thus, whereas the national dashboard summary shows the status for the whole country, the ward dashboard (lowest level) shows the status of the same indicators at that level as it aggregates village level data. Although the analysis can go as low as the household, a codebook should be used since the specific household identities are codified by numbers. Besides checking indicator status by the level, an enquirer can opt to browse details of functionality, social accountability, SMS alerts or ward level micro-planning.

The system design allows for aggregation of data by ward, district, provincial or national level. It also has drill-down features that enable each level to view its own performance against that of others. The data summaries were used to inform community dialogue. Hard copies of simple community-specific reports were generated from the system and shared with ward-level committees to share with their villages. Feature phones were provided to focal persons in the village committees. The gadgets were to enable them to provide information on support needs from multi-sectors, type of services received and their level of satisfaction or otherwise with the services. The system was also designed in such a way that the information provided by the community would also be visible at various administrative levels in the up-ward hierarchy.

The implementation of this project had an intensive training component. Two Provincial Food and Nutrition Security Committees (30 members from Masvingo and Manicaland provinces), about 60 district FNSCs members and 110 ward FNSC members, were trained in their various functions and responsibilities. Training

![Food & Nutrition Council Dashboard](image-url)

**Fig. 3** Landing page of the data access and visualization dashboard.
on the data and monitoring component was incorporated in the training materials for the multi-sector community-based approach to the reduction of stunting. A training manual was developed to cover all important aspects of the project. The training content was continuously reviewed and improved considering emerging practicalities and new information. An important component of the training manual is on community responsibilities, which covers identification of contextual drivers of stunting and how to draw up micro-plans that respond to the issues. These micro-plans outline activities, responsibilities, timelines and type of support expected from the different levels of the multi-sectors.

2.2 Technical Expertise and Coordination

To achieve the objectives of such a huge and multi-sectoral project, it was necessary to harness the comparative and absolute advantages resident in various disciplines and specialties. As such, the project involved several people specializing in different aspects.

Firstly, because it was about data and its applications to monitoring a programme, there was a planning and monitoring specialist.

Secondly, because the intervention was based on ICT gadgets, there were one system developer and two ICT officers. Technical guidance and advice on the nutrition aspects were provided by two nutrition specialists. Since the project also had a major community component, there was a communication expert working on the citizen engagement and social accountability modules.

Overall coordination and management was done by UNICEF’s country office senior management team and the Director of the FNC in Zimbabwe. The system was hosted and owned by the government (FNC) and a team was set-up at FNC including programmers, data analysts who were technically supported by UNICEF, IT Programme Monitoring and Evaluation
(PME) and Nutrition experts.

At the lower level structures, there were provincial, district and ward officers coordinated by the FNC through established FNSCs.

3. Results

3.1 Successes

Overall, there has been an improvement in coordination of the Multi-sectoral Community Based Model (MCBM) for stunting reduction because of the improved monitoring and feedback through the NRTM and citizenship engagement.

An improvement in data flows at household level has been noted from January to June 2017 as shown in Fig. 5.

Fig. 6 shows the data flow patterns at the ward level, which were consistent with those for households.

Despite inconsistencies, the innovation has demonstrated the potential to bring together several types of data, concepts, stakeholders and multi-sector energies into focused programming. A common platform is being used to capture and present data on situational factors; community conditions and practices that can be acted upon to reduce stunting; activities of stakeholders who bring about changes; community knowledge and actions and social accountability that would otherwise not be available or visible beyond participating communities.

The social accountability component has suffered from a hesitancy by government stakeholders to allow for direct uploads of community views. Understandably, this has been due to the sensitivities around direct and real-time relay of data from source (community) to a wider audience. Government was more comfortable with a telephone-exchange approach, whereby data are first pooled, screened and verified by a government officer before being re-routed to higher levels. After advocacy, the need to stage data at each structure in the hierarchy was rejected in preference for near real-time data flows, leaving the verification to happen at the server-end within the FNC.

U-Report surveys (Citizen Engagement/feedback mechanism) were conducted to inform programming (Fig. 7). Three polls have been conducted to date in May, June and September 2018. In August 2018, based on the feedback received through the polls, a message promoting continued breastfeeding even after one discovers she is pregnant was sent through the SMS feedback platform. Through the polls, knowledge gaps on stunting reduction, attitudes and practices that have a bearing on stunting were identified and results are being used to develop awareness-raising messages, for example on whether a woman can continue breastfeeding once she discovers she is pregnant.
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3.2 Adaptations during the Project Life Cycle

Because of its innovative nature, the implementation of the NRTM system in Zimbabwe adopted a build-while-driving strategy. While the general trajectory of the project was guided by the concept note, the project team had to make necessary adjustments in response to the emerging practical realities. Two major adjustments were made during this project.

Fig. 6  Trends in number of wards submitting data (January 2017-June 2017).

Fig. 7  Dashboard illustration that shows both the family and community behavior change indicators (a qualitative citizen engagement dashboard).
3.2.1 Adaptation 1: Shifting from Health Facility to Ward Data Collection and Entry

The NRTM data collection system was designed around the health facility, where it would be managed by the ward Environmental Health Technician (EHT). However, it emerged during implementation that not all wards had health facilities, and hence resident EHTs. Agricultural extension officers, who are available in each ward, were therefore nominated as the ward focal points for data collection, supervision and entry. However, another problem was that some village health workers who were responsible for collecting the household data were reporting to more than one health facility, which could be in different wards. This resulted in challenges around coordinating data collection and entry, and the NRTM model was adjusted so that all data processing became ward-based.

To address the challenge of recurrent shortages of paper data-collection tools in the field, UNICEF supported the design and printing of book-like registers to capture and track longitudinal data from birth to 24 months, whilst a register for pregnant women could be used for nine months. In addition, the submission of ward-level data was enhanced by building the capacity of ward FNSCs to use and manage data collection tools. In addition to that, plans were established to incentivize village health workers for data-collection.

3.2.2 Adaptation 2: Adjusting the Pace of Implementation

Although the NRTM model was designed to strengthen the implementation of the multi-sectoral model, the two initiatives had different funding sources and different implementation periods (18 months for NRTM and five years for the multi-sectoral model). To meet its shorter timeline, NRTM was moving considerably faster and began to generate dashboards when the programme team was not yet ready to utilize the data. These shortcomings were addressed through joint work plans, weekly planning and coordination meetings between focal persons in charge of the two components.

System changes also focused on aspects that had no implications for data collection or system design, e.g. enhancing accessibility, analysis and presentation of data. The program was scaled back to a few wards to generate enough data cycles to support the data utilization and social accountability components, and capacity was built for district-level personnel to provide technical support. Because of these changes, the NRTM component became a fully functional model and the focus shifted to data use and social accountability.

3.3 Implementation Challenges

Several challenges were encountered during the implementation of this initiative. Broadly, they can be broken down in various themes as follows.

3.3.1 Conceptual Issues

There was a limited conceptual understanding of the programmatic approach to reduce stunting and its relation to the near-real time monitoring component. Consequently, this led to unnecessary bureaucracy around data. In response, the project team convened a meeting to discuss issues and respond to questions from stakeholders. After clarity of issues and consensus, there was increased support to the project by all stakeholders.

3.3.2 Coordination

Most of the challenges in this respect were around complex coordination systems at national level, typified by inconsistent meetings of the national committee, lack of accountability for participating sectors and competing sector specific activities. Working with the FNC, UNICEF funded the post of a national coordinator and advocated for more regular meetings of the national committee. A technical committee was also formed to monitor and discuss day-to-day technical issues related to the project. This committee was tasked to check on progress, note challenges and make recommendations for action by the national committee.
3.3.3 Multi-sectorality of the Intervention
Because of the multi-sectoral nature of the committees, there was a duplication of roles for members of the national committee who also participated in other multi-stakeholder forums. This apparent role overload and conflict confused members of their sector roles and responsibilities in the multi-sectoral model. Although this scenario presented an opportunity for integration with all sectors, it resulted in lack of accountability by sectors. In response, the technical team worked on defining clear roles and responsibilities for the committee members.

3.3.4 Partnerships
The project missed on crucial support from partners that were already implementing projects and programmes in the same districts. In this way, it missed opportunities for synergies and effective utilization of resources. It was later discovered that non-state actors such as Plan International and World Vision were already implementing nutrition interventions in the same districts. Consequently, the project team embarked on a serious partner engagement drive at national level and cascading it downwards. It was agreed that the existing interventions by the non-governmental actors will be strengthened by the near-real time monitoring component.

3.3.5 Availability of the Technology
Late procurement and distribution of critical ICT supplies such tablets, feature phones, computers and servers delayed the implementation of the project and constrained data collection and dissemination. In addition, operation challenges related to power outages were noted. In response, UNICEF supported the installation of solar back-ups for the servers and recruitment of a data analyst to help with timely analysis and storage of data.

3.3.6 Reporting and Documentation
The project started with weak reporting and poor documentation of progress at the provincial and national levels at both sector and committee levels. Nevertheless, this challenge was effectively addressed since reporting and documentation protocols and tools were developed and made available to the teams.

3.3.7 Limited Use of Data and Slow Responsiveness to Emerging Trends
The limited use of data led to inadequate operationalization of FNSCs at different administrative levels. This also hinted on operational challenges faced by the committees but which are not normally communicated in a formal manner. This challenge helped the project management team to expand the use of the system for performance diagnosis in addition to monitoring and accountability. Concerns arising from observations relating to data flow and utilization led to discussions on sector responsiveness, which in turn exposed weaknesses in the planning and operationalization of the multi-sector community-based approach. One major weakness was the overemphasis on structures without adequate attention to clarity of responsibilities and confirming the commitment of the multi-sector players.

3.4 Key Lessons
Several key lessons in supporting decentralized decision makers to use data have arisen, which cut across all contexts:

3.4.1 Create Easily Accessible Data That Speak to Its Audience
Enabling the use of data entails simply but effectively communicating the analysis undertaken in a way that works for the audience—in this case decentralized government staff and community members. It was found that easy-to-understand dashboards with minimal text, with “at a glance” color-coded status in near real-time meet that need in all contexts.

3.4.2 Data Availability and Analysis Does Not Mean Data Use
It is vital that feedback loops and accountability mechanisms ensure that insights from data analysis
are acted upon and routinely monitored to create results for children. In some contexts, although plenty of data may be available—even at the subnational levels, owning and using the data remains irregular.

3.4.3 Government Ownership and Working Relationships Are Key to Data Use

Strong working relationships between targeted government units and development actors like UNICEF, as well as between the various levels within the government systems (e.g. provinces/districts, districts/facilities, facilities/communities) are critical. Data use is inherently about cultural and behavioral change within the work of decentralized units, which can be both sensitive and empowering. Close collaboration between various development actors involved in the data management space is also crucial to ensure that all partners improve data availability and use.

3.4.4 Need to Balance “Trusting Data” with “Questioning Data Quality”

When presented with near real-time data which challenges assumptions, the service providers may initially question the accuracy of the data. These queries may be valid and thereby may lead to questioning and improving the data quality. However, the data may in fact be correct and may be highlighting a problem that the service providers were not aware of. This creates a helpful interplay between improving data quality and accepting and acting upon data that are critical of performance.

4. Conclusion

Traditionally, statistics would be consolidated and used at the national level, while at the local service delivery levels, national guidance and higher-level resource allocation decisions would generally be followed. The use of decentralized NRTM transforms that dynamic into a powerful strategy for subnational-level ownership of both problems and solutions.

The near-real time monitoring system in Zimbabwe improved data flows for programme monitoring at households and wards level. It also brought together several key stakeholders and multi-sector skills and energies thus providing a platform to capture and present data on situational factors, community conditions and practices that can be acted upon to address stunting. Better planning and coordination, increased financial resources and proper documentation are needed to make the near-real time monitoring system even more effective.

The NRTM has proved to be a good monitoring tool for the Zimbabwe stunting reduction model that involves multiple sectors/actors, captures citizen’s demands and service satisfaction ratings on an ongoing basis and highlights accountability of service providers.

Acknowledgements

The funding of the NRTM project in Zimbabwe was provided by the Bill and Melinda Gates Foundation through the United States Fund for UNICEF. The UNICEF Eastern and Southern Africa Regional Office provided technical guidance and support. The Government of Zimbabwe, through the Food and Nutrition Council and its different structures coordinated the implementation of the project.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. They further declare that the opinions expressed in this paper are those of the authors and do not necessarily reflect the views of UNICEF.

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