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Integrating micronutrient status assessment into the 2015–2016 Malawi Demographic and Health Survey: A qualitative evaluation

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Abstract

Demand for national-level micronutrient status data continues to grow, yet little is known about the implementation of different approaches for collecting these data. We conducted an evaluation of the process of linking the 2015–2016 Malawi Demographic and Health Survey (MDHS) and 2015–2016 Malawi Micronutrient Survey (MNS). We conducted 24 in-depth interviews with stakeholders from the Malawi government and international agencies and field staff. Interview questions explored perceptions of what worked and what was challenging during three phases of implementation: preparation; data collection; and data analysis, reporting, and dissemination. Data were analysed using thematic analysis. Results showed that there was strong government interest to integrate the MDHS and MNS. Perceived benefits included potential cost savings and lower respondent burden. However, government and international agency stakeholders did not view the linkage of the surveys to be a fully integrated approach. The lack of full integration produced challenges throughout implementation, such as complex field logistics and duplication in nutrition indicators assessed and reported. Some stakeholders believed integration was not attainable primarily due to timing. The MDHS and MNS were originally designed as stand-alone surveys, and planning for each survey was at an advanced stage once the government sought to integrate the surveys. Additionally, the MNS could not be incorporated as a module within the MDHS given the complexity of the MNS data collection and short timeframe for planning. These findings can inform decisions about implementing the next MNS and may be transferable to other countries that are conducting micronutrient surveys to address data gaps.

KEYWORDS

implementation science, micronutrient status assessment, nutrition, process evaluation, surveillance, surveys

1 | INTRODUCTION

The demand for high quality and timely nationally representative nutrition data continues to grow. In 2014, the Global Nutrition Report

called for a “data revolution” to increase the availability of national nutrition data (International Food Policy Research Institute, 2014). As low- and middle-income countries (LMICs) intensify action to address malnutrition, data gaps must be closed to inform policy

decisions, target programs and resources, and track progress (Mei, Jefferds, Namaste, Suchdev, & Flores-Ayala, 2017; Tuffrey, 2016; Tuffrey & Hall, 2016). Routinely collected data on micronutrient status and coverage of micronutrient interventions are especially lacking in many LMICs (Gernand, Schulze, Stewart, West, & Christian, 2016; Mei et al., 2017; Wirth et al., 2017), hindering planning and accountability for actions to improve micronutrient status, including both nutrition-specific (e.g., micronutrient supplementation) and nutrition-sensitive (e.g., agriculture and food security) interventions (Bhutta et al., 2013; Ruel & Alderman, 2013; Tuffrey & Hall, 2016). For governments and international agencies seeking to address these data gaps, knowledge of different approaches for collecting population micronutrient status data would be useful. However, experiences from implementing nutrition surveys in LMICs have not been well documented, and therefore, little evidence exists for guiding survey implementation.

To date, the predominant approach for assessing population micronutrient status has been to conduct stand-alone national micronutrient status surveys, which may be hard to implement and sustain in settings where resources are stretched (Tuffrey, 2016). Cambodia pioneered linking micronutrient status data collection with the 2014 Cambodia Demographic and Health Survey (DHS) by using the DHS sampling frame to collect micronutrient status data from a subsample of households one to three months following the DHS (National Institute of Statistics, Directorate General for Health, & ICF International, 2015). Recently, Malawi undertook a similar approach. The 2015–2016 Malawi Micronutrient Survey (MNS) was administered to a subsample of households surveyed by the 2015–2016 Malawi Demographic and Health Survey (MDHS). MNS field teams visited the subsample of households immediately after the MDHS collected data (National Statistical Office, Community Health Sciences Unit, Centers for Disease Control and Prevention, & Emory University, 2017).

The purpose of the MNS was to provide policy makers and health practitioners with the data needed to plan, implement, monitor, and evaluate nutrition interventions (National Statistical Office, Community Health Sciences Unit, Centers for Disease Control and Prevention, & Emory University, 2017). Findings from two previous MNS conducted in 2001 and 2009 showed that micronutrient malnutrition, for example, vitamin A deficiency, was a public health problem in Malawi (National Statistical Office, Department of Nutrition, HIV and AIDS, Ministry of Health, United Nations Children's Fund, & Centers for Disease Control and Prevention, 2009; National Statistical Office, Ministry of Health, United Nations Children's Fund, & Centers for Disease Control and Prevention, 2001). Thus, numerous national micronutrient interventions were implemented, including industrial fortification of staple foods and targeted micronutrient supplementation. Recently, the government launched the 2018–2022 National Multi-Sector Nutrition Policy and Strategic Plan to renew and expand its efforts to eliminate malnutrition, including micronutrient deficiencies (Government of Malawi, Department of Nutrition, HIV and AIDS, 2018a; Government of Malawi, Department of Nutrition, HIV and AIDS, 2018b). To guide the development of this policy and strategic plan, the government prioritized timely, high quality micronutrient status data (National Statistical Office, Community Health Sciences Unit, Centers for Disease Control and Prevention, & Emory University, 2017).

Key messages

- Best practices need to be identified to inform the design and implementation of micronutrient status surveys as interest in high quality and timely nutrition data increases.
- More evidence on strengths and limitations of different survey approaches to obtain national micronutrient status data, including integrated approaches, is needed.
- Characteristics of the national survey in which micronutrient status assessment is to be integrated need to be well understood by all stakeholders, as national surveys vary in size, complexity, and level of standardization.
- It is necessary to start planning more than a year in advance of data collection when integrating micronutrient status assessment into a national health survey.

We evaluated the process of linking the MDHS and MNS in Malawi. Our objective was to understand what worked and what were the challenges of linking the surveys, from the perspectives of implementing individuals and agencies. We conducted qualitative in-depth interviews with individuals from the government, international agencies, and field teams. We focused particularly on three phases of implementation: (a) preparation; (b) data collection; and (c) data analysis, reporting, and dissemination.

2 | METHODS

2.1 | Context

DHS surveys are nationally representative household surveys that serve as a primary data source for population and health indicators (family planning, HIV/AIDS and sexually transmitted infections, immunization, malaria, maternal and child health, nutrition [e.g., anaemia and anthropometric indicators], and women's empowerment) in LMICs (Hancioglu & Arnold, 2013). The DHS Program, funded by the United States Agency for International Development (USAID) and coordinated by ICF, has worked with participating countries and donors to conduct over 300 DHS surveys in more than 90 countries (Hancioglu & Arnold, 2013; ICF, 2018).

The 2015–2016 MDHS was the fifth DHS conducted in Malawi and the first to attempt to integrate a micronutrient status survey. There were two government principal investigators—one from the National Statistical Office responsible for the MDHS and coordination with the MNS and one from the Community Health Sciences Unit responsible for the MNS. The Department of Nutrition, HIV and AIDS was a key government agency that supported the MNS. ICF provided technical assistance for the MDHS, whereas the Atlanta Centers for Disease Control and Prevention (CDC) and Emory University provided

technical assistance for the MNS. Additional contributing agencies included USAID, United Nations Children's Fund (UNICEF), Irish Aid, World Bank, UN Women, United Nations Population Fund (UNFPA), and the Malawi National AIDS Commission (National Statistical Office, Community Health Sciences Unit, Centers for Disease Control and Prevention, & Emory University, 2017).

The 2015–2016 MNS was designed to collect anthropometry and biologic specimens (venous blood and urine) to estimate prevalence of anaemia and micronutrient deficiencies (iron, vitamin A, iodine, zinc, vitamin B12, and folate), inflammation, infection (malaria and urinary schistosomiasis), and inherited blood disorders. The prevalence of households with adequately iodized salt, vitamin A fortified oil, and vitamin A fortified sugar; household hunger; and coverage of social protection programs, and key nutrition interventions were also estimated within the MNS. Survey population groups included preschool-aged children (6–59 months), school-aged children (5–14 years), women of reproductive age (15–49 years), and men (20–55 years) (National Statistical Office, Community Health Sciences Unit, Centers for Disease Control and Prevention, & Emory University, 2017).

Government capacity would have been insufficient for conducting a stand-alone MNS because three other national surveys requiring government resources were planned for 2015/2016. Hence, the government requested to combine the MNS with another survey, and the MDHS was the best option based on design, logistics, and estimated costs. A subsample of 105 out of 850 MDHS clusters was randomly selected for the MNS in order to produce nationally and regionally representative estimates. Details of the survey respondents, design, and sampling methods of the MDHS and MNS have been presented elsewhere (National Statistical Office, Community Health Sciences Unit, Centers for Disease Control and Prevention, & Emory University, 2017; National Statistical Office & ICF, 2017).

The MDHS and MNS were designed to be linked at three points. First, after finishing MDHS data collection in a cluster that was selected for the MNS, MDHS and MNS field teams met for a “hand-over” process. This process involved MDHS field team supervisors filling out sections of the MNS paper questionnaires with identification information for eligible individuals (names, ages, household label with a unique barcode, and identification numbers). Paper questionnaires with approximately 30 questions were then used by MNS field teams to identify households and individuals and proceed with data collection. Second, once both surveys were complete and data cleaning final, the MDHS and MNS datasets were linked using identifying variables (cluster, household, and line number). Third, the government in collaboration with international agencies held a joint dissemination of MDHS and MNS results in March 2017. A report of MNS results also was produced and included on The DHS Program website.

2.2 | Participant recruitment

We used purposive sampling to recruit individuals from government and international agencies with experience in all phases of the MDHS and MNS implementation process. Additionally, we recruited MDHS and MNS field staff to provide data on day-to-day field issues, which may not be identified in detail by government and international

agency staff. We requested participation by government and international agency staff via email and gave three reminders, where needed. Field staff were contacted by phone and invited to participate. Out of 27 individuals contacted, 24 responded and were interviewed. Our overall sample size was sufficient to reach code saturation (the point at which the range of thematic issues have been identified) and meaning saturation (the point at which a rich understanding of issues has been developed) (Hennink, Kaiser, & Marconi, 2017). Within each participant group, sufficient individuals were interviewed to reach code saturation (government, $n = 7$; international agencies, $n = 10$; field staff, $n = 7$) (Guest, Bunce, & Johnson, 2006; Hennink et al., 2017).

2.3 | Data collection

We conducted in-depth interviews face-to-face and by telephone, using semistructured interview guides. Government and international agency staff were asked about each implementation phase with questions on successes and challenges. Field staff were asked solely about the data collection phase. We used open-ended questions and probing to explore topics in depth. Additionally, we used an inductive process of data collection, identifying issues that emerged early in data collection and refining questions and probes in subsequent interviews to go deeper into each topic as data collection progressed (Hennink, Hutter, & Bailey, 2011). However, all participants were asked the same key questions in the respective guides with only slight refinements from the inductive approach to go deeper into issues identified as relevant by participants themselves.

Two interviewers were trained on best practices for qualitative interviewing, ethical data collection, and the interview guides and received retraining and technical assistance throughout data collection (Hennink et al., 2011). Interviewers were involved in the MDHS and MNS in various capacities, such as logistics, technical assistance, training field teams, and dissemination of results. The interviewers practiced reflexivity, which involved conscious self-reflection to acknowledge any potential influence on the data collection process due to familiarity or involvement in the MDHS and MNS. All interviews were conducted in English, digitally recorded, and transcribed verbatim. Two interviews were not recorded due to recorder error; detailed notes were taken and included in the data analysed.

2.4 | Data analysis

We analysed data using thematic analysis. An initial list of issues, or “codes,” was generated from topics on the interview guides, and additional codes were developed by reading and rereading transcripts to identify issues discussed by participants. All codes were then compiled into a codebook, and MAXQDA12 software was used to code the data. We developed thick descriptions of codes and conducted structured comparisons of issues by various strata, such as type of participant (e.g., government versus international agency) (Hennink et al., 2011). Codes were then grouped into broader themes, which we report in the results.

Several authors (A. M. W., P. S. S., C. M., E. N., and K. T.) were interviewed for this evaluation given their roles as key personnel in

MNS implementation. However, these authors were not involved in any data analysis tasks, which were carried out by the lead author independently of those interviewed. The lead author practiced reflexivity throughout data analysis, recognizing personal views of the MDHS and MNS implementation process and continuously reflecting on any possible effect of these views on the findings. To validate analyses, the lead author reread data after drafting results to check that the findings were strongly grounded in the data (Hennink et al., 2011) and used the concept-indicator model to verify that themes presented were well supported by data (Strauss, 1987).

The National Health Sciences Research Committee in Malawi granted ethical approval for the MDHS and MNS. The project was also reviewed by the institutional review board of Emory University and deemed nonhuman subjects research.

3 | RESULTS

We present the overall views of government and international agency staff on the MDHS and MNS implementation process, followed by detailed descriptions of what worked well and what was challenging during each phase of implementation from their perspectives. The perspectives of field staff also are presented as part of the findings regarding the data collection phase. Accounts of the data collection phase generated the greatest number of issues, and therefore, the results presented here focus predominately on this phase of implementation.

3.1 | Overall perceptions of the implementation process

3.1.1 | Benefits and costs

Most stakeholders saw many benefits to implementing the MDHS and MNS together. Potential cost savings, efficiencies (e.g., the use of the MDHS sampling frame and household listing for the MNS), the value of limiting “survey fatigue,” and reducing the “burden” on government staff and survey respondents were discussed by many:

“From the country standpoint, then, I think that they [Government staff] were able to put their time and energy into one survey, even though essentially, there were two big components of it. I think that that still required somewhat less effort than if you had two completely independent surveys.”
(International agency staff)

Furthermore, most stakeholders highlighted benefits specific to those invested in nutrition. For example, linking the surveys was viewed as an opportunity to assure sustainable assessment of micronutrient status, given that MDHS is conducted approximately every five years:

“From a nutrition perspective, it's a way to ensure that nutrition surveys are done on a more regular basis. We typically recommend [nutrition] surveys being done every ... two to five years and often that doesn't happen

because of lack of funding, et cetera.”
(International agency staff)

Yet, many stakeholders felt that The DHS Program staff benefited little or not at all from linking the MDHS and MNS and instead faced substantial costs. Indeed, The DHS Program staff stressed that coordinating with the MNS and troubleshooting implementation challenges required significant time:

“The amount of time that DHS staff spent on integration-related work was pretty significant ... On a spectrum from one to ten, ten spending a lot more time, one being low ... Malawi was definitely nine or a ten compared to other countries.”
(International agency staff)

Echoing this point, several CDC staff noted that The DHS Program staff devoted considerable time to coordination of the surveys on top of their MDHS specific responsibilities. Furthermore, one international agency staff had the impression that The DHS Program's work to coordinate the surveys, for example additional technical assistance, “was not really adequately budgeted.” Some stakeholders believed that these resource issues made it difficult to gain support from The DHS Program staff for conducting the MDHS and MNS together.

3.1.2 | Lack of integration

Stakeholders generally felt that the MDHS and MNS seemed like two “separate” or “parallel” surveys, even though the government had wanted them to be integrated:

“I think what happened wasn't integration in the truest sense of the word. So, people would say, in [Malawi], 'We want this [the surveys] to be integrated. This needs to be integrated.' But I sense that there was quite a bit of disappointment ... I don't think what happened was exactly how people intended it to be. So, [the linkage of the surveys] was more of a compromised method and everybody kind of accepted it and did the best they could with it, versus it being truly the approach that perhaps the country envisioned having.”
(International agency staff)

Stakeholders perceived most of the challenges across implementation phases to be related to the lack of full integration between the MDHS and MNS. Nevertheless, the levels of concern about the lack of integration varied among stakeholders. International agency staff voiced the deepest concern about the approach. Government staff acknowledged problems with the lack of integration but ultimately felt pleased that challenges were overcome and the surveys were completed, especially because the country had implemented the MDHS and MNS together for the first time:

“This opportunity [to conduct the MDHS and MNS together] was a good opportunity that we had as a country, and we have to be very proud of it ... For now, we are celebrating because we have all these

things coming out despite the challenges, despite everything that we had, and despite being a learning ground. So, that's very great.”
(Government staff)

3.2 | Preparation phase

3.2.1 | Decision to attempt integration of surveys

Stakeholders' accounts of the preparation phase suggested that the timing of the decision to attempt to integrate the MDHS and MNS was problematic and a key reason that the surveys were not fully integrated. Once the government decided to attempt integration of the MDHS and MNS, the respective surveys had already been planned to be stand-alone surveys. Protocol development for each survey was far along, making it difficult to integrate them:

“... the planning process was relatively difficult, because neither MDHS or MNS had been intended to be integrated...essentially, we were still trying somehow to fuse two very different things together.”
(International agency staff)

Furthermore, stakeholders reported that there was insufficient time to incorporate MNS as a module within the MDHS given the size of the MNS questionnaire, number of biomarkers, complexity of specimen collection and processing, and cold chain requirements. As a result, government and international agencies decided the most feasible approach was to link the surveys, rather than integrate them. Overall, stakeholders felt that the decision to attempt integration of the surveys “seemed somewhat last-minute” and wished integration efforts started earlier, with several stakeholders positing that earlier planning might have allowed for greater integration.

3.2.2 | Communication, coordination, and accountability

Stakeholders emphasized that linking the MDHS and MNS required them to communicate frequently and coordinate closely. They identified two main actions during the preparation phase that facilitated this

communication and coordination. First, two separate steering committees were established—one for MDHS and one for MNS with some members overlapping between the two committees. The MDHS steering committee met at key decision points along the survey process, and the MNS steering committee met approximately every two weeks. There was consensus among stakeholders that these committees were critical for enabling regular communication and coordination of MDHS and MNS activities. Some stakeholders found that an added benefit of the committees was that they promoted accountability:

“Having the [MNS] steering committee meet on a regular basis was also an excellent idea that really helped move things along. Also, there was accountability there. So, it ensured that a lot of things were followed up on and things didn't fall through the cracks.”
(International agency staff)

Second, a memorandum of understanding (MOU) was put in place to define agencies' roles and outline a clear work plan. A few international agency staff reported that the MOU helped to create a shared understanding of expectations of each agency and promoted transparency and accountability, describing a MOU as “a must.”

Additionally, some stakeholders reported that the MNS survey coordinator played an important role in facilitating coordination. The MNS survey coordinator worked on the MDHS and was up-to-date on MDHS activities and, thus, could help coordinate MDHS and MNS activities.

3.3 | Data collection phase

3.3.1 | Aligning data collection timelines

Stakeholders and field staff described immense challenges in aligning the data collection timelines of the surveys. First, the delivery of MNS supplies for micronutrient status assessment was delayed, which then delayed other MNS activities, namely, the training for field teams, pilot, and start of data collection (Figure 1). Because MNS field teams were following MDHS field teams, the delay in starting MNS data collection impacted the MDHS itinerary for data collection. Specifically, MDHS field teams had to delay data collection in the subsample of clusters selected for inclusion in the MNS until the MNS field teams

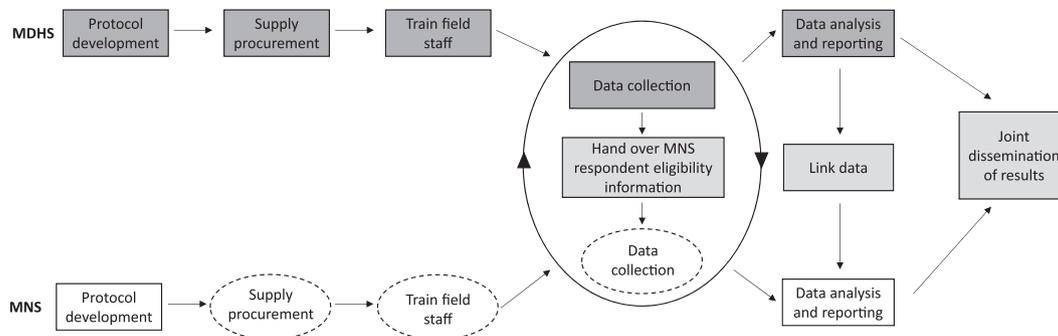


FIGURE 1 Tasks and delays of the 2015–2016 Malawi Demographic and Health Survey and 2015–2016 Malawi Micronutrient Survey. MDHS = Malawi Demographic and Health Survey; MNS = Malawi Micronutrient Survey. Circled dash-lined tasks show where delays occurred and, in turn, led to difficulties in aligning the data collection timelines of the MDHS and MNS

were ready to start their data collection. This involved changing the order in which MDHS field teams visited clusters. One government staff summed it up this way: “Some materials and shipments for the MNS came late ... and that actually threw the whole [data collection] plan out of kilter.” A few government staff raised the potential cost implications of adjusting the MDHS itinerary. They reported that, in some instances, MDHS field teams had to go back to districts where they had already collected data in order to collect data in MNS clusters. Returning to these districts required additional travel time and funds for more vehicle fuel. Because of the difficulties and stress that the delay in MNS supplies caused, some stakeholders highlighted the delay in supplies as one of the biggest obstacles they faced in implementing the MDHS and MNS.

Second, MNS field teams planned to arrive in each cluster and start data collection immediately after MDHS field teams completed their data collection, but most stakeholders and field staff agreed that implementing this plan was tough. They explained that the change in the MDHS data collection itinerary resulted in the sequence of clusters not being as well matched to the movement of the MNS field teams as originally planned. Moreover, the MDHS and MNS field teams moved at different speeds; the MDHS field teams could be delayed because of fuel shortages or tablets used for data collection requiring updates, and the MNS field teams could be delayed due to supply procurement issues, requiring counterpart teams to wait. Several stakeholders pointed out that this waiting time reduced efficiency of both the MDHS and MNS field teams. In addition, over half of field staff reported feeling pressure to match the speed of the other field teams.

Overall, many stakeholders reported that aligning the MDHS and MNS data collection timelines was a highly complex process. One international agency staff likened it to a “complicated puzzle,” while another questioned whether the plan to align timelines was too sophisticated to implement well.

3.3.2 | Coordination of field teams

Many stakeholders and field staff discussed the difficulties of the handover process in which the MDHS field teams met with MNS field teams in each cluster to give them the MNS paper questionnaires filled with identification information for MNS eligibility. They attributed these difficulties to two related issues. First, MDHS and MNS field teams attended separate trainings and did not practice the handover process together. Once data collection began, not all MDHS supervisors fully understood the correct way to fill out MNS questionnaires with identification information for eligible individuals. Second, because there was no pilot of the handover process, the MDHS electronic program that generated information on eligibility for the MNS was not field tested, and a program error was not detected until data collection began. Stakeholders and field staff also noted that MDHS field teams used an electronic program for data collection, and MNS field teams used paper questionnaires, making the transfer of eligibility information difficult. Many stakeholders and field staff would have preferred a joint training, pilot of the handover process, and electronic data collection for both the MDHS and MNS field teams.

Stakeholders and field staff generally felt that once the initial challenges of the handover process were addressed, the coordination

between MDHS and MNS field teams worked very well. According to many stakeholders and field staff, the regular communication between the MDHS and MNS field teams, including frequent and ad hoc text messaging, enabled effective coordination. The MNS survey coordinator and other field staff also strove to foster a shared purpose among MDHS and MNS field teams to encourage coordination:

“We were trying as much as possible to create that relationships, that strong bond between the teams so that they could understand that we can't do without the other. [MDHS] can't do without MNS, and MNS can't do without MDHS.”

(Government staff)

3.3.3 | Decision making

The process for decision making was complicated and unclear to stakeholders, especially those primarily responsible for implementing the MNS. Some stakeholders reported difficulties in mobilizing funds quickly and receiving approval for protocol changes. For example, when stakeholders needed to purchase sugar to replace sugar samples collected from households as part of the MNS, the purchase request had to go through “an entire MDHS chain of command” for approval. One international agency staff reported that this process was particularly difficult because those within the MDHS chain of command often were unaware of the needs of the MNS. Other stakeholders felt confused over who controlled the MNS budget:

“Like who's controlling the money and ... who is able to actually say, 'yes we can ship samples out, we can order ... dry ice, we can order all the supplies to get started, we can start hiring people?’”

(International agency staff)

These challenges were perceived to be largely the result of the administrative structure, such as having two principal investigators, as well as no clear process for the MNS to function under the MDHS.

3.3.4 | Community mobilization

Some stakeholders and field staff reported that it worked very well to have MDHS field teams inform communities that MNS field teams would be arriving for data collection. For example, they explained that MDHS field teams built rapport with traditional authorities, and therefore, MNS field teams did not have to spend much time on community mobilization. Additionally, they shared that entering communities and visiting households went “smoothly” for MNS field teams because people were aware that MNS field teams would be visiting.

3.4 | Data analysis, reporting, and dissemination phase

3.4.1 | Duplication of nutrition indicators

Stakeholders pointed out that both the MDHS and MNS collected anthropometric data and assessed hemoglobin. They cited this

duplication in data collection as an example of how the surveys were not fully integrated. This duplication in data collection also was perceived to be inefficient. Furthermore, there were some marked differences in the results, which may have been due to differences in biospecimen collection methods, for example, but which made data interpretation and utilization difficult (National Statistical Office, Community Health Sciences Unit, Centers for Disease Control and Prevention, & Emory University, 2017; National Statistical Office & ICF, 2017).

3.4.2 | Knowledge of data quality

For The DHS Program staff, a critical issue was that they did not have oversight over the MNS field work and knowledge of MNS data quality. This issue was concerning because The DHS Program hosts the MNS data and report on its website. They also receive inquiries about MNS data from data users, and rather than handling them internally, they need to forward them to CDC technical advisors for input. One CDC staff noted that CDC technical advisors shared concern that The DHS Program did not participate in any data quality checks for the MNS. Several stakeholders noted that if the surveys had been truly integrated, knowledge of data quality would not have been an issue, because The DHS Program would have had full oversight over data quality.

4 | DISCUSSION

Overall, our results showed that there was strong government interest in Malawi to integrate micronutrient status assessment into a planned MDHS, but full integration was not achieved. Stakeholders believed that integration was not attainable primarily due to insufficient time for planning. According to stakeholders and field staff, most difficulties during the data collection phase, including aligning data collection timelines, stemmed largely from the lack of full integration of the surveys. Similarly, during the data analysis, reporting, and dissemination phase, the lack of full integration produced challenges, such as the duplication of measurements reported. At the same time, stakeholders and field staff reported aspects of MDHS and MNS implementation that worked well, such as community mobilization. Although government staff recognized that implementing the MDHS and MNS was challenging, they expressed great satisfaction that the surveys were completed. Most international agency staff recognized benefits of linking the surveys but described implementation as complex and arduous. All stakeholders, as well as many field staff, expressed a preference for greater integration of the surveys.

By documenting the experience in Malawi, we generated evidence on micronutrient status survey implementation. This contribution is noteworthy because existing literature on micronutrient status assessment has tended to focus on technical issues, such as selection of indicators (Tanumihardjo et al., 2016) and methods to accurately measure micronutrient biomarkers (Namaste, Aaron, Varadhan, Peerson, & Suchdev, 2017), rather than approaches for data collection. Capturing experiences and lessons learned from other LMICs that have conducted national micronutrient status surveys would greatly contribute to expanding the evidence base and enable

comparisons of approaches. Specifically, it is critical to capture the views and preferences of implementing individuals and agencies and incorporate these into best practices for micronutrient status data collection. Furthermore, although interviewing survey respondents was outside of the scope of our evaluation, future research should explore their views of different survey approaches, including acceptability and perceptions of respondent burden. Additionally, efforts should be made to assess costs of different survey approaches. Although costs of the MDHS and MNS were perceived to be an important issue among stakeholders in Malawi, a cost analysis was not within the purview of this evaluation. Altogether, more evidence on the advantages and disadvantages of different survey approaches could help to identify effective and efficient approaches for routinely collecting high-quality, national micronutrient status data in LMICs. Such approaches are essential because historically nutrition surveillance systems in LMICs that were complex and expensive were discontinued, and a cost-efficient process for nutrition surveillance has been identified as a key factor for sustainability (Tuffrey, 2016).

Providing information for decision making is a key objective of nutrition surveillance (Tuffrey, 2016; Tuffrey & Hall, 2016). In Malawi, the 2015–2016 MNS results were the basis for the government's planned response to malnutrition outlined in the 2018–2022 National Multi-Sector Nutrition Strategic Plan, such as micronutrient supplementation (vitamin A, iron, and folic acid) and deworming through routine child health campaigns, vitamin A and iron supplementation for school-aged children, micronutrient powders for children under 5 years and pregnant women, and integrated homestead farming to promote consumption of micronutrient rich foods (Government of Malawi, Department of Nutrition, HIV and AIDS, 2018a). Planned activities also include developing and disseminating a National Micronutrient Strategy and conducting another MNS. Additionally, technical working group meetings with stakeholders from the government, UN, CDC, and other agencies were held in Malawi to discuss the MNS findings and implications for policies and programs implemented through the country's health system. Future research should investigate how different approaches for collecting, reporting, and disseminating data influence the extent to which data are used for action.

Malawi was one of the first countries to aim to integrate a national micronutrient status survey with a DHS. As with any new approach, there was a learning curve and unanticipated issues that arose. The experience in Malawi brings to light seven key lessons that may be useful to consider when designing and implementing integrated survey models:

- Start planning for integration early: Joint planning among all implementing agencies early in the preparation phase may be a key factor for successfully designing an integrated survey. Further, adequate time may be needed to accomplish critical planning tasks and activities, such as gaining stakeholder support for integration; negotiating an affordable, feasible, and acceptable integrated design; planning logistics; and avoiding duplication in the indicators assessed.
- Consider the characteristics of the survey in which micronutrient status assessment is to be integrated: National surveys vary in size, complexity, and level of standardization. Understanding

survey characteristics might provide insight into the level of difficulty and time required for integration. It is worth noting that DHS surveys typically are planned more than one year in advance of data collection and are very large and standardized, as they collect extensive demographic and health data and have large sample sizes. In Malawi, integration may have been particularly difficult, in part, because the MDHS was highly standardized and large, with its own complex logistics and data collection protocols.

- Consider benefits and costs of survey integration for all implementing agencies: To promote support for an integrated survey approach, it may be useful to identify benefits for all stakeholders. Costs of integration-related activities must be considered when developing budgets and allocating staff time for survey implementation. It is essential that the work required for integration is adequately funded. For example, agencies conducting population-based surveys should have extra resources to direct towards integration-related activities, which can prevent overstretched staff and help ensure data quality can be maintained.
- Responsibility for survey implementation: It may be beneficial to designate one agency to be principally responsible for implementation and another agency to lead technical assistance activities related to the micronutrient status assessment component. This may prevent coordination issues, streamline decision-making processes, and consolidate oversight and quality assurance activities. Furthermore, considering the local context and norms, establish management and steering committee structures to support the best communication and coordination across all agencies.
- Promote transparency and accountability: An MOU that clearly defines agencies' roles can be a useful tool for ensuring transparency and accountability. Regular steering committee meetings also may help promote accountability, as tasks can be followed up on periodically.
- Allow ample lead time for procuring supplies for micronutrient status assessment: Allowing sufficient time for the procurement and receipt of supplies is crucial when integrating micronutrient assessment into a population-based survey. There may be little flexibility for delaying the start of the entire survey if the supplies for the micronutrient component are delayed. To synchronize the supply procurement process, it may be best for one agency to lead the supply procurement process for all components of the survey.
- Conduct joint training for field teams and allocate time for piloting: Joint training and piloting can prepare field teams to coordinate data collection activities and bring to light potential coordination issues before data collection begins.

The major strength of this evaluation was that we explored the process of linking the MDHS and MNS from the perspectives of individuals who implemented the surveys. We also captured a diversity of perspectives by interviewing stakeholders from government and international agencies, as well as both MDHS and MNS field staff. Additionally, the implementation phases of the surveys provided a useful framework for collecting data and organizing the presentation of the findings. Of note was that interviewers were involved in implementing the surveys and had met or worked with some of the individuals

whom they interviewed. Stakeholders and field staff potentially limited their responses due to perceived hierarchy or discomfort with sharing honest opinions with someone they knew. To mitigate this, we emphasized confidentiality in their views and stressed our interest in hearing honest opinions. Further, individuals from The DHS Program were not part of the evaluation team. The findings presented here are, therefore, not the result of a joint evaluation process with all stakeholders. Notably, our sample did include individuals from The DHS Program to capture their perspectives.

5 | CONCLUSION

High-quality timely data on micronutrient program performance and micronutrient deficiencies are a critical component of effective health systems. For countries seeking to collect these data, there are a variety of survey approaches. This evaluation contributes to the evidence base on survey approaches by exploring the experience of linking a micronutrient status survey with a DHS survey in Malawi. These findings can inform the design and implementation of the future MNS as specified in the 2018–2022 National Multi-Sector Nutrition Strategic Plan (Government of Malawi Department of Nutrition, HIV and AIDS, 2018b). The results may be useful to other LMICs that are considering incorporating micronutrient status assessment into national surveys. Altogether, our findings highlight the need for greater attention on innovative approaches to shrink nutrition data gaps. It is our hope that this paper stimulates implementation research, including rigorous process evaluations and cost analyses, on approaches for collecting population micronutrient status data in different settings.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

CONTRIBUTIONS

ECR and KT developed the evaluation plan with input from AW and PSS. ECR and GM collected the data. ECR conducted the data analysis with support from MH. ECR wrote the original manuscript and all authors contributed substantially to revisions and approved the final manuscript.

DISCLAIMER

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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REFERENCES

- Bhutta, Z. A., Das, J. K., Rizvi, A., Gaffey, M. F., Walker, N., Horton, S., ... Black, R. E. (2013). Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? *Lancet*, 382(9890), 452–477. [https://doi.org/10.1016/s0140-6736\(13\)60996-4](https://doi.org/10.1016/s0140-6736(13)60996-4)
- Germand, A. D., Schulze, K. J., Stewart, C. P., West, K. P. Jr., & Christian, P. (2016). Micronutrient deficiencies in pregnancy worldwide: Health effects and prevention. *Nature Reviews. Endocrinology*, 12(5), 274–289. <https://doi.org/10.1038/nrendo.2016.37>
- Government of Malawi, Department of Nutrition, HIV and AIDS (2018a). National Multi-Sector Nutrition Strategic Plan 2018-2022. Retrieved from Malawi: <https://www.fantaproject.org/sites/default/files/resources/Malawi-National-Nutrition-Strategic%20Plan-2018-2022.pdf>
- Government of Malawi, Department of Nutrition, HIV and AIDS (2018b). National Multi-Sector Nutrition Policy 2018-2022. Retrieved from Malawi: <https://www.fantaproject.org/sites/default/files/resources/Malawi-National-Multi-Sector-Nutrition-Policy-2018-2022.pdf>
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough?: An experiment with data saturation and variability. *Field Methods*, 18(1), 59–82. <https://doi.org/10.1177/1525822x05279903>
- Hancioglu, A., & Arnold, F. (2013). Measuring coverage in MNCH: Tracking progress in health for women and children using DHS and MICS household surveys. *PLoS Medicine*, 10(5), e1001391. <https://doi.org/10.1371/journal.pmed.1001391>
- Hennink, M., Hutter, I., & Bailey, A. (2011). *Qualitative research methods*. Thousand Oaks, California USA: Sage publications.
- Hennink, M. M., Kaiser, B. N., & Marconi, V. C. (2017). Code saturation versus meaning saturation: How many interviews are enough? *Qualitative Health Research*, 27(4), 591–608. <https://doi.org/10.1177/1049732316665344>
- ICF (2018). The DHS Program [Internet]. Retrieved from <https://dhsprogram.com/>
- International Food Policy Research Institute (2014). Global nutrition report 2014: Actions and accountability to accelerate the world's progress on nutrition. Retrieved from Washington, DC:
- Mei, Z., Jefferds, M. E., Namaste, S., Suchdev, P. S., & Flores-Ayala, R. C. (2017). Monitoring and surveillance for multiple micronutrient supplements in pregnancy. *Maternal & Child Nutrition*. <https://doi.org/10.1111/mcn.12501>
- Namaste, S. M., Aaron, G. J., Varadhan, R., Peerson, J. M., & Suchdev, P. S. (2017). Methodologic approach for the Biomarkers Reflecting Inflammation and Nutritional Determinants of Anemia (BRINDA) project. *American Journal of Clinical Nutrition*, 106(Suppl 1), 333s–347s. <https://doi.org/10.3945/ajcn.116.142273>
- National Institute of Statistics, Directorate General for Health, & ICF International (2015). Cambodia Demographic and Health Survey 2014. Retrieved from Phnom Penh, Cambodia, and Rockville, Maryland, USA:
- National Statistical Office, Community Health Sciences Unit, Centers for Disease Control and Prevention, & Emory University. (2017). Malawi Micronutrient Survey 2015-16. Retrieved from Atlanta, GA, USA:
- National Statistical Office, Department of Nutrition, HIV and AIDS, Ministry of Health, United Nations Children's Fund, & Centers for Disease Control and Prevention (2009). A report for the National Micronutrient Survey 2009. Retrieved from Atlanta, GA, USA:
- National Statistical Office, & ICF (2017). Malawi Demographic and Health Survey 2015-16. Retrieved from Zomba, Malawi and Rockville, Maryland, USA:
- National Statistical Office, Ministry of Health, United Nations Children's Fund, & Centers for Disease Control and Prevention (2001). Malawi Micronutrient Survey 2001. Retrieved from Atlanta, GA, USA:
- Ruel, M. T., & Alderman, H. (2013). Nutrition-sensitive interventions and programmes: How can they help to accelerate progress in improving maternal and child nutrition? *Lancet*, 382(9891), 536–551. [https://doi.org/10.1016/s0140-6736\(13\)60843-0](https://doi.org/10.1016/s0140-6736(13)60843-0)
- Strauss, A. (1987). *Qualitative analysis for social scientists*. Cambridge: Cambridge University Press.
- Tanumihardjo, S. A., Russell, R. M., Stephensen, C. B., Gannon, B. M., Craft, N. E., Haskell, M. J., ... Raiten, D. J. (2016). Biomarkers of Nutrition for Development (BOND)-Vitamin A Review. *Journal of Nutrition*, 146(9), 1816s–1848s. <https://doi.org/10.3945/jn.115.229708>
- Tuffrey, V. (2016). A perspective on the development and sustainability of nutrition surveillance in low-income countries. *BMC Nutrition*, 2(1), 15. <https://doi.org/10.1186/s40795-016-0054-x>
- Tuffrey, V., & Hall, A. (2016). Methods of nutrition surveillance in low-income countries. *Emerging Themes Epidemiology*, 13, 4. <https://doi.org/10.1186/s12982-016-0045-z>
- Wirth, J. P., Petry, N., Tanumihardjo, S. A., Rogers, L. M., McLean, E., Greig, A., ... Rohner, F. (2017). Vitamin A supplementation programs and country-level evidence of vitamin A deficiency. *Nutrients*, 9(3). <https://doi.org/10.3390/nu9030190>

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