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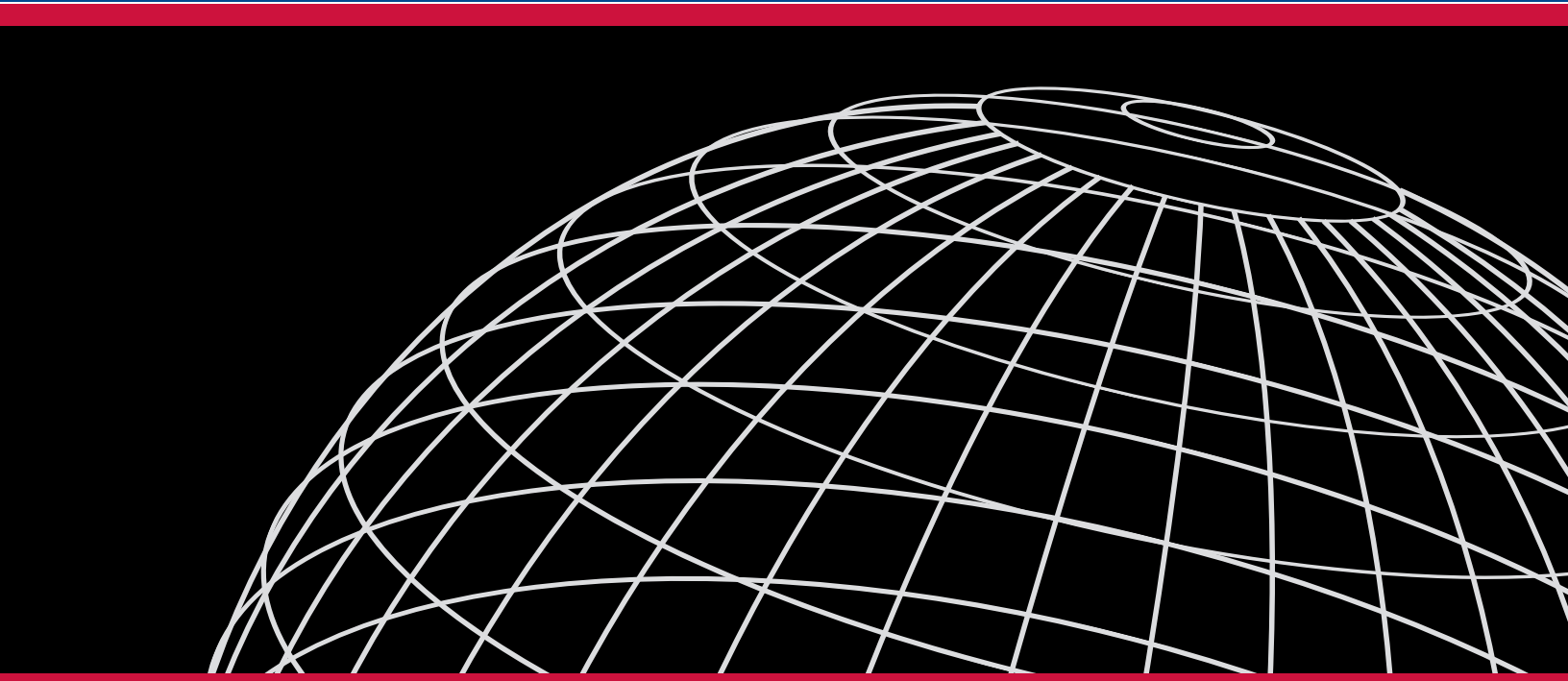
NUTRITION DATA COLLECTION PROCEDURES: ENHANCEMENTS AND INNOVATIONS



DHS Qualitative Research Studies 26

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Nutrition Data Collection Procedures: Enhancements and Innovations

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The DHS Program assists countries worldwide in the collection and use of data to monitor and evaluate population, health, and nutrition programs. Additional information about The DHS Program can be obtained from ICF, 530 Gaither Road, Suite 500, Rockville, MD 20850 USA; telephone: +1 301-407-6500, fax: +1 301-407-6501, email: info@DHSprogram.com, internet: www.DHSprogram.com.

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PREFACE

The Demographic and Health Surveys (DHS) Program is one of the principal sources of international data on fertility, family planning, maternal and child health, nutrition, mortality, environmental health, HIV/AIDS, malaria, and provision of health services.

Occasionally DHS is able to supplement surveys with qualitative data collection and analysis to answer specific questions that are better explored using qualitative or mixed method approaches. Such research can also help clarify the interpretation of some complex indicators and improve understanding of measurement issues in DHS surveys. Results from these qualitative studies are made available in the DHS Qualitative Research Studies series.

The topics in this series are selected by The DHS Program in consultation with the U.S. Agency for International Development.

It is hoped that the DHS Qualitative Research Studies will be useful to researchers, policymakers, and survey specialists, particularly those engaged in work in low- and middle-income countries.

Sunita Kishor
Director, The DHS Program

ABSTRACT

The Demographic and Health Surveys (DHS) Program is a leading source of national and subnational nutrition data. Countries use nutrition indicators measured through DHS surveys to develop policies, evaluate programs, and reach nutrition targets. Several recommendations to improve the collection of data on anthropometry, hemoglobin, and infant and young child feeding practices have been incorporated into DHS-8. Five activities consisting of observations, interviews, and focus groups discussions with informants (that is, implementing agency staff, biomarker technicians, team supervisors, and DHS interviewers) were conducted to document the implementation of nutrition data collection in DHS-8 surveys and to explore new methodologies. Results of activity 1 suggest that the severe acute malnutrition referral process should continue to be documented and that referral monitoring could be enhanced. Activity 2, which examined the capture of data from food and drink questions in the Woman's Questionnaire, identified a need for more awareness of the "foods and drinks" menu button in the computer-assisted personal interviewing system. Activity 3 resulted in a recommendation to use high flow, contact-activated Becton Dickinson lancets (instead of Unistik lancets) to draw capillary blood for biomarker collection in all populations. For measuring children's height/length, activities 4 and 5 tested SECA equipment as an alternative to ShorrBoards and evaluated the feasibility of using multiple measurements instead of single measurements, respectively. Results suggest continued use of ShorrBoards, but exploration and use of alternative equipment if ShorrBoard quality issues persist, and the need for more exploration of multiple measurement techniques. These findings and recommendations will be used to strengthen DHS survey processes and direct future research in a variety of country contexts.

Key words: anthropometry, blood collection, infant and young child feeding

ACRONYMS AND ABBREVIATIONS

BD	Becton Dickinson (BD) high flow contact-activated lancet
CAPI	computer-assisted personal interviewing
DHS	Demographic and Health Survey
FGD	focus group discussion
IYCF	infant and young child feeding
JPFHS	Jordan Population and Family Health Survey
MDD-W	minimum dietary diversity for women
SAM	severe acute malnutrition
USAID	United States Agency for International Development
ZDHS	Zimbabwe Demographic and Health Survey

INTRODUCTION

The Demographic and Health Surveys (DHS) Program is a leading source of national and subnational nutrition data including dietary practices, anthropometric measurements, hemoglobin concentration/ anemia, and nutrition interventions such as iron supplementation and counseling on breastfeeding. Countries use the nutrition indicators measured in DHS surveys to develop policies, evaluate programs, and monitor progress toward the Sustainable Development Goals and other nutrition targets.

The DHS Program is committed to producing high quality nutrition data. In 2018, at the end of DHS-7, The DHS Program released a report, *Enhancing Nutrition Data Quality in The DHS Program,* recommending several actions to improve the collection of nutrition data, including data on anthropometry, hemoglobin, and infant and young child feeding practices.[1]) In DHS-8, many of the recommended actions are now standard practice, and others are still being explored.

The purpose of this study was (a) to document the implementation of recommendations that are now standard practice to understand how procedures and/or systems can be strengthened and (b) to explore new recommendations related to height/length measurement. The study included five activities conducted with informants who had experience in a variety of countries. For each activity, we describe the background, aim, methods, findings, and recommendations. The five activities are listed below:

- Examine the severe acute malnutrition referral process
- Examine data collection for food and drink questions in the Woman's Questionnaire
- Use high flow lancets for blood collection
- Explore alternative equipment for measuring height/length
- Test multiple height/length measurement techniques to measure children's height/length

ACTIVITY I: SEVERE ACUTE MALNUTRITION REFERRAL PROCESS

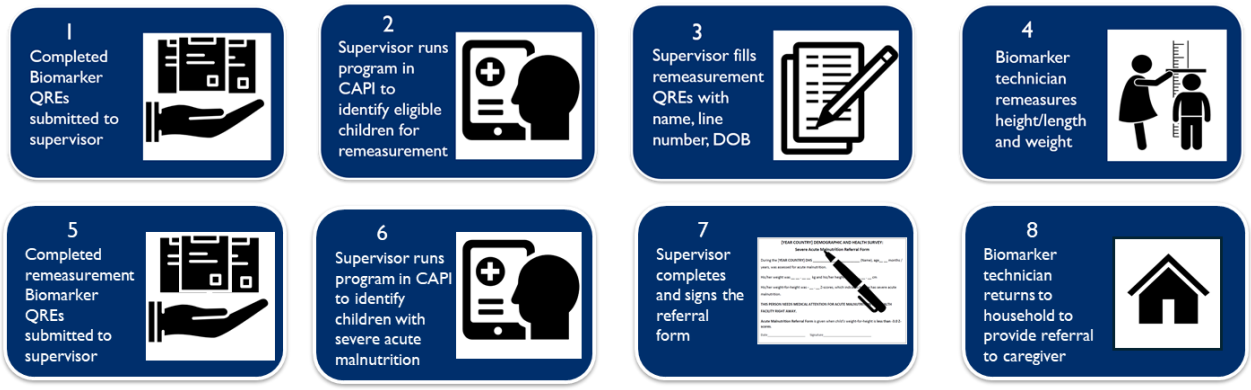
Background

The severe acute malnutrition (SAM) referral process is new in DHS-8. The referral informs caregivers that their child has been identified as having SAM, defined as a weight-for-height/length *z* score less than -3 standard deviations from the mean of a reference population. Upon receipt of the referral, caregivers are prompted to take their child to the nearest health facility for treatment.

In the field, SAM referrals take place after children's initial height/length and weight measurements and any remeasurements have been taken. A program in the computer-assisted personal interviewing (CAPI) system is run to identify children with severe acute malnutrition. The CAPI program calculates the weight-for-height/length *z* scores from each child's height/length and weight measurements. Typically, the supervisor completes and signs the SAM referral form noting the child's height/length, weight, and weight-for-height/length *z* score, and the biomarker technician returns to the household to give the referral to the caregiver (Figure 1). However, there is flexibility on how this happens in practice.

Reports from a few countries have indicated different ways surveys are implementing the SAM referral process, such as team supervisors and biomarker technicians traveling together for remeasurements, or technicians traveling alone for remeasurements and making subsequent trips to complete the referral process. Therefore, the aim of this activity was to examine the SAM referral process in the field.

Figure 1 Procedures for a severe acute malnutrition referral, starting from remeasurement



Methods

In March 2023, field visits were conducted in the 2023 Jordan Population and Family Health Survey (JPFHS) to observe and interview staff on the implementation of SAM referrals (and on the administration of food and drink questions in the Woman's Questionnaire, as described in activity II).

Convenience sampling was used to identify data collection teams for field monitoring visits. Observations of the SAM referral process (including interviews with survey respondents) were captured using an observation form (Appendix I). In-depth interviews were conducted with team supervisors, biomarker technicians, and implementing agency staff. A semi-structured interview guide that focused on the successes

and challenges of collecting data on SAM referrals (as well as on the food and drink questions) was used for all interviews (Appendix II). Interviews were conducted in person in English; and an interpreter conducted simultaneous English and Arabic translation. Notes were taken during the interviews, which were also audio-recorded and transcribed.

A codebook was developed a priori based on the interview guide. Interview notes were entered into Taguette software, and coding and content analyses were conducted iteratively.[2] Audio transcripts were also reviewed, and quotes were extracted.

The researcher obtained verbal informed consent for interviews/observations prior to data collection. In reporting results, no statements were attributed to individuals, although the key informants agreed to their names being listed in this report's appendix section. Throughout the report, "informant" refers to those interviewed. Ethical approval for this research was provided by the ICF Institutional Review Board.

Findings

A total of 17 interviews and eight observations were conducted. Informants included four implementing agency staff, seven biomarker technicians, and six team supervisors. Educational attainment ranged from diplomas (71%) to higher diplomas/bachelor's and master's degrees in various fields (29%). For the majority of biomarker technicians and team supervisors (85%), this was their first experience with survey work. However, the experience of the four implementing agency staff ranged from 10 to 20 years.

At the time of the interviews, no SAM referrals had been captured during the field observations and no informants had experienced any SAM referrals, as SAM is rare, especially in most well-nourished populations. However, informants understood the importance of the SAM referral, considering it analogous to the severe anemia referral.

> *"If they have severe anemia, they will have some referral to the medical centers for free."*
>
> Team supervisor 6

Team supervisors and implementing agency staff explained that the supervisor always travels with the biomarker technician for remeasurement, allowing the supervisor to enter the remeasurement data into CAPI while in the household. The supervisor would then be able to complete the SAM referral form and hand it to the biomarker technician to share with the caregiver, stressing the importance of visiting the nearest health center as soon as possible.

Overall, the viewpoints shared in Jordan aligned with some anecdotal reports of how SAM referrals are administered in other settings. The Jordan approach is likely the most efficient way to complete the referrals, as it does not require the fieldworker to make a third trip to the household (after the initial visit and the remeasurement visit) to share the SAM referral. Since SAM referrals are very rare in Jordan, continuing to collect information on how the referral process is working in other settings can inform The DHS Program on how the process can be strengthened, for example if there are multiple biomarkers in a survey.

Recommendation 1

- For surveys in which SAM referrals are/have been implemented, conduct analyses to assess what percentage of children are eligible for referrals. Additionally, continue to document the process to better understand the procedures in the field, including technicians' perceptions of how the referrals are received by caregivers.

- As part of the ongoing development of CAPI for biomarker collection, revise the SAM referral procedures to enhance monitoring of the referrals for example indicating in CAPI the number of referrals given.

ACTIVITY II: DATA COLLECTION FOR FOOD AND DRINK QUESTIONS

Background

The Demographic and Health Surveys (DHS) program has a formalized process for adapting the food and drink questions used to collect list-based 24-hour dietary recall data for children and women in DHS-8. The process is in alignment with new indicator guidance from the World Health Organization and United Nations Children's Fund on infant and young child feeding (IYCF)[3] and from the Food and Agriculture Organization of the United Nations on minimum dietary diversity for women (MDD-W).[4] Adaptations of the food and drink questions are part of a global good provided through the Global Diet Quality Project.[5] Cognitive testing has been used to assess the wording of some of the food and drink questions as part of the DHS-8 pilot,[6] and recommended changes have been incorporated into the standard questionnaire.

The process of adapting the food and drink questions starts with The DHS Program requesting a country adaptation from the Global Diet Quality Project. The DHS Program then reviews the adaptations and requests any changes, from the Global Diet Quality Project based on DHS Program key informants, before the adaptations are shared with the implementing agency. Frequently, implementing agencies also offer feedback on the adaptations, which requires circling back to the Global Diet Quality Project to determine if the changes can be accommodated. This robust adaptation process can be time intensive, but it provides high quality adaptations of the food and drink questions.

The adaptations have increased the data collection burden for interviewers, who must ensure that data on foods and liquids are captured correctly. As more DHS-8 surveys are implemented, streamlining the data capture procedures in the computer-assisted personal interviewing (CAPI) system for the food and drink questions is important. The aim of this activity was to examine the data capture procedures in the field for the food and drink questions in the Woman's Questionnaire.

Methods

In March 2023, field visits were conducted in the 2023 Jordan Population and Family Health Survey to observe and interview staff on the administration of food and drink questions in the Woman's Questionnaire (as well as severe acute malnutrition referrals, as described in activity I).

Convenience sampling was used to identify data collection teams for field monitoring visits. Observations and interviews with survey respondents were captured using an observation form (Appendix III). In-depth interviews were conducted with team supervisors, survey interviewers, and implementing agency staff. A semi-structured interview guide that focused on the successes and challenges of collecting data from the food and drink questions (as well as severe acute malnutrition referrals, as described in activity I) was used for all interviews (Appendix II). Interviews were conducted in person in English by Dr. Benedict; an interpreter conducted simultaneous English and Arabic translation. Notes were taken during the interviews, which were also audio-recorded and transcribed.

A codebook was developed a priori based on the interview guide. Interview notes were entered into Taguette software, and coding and content analyses were conducted iteratively.[2] Audio transcripts were also reviewed, and quotes were extracted.

The interviewer obtained verbal informed consent for interviews/observations prior to data collection. In reporting results, no statements were attributed to individuals, although the key informants agreed to their names being listed in this report's appendix section. Throughout the report, "informant" refers to those interviewed. Ethical approval for this research was provided by the ICF Institutional Review Board.

Findings

A total of 17 interviews and eight observations were conducted. Informants included four implementing agency staff, seven interviewers, and six team supervisors (n=17). Educational attainment was as described previously for activity I.

The 2023 Jordan Population and Family Health Survey was among the first DHS-8 surveys to use adaptations from the Global Diet Quality Project. Implementing agency informants explained how even with the country-specific adaptations to the food and drink questions from the Global Diet Quality Project, multiple discussions were required to finalize them. Local feedback on the adaptations helped to further refine them both for the survey and the Global Diet Quality Project. Informants reported that during fieldwork, women did not have any problems understanding the food and drink questions.

> *"We would always debate about Indomie and Jameed…there were continuous meetings and at last we reached a common solution. Everything was okay, but it took a much time."*
>
> Implementing agency staff 4

> *"No, most of the questions are understandable, these are foods we eat every day, it's not hard."*
>
> Interviewer 6

Training on the Woman's Questionnaire, including the IYCF and MDD-W questions, covered both questionnaire content and use of the CAPI application on Android tablets. Interviewers were trained to read every food and drink question to the respondent. Interviewers also learned why specific liquids and foods were grouped together, why certain questions had follow-up questions, and what problems/issues they might expect in the field.

> *"We first have to make sure that the interviewers understand what we're asking."*
>
> Implementing agency staff 4

> *"We gave the interviewers the tablets….someone asks [questions] and someone answers, and the interviewer enters the data into CAPI. We had three weeks dedicated to CAPI, and trained interviewers on all the possibilities that could confront them in the field."*
>
> Implementing agency staff 1

Informants described the general process of reading the introduction to the food and drink questions and reading each question to the respondent. Informants explained that women did not have any difficulties understanding the instructions or responding to the questions. They explained that for each question, the reference period "yesterday during the day and night" was included so mothers understood the recall period. This finding corroborated the DHS-8 pilot results, which showed that respondents understood the short version of the introductory statement to IYCF questions.[6]

Results also suggested that building rapport with respondents can help mitigate their frustrations or anxieties with the interview process. For example, informants explained that some respondents may get annoyed with the long list of food and drink questions, and others may be sensitive to the questions if they can't give their children (or themselves) the wide range of foods and drinks covered. Informants reported that, even among respondents with infants who were being exclusively breastfed, they still asked all the food and drink questions as they were trained to do.

> *"Sometimes during the period of questions, I apologize because the questionnaire is long, and the questions are many. [I have to] keep loosening it up."*
>
> Interviewer 3

> *"I'd say bear with me, we need to finish this. Even when she's in the kitchen cooking, we tell her speak loudly and we can hear you."*
>
> Interviewer 4

> *"[If the baby is only breastfeeding] I'll explain that the questions are to make sure she might not have fed them something she's not remembering."*
>
> Interviewer 6

Several informants also discussed translating food or drink items "on the fly" to help respondents better understand a question. Interviewers were drawn from the regions in which they were assigned to conduct fieldwork. They therefore knew the local/slang names of certain food/drink items and would use these terms if respondents did not fully comprehend the items listed in the question. Although our study did not capture how commonly or for what specific food or drink items these "on the fly" translations occurred, this result does reinforce the importance of high quality training to ensure that interviewers are well versed in, and understand, the food and drink questions. It also highlights the importance of selecting fieldworkers from the regions in which the fieldwork is being conducted, as they will have a deeper understanding of cultural nuances that are not easily captured directly in the survey questions.

> *"I explain the question in a simple way when I feel it is over her head, when I feel that she did not understand."*
>
> Interviewer 6

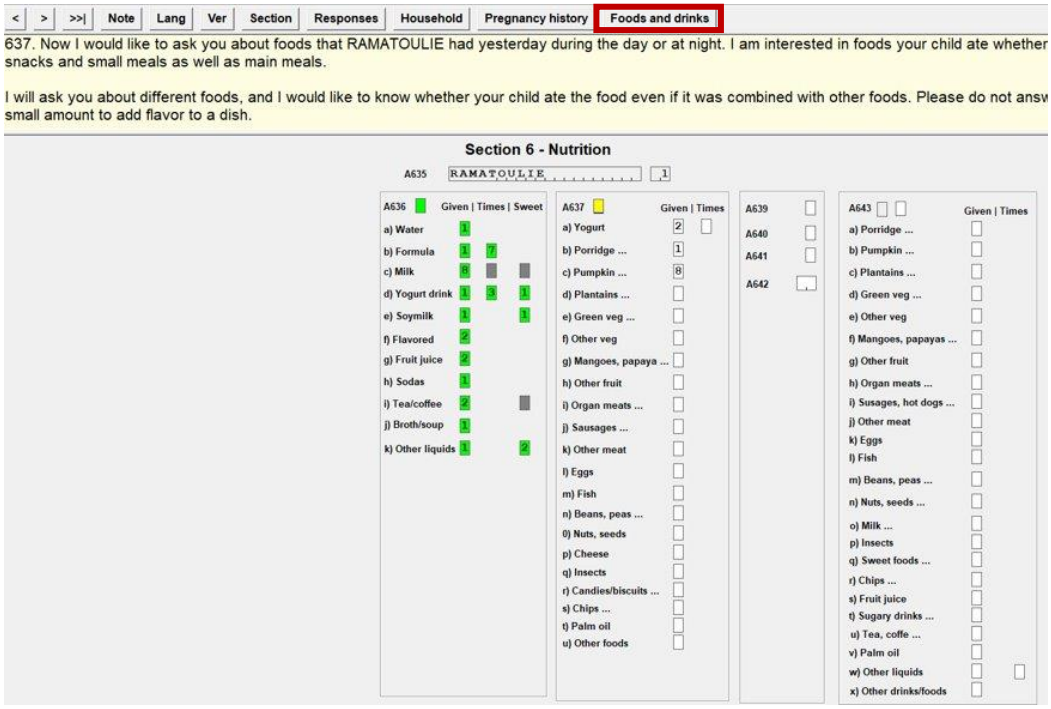
> *"I will give you a clear example from Jordan, if we say the word cauliflower, it has many names in Arabic, as a governorate person I know the name familiar to them in their place, so I'll address it by what they call it there."*
>
> Interviewer 4

As foods are rarely eaten as single foods, we probed how the interviewers handled mixed dishes. All interviewers stated that they asked the respondent to list the main ingredients of any mixed food dishes, but they used two approaches. In the first approach, the interviewer reads out every food group question, even if the respondent mentions multiple ingredients in the first question. In the second approach, the interviewer reads out the food group question, and if the respondent mentions multiple ingredients, then the interviewer asks subsequent questions only if they mention the food groups the respondent has not already mentioned (because the interviewer has marked "YES" to the food groups already mentioned). Irrespective of which approach is taken, interviewers mentioned that they enter any mixed dish ingredients into the "other" category if the items cannot be captured in any of the food group questions.

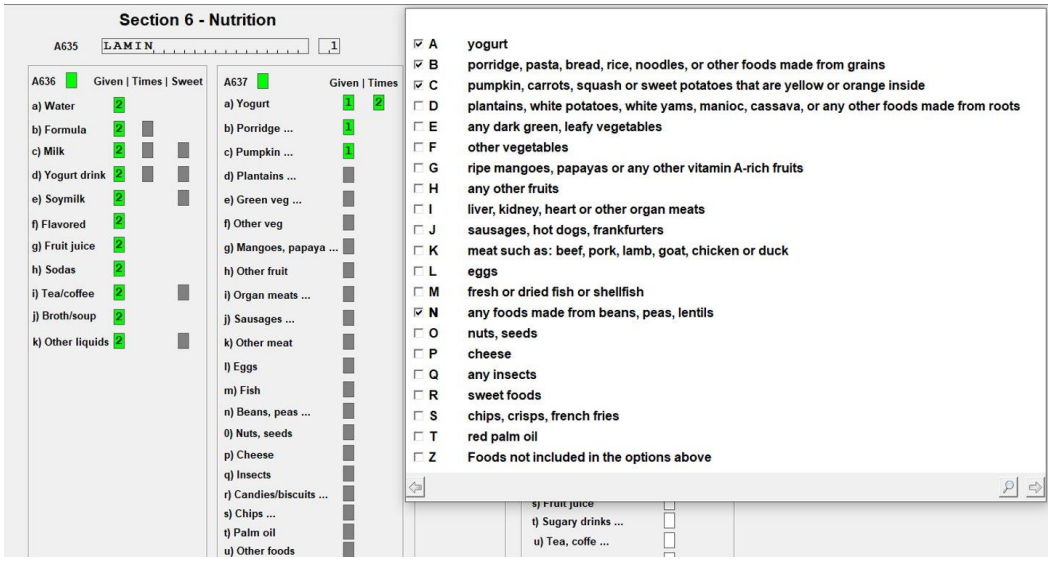
The CAPI system now has a "foods and drinks" menu button that, if clicked, displays the complete list of food and drink questions (Figure 2). At any time during the interview, if a respondent mentions a food or drink unrelated to the current question, the interviewer can access the list via the menu button and select each item the respondent mentions, before returning to the question. In Jordan, interviewers reported not using the "foods and drinks" menu, because this feature was not available on their tablets (as it was a new at the time). Instead, interviewers either opted to remember food items that respondents mentioned and skip subsequent questions about those items (but mark the answers to those questions appropriately), or opted to ask every question, regardless of whether it was a food item the respondent had already mentioned. The latter option likely results in less data entry error but could increase the survey burden on the respondent, especially because the food and drink questions are asked both of the respondent and for the youngest biological child under age 2 living with the respondent. However, the "foods and drinks" menu feature in CAPI could help reduce the respondent burden by cutting down on the time needed for the food and drink questions.

Figure 2 **Example of the "foods and drinks" menu button in the computer-assisted personal interviewing system (a) and the complete list of foods and drinks displayed (b)**

(a)



(b)



Recommendation 2

- Enhance awareness of the "foods and drinks" menu button in the CAPI system, for example by incorporating examples of its use during training.

ACTIVITY III: HIGH FLOW LANCETS FOR BLOOD COLLECTION

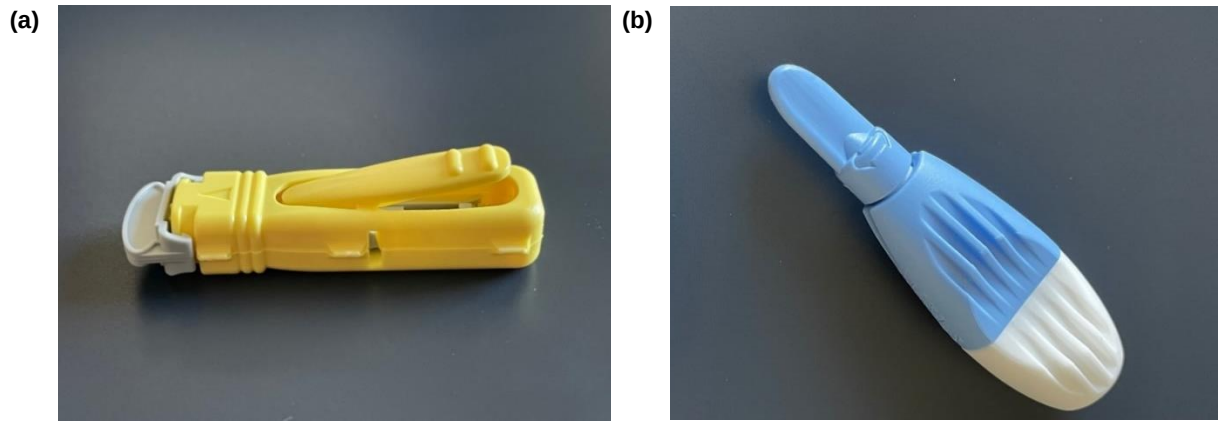
Background

Capillary blood collection is used for many biomarkers collected by The Demographic and Health Surveys (DHS) Program. The DHS-7 and DHS-8 recommendations have been to use two low flow lancets made by Unistik: Unistik 3 (yellow), primarily for children, and Unistik 2 (orange or gray) for adults only. As the collection of blood biomarkers has expanded beyond just hemoglobin testing in many surveys, having sufficient blood drops is a common problem. In addition, concerns have arisen about the quality of hemoglobin data obtained using low flow lancets.[7] Therefore, selecting appropriate lancets for optimal blood flow is important.

In DHS-8, The DHS Program has been exploring high flow Becton Dickinson (BD) contact-activated lancets as an alternative to the Unistik lancets. The Unistik lancets are trigger-activated, requiring biomarker technicians to manually release the trigger once they have positioned the lancet on the fingertip or heel and applied pressure. The Unistik lancets use a needle with a 0.8-mm width to puncture to a depth of 1.8 mm for children (yellow) and 2.0 or 3.0 mm for adults (orange or gray, respectively). The BD lancets (blue) that have been tested in The DHS Program use a blade (with a width of 1.5 mm) rather than a needle and slice to a depth of 2.0 mm. Because the BD lancets are contact-activated, the blade is automatically activated when the correct amount of pressure against the fingertip or heel is achieved (Figure 3).

The aim of this activity was to describe the use of high flow lancets to minimize improper capillary blood collection techniques (for example, milking and excessive pressure).

Figure 3 Unistik lancet (yellow) with trigger activation (a) and Becton Dickinson lancet (blue), activated with pressure against the fingertip or heel (b)



Methods

In August 2023, interviews were conducted with DHS biomarker specialists as part of a focus group discussion (FGD) to learn more about the experience of using BD contact-activated lancets. Interviews followed an FGD/interview guide focused on the informants' experiences using and training on the BD

lancets (Appendix IV). Interviews were conducted virtually and audio-recorded, and written notes were taken concurrently.

A codebook was developed a priori based on the FGD/interview guide. FGD/interview notes were entered into Taguette software, and coding and content analyses were conducted iteratively. [2] Audio transcripts were also reviewed, and quotes were extracted. In the report, "informant" refers to those interviewed.

The interviewer obtained verbal informed consent for interviews prior to data collection. In reporting results, no statements were attributed to individuals, although the key informants agreed to their names being listed in this report's appendix section. Ethical approval for this research was provided by the ICF Institutional Review Board.

Findings

Interviews were conducted with three DHS biomarker specialists. All biomarker specialists had advanced degrees (master's or PhDs) and had experience in blood collection ranging from 1 to 20 years. One biomarker specialist was in their first year of working with The DHS Program, and the other two had each been working with the program for almost a decade.

The DHS biomarker specialists had been trained on and used the BD contact-activated lancets in Tajikistan, Angola, Democratic Republic of Congo, and Zimbabwe. The specialists cited several advantages of the BD lancets from their experiences. First, the same size lancet can be used for children and adults. This simplifies training, the procurement process, and management of supplies. Next, BD lancets are activated when the correct amount of pressure against the fingertip/heel is achieved, producing more consistent finger/heel pricks than the Unistik lancets. This eliminates a common source of failure in capillary blood collection attempts (for example, shallow finger/heel pricks) and makes the BD lancets easier for trainee biomarker technicians to use.

> *"You get a really consistent puncture because you know the depth is going to be the same every time because the pressure is the same every time before the blade comes out."*
>
> Biomarker specialist 1

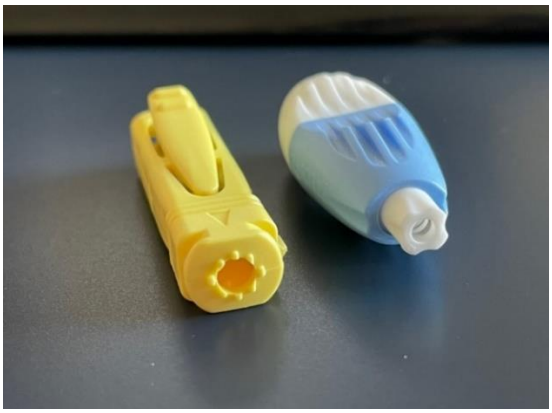
Because BD lancets are "high flow," the puncture produces a sufficient amount of blood for multiple tests and facilitates pooled capillary blood collection. The latter is of particular interest if The DHS Program were to switch to pooled capillary blood collection to measure hemoglobin and related biomarkers. The high flow lancets also reduce the chance that biomarker technicians will put excessive pressure on the finger (e.g., milking) to produce an adequate drop of capillary blood. It has been suggested that this may also improve the quality of anemia data, although a direct evaluation of the effect of lancet type on that biomarker has not been conducted. Lastly, BD lancets have a small, circular tip that allows better visibility of the puncture site than the larger, rectangular Unistik tip (Figure 4). Feedback from biomarker trainees in the 2023 Tajikistan DHS confirmed that the BD lancets were easy to use and that blood flow was sufficient (Eleanor Brindle, PhD, email communication, September 26, 2023).

"If you don't get a high [blood] flow, technicians tend to start milking the finger, which we don't want."

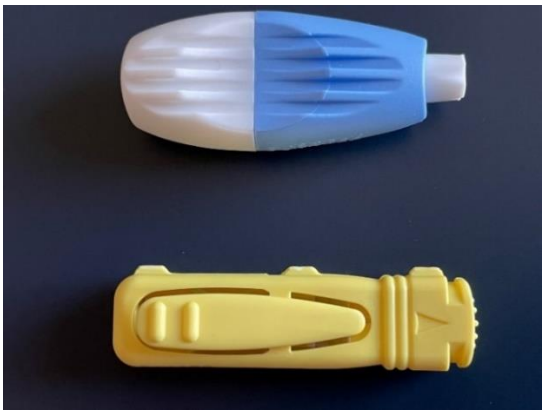
Biomarker specialist 2

Figure 4 Unistik (yellow) versus BD (blue) tip size viewed from an angle (a) and from above (b)

(a)



(b)



BD lancets are not without challenges. Informants commented that for respondents with calloused fingers, BD lancets sometimes fail to produce blood flow because the blade consistently punctures to a specific depth. With the Unistik lancet, biomarker technicians can apply more pressure to the fingertip before triggering the needle, effectively puncturing deeper. However, field observations showed that biomarker technicians are still achieving adequate blood flow through training and other means, such as selecting an alternate finger.

"The quantity of the blood flow will depend on the type of lancet, but the quality or the ability to produce good blood drops also depends on the biomarker technician's training."

Biomarker specialist 3

In contrast, some respondents reported that bleeding does not stop immediately given the ample amount of blood produced by the BD lancets. As a consequence, extra supplies of gauze and bandages are needed to stop the bleeding. Since BD lancets produce blood flow quickly, biomarker technicians using the HemoCue 201+ system to measure hemoglobin must be able to fill the microcuvette quickly. If they aren't quick enough, blood can trickle down the finger rather than form individual blood drops. Informants discussed revising the training materials (which in their current iteration were developed for the Unistik lancets) to help address this challenge. Lastly, because the BD lancets are contact-activated, biomarker technicians must make sure to position them correctly on the fingertip. With the Unistik lancets, biomarker technicians can position the lancet, apply pressure, and then observe the position of the indentation before triggering the lancet. Nonetheless, The DHS Program is confident that these challenges can be overcome through adequate training, including the recent updates made to the training manual.

"That was one problem, sometimes the blood drops were not well formed because the blood was flowing so fast. That to me is the big drawback and that [is] the reason that we have to think about backing off on all of our tricks to get blood to flow."

Biomarker specialist 1

"You have to have the positioning correctly right to have a good effective pricking."

Biomarker specialist 1

Recommendation 3

- Use BD contact-activated lancets for capillary blood collection in DHS surveys for all populations (children and adults).
- Continue to gather feedback from biomarker technicians on their experiences with the lancets and update DHS training materials based on informant feedback for example biomarker training manuals and PowerPoint slides.

ACTIVITY IV: EQUIPMENT FOR MEASURING HEIGHT/ LENGTH

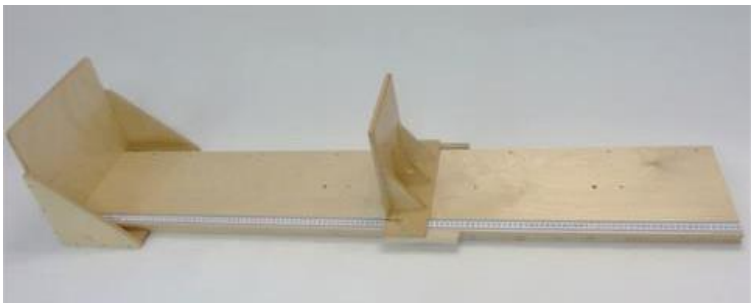
Background

Studies have shown that height/length measurements are particularly prone to measurement error. [8-10] For as long as The Demographic and Health Surveys (DHS) Program has collected height/length data, the instrument of choice has been the ShorrBoard (Figure 5), a portable board that can be used to measure the height/length of both children and adults. A few recent surveys have identified challenges with the quality of the ShorrBoard, such as the clasps falling out and the sliding head pieces not fitting well. ShorrBoards are also notoriously heavy. Alternative height/length equipment that is available on the market may perform as well or better than ShorrBoards. The purpose of this activity was to test the performance of different height/length equipment on children in a DHS-like setting.

Methods

The study took place after the pretest for the 2023 Zimbabwe DHS. Ten biomarker technicians who had participated in the pretest and completed the standard DHS anthropometry training workshop, standardization exercise, and field practice participated in the study. All technicians had been trained on and used the ShorrBoard.

Figure 5 ShorrBoard



For the study, four of the biomarker technicians were divided into two teams (team A and team B) each consisting of a measurer and an assistant. and were trained to measure children using the SECA height/length equipment. The teams tested three types of SECA equipment: SECA 213 (Figure 6a) for measuring standing height and SECA 417 (Figure 6b) and SECA 416 (Figure 6c) for measuring infant length. The selection criteria for the four biomarker technicians included passing the standardization exercise, being able to speak the local language where the equipment was being tested, and having access to the SECA equipment.

Figure 6 SECA 213 stadiometer (a), SECA 417 portable infantometer (b), and SECA 416 infantometer (c)

(a)

(b)

(c)

Measurements of children took place in a classroom and field setting, and the teams obtained verbal consent from caregivers before taking any measurements. Children under age 2 years were measured lying down, and children ages 2–4 years were measured standing up.

In the classroom setting, the two teams using the SECA equipment (team A and team B) each took a single measurement for 20 children, but with multiple rounds of single measurements. In the field setting, the equipment was set up on the ground floor of a block of high-density apartments. In this setting, team A and team B each took a single one-time measurement on the SECA equipment from 12 and 13 children, respectively. The other six biomarker technicians were divided into three teams of two and used ShorrBoards as per standard DHS procedures to measure the children, to allow for (a timing) comparison between the SECA equipment and ShorrBoards. All teams (those using the SECA equipment and those using ShorrBoards) were observed during measurements, and four observers followed a standard protocol for timing the measurements (Appendix V). Briefly, for all measurements, the timer was started as soon as the child was on the measuring board and being moved into position, and it was stopped when the final measurement was read out by the assistant. After each of the classroom and field measurement sessions, all biomarker technicians completed a questionnaire about their experiences using the different or standard equipment (Appendix VI). A focus group discussion (FGD) with all technicians was also held in English (Appendix VII). The discussion was audio-recorded, and written notes were taken concurrently.

A codebook was developed a priori based on the focus group discussion guide. Focus group discussion notes were entered into Taguette software, and coding and content analyses were conducted iteratively.[2] Audio transcripts were also reviewed, and quotes were extracted. In the report, “informant” refers to those interviewed.

Verbal informed consent for FGDs was obtained prior to data collection. In reporting results, no statements were attributed to individuals, although the key informants agreed to their names being listed in this report's appendix section. Ethical approval for this research was provided by the ICF Institutional Review Board.

Findings

The teams measured 45 children and completed 60 measurements on the SECA 213, 33 measurements on the SECA 417, and 36 measurements on the SECA 416 (Table 1).

Table 1 Number of measurements by team and equipment type

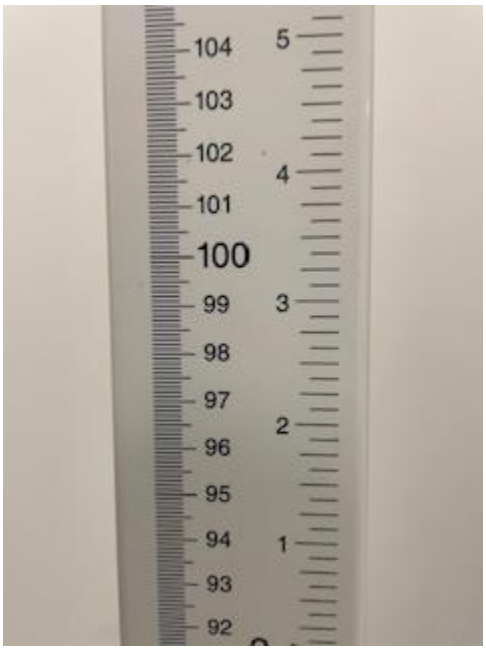
	Number of measurements on each equipment type					
Team ID	SECA 213	Number of children	SECA 417	Number of children	SECA 416	Number of children
Team A	32	(14)	17	(12)	17	(13)
Team B	28	(14)	16	(14)	19	(14)

Durability of the equipment

For all the SECA equipment (213, 417, and 416), informants appreciated that a ruler was printed onto the equipment and found it more durable than the measuring tape attached to the ShorrBoard (Figure 7). Informants thought that the SECA 416 infantometer was the most durable of all the SECA equipment tested because of its design (one piece and thicker plastic material).

Figure 7 Ruler on the SECA 213 stadiometer (a) and measuring tape on the ShorrBoard (b)

(a)



(b)

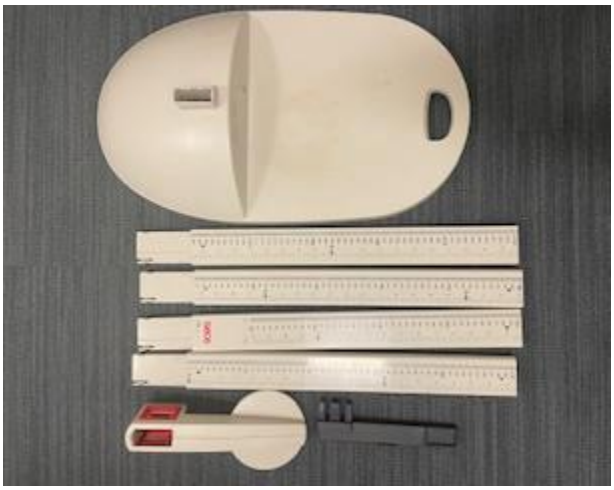
When discussing concerns about each type of SECA equipment, informants raised a few points. They suspected that the SECA 213 would not hold up over time because it is composed of seven separate pieces that require constant assembly and disassembly during fieldwork (Figure 8). Informants also thought that

the plastic material of the SECA 417 was easily breakable, because it was thin and had a very low ground profile.

> *"I'm not sure now if we are going to be measuring, let's say 20 kids, and we are dismantling the SECA 213 and we are putting it back. I don't know whether those pieces will be able to be firmly connected together after a number of measurements. I think it will have some issues."*
>
> FGD participant 1

A focus group participant discussed the need for more practice with the SECA equipment in the field to be able to comment more objectively on its durability and portability. This was a valid comment since in the study, the biomarker technicians took measurements on the equipment in a classroom and on the ground floor of a block of high-density apartments, where the women and children had to come to them. More observations in a typical DHS-like field setting, where technicians travel to households and assemble and disassemble their equipment at each household, could further validate or repudiate our findings.

Figure 8 The foot piece, measuring rod (in four pieces), head piece, and wall stabilizer that make up the SECA 213 stadiometer



Portability of the equipment

The SECA equipment is lighter than the ShorrBoard. However, measurement with the SECA equipment requires two pieces of equipment: a stadiometer for standing height (SECA 213) and an infantometer for length of children lying down (SECA 416 or 417). Informants explained that when they are collecting multiple biomarkers that require other equipment, they prefer to carry fewer pieces of equipment. Thus, they preferred the ShorrBoard since it can be used for both standing height and recumbent length. Furthermore, the SECA 416 infantometer is not designed to be portable and is not collapsible. Unsurprisingly, even after procuring makeshift bags for carrying the SECA 416, the informants did not find it easily portable because of its bulkiness.

> *"I think that portability was the major thing they had in mind for the SECA 213 and 417."*
>
> FGD participant 1

Equipment setup and stability

The SECA 213 stadiometer is designed to stand upright unsupported, but it comes with an optional wall stabilizer piece that can be used when the equipment is placed against a wall or supporting surface. This is unlike the ShorrBoard, which must be supported from the back when standing upright. When using the SECA 213, informants reported that the measuring rod seemed unstable when not using the wall stabilizer against a wall. They explained how in some locations, the oval base of the stadiometer made it difficult to set up so that the wall stabilizer piece would reach the wall.

> *"If you do not [have] the wall stabilizer in place, the measuring road keeps on [moving], it's not firm."*
>
> FGD participant 3

> *The SECA 417 infantometer has a very low profile, and informants explained how it needs to be placed on a flat surface. They reported that this can be a challenge if measurements are taken outside or even inside, since floors of traditional homes are not always flat. The ShorrBoard also needs to be placed on a level surface, but informants explained that it's possible to use small pebbles to level the surface because of the ShorrBoard's sturdy material and higher ground profile. "The SECA 417 feels like it's on the floor…it's very thin... for it to function properly, you really need a smooth, flat, firm, surface. Which is not the situation that you will get especially in the field."*
>
> FGD participants 1 and 2

Ease of taking measurements

Unlike the measuring tape on the ShorrBoard, the ruler on the SECA equipment has a window and/or pointer that shows where to read the measurement (Figure 9). Informants expressed that this made it very easy to read measurements on the ruler. For the SECA 416 infantometer, informants also found that the V-shape of the measuring board helped to put the child in position easily.

Figure 9 Window with a pointer on the SECA 213 stadiometer (a) and pointer on the SECA 417 infantometer (b)

(a)

(b)

Informants also highlighted a few challenges of taking measurements with the SECA equipment. Although the V-shape of the SECA 416 infantometer was helpful in positioning young children, informants reported that for bigger children, both of their feet would not sit in the in the hollow V-shape. This made it difficult to take an accurate reading. In such cases, informants described having to use one leg to take the measurement.

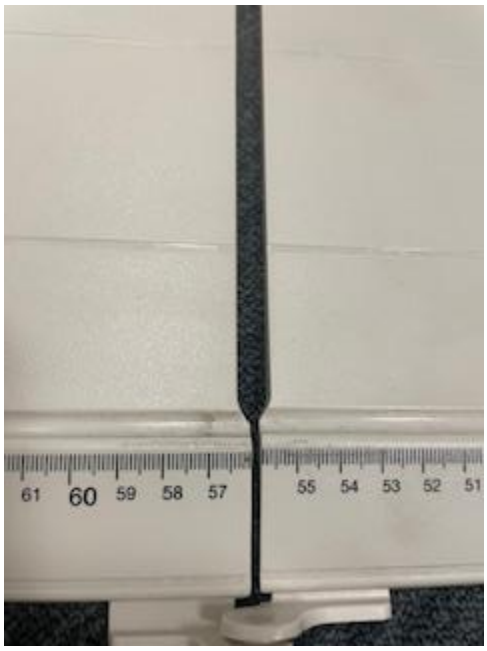
> *"Yesterday I tried measuring the child using both limbs. There is a little flat space [on the SECA 416] that would allow us to have the heels meet the foot piece at 90 degrees. This [small space] makes it quite difficult to measure a child using both limbs. It's easier when you're using one. However, then the challenge will be that the child will be using the other limb to kick."*
>
> FGD participant 4

For the SECA 417 infantometer, the height of the foot piece was problematic when taking measurements. Informants explained that the foot piece was too short and larger children could easily kick it off the board (since it was not fixed on the board). Therefore, when taking measurements, technicians were balancing between keeping the child in the correct position and holding down the foot piece so it did not come off the tracks. This is unlike the ShorrBoard, which has the foot piece attached to the measuring board.

> *"The foot piece it's quite light…the baby can push it back. They push the upper part and then it comes off the rail."*
>
> FGD participant 1

A few informants also highlighted the small 2-mm gap on the ruler where the SECA 417 folds over, and how this can lead to inaccurate measurements for children whose lengths fall within the gap (Figure 10).

Figure 10 Small 2-mm gap in the ruler of the SECA 417 infantometer

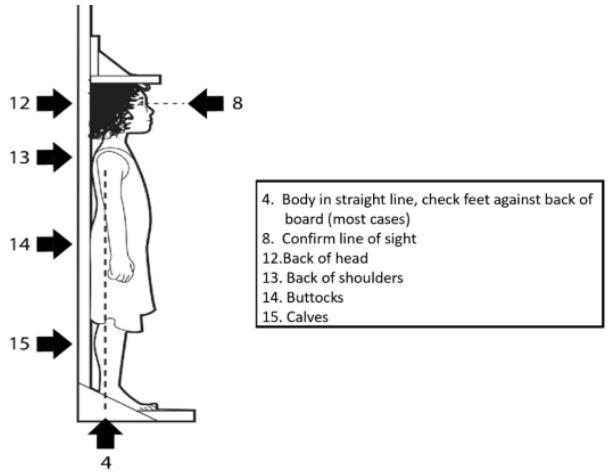


Technicians felt it was harder to tell when the child was in the correct position with the SECA 213 stadiometer than with the ShorrBoard. This is because very few body parts (for example, the heels) may touch on the stadiometer, whereas many body parts touch the ShorrBoard (Figure 11). Informants also felt children were more nervous on the SECA 213 because it is a rod rather than a board like the ShorrBoard, which allowed children to feel secure and steady themselves.

> *"With the SECA 213 positioning of the child is quite difficult because of the shape it has. It's easier to position a child on a ShorrBoard with the back, the shoulders aligned against the ShorrBoard. With the SECA 213 you really need to be careful or else you might have children falling."*
>
> FGD participant 4

> *"When you are placing the child [on ShorrBoard], they use it to feel comfortable and support themselves. They feel there is an object behind them and then they feel a bit secure. They will stay there. I think it's a feeling of [security] because they touch the board. They hold it and then you tell them not to hold for the measurement. But at least they feel that there's something behind them and that also makes it easy to see the positioning of the child."*
>
> FGD participant 2

Figure 11 Side profile of a child being measured on the ShorrBoard



Safety

There were no safety concerns discussed by the group, as informants felt the SECA equipment was safe to use.

Time for measurements

Informants were observed taking measurements and also asked about their perceptions of how much time measurements take on the different equipment. The technicians felt that measurements were faster with the ShorrBoard than with the SECA 213 and SECA 417. They explained that it's easier to position the child on the ShorrBoard than on the SECA 213, and that more time was needed for the SECA 417 to make sure the child was secure and in the correct position. The technicians felt that measurements with the SECA 416 took about the same amount of time as measurements with the ShorrBoard. However, all informants had much more experience taking measurements with the ShorrBoard, as it is part of the survey training.

Based on the field observations, the average amounts of time taken for measurements on the ShorrBoard and the SECA equipment were comparable (Table 2).

Table 2 Average duration of a single measurement on each type of equipment

	Equipment type							
	ShorrBoard		SECA 213		SECA 417		SECA 416	
Setting	Average duration (s)	N	Average duration (s)	N	Average duration (s)	N	Average duration (s)	N
Classroom	34	(7)	45	(32)	35	(18)	37	(15)
Field	44	(5)	38	(6)	35	(8)	25	(8)
Total average	38	(12)	44	(38)	35	(26)	33	(23)

Note: N refers to the number of observations. For the different types of equipment, the number of observations varies.

Recommendation 4

- Continue to use the ShorrBoard in DHS surveys and provide feedback to the manufacturer on the features that promote ease of use during data collection. Also continue to document any quality issues with ShorrBoards and seek remedial action with the manufacturer when necessary. If quality issues persist, revisit current and emerging alternative equipment for measuring height/length.

ACTIVITY V: MULTIPLE HEIGHT/LENGTH MEASUREMENTS

Background

In the Demographic and Health Surveys (DHS) Program, the standard procedure for measuring the height/length of a child is for a biomarker technician to take a single measurement during data collection. An alternative approach is to take multiple measurements, which can be achieved by a measurer taking three height/length measurements while the child is still in position, or taking two measurements (each time removing the child from the board) and obtaining a third measurement only if the difference between measurements is beyond an allowed maximum. [11,12] One more multiple measurement technique involves two measurers taking and recording measurements independently, comparing their height/length values, and remeasuring the child if the values are inconsistent (Sorrel Namaste, DrPH, personal correspondence with SMART and Groundwork).

A single height/length measurement is the easiest, most practical approach, but it is more susceptible to measurement error. A multiple measurement approach by the same measurer may be more reliable because it allows multiple inputs. However, this may not always be the case since a child can become more agitated when measurement takes longer. Height/length measurements by two independent measurers may yield the most accurate results, but this technique has the highest training and fieldworker burden. There is currently no agreement on whether a multiple measurement approach is preferable to a single measurement approach. Nor is there consensus on the optimal technique for taking multiple measurements in field settings in different contexts.

The aim of this activity was to test the feasibility of using multiple measurement techniques to measure children's height/length in a DHS-like setting.

Methods

The study took place after the pretest for the 2023 Zimbabwe Demographic and Health Survey. Ten biomarker technicians who had participated in the pretest and completed the standard DHS anthropometry training workshop, standardization exercise, and field practice were eligible to participate in the study. All technicians had been trained on and used ShorrBoards for taking single height/length measurements.

For the study, a team of two biomarker technicians (a measurer and an assistant) were trained on multiple measurement techniques. The selection criteria for the biomarker technicians included passing the standardization exercise and ability to speak the local language where testing of the multiple measurement techniques would take place. The biomarker technicians used a ShorrBoard to measure children and tested three multiple measurement techniques:

1. Multiple technique 1: Two independent measurers each took a single height/length measurement. If the measurements differed by 1 cm or more, a second measurement was taken by each measurer.

2. Multiple technique 2: One measurer took three height/length measurements while the child remained on the board.

3. Multiple technique 3: One measurer took two height/length measurements, with the child removed from the board after each measurement. If the measurements differed by 1 cm or more, a third measurement was taken by the same measurer.

The team also conducted single measurements of children as per standard DHS procedures to allow for comparison between the multiple and single measurement procedures.

As described in activity IV, children were measured in a classroom and field setting. The team obtained verbal consent from caregivers before taking any measurements. In the classroom setting, the team measured 20 children multiple times (using either the single measurement procedure or one of the three measurement techniques). In the field setting, the team measured 25 children one time each using either the single measurement procedure or one of the multiple measurement techniques. The team was observed during measurements, the duration of each measurement was timed, and all biomarker technicians completed a questionnaire about their experiences with the multiple measurement techniques or single measurement procedure before participating in a focus group discussion (FGD). See activity IV for more details (Appendices V–VII).

Findings

The team measured 45 children and completed 14 measurements following the standard DHS single measurement procedure, 38 measurements using multiple measurement technique 1, 48 measurements using multiple measurement technique 2, and 36 measurements using multiple measurement technique 3 (Table 3).

Table 3 Number of measurements by measurement approach and number of children measured

Measurement approach	Number of measurements	N
Single measurement	14	(14)
Multiple measurement technique 1	38	(18)
Multiple measurement technique 2	48	(19)
Multiple measurement technique 3	36	(15)

Communication

For multiple measurements, informants explained that good communication between the measurer and the assistant was critical and prevented delays. When the measurer and the assistant were focused on their respective roles, measurements could be executed quickly. In addition, explaining the procedures to the caregivers beforehand helped the caregivers understand the process and their role (e.g., comforting the child or encouraging them to stay on the board).

> *"I think the multiple measurements improves the communication between the two of you. For the second measurement you want to say everything is okay before you take the final reading. When we agree [that the child is correctly positioned], then we take the final reading."*
>
> FGD participant 7

"When we're out there, we are actually focusing on the mother as well, telling her that we're going to do this measurement twice or thrice."

FGD participant 7

Tolerance

In general, children and their caregivers tolerated multiple measurements. However, informants noted that children could become more agitated the longer the measurements took. Not surprisingly, older children were more tolerant of the multiple measurements than younger children (under 1 year), and these observations also held true for the single measurements.

"Well, with older kids there is not much challenge [for the multiple measurements], but with the younger ones, I can say those under the age of one, it becomes difficult because obviously they are not used to being handled that way. Then you take them off the measuring board, bring them back, you take them off, you bring them back, then they become agitated."

FGD participant 7

Informants described the classroom as stressful for children and their caregivers, both because it was an unfamiliar environment and because the children were measured multiple times. However, during field practice, children and caregivers were more relaxed and comfortable. Some of the children in the field had already participated in the classroom sessions and were familiar with the procedures, which gave confidence to other children.

"I can say for the classroom since the mothers, it was new to them, you could actually see the mothers being a little bit tense, but out [in the field], they were more comfortable."

FGD participant 7

"The children just went with the flow, seeing that the other children were comfortable around the whole thing."

FGD participant 8

Ease of taking measurements and bias

Informants found it easy to take multiple measurements, especially during field practice (because of the reasons noted previously). With the multiple measurements, informants could observe their precision (how close their measurements were to each other) in real time. They felt it helped their skills and confidence in taking the measurements.

"[Multiple measurement technique 3] helps in redefining your skills. You have your first measurement, then let the child off the board. And then you try again with your second measurement, so you see your precision."

FGD participant 8

In some cases, the multiple measurements did not match. For example, with multiple measurement technique 1, informants described measurements being more than 1 cm apart both times they were independently taken. The informants then spent extra time making sure the child's positioning was correct, but this further agitated the child and made it even more difficult to position them.

> *"[For multiple measurement 1 technique there was one instance where you had to measure that child four times] For each one of us, our two individual measurements were close together (precise). But comparing the two of us, our measurements were far apart… we couldn't even figure out why."*
>
> FGD participant 8

Informants thought multiple measurement techniques 2 and 3 were unnecessarily repetitive, which could result in biased measurements since both techniques are performed by a single measurer.

> *"[For multiple measurement techniques 2 and 3] You're not going to see much difference because you'll still be aware of the first measurement you did. And if everything was perfect the first time, you wouldn't expect any difference. So, it's more like you just do the same thing again to come up with the same measurements. If there is a difference, it could be a difference of 0.1 cm, so it's not much. You feel like you are doing this thing just because it needs to be done, but if you measure once and it's perfect, then it's fine."*
>
> FGD participant 7

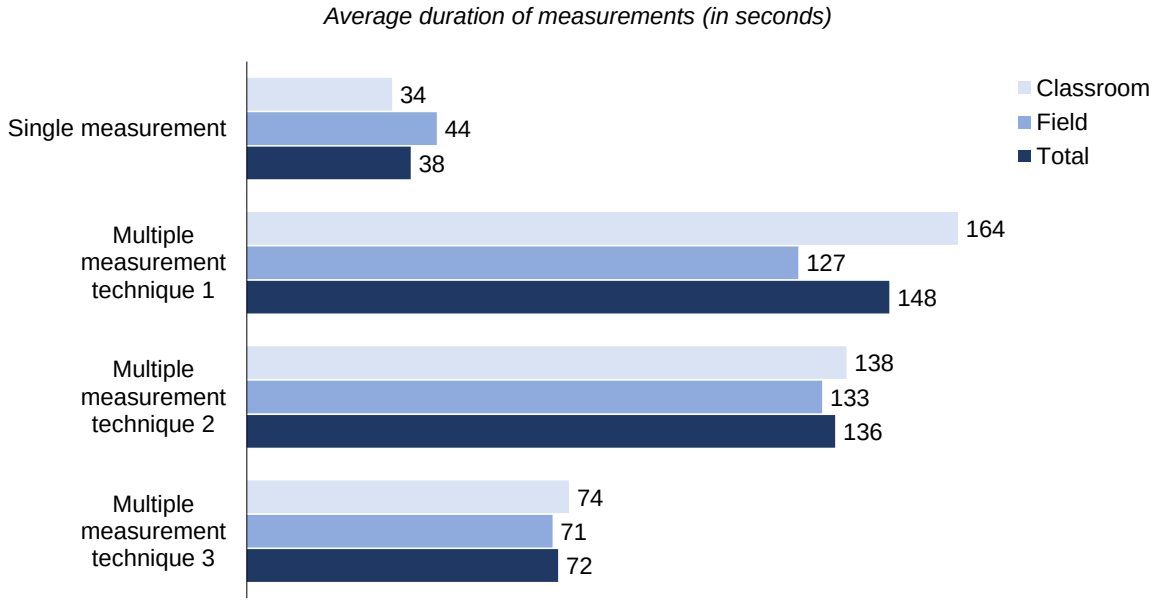
Informants thought that multiple measurement technique 1 would result in less bias because two measurers take independent measurements. However, technique 1 requires standardization for both technicians, unlike the other two techniques, which require standardization for only one technician. Standardization for both technicians is possible, but this has a higher training burden (for example, longer duration, higher cost) and may not be practical in many contexts. One informant suggested that multiple measurement technique 1 could be implemented as a data quality measure during remeasurement only, rather than as part of the routine measurements.

> *"I think when it comes to surveys, we can take the multiple measurement technique 1 for a quality check for the measurers."*
>
> FGD participant 7

Time for measurements

The multiple measurement techniques took longer than single measurements, with differences between the classroom and field settings (Figure 12). On average, a single measurement took 38 seconds, multiple measurement technique 1 took 148 seconds, multiple measurement technique 2 took 136 seconds, and multiple measurement technique 3 took 72 seconds (since measurers rarely took a third measurement).

Figure 12 Average duration of measurements (in seconds) by measurement approach and setting



Note: Sample size varied among the measurement techniques. Single measurements, n=14 observations (classroom n=9, field n=5); Multiple technique 1, n=38 observations (classroom n=32, field n=6); Multiple technique 2, n=48 observations (classroom n=40, field n=8); Multiple technique 3, n=36 observations (classroom n=30, field n=6).

Recommendation 5

- Engage with other researchers on the results of multiple measurement techniques and, where feasible, continue to explore multiple measurements for anthropometry in other contexts.

CONCLUSION

The Demographic and Health Surveys (DHS) Program is committed to collecting high quality nutrition data. The findings from these five activities reflect the expertise and experiences of DHS Program staff, implementing agency staff, and survey fieldworkers in the implementation of severe acute malnutrition (SAM) referrals, data capture for food and drink questions, blood collection with high flow lancets, testing of alternative equipment for measuring height/length, and exploration of multiple measurement techniques. Their experiences highlight important opportunities for strengthening processes for collecting nutrition data in DHS surveys.

Although informants in Jordan had no experience with SAM referrals because they are so rare there, experiences from other survey staff suggest the referral process is working well. Having the team supervisors travel with the biomarker technicians for remeasurement appears to be an efficient way for the team to travel and provide a SAM referral if a child is identified. Currently, the number of referrals is not tracked. However, with the move to develop a computer-assisted personal interviewing (CAPI) biomarker collection system for The DHS Program, this type of tracking could be added. Further, the CAPI system could result in additional efficiencies in the field movements.

The food and drink questions in DHS surveys contribute to numerous dietary indicators for children and women. Informants in Jordan did not have any difficulty asking the questions, including probing for mixed dishes, and they reported that respondents did not have any challenges understanding the questions. The data entry into CAPI also worked well, even with the two slightly different approaches that informants described for entering the data when respondents mention foods or drinks unrelated to the current question in the Woman's Questionnaire. Promoting the use of the new "foods and drinks" menu button in CAPI will reduce the likelihood that different approaches will be taken and may also reduce respondent burden.

Feedback from DHS experts confirmed that for capillary blood collection, high flow lancets (the BD lancets) are acceptable, easy to use, and preferable to low flow lancets (Unistik), especially when multiple blood biomarkers need to be collected. Anthropometry equipment informants from Zimbabwe preferred ShorrBoards over SECA equipment, likely because they were more familiar with them. However, informants also noted features on the SECA equipment, such as the printed ruler and the pointer to facilitate reading of measurements, that were advantageous. Recent challenges with the ShorrBoard in some surveys is a concern that The DHS Program is actively monitoring. A few past DHS surveys used the SECA equipment, and if challenges persist with the ShorrBoard, the SECA or other equipment may become preferable.

Findings from the activity on multiple measurement techniques showed that taking multiple height/length measurements from children takes longer than taking single measurements, can be more challenging with younger children who are less tolerant, and works best when communication between the anthropometry team and the caregiver is good. Although standard practice in DHS surveys is to take a single measurement, it's not uncommon for measurers to read the tape multiple times before recording the measurement. Therefore, multiple measurement technique 2 (in which three measurements are taken by the same measurer) may be similar in some ways to standard practice, except that all readings are recorded. Overall, it is feasible to take multiple measurements from children in both classroom and field settings using any of

the techniques. For DHS surveys, the preferred technique is one that balances survey costs (for example, using one or both technicians as measurers), how much time the technique adds in the field, and whether multiple measurements add to the quality of anthropometry data. Our activity was not designed to fully answer all these questions but can serve to inform future research in this area.

Of course, this work is not without some limitations. Observations and interviews for the SAM referrals and food and drink questions were conducted in one country, so the findings may not reflect the processes in other contexts. For the high flow lancets, our work primarily captured the DHS experts' experience, and incorporating more feedback from biomarker trainees could further help revise training materials. Because the activities on height/length measurement equipment and multiple measurement techniques were conducted after a DHS pretest, during which the biomarker technicians had been trained following standard DHS procedures, the technicians' opinions might have been biased because of their familiarity with ShorrBoards. The field practice was also not a true DHS-like setting. The biomarker technicians did not travel from household to household, and the mothers involved were not respondents of a long survey, so tolerance for the multiple measurements might have been reduced. Further, some of the children in the field practice had participated in the classroom sessions. Having a more traditional DHS-like experience and possibly conducting the study after survey fieldwork could potentially mitigate some of these limitations.

The DHS Program has successfully collected nutrition data for many years, and this work will continue to enhance nutrition data collection moving forward. Our findings and the resulting recommendations will be used to strengthen nutrition data collection survey processes and direct future research. A summary of the recommendations is provided below:

- For surveys in which SAM referrals are/have been implemented, conduct analyses to assess what percentage of children are eligible for referrals. Additionally, continue to document the process to better understand the procedures in the field, including technicians' perceptions of how the referrals are received by caregivers.

- As part of the ongoing development of CAPI for biomarker collection, revise the SAM referral procedures to enhance monitoring of the referrals for example recording in CAPI the number of referrals given.

- Enhance awareness of the "foods and drinks" menu button in the CAPI system, for example by incorporating examples of its use during training.

- Use BD contact-activated lancets for capillary blood collection in DHS surveys for all populations (children and adults).

- Continue to gather feedback from biomarker technicians on their experiences with the lancets and update DHS training materials based on informant feedback for example biomarker training manuals and PowerPoint slides.

- Continue to use the ShorrBoard in DHS surveys and provide feedback to the manufacturer on the features that promote ease of use during data collection. Also continue to document any quality issues with ShorrBoards and seek remedial action with the manufacturer when necessary. If quality issues persist, revisit current and emerging alternative equipment for measuring height/length.

- Engage with other researchers on the results of multiple measurement techniques and, where feasible, continue to explore multiple measurements for anthropometry in other contexts.

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APPENDIX I: OBSERVATION FORM: SEVERE ACUTE MALNUTRITION REFERRAL

Date
Observation ID
Country
Cluster ID
Household ID
Technician IDs
Supervisor IDs

Observe and take notes on the following for the **SAM referral:**

For each of the following describe what is observed and record notes.	*Notes*
1. After the remeasurement form has been entered, does the CAPI program show children who need referral immediately?	
2. Who completes the SAM referral?	
3. Who signs the SAM referral?	
4. What are the logistics for the technician/others to return to the household: (describe for each)?	
a. How is travel organized?	
b. Is the referral the main purpose of the trip?	
c. Are technicians dropped off on the way to other households in the same cluster?	
d. Are technicians dropped off on the way to other households in next cluster?	
5. Does the technician travel alone or with anyone to the household? Specify who	
6. What does the technician communicate to the household when returning for the remeasurement visit?	
7. Are there any household concerns and how does the technician respond?	
Any other observations	

APPENDIX II: IN-DEPTH INTERVIEW GUIDE: ANTHROPOMETRY DATA QUALITY PROCEDURES AND DATA CAPTURE FOR FOODS AND LIQUIDS

Implementing Agency

Hello, I am talking to you today because we are writing a report to understand the implementation of anthropometry remeasurement, the severe acute wasting referral, and the liquid and food lists in DHS surveys.

The report will be published, and the learnings will be used to inform future DHS procedures. In order to do this successfully, it is important to understand the perspectives of people that have experience with implementation. So thank you for agreeing to talk with us today to share your experiences.

Your participation in this interview is completely voluntary. If you want to stop at any time or don't feel comfortable answering a question, please let me know. Taking part in this interview is your agreement to participate.

This discussion will be recorded, and the recordings will be kept securely and only accessed by the report team. Do I have your permission to record the discussion?

The information you provide will not be attributed to you individually but there will be acknowledgement section in the appendix. Would you like your name to appear in the appendix of the report? Our discussion today will take approximately 1 hour.

*[*Do you have any questions before we start?]

[Answer any questions.]

Let's begin.

[START RECORDER]

I. Demographic Information

First, some demographic information before we jump in

1. What is your title and role in your institution?
   Probe:
   - Does your institution implement DHS surveys? Other surveys (specify)?
2. How many years of work experience do you have in survey work if any?
3. What's your highest level of education completed?

Next I would like to ask you about the Severe Acute Malnutrition Referral process

4. Referral for severe acute malnutrition is included in DHS surveys, what is your experience with this procedure?
5. Can you describe the training that technicians receive on for severe acute malnutrition?
   Probes:
   - Ask for what works well, why.
   - Ask about any challenges and potential solutions to the challenges.
   - Ask about any clarifying questions or confusions being asked by the trainees.
   - Ask whether the severe acute malnutrition is part of the field practice or simulated.
6. Can you describe how the severe acute malnutrition referral process is working? I'm interested to know what works well and if there are any challenges.
   Probes:
   - Ask for what works well, why.
   - Ask if they have any solutions to the challenges.
7. Can you describe how the CAPI program for severe acute malnutrition referral is working?
   Probes:
   - Ask who does each step and how well it's working.
   - Ask who completes and signs the referral form.
   - Ask about any challenges with the program.
   - Ask whether the CAPI program is easy to use and understand.
   - Ask if anything could be improved with the program or process.
8. Can you describe how the process for providing the severe acute malnutrition referral back to the households is working?
   Probes:
   - Ask who does each step and how well it's working.
   - Ask whether the supervisor is near the households that are eligible for remeasurement when the program is run.
   - Ask who returns to the household to give the referral.
   - Ask about any challenges and potential solutions to the challenges.
   - Ask what is communicated to the households when providing the referral and are there are any messages that are particularly helpful.
   - Ask about how the respondents are responding to the visits e.g., what questions do they ask.

II. Liquids and foods list

Now let's switch gears and talk about questions for liquids and foods.

9. What is your experience with the collection of liquids and foods for children and women?
10. During questionnaire design, what was the process for translation of the liquid and food lists?
    Probes:
    - Ask who did the translations.
    - Ask how translations were reviewed.
    - Ask if there were any challenges with translations, for what items, and how were they were addressed.

11. Can you describe the training that interviewers receive on the liquids and foods questions?
    Probes:
    - Ask for what works well, why.
    - Ask about any challenges and potential solutions to the challenges.
    - Ask about any clarifying questions or confusions being asked by the trainees.
12. Can you describe how the interview process is working for the questions on liquids and foods? I am interested to know if respondents are asking for clarification on the questions being asked.
    Probes:
    - Ask about any clarifying questions being asked by the respondent on the introduction/instructions to the liquid and food questions.
    - Ask about any clarifying questions being asked by the respondent on the liquid and foods being asked about.
    - Ask about any liquids or food questions that the respondent is not sure whether to answer yes or no.
    - Ask about if there is any translation on the fly needed for the respondent to understand the question.
    - Ask about how interviewers handle respondents' confusion or frustration, for example when respondents say that the child did not have anything to eat only breastmilk, but interviewers must continue asking all liquid and food questions.
    - Ask about how the interviewer responds to inquiries from the respondent.
13. Can you describe how the data capture process for the liquids and foods in CAPI is working? I'm interested to know what works well and if there are any challenges.
    Probes:
    - Ask about strategies used to overcome the challenges.
    - Ask how they navigate the program if a respondent provides multiple food items that belong in different groups.
    - Ask how they navigate the program if a respondent says that the child did not have anything to eat only breastmilk.
    - Ask how they capture mixed dishes.
14. Can you describe how "other" liquids and foods are captured in CAPI?
    Probes:
    - Ask what works well.
    - Ask about challenges and any strategies used to overcome.

IV. Closing Questions

15. Do you have anything else you would like to add that we have not already talked about?
16. Do you have any questions for me?

Thank you for your time. I really appreciate you talking with me today.

Team Supervisor

Hello, I am talking to you today because we are writing a report to understand the implementation of anthropometry remeasurement, the severe acute wasting referral, and the liquid and food lists in DHS surveys.

The report will be published, and the learnings will be used to inform future DHS procedures. In order to do this successfully, it is important to understand the perspectives of people that have experience with implementation. So thank you for agreeing to talk with us today to share your experiences.

Your participation in this interview is completely voluntary. If you want to stop at any time or don't feel comfortable answering a question, please let me know. Taking part in this interview is your agreement to participate.

This discussion will be recorded, and the recordings will be kept securely and only accessed by the report team. Do I have your permission to record the discussion?

The information you provide will not be attributed to you individually but there will be acknowledgement section in the appendix. Would you like your name to appear in the appendix of the report? Our discussion today will take approximately 1 hour.

*[*Do you have any questions before we start?]

[Answer any questions.]

Let's begin.

[START RECORDER]

I. Demographic Information

First, some demographic information before we jump in

1. What is your title and role in the survey?
2. How many years of work experience do you have in survey work if any?
3. What's your highest level of education completed?

Next I would like to ask you about the Severe Acute Malnutrition Referral process

4. Can you describe how the severe acute malnutrition referral process is working? I'm interested to know what works well and if there are any challenges.
   Probes:
   - Ask for what works well, why.
   - Ask if they have any solutions to the challenges.
5. Can you describe how the CAPI program for severe acute malnutrition referral is working?
   Probes:
   - Ask who does each step and how well it's working.
   - Ask who completes and signs the referral form.
   - Ask about any challenges with the program.
   - Ask whether the CAPI program is easy to use and understand.
   - Ask if anything could be improved with the program or process.

6. Can you describe how the process for providing the severe acute malnutrition referral back to the households is working?
   Probes:
   - Ask who does each step and how well it's working.
   - Ask whether the supervisor is near the households that are eligible for remeasurement when the program is run.
   - Ask who returns to the household to give the referral.
   - Ask about any challenges and potential solutions to the challenges.
   - Ask what is communicated to the households when providing the referral and are there are any messages that are particularly helpful.
   - Ask about how the respondents are responding to the visits e.g., what questions do they ask.

II. Food and drinks list

Now let's switch gears and talk about talk about questions for liquids and foods.

7. What is your experience with the data capture procedures in CAPI?
8. Can you describe how the interview process is working for the questions on liquids and foods? I am interested to know if respondents are asking for clarification on the questions being asked.
   Probes:
   - Ask about any clarifying questions being asked by the respondent on the introduction/instructions to the liquid and food questions.
   - Ask about any clarifying questions being asked by the respondent on the liquid and foods being asked about.
   - Ask about any liquids or food questions that the respondent is not sure whether to answer yes or no.
   - Ask about if there is any translation on the fly needed for the respondent to understand the question.
   - Ask about how interviewers handle respondents' frustration, for example when respondents say that the child did not have anything to eat only breastmilk, but interviewers must continue asking all liquid and food questions.
   - Ask about how the interviewer responds to inquiries from the respondent.
9. Can you describe how the data capture process for the liquids and foods in CAPI is working? I'm interested to know what works well and if there are any challenges.
   Probes:
   - Ask about strategies used to overcome the challenges.
   - Ask how they navigate the program if a respondent provides multiple food items that belong in different groups.
   - Ask how they navigate the program if a respondent says that the child did not have anything to eat only breastmilk.
   - Ask how they capture mixed dishes.
10. Can you describe how "other" liquids and foods are captured in CAPI?
    Probes:
    - Ask what works well.
    - Ask about challenges and any strategies used to overcome.

IV. Closing Questions

11. Do you have anything else you would like to add that we have not already talked about?

12. Do you have any questions for me?

    Thank you for your time. I really appreciate you talking with me today.

Fieldworkers

Hello, I am talking to you today because we are writing a report to understand the implementation of [anthropometry remeasurement and the severe acute wasting referral] / [the liquid and food lists] in DHS surveys.

The report will be published, and the learnings will be used to inform future DHS procedures. In order to do this successfully, it is important to understand the perspectives of people that have experience with implementation. So thank you for agreeing to talk with us today to share your experiences.

Your participation in this interview is completely voluntary. If you want to stop at any time or don't feel comfortable answering a question, please let me know. Taking part in this interview is your agreement to participate.

This discussion will be recorded, and the recordings will be kept securely and only accessed by the report team. Do I have your permission to record the discussion?

The information you provide will not be attributed to you individually but there will be acknowledgement section in the appendix. Would you like your name to appear in the appendix of the report? Our discussion today will take approximately 30 minutes.

*[*Do you have any questions before we start?]

[Answer any questions.]

Let's begin.

[START RECORDER]

I. Demographic Information [ALL]

First, some demographic information before we jump in

1. What is your title and role in the survey?

2. How many years of work experience do you have in survey work if any?

3. What's your highest level of education completed?

II. Anthropometry [BIOMARKER TECHNICIANS ONLY]

Next I would like to ask you about the Severe Acute Malnutrition Referral process

4. Can you describe how the process for providing the severe acute malnutrition referral back to the households is working?
   Probes:
   - Ask who does each step and how well it's working.
   - Ask whether the supervisor is near the households that are eligible for remeasurement when the program is run.
   - Ask who returns to the household to give the referral.

- Ask about any challenges and potential solutions to the challenges.
- Ask what is communicated to the households when providing the referral and are there are any messages that are particularly helpful.
- Ask about how the respondents are responding to the visits e.g., what questions do they ask.

II. Food and drinks list [INTERVIEWERS ONLY]

I'd like to start and talk about questions for liquids and foods..

5. What is your experience with the data capture procedures in CAPI?

6. Can you describe how the interview process is working for the questions on liquids and foods? I am interested to know if respondents are asking for clarification on the questions being asked.
   Probes:
   - Ask about any clarifying questions being asked by the respondent on the introduction/instructions to the liquid and food questions.
   - Ask about any clarifying questions being asked by the respondent on the liquid and foods being asked about.
   - Ask about any liquids or food questions that the respondent is not sure whether to answer yes or no.
   - Ask about if there is any translation on the fly needed for the respondent to understand the question.
   - Ask about how interviewers handle respondents' frustration, for example when respondents say that the child did not have anything to eat only breastmilk, but interviewers must continue asking all liquid and food questions.
   - Ask about how the interviewer responds to inquiries from the respondent.
7. Can you describe how the data capture process for the liquids and foods in CAPI is working? I'm interested to know what works well and if there are any challenges.
   Probes:
   - Ask about strategies used to overcome the challenges.
   - Ask how they navigate the program if a respondent provides multiple food items that belong in different groups.
   - Ask how they navigate the program if a respondent says that the child did not have anything to eat only breastmilk.
   - Ask how they capture mixed dishes.
8. Can you describe how "other" foods and liquids are captured in CAPI?
   Probes:
   - Ask what works well.
   - Ask about challenges and any strategies use to overcome.

IV. Closing Questions [ALL]

9. Do you have anything else you would like to add that we have not already talked about?

10. Do you have any questions for me?

Thank you for your time. I really appreciate you talking with me today.

APPENDIX III: OBSERVATION FORM: FOOD AND DRINK QUESTIONS

Date
Observation ID
Country
Cluster ID
Household ID
Technician IDs
Supervisor IDs

Observe and take notes on the following**:**

For each of the following describe what is observed and record notes.		*Notes*
1.	Do interviewers completely read the introduction to the liquids and foods lists for children and adults?	
2.	Do interviewers continue to read each question fully even if a respondent responds “YES” to an item in the list?	
3.	Do interviewers probe about mixed dishes and what the child ate? Describe how.	
4.	What items do respondents seem to have trouble with?	
5.	What type of questions do respondents have?	
6.	How do interviewers handle respondent questions?	
7.	Do interviewers correctly capture “other” items in the food groups? Describe how.	
8.	Do interviewers write out the “other” options when they cannot mark any of the food groups? Describe.	
9.	Are interviewers able to navigate the CAPI data entry system as respondents respond to questions on liquids and foods: (describe for each)?	
	a. For children, if respondents mention food items while responding to liquid questions, do they complete the liquid question then access the food and drink button and mark food items before they return to the next liquid question?	
	b. If the respondent mentions multiple food items in a response to a question, do interviewers enter the item on the question they are on, then select the food and drink button and mark the food groups for the other items before going on to the next question.	
	c. For young children, if respondents mention that the child only consumed breastmilk and nothing else, do they continue to read each liquid or food item and mark appropriately, or do they mark “No” for all items and move on to the next (non liquid or food) question.	

APPENDIX IV: FOCUS GROUP DISCUSSION/INTERVIEW GUIDE: USE OF BECTON DICKINSON CONTACT-ACTIVATED LANCETS

The use of the BD contact-activated lancets for capillary blood collection is relatively new in DHS surveys and I wanted to talk to you about your experiences using the lancets during training and field practice.

Your participation in this discussion is completely voluntary and the experiences you share will be documented in a report and used to inform future DHS processes. Taking part in this discussion is your agreement to participate.

This discussion will be recorded, and I will take some notes. Both the recordings and notes will be kept securely and only accessed by the report team. Do I have your permission to record the discussion?

Lastly, any information shared during this discussion will not be attributed to anyone individually. Our discussion today will take approximately 60 minutes.

[Do you have any questions before we start?]

[START RECORDER]

Interviewer collect the below information in the notes

Interviewer Name
Country
Date
Number of participants in the session

Let's start with a general question to begin.

1. Does anyone have any experience using lancets for capillary blood collection prior to this survey?
   Probes:
   - Ask them to describe their prior experience.
   - Was their experience similar, different, or about the same as the BD contact-activated lancets used in this survey?
2. For those with prior experience using lancets, were the lancets previously used trigger lever lancets (such as Unistik) or BD contact-activated lancets such as the ones used in this survey, or any another type?

Now let's move on to talk about the training.

3. When you think about the instructions in the biomarker manual for how to use the BD contact-activated lancets what do you remember?
   Probes:
   - What was useful from the instructions?
   - What if anything do you think needs to be changed to make the instructions clearer or easier to understand?

4. During the classroom demonstrations with the BD contact-activated lancets what worked well and why?
   Probe:
   - Were there any challenges and how were they overcome?
5. For the hands-on practice sessions during training, what was your experience using the BD contact-activated lancets?
   Probes:
   - What was easy about using the BD contact-activated lancets?
   - What was difficult about using the BD contact-activated lancets?
6. For the hands-on practice sessions during training, what was your experience producing blood flow with the BD contact-activated lancets?
   Probes:
   - What was the amount of blood flow produced?
   - What was the quality of the blood drops like e.g., well formed, not well formed?
   - What the size of the blood drops produced?
   - What if any challenges did you face?
   - How did the blood flow compare to other lancets you have used?
7. For the hands-on practice sessions during training, what your experience with filling the microcuvette?
   Probes:
   - What was easy about filling the microcuvette?
   - What if any challenges did you face when filling the microcuvette and how were these overcome?
8. For the hands-on practice session, do you feel you had sufficient experience using the BD contact-activated lancets on adults and children?
   Probes:
   - What would have liked more experience on?
   - What would have liked less experience on?

Next let's talk about the field practice.

9. For the field practice, what was your experience using the BD contact-activated lancets during field practice?
   Probes:
   - What was easy about using the BD contact-activated lancets?
   - What was difficult about using the BD contact-activated lancets? And how did you overcome any challenges?
   - How, if at all did any environmental factors that affect how easy or difficult it was to use the BD contact-activated lancets?
10. For the field practice, what was your experience producing blood flow with the BD contact-activated lancets?
    Probes:
    - What was the amount of blood flow produced like?
    - What was the quality of the blood drops like e.g., well formed, not well formed?
    - What the size of the blood drops produced?

- What if any challenges did you face?

11. For the field practice, what your experience with filling the microcuvette?
    Probes:
    - What was easy about filling the microcuvette?
    - What if any challenges did you face when filling the microcuvette and how were these overcome?
12. What sort of reactions did respondents have to the finger pricks?
    Probe:
    - To what extent do you think their reactions were because they found the finger pricks painful?

Closing questions

13. Do you have any else you would like to share that we have not already talked about?

14. Do you have any questions for me?

Thank you for your time, I appreciate you talking with me today.

APPENDIX V: OBSERVATION PROTOCOL: HEIGHT/LENGTH EQUIPMENT AND MULTIPLE MEASUREMENTS

Observation Protocol Instructions

The purpose of this observation protocol is to describe the process of taking height/length measurements using alternate types of equipment and modifications to the DHS standard height/length measurement procedures. It uses a mix of checklist questions (from the DHS standard biomarker anthropometry technical checklist) and other questions that require a more detailed response.

The Types of Equipment are:

- Shorrboard (DHS standard equipment)
- SECA 213 stadiometer
- SECA 417 portable infantometer
- SECA 416 infantometer

The height/length measurement procedures are:

- Single: A single height/length measurement of each child by one measurer.
- Multiple 1: A single independent height/length measurement of each child by *the two measurers*. If height/length measurements differ by 1cm or more a third measurement is taken by *both measurers.*
- Multiple 2: Three height/length measurements of each child while the child remains on the board. One measurer takes all measurements.
- Multiple 3: Two height/length measurements of each child, with the child removed from the board after each measurement. If measures differ by 1cm or more a third measurement is taken. One measurer takes all measurements.

Background information

In Cluster ID or ID number include the **cluster number and team number**

How to record timing of measurements

- Do not include any time needed to establish rapport with the household
- Do not include time taken to remove any clothing
- Do not include time taken to set up equipment
- Do not include time taken for child to get to the stadiometer/board
- Start the timer when child is on the board and is being moved in position
- Stop the timer when the child's measurement has been read out.

For multiple measurements follow note the following:

Multiple 1:

- Start the timer when first measurer has the child on the board as indicated above.
- Do not stop the timer until both measurers have read out their third measurement OR until measurers have determined that a third measurement does not need to be taken (i.e. measurements are within 1cm).

Multiple 2:

- Start the timer when the child is on the board and is being moved in position
- Stop the timer when all three measurements have been read out

Multiple 3

- Start the timer when the child is on the board and is being moved in position
- Do not stop the timer until the third measurement is read out OR until the team has determined that a third measurement does not need to be taken (i.e. measurements are within 1cm).

RECORD BACKGROUND INFORMATION

Observer Name
Country
Date
Location (classroom/field)
Cluster ID or ID number
Household ID

RECORD EQUIPMENT OBSERVATIONS

Circle and take notes as indicated

1. Circle the equipment being observed.
   SECA 213 SECA 417 SECA 416
2. How easy was it to set up equipment?
   1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion
3. Was the equipment set up correctly?
   1=Yes 2=No 3=Don't Know 9=No opinion
4. Was the equipment adequately supported?
   1=Yes 2=No 3=Don't Know 9=No opinion
5. Comment on what works /doesn't work well for equipment setup:

6. Was the equipment set up indoors or outdoors?
   1=Indoors 2=Outdoors 3=Other. If other please describe:

7. Comment on any other aspects of the environment that may affect setup/use of equipment:

8. Was the child measured lying down or standing up?
   1= Lying down 2=Standing up
9. Record Start and Stop time of measurement. **Start time**

   Stop time

10. How easy was it to get the child into position?
    1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion
11. Was the child correctly positioned for the measurement?
    1=Yes 2=No 3=Other. If no/other please describe

12. Comment on what works /doesn't work well during positioning of the child:

13. How easy was it to take the reading of the measurement?
    1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

14. Was the reading taken correctly?
    1=Yes 2=No 3=Other. If no/other please describe

15. Comment on what works /doesn't work well when taking the reading:

16. How physically comfortable does the child seem on the equipment?
    1=Very comfortable 2=Comfortable 3=Neutral 4=Uncomfortable 5=Very uncomfortable 9=No opinion
17. How cooperative is the child during measurement?
    1=Very cooperative 2=Cooperative 3=Neutral 4=Agitated 5=Very Agitated 9=No opinion
18. Comment on child's temperament during measurement and any physical or verbal reactions:
19. How concerned is the caregiver during the measurement on the equipment?
    1= Very unconcerned 2=Unconcerned 3=Neutral 4=Concerned 5=Very concerned 9=No opinion
20. Comment on caregivers' reaction to the measurement including any physical or verbal reactions on any of the following:
    - child's temperament
    - the equipment
    - the measurement procedures
    - the duration of the measurements
    - anything else
21. How would you rate the durability of the equipment?
    1=Very Durable 2=Durable 3=Neutral 4=Less durable 5=Not durable 9=No opinion
22. Comment on any damages and robustness of the equipment in different settings:
23. Comment on portability of the equipment e.g. transporting and carrying equipment:
24. How would you rate the safety of the child with the equipment?
    1=Very safe 2=Safe 3=Neutral 4=Unsafe 5=Very unsafe 9=No opinion
25. Comment on any safety issues observed:

Summary on overall observation:

The height/length measurement procedures (on Shorr Board) are:

- Single: A single height/length measurement by one measurer.
- Multiple 1: A single independent height/length measurement by *the two measurers*. If height/length measurements differ by 1cm or more a third measurement is taken by *both measurers.*
- Multiple 2: Three height/length measurements of each child while the child remains on the board by *one measurer*.
- Multiple 3: Two height/length measurements, with the child removed from the board after each measurement by *one measurer*. If measures differ by 1cm or more a third measurement is taken by the *same measurer*.

RECORD BACKGROUND INFORMATION

Observer Name
Country
Date
Location (classroom/field)
Cluster ID or ID number
Household ID

RECORD HEIGHT MEASUREMENT OBSERVATIONS

Circle and take notes as indicated

1. Circle the measurement procedure being observed.
   Single Multiple 1 Multiple 2 Multiple 3
2. Was the measurement done indoors or outdoors?
   1=Indoors 2=Outdoors 3=Other. If other please describe:
3. Was the measurement done in a space that was well lit or dimly lit?
   1=Well lit 2=Dimly lit 3=Other. If other please describe:
4. Was the child is measured lying down or standing up?
   1= Lying down 2=Standing up
5. Record Start and Stop time of measurement. **Start time**

   (Note for multiple measurements this means all measurements) **Stop time**
6. How easy is it to position the child for measurement?
   Note for multiple measurements, please comment for each measurement
   1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

   1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

   1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

   1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

7. Comment on any changes in the ease of measurement between measurements:
   Note for multiple measurements, please comment for each measurement

8. Was the child correctly positioned for the measurement?
   Note for multiple measurements, please comment for each measurement
   1=Yes 2=No 3=Other. If no/other please describe

   1=Yes 2=No 3=Other. If no/other please describe

   1=Yes 2=No 3=Other. If no/other please describe

   1=Yes 2=No 3=Other. If no/other please describe

9. Comment on what works /doesn't work well during positioning of the child:
   Note for multiple measurements, please comment for each measurement

10. How easy was it to take the reading of the measurement?
    Note for multiple measurements, please comment for each measurement
    1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

    1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

    1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

    1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion

11. Comment on any changes (ease or difficulty) in taking the reading of the measurement between measurements:
    Note for multiple measurements, please comment for each measurement

12. Was an independent measurement read out for all measurements?
    1=Yes 2=No 3=Other. If no/other please describe

13. Comment on what works /doesn't work well reading the ruler:
    Note for multiple measurements, please comment for each measurement

14. Describe what, if any, modifications technicians make to procedures:

15. How physically comfortable does the child seem with the measurement?
Note for multiple measurements, please comment for each measurement
1=Very comfortable 2=Comfortable 3=Neutral 4=Uncomfortable 5=Very uncomfortable 9=No opinion

1=Very comfortable 2=Comfortable 3=Neutral 4=Uncomfortable 5=Very uncomfortable 9=No opinion

1=Very comfortable 2=Comfortable 3=Neutral 4=Uncomfortable 5=Very uncomfortable 9=No opinion

1=Very comfortable 2=Comfortable 3=Neutral 4=Uncomfortable 5=Very uncomfortable 9=No opinion

16. How cooperative is the child during measurement?
Note for multiple measurements, please comment for each measurement
1=Very cooperative 2=Cooperative 3=Neutral 4=Agitated 5=Very Agitated 9=No opinion

1=Very cooperative 2=Cooperative 3=Neutral 4=Agitated 5=Very Agitated 9=No opinion

1=Very cooperative 2=Cooperative 3=Neutral 4=Agitated 5=Very Agitated 9=No opinion

1=Very cooperative 2=Cooperative 3=Neutral 4=Agitated 5=Very Agitated 9=No opinion

17. Does child's cooperativeness change between measurements?
1=Yes 2=No 3=Other. If yes/other please describe

18. Comment on child's temperament during measurement and any physical or verbal reactions:
Note for multiple measurements, please comment for each measurement

19. How concerned is the caregiver during the measurement?
Note for multiple measurements, please comment for each measurement
1= Very unconcerned 2=Unconcerned 3=Neutral 4=Concerned 5=Very concerned 9=No opinion

1= Very unconcerned 2=Unconcerned 3=Neutral 4=Concerned 5=Very concerned 9=No opinion

1= Very unconcerned 2=Unconcerned 3=Neutral 4=Concerned 5=Very concerned 9=No opinion

1= Very unconcerned 2=Unconcerned 3=Neutral 4=Concerned 5=Very concerned 9=No opinion

20. Comment on caregivers' reaction to the measurements including any physical or verbal reactions on any of the following:
- child's temperament
- the equipment
- the measurement procedures
- the duration of the measurements
- anything else

21. Comment on how if at all, the environment influences the measurement procedures:

22. Describe the level of skill of each of the measurers:

23. Summary on overall observation:

APPENDIX VI: BIOMARKER TECHNICIAN QUESTIONNAIRE

The biomarker questionnaire is self-report and will be used after classroom practice and field practice.

Basic Information

Enter years of experience taking anthropometry measurements:

Enter Biomarker ID number:

Circle if responding to: **classroom** or **field experience**

EQUIPMENT (213, 416,417)

For each of the following questions, rate the equipment. Write the corresponding number for your rating for each type of equipment in the appropriate equipment box.

Question	SECA 213	SECA 417	SECA 416
1. How would rate the ease of using the equipment? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*			
2. How would you rate the ease of using the equipment in low light? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*			
3. How would you rate the ease of using the equipment in bright light? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*			
4. How would you rate the ease of using the equipment indoors? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*			
5. How would you rate the ease of using the equipment outdoors? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*			
6. How would you rate the ease of carrying the equipment? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*			
7. How would you rate the durability of the equipment? *1=Very Durable 2=Durable 3=Neutral 4=Less durable 5=Not durable 9=No opinion*			
8. How easy is it to position the child on the equipment? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*			
9. How easy is it to read the ruler on the equipment? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*			
10. How would you rate children's tolerance for measurement on the equipment? *1=Very cooperative 2=Cooperative 3=Neutral 4=Agitated 5=Very Agitated 9=No opinion*			
11. How would you rate caregiver's acceptance of the measurement equipment? *1=Very Unacceptable 2=Unacceptable 3=Neutral 4=Acceptable 5=Very Acceptable 9=No opinion* \			
12. How would you rate the safety of the equipment if used indoors? *1=Very safe 2=Safe 3=Neutral 4=Unsafe 5=Very unsafe 9=No opinion*			
13. How would you rate the safety of the equipment if used outdoors? *1=Very safe 2=Safe 3=Neutral 4=Unsafe 5=Very unsafe 9=No opinion*			
14. Do you think it takes the same amount of time, less time, or more time to take the measurement on the SECA equipment compared to the Shorr board? *1=the same amount of time 2=less time 3=more time 9=No opinion*			
15. How would you rate the physical comfort for children using the SECA equipment compared to the Shorr board? *1= About the same 2=Shorr more comfortable 3=SECA more comfortable 9=No opinion*			

Question	SECA 213	SECA 417	SECA 416
16. How would you rate the ease of using the SECA equipment to take the measurements compared to the Shorr board? *1= About the same 2=Shorr easier 3=SECA easier 9=No opinion*			
17. Would you use the SECA equipment again? *1=Yes 2=No 3=Don't Know 9=No opinion*			
18. Would you use the Shorr board again? *1=Yes 2=No 3=Don't Know 9=No opinion*			
19. Do you think the SECA equipment is appropriate to use in a survey? *1=Yes 2=No 3=Don't Know 9=No opinion*			
20. Do you think the Shorr board is appropriate to use in a survey? *1=Yes 2=No 3=Don't Know 9=No opinion*			

Any other comments:

Basic Information

Enter years of experience taking anthropometry measurements:

Enter Biomarker ID number:

Circle if responding to: classroom or field experience

MULTIPLE MEASUREMENTS (4 options: single, multiple 1, multiple 2, multiple 3)

For each of the following questions, rate each height/length measurement procedure (see bullets below for descriptions). Write the corresponding number for your rating for each of the height/length measurement procedures in the appropriate box.

- Single: A single height/length measurement by one measurer.
- Multiple 1: A single independent height/length measurement by *the two measurers*. If height/length measurements differ by 1cm or more a third measurement is taken by *both measurers.*
- Multiple 2: Three height/length measurements while the child remains on the board by *one measurer*.
- Multiple 3: Two height/length measurements, with the child removed from the board after each measurement by *one measurer*. If measures differ by 1cm or more a third measurement is taken by the *same measurer*.

Question	Single	Multiple 1	Multiple 2	Multiple 3
1. How easy is the height measurement procedure to perform? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*				
2. How easy is it to position the child for measurements? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*				
3. How would you rate children's tolerance for the height measurement procedure? *1=Very cooperative 2=Cooperative 3=Neutral 4=Agitated 5=Very Agitated 9=No opinion*				
4. How would you rate caregiver's acceptance for the height measurement procedure? *1=Very Unacceptable 2=Unacceptable 3=Neutral 4=Acceptable 5=Very Acceptable 9=No opinion*				
5. How would you rate the physical comfort for children of the height measurement procedure? *1= About the same 2=Single measurement is more comfortable 3=Multiple measurements are more comfortable 9=No opinion*				
6. Would you use the height measurement procedures again? *1=Yes 2=No 3=Don't Know 9=No opinion*				
7. Do you think the height measurement procedures are appropriate to use in a survey? *1=Yes 2=No 3=Don't Know 9=No opinion*				
8. How would you rate the ease of taking the multiple 1 compared to a single height measurement? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*				
9. How would you rate the ease of taking the multiple 2 compared to a single height measurement? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*				
10. How would you rate the ease of taking the multiple 3 compared to a single height measurement? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*				

Question	Single	Multiple 1	Multiple 2	Multiple 3
11. How would you rate the ease of taking the multiple 1 compared to multiple 2 height measurement? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*				
12. How would you rate the ease of taking the multiple 1 compared to multiple 3 height measurement? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*				
13. How would you rate the ease of taking the multiple 2 compared to multiple 3 height measurement? *1=Very easy 2=Easy 3=Neutral 4=Difficult 5=Very difficult 9=No opinion*				
Any other comments:				

APPENDIX VII: FOCUS GROUP DISCUSSION GUIDE: HEIGHT/LENGTH EQUIPMENT AND MULTIPLE MEASUREMENTS

Hello, I am talking to you today because we are writing a report to describe the advantages and disadvantages of using alternate height/length equipment and the practicality of taking multiple height/length measurements in DHS surveys.

The report will be published, and the learnings will be used to inform future DHS procedures. In order to do this successfully, it is important to understand the perspectives of people that have used alternate equipment and multiple measurement protocols. So, thank you for agreeing to talk with us today to share your experiences.

Your participation in this discussion is completely voluntary. If you want to stop at any time or don't feel comfortable answering a question, please let me know. Taking part in this discussion is your agreement to participate.

This discussion will be recorded and notes will be taken. Both the audio recordings and notes will be kept securely and only accessed by the report team. Do I have everyone's permission to record the discussion?

Note that the information you provide will not be attributed to you individually but there will be acknowledgement section in the appendix. Would you like your name to appear in the appendix of the report? Our discussion today will take approximately 1.5 hours.

*[*Do you have any questions before we start?]

[Answer any questions.]

Let's begin.

[START RECORDER]

CLASSROOM EXPERIENCES

Let's start with the height equipment.

1. From your experiences during classroom practice, describe what was easy about taking measurements on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - Set up of equipment?
    - How does this equipment compare to the Shorr board?

2. From your experiences during classroom practice, describe what was difficult about taking measurements on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - Set up of equipment?
    - How does this equipment compare to the Shorr board?
3. Describe your experience positioning the child on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - What works well and why?
    - What are any challenges and how were they overcome?
    - How does this equipment compare to the Shorr board?
4. Describe your experience reading the ruler on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - What works well and why?
    - What are any challenges and how were they overcome?
    - How does this equipment compare to the Shorr board?
5. In your opinion, how does the amount of time taken for the measurement of a child using a Shorr board compare to the amount of time taken for a measurement on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - What are some of the main reasons for this?
    - What about if there are multiple children in a household?
6. What are your thoughts on the durability of the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - What makes the equipment more durable?
    - What makes the equipment less durable?
    - How does this equipment compare to the Shorr board?
    - How would you rank the equipment from the most to least durable?

7. What if any modifications did you have to make to the measurement procedures on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probe:
    - How did the modification make it easier to take the measurement?
8. What if any features would change about the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

Next let's talk about the multiple measurement procedures.

9. From your experiences during classroom practice, describe what was easy about the multiple measurement procedures?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probe:
    - How does this compare to taking a single measurement?
10. From your experiences during classroom practice, describe what was difficult about the multiple measurement procedures?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probe:
    - How does this compare to taking a single measurement?
11. Describe your experience positioning the child for the multiple measurements?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - What works well and why?
    - What are any challenges and how were they overcome?
    - How does this compare to taking a single measurement?
12. In your opinion, how does the amount of time taken for the multiple measurements compare to taking a single measurement?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - What are some of the main reasons for this?
    - Can anything be done to shorten the time?

13. What was your experience of children's tolerance taking the multiple measurements?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - How would you describe their reactions to each measurement for example were they more or less cooperative?
    - What things do you think we could do to increase children's tolerance for multiple measures?

14. What was your experience of caregiver's tolerance/acceptance for taking the multiple measurements?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - How would you describe their reactions?
    - What concerns , if any, did they share about the multiple measurements?
    - What things do you think we could do to increase caregiver's acceptance/tolerance for multiple measures?

15. What if any modifications to the standard procedure did you have to make to take the multiple measurements?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probe:
    - How did the modification make it easier to take the measurements?

Closing questions

16. Do you have any else you would like to share that we have not already talked about?

17. Do you have any questions for me?

Thank you for your time, I appreciate you talking with me today.

FIELDWORK EXPERIENCES

Let's start with the height equipment.

1. From your experiences during field practice, describe what was easy about taking measurements on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - Set up of equipment?
    - How does this equipment compare to the Shorr board?
2. From your experiences during field practice, describe what was difficult about taking measurements on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - Set up of equipment?
    - How does this equipment compare to the Shorr board?
3. Describe your experience positioning the child on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - What works well and why?
    - What are any challenges and how were they overcome?
    - How does this equipment compare to the Shorr board?
4. Describe your experience reading the ruler on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - What works well and why?
    - What are any challenges and how were they overcome?
    - How does this equipment compare to the Shorr board?
5. In your opinion, how does the amount of time taken for the measurement of a child using a Shorr board compare to the amount of time taken for a measurement on the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - What are some of the main reasons for this?
    - What about if there are multiple children in a household?

6. What are your thoughts on the portability and durability of the SECA equipment?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probes:
    - How easy or difficult was it to carry the equipment?
    - What makes the equipment more durable?
    - What makes the equipment less durable?
    - How does this equipment compare to the Shorr board?
    - How would you rank the equipment from the most to least durable?
7. What if any modifications did you have to make to the standard procedures to take the measurements?
    a. SECA 213
    b. SECA 416
    c. SECA 417

    Probe:
    - How did the modification make it easier or harder to take the measurement?

Next let's talk about the multiple measurement procedures

8. From your experiences during field practice, describe what was easy about the multiple measurement procedures?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probe:
    - How does this compare to taking a single measurement?
9. From your experiences during field practice, describe what was difficult about the multiple measurement procedures?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probe:
    - How does this compare to taking a single measurement?
10. Describe your experience positioning the child for the multiple measurements?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - What works well and why?
    - What are any challenges and how were they overcome?
    - How does this compare to taking a single measurement?

11. In your opinion, how does the amount of time taken for the multiple measurements compare to taking a single measurement?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - What are some of the main reasons for this?
    - What about if there are multiple children in a household?
    - Can anything be done to shorten the time?
12. What was your experience of children's tolerance taking the multiple measurements?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - How would you describe their reactions to each measurement for example were they more or less cooperative?
    - What things do you think we could do to increase children's tolerance for multiple measures?
13. What was your experience of caregiver's tolerance/acceptance for taking the multiple measurements?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - How would you describe their reactions?
    - What concerns , if any, did they share about the multiple measurements?
    - What things do you think we could do to increase caregiver's acceptance/tolerance for multiple measures?
14. What if any modifications to the standard procedure did you have to make to take the multiple measurements?
    a. Multiple 1
    b. Multiple 2
    c. Multiple 3

    Probes:
    - How did the modification make it easier to take the measurements?

Closing questions

15. Do you have any else you would like to share that we have not already talked about?

16. Do you have any questions for me?

Thank you for your time, I appreciate you talking with me today.

APPENDIX VIII: LIST OF KEY INFORMANTS

Key Informant	Affiliation
Eman Bny Mfarej	Head of Statistical Analysis and Studies Division, Jordan Department of Statistics
Amani Judeh	Jordan Department of Statistics
Wala'a al-Hadidi	Jordan Department of Statistics
Rania Abu Dhaim	Jordan Department of Statistics
Alia al-Eamayrat	JPFHS Biomarker technician
Nisreen al-Haju	JPFHS Team Supervisor
Amira Sahwil Sahwil	JPFHS interviewer
Sura al-Darawish	JPFHS Team Supervisor
Tahani al-Eaqili	JPFHS interviewer
Ola Abu Rumaan	JPFHS Biomarker technician
Hind Ambishi	JPFHS Team Supervisor
Kefayah Earab	JPFHS Biomarker technician
Saeda al-Qasas	JPFHS interviewer
Ayat Dhiab Dhiab	JPFHS Biomarker technician
Khetam al-Eakl	JPFHS interviewer
Amani al-Humarishat	JPFHS Team supervisor
Nuha Najarat	JPFHS Biomarker technician
Kawthar al-Shamaylat	JPFHS interviewer
Hayat Aleasi Aleasi	JPFHS Team supervisor
Ahdab Hanatilat	JPFHS Biomarker technician
Rawan Abughazlat	JPFHS interviewer
Sausan al-Hafiz	JPFHS Team supervisor
Hadeel al-Shiear	JPFHS Biomarker technician
Siham Sarhan	JPFHS interviewer
Shingirai Mikiri	Zimbabwe Ministry of Health and Child Care
Themba Nduna	USAID/Zimbabwe
Lyna Matika	ZDHS Biomarker technician
Lennimore Mabuza	ZDHS Biomarker technician
Rosemary Tafirenyika	ZDHS Biomarker technician
Vinnet Ngwenya	ZDHS Biomarker technician
Pretty Ndaba	ZDHS Biomarker technician
Brian Mapeta	ZDHS Biomarker technician
Clive Shereni	ZDHS Biomarker technician
Fadzai Sungai	ZDHS Biomarker technician
Kudzai Prince Ndlovu	ZDHS Biomarker technician
Theresa Mukanga	ZDHS Biomarker technician
Peter Aka	The DHS Program
Eleanor Brindle	The DHS Program
Kevin Laoh	The DHS Program