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Cooking Instruction Development and Acceptability Tests of Corn-Soy Blend Porridges: Pujehun District, Sierra Leone

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July 2016

This report was produced for the United States Agency for International Development (USAID). It was prepared by Tufts University, under the terms of contract AID-OAA-C-16-00020 awarded to the Friedman School of Nutrition Science and Policy.

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Executive Summary

In July 2016, the United States Agency for International Development's (USAID's) Food Aid Quality Review Phase III (FAQR III) project collaborated with Sierra Leone's Ministry of Health and Sanitation (MoHS), Ministry of Education, Science and Technology (MEST), with support from the World Food Programme (WFP) and Project Peanut Butter to conduct formative research on proper cooking instructions and taste acceptability for three fortified blended flour (FBF) products. This research was carried out in preparation for a cluster-randomized, intent-to-treat, cost-effectiveness study of four fortified food products in the treatment of moderate acute malnutrition (MAM) in the Pujehun District of Sierra Leone set to begin in March 2017 ("Four Foods Study"). The results will be used to finalize the standard packaging for the FBFs and to adapt training materials or messaging at point of distribution.

Over a one-week period, 96 female caregivers participated in standardized sensory and taste tests, controlled cooking observations, and focus group discussions to provide insight on normal cooking practices. Overall, the FBFs were well received by the female caregivers, with reported high levels of acceptability of taste and smell (i.e., "liked a lot" on the five-point Likert Scale). Factors identified as influencing proper preparation of the Corn-Soy Blend (CSB) porridges included: literacy and exposure to a demonstration of proper procedures. From participants' feedback, the team recommended slight changes to the pictures that will appear on the FBF packaging, including: darkening the color of the oil, changing the image for water to better represent water droplets, and altering the images to be more literal (e.g., showing two cups of water pouring into a pot when two cups of water are needed). These changes will be incorporated into the instructions which will appear on the FBF packages distributed during the Four Foods Study.

Acknowledgements

This research would not have been possible without the support and feedback of the staff at USAID/Food for Peace and the World Food Programme. Special thanks to Brigitte Broersen at WFP for providing feedback to the protocol design and to the final pictogram instructions and thanks to Sarah Cronin at Tufts University for her graphic design leadership. To the staff of Project Peanut Butter, a sincere thank you for assisting with logistics both in Freetown and in Pujehun, without which this research would not have been feasible. To the Sierra Leone research team, thank you to Mariatu Koroma, Daniel Quee, Harrison Tucker, Elizabeth Swaray and Elizabeth Matia for providing context and insight to the design of the study and for their professionalism over the course of data collection. To the Pujehun District Nutrition team, thank you to Victor Palmer and Mariama George for identifying beneficiary groups and assisting the team with carrying out this program. Their assistance was invaluable to the success of the project.

Ethical Approval

Ethical approval was provided by the Institutional Review Board (IRB) at Tufts University and from the Sierra Leone Agricultural Research Institute (SLARI) and the Office of Sierra Leone Ethics and Scientific Review Committee. Appropriate consent from each individual participant was received verbally and a paper copy of the consent form was provided to each participant.

Introduction

The Food Aid Quality Review Phase III (FAQR III) project is part of the United States Agency for International Development's (USAID)/Food for Peace (FFP) efforts to improve the nutrition and quality of the Title II Food Aid Basket. In the beginning of 2017, FAQR III will begin a study comparing the effectiveness and cost-effectiveness of four foods used in the treatment of moderate acute malnutrition (MAM) in children. Those foods are:

1. Super Cereal Plus (SC+) with amylase¹
2. Corn-soy Blend Plus (CSB+) and Fortified Vegetable Oil (FVO)
3. Corn-soy-whey blend (CSWB) and Fortified Vegetable Oil (FVO)
4. Plumpy'Sup (RUSF)

In preparation for this study, in July 2016, FAQR III carried out formative research to better understand and gain feedback on the acceptability and taste of the three corn-soy blended (CSB) fortified flour products (FBF) and to test cooking instructions and messaging used to assist with their preparation. The results will be used to finalize the standard packaging for the FBFs and to adapt training materials or messaging at point of distribution.

Background

Acceptability trials for food-aid commodities used in the prevention and treatment of malnutrition are a necessary and standard part of both research and programming. In Ethiopia, acceptability trials of ready-to-use supplementary food (RUSF) to gain understanding of taste preference and physiological effects in HIV-affected individuals on antiretroviral therapy (ART) showed that the product caused nausea and vomiting in most, but not all, of the sample population.¹ In Burkina Faso, acceptability trials of CSB and lipid-based nutrient supplements (LNS) were carried out prior to a randomized controlled trial on the effectiveness of their use in the treatment of MAM. In doing so, the researchers were able to conclude that—with respect to taste—all of the foods were equally acceptable, thus ruling out taste preference as a potential confounder.² Similar activities have also been carried out elsewhere, for example, in Haiti³ and Uganda⁴ to understand perceptions of color and consistency as well as of taste.

Apart from sensory acceptability, contextualizing preparation techniques is an important step for ensuring that instructions are neither too complex nor too far from a cultural norm to be implemented.⁵ Lab tests on nutrient bioavailability of FBFs and evidence on nutrient needs of MAM children serve as the basis for recommended preparation ratios of FBF, fortified vegetable oil, and water. Such preparation recommendations, ranging in scope from viscosity⁶ to vitamin levels,⁷ are used when translating ideal formulations from the lab to standard cooking instructions for the home. Studies exploring preparation techniques and cooking instructions prior to implementation of a feeding program are commonly used to assure appropriateness of the cooking methods.^{8,9}

Packaging is also a key element in branding—a vehicle to shape perceptions of value about the product inside as well as to educate consumers and change behaviors related to product utilization. Enhanced packaging and/or programming might improve the proportion of

¹ Adding amylase to CSB porridges is a potential strategy for achieving a more liquid consistency of the prepared porridge, making it easier for young children to achieve a higher energy and nutrient intake.

distributed products actually consumed by the target group. The data collected over the course of this formative research will be used to finalize the development of visual aids and messages for instruction on correct preparation. World Food Program (WFP) currently uses pictograms on every SC+ package as do other implementers distributing FBFs in individually-sized packets.

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The formative research detailed in this report included informal taste tests to understand the acceptability of the foods for children, cooking demonstrations to develop standardized cooking directions, and focus group discussions for development of visual aids and messages for instruction on correct preparation of the study's foods in the Pujehun District of Sierra Leone.

Purpose

The purpose of this formative research was twofold:

1. To test the clarity of cooking instructions for FBF porridge among female caregivers residing in the Pujehun District of Sierra Leone and;
2. To conduct taste tests of the FBF porridges, examining whether the porridges will be palatable to children under age-5 residing in Pujehun District.

To achieve this, the following questions guided the research:

1. What are the caregivers' FBF porridge preparation techniques?
2. How do beneficiaries respond to various porridges?
3. What are the appropriate preparation instructions and pictures to prepare porridge?

Methods

This formative research was conducted over a three-day period in July 2016, in four communities in Pujehun District, Sierra Leone (see Table 1). Ninety-six female caregivers were recruited by the In-Charge (i.e., supervisory) Peripheral Health Unit (PHU) worker of the community using convenience sampling. Inclusion criteria were: age 18 or older; currently caring for a child under the age of 5; and did not exhibit signs of severe mental or physical illness. Consent was obtained from all participants prior to their participation. All activities were carried out in the Mende language.

Prior to recruitment, informal interviews with the Pujehun District Government's Nutrition Officers were led to confirm local utensils used for cooking. Utensils were purchased from the local market in Pujehun or from Freetown for more expensive items such as the coal stoves. Amounts of flour, oil, and water were measured with different combinations of utensils. Each portion was weighed using an electronic food scale which measured to .1 grams accuracy. Appropriate "cups" and "spoons" were chosen as the study's standard measurements based on weighing and prescribed ingredient ratios for each porridge.

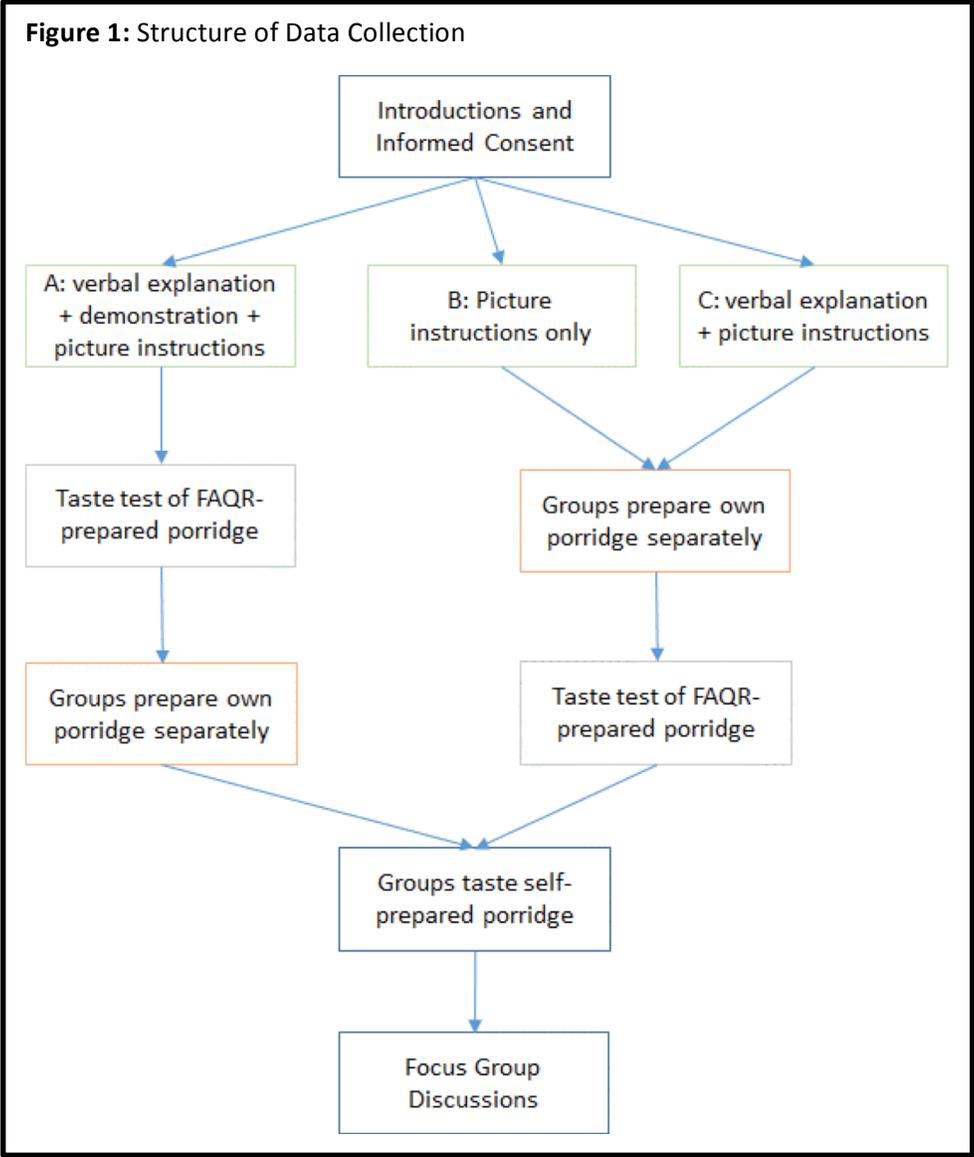
Participants were divided into groups of 16 women, with each group assigned to one of three phases to test acceptability, instruction clarity, and cultural appropriateness (See Figure 1). Three groups (one for each FBF) received a full cooking demonstration (Phase A). Immediately following the third group in Phase A, Phase B was conducted with a group who received no instruction. From the experiences of Phases A and B, Phase C was conducted with two groups to test different combinations of visual to verbal instructions until an appropriate and feasible

combination of the two exhibited the desired results with respect to porridge preparation. For all three phases, following the cooking instructions (Phases B and C) or demonstration (Phase A), participants were then randomly divided into two subgroups of eight for the taste test, cooking observation, and focus group discussions. Figure 1 provides details of the study's activities schedule.

The Phases were conducted as follows:

- Phase A (verbal explanation of cooking instructions + cooking demonstrations + providing a copy of the picture cooking instructions): An explanation of each picture on the cooking instructions card was verbally shared by the enumerators to the group. Each step was carried out by the enumerator in front of the group simultaneously with a verbal explanation of what the enumerator was doing—for example, “I am now pouring the flour into the cup but only to the line.” The utensil with the proper amount of the ingredient was shown to the group by a second enumerator so they could see what the amount actually looked like. Then participants were invited to come to the stove to observe the timing process and could see that it needed to be constantly stirred until the porridge was completely and properly cooked.
- Phase B (a copy of picture cooking instructions): Caregivers were only provided with the picture cooking instructions and asked to prepare the provided porridge as explained through the picture instructions. There was no verbal explanation of the pictures on the cooking instruction cards nor were enumerators permitted to answer questions from caregivers.
- Phase C (verbal explanation of cooking instructions + providing a copy of picture cooking instructions): An explanation of the picture representations of utensils and ingredients—for example, “this is one full tablespoon of oil”—and a verbal explanation of the images in proper order were provided. However, the enumerators specifically did not tell participants in which order to carry out each step.

For the cooking trials, each subgroup of eight was given a bucket containing all of the cooking utensils and ingredients necessary to prepare the porridge according to the recommended instructions and local standards of measurement. Subgroups were then physically separated to assigned cooking spaces so that they could not observe one another. Each subgroup's cooking techniques were observed by two enumerators and recorded using a standard data collection instrument (See Appendix 1). In this way, each food had four different observed cooking opportunities and focus group discussions. For Phase A, following the introduction and demonstration, all caregivers in the subgroups tasted the porridge which was prepared by the enumerators. For Phases B and C, caregivers were given porridge which was simultaneously but separately prepared by the enumerators in a different location while the self-prepared porridge was cooking on the stove. Following the subgroups' porridge preparation and taste tests, caregivers were given the opportunity to try the self-prepared porridge to help inform the focus group discussion. Focus group discussions were held at the same time, but in their subgroups in separate locations so each subgroup's experiences with the preparation and cooking instructions would not inform another subgroup's experience.



Instruments

Data collection instruments included: structured sensory test questionnaires, food preparation observation sheets, and a FGD guide. These tools were designed to elicit information about acceptability of the porridge and clarity of the cooking instructions. The sensory test comprised a standard Likert Scale from 1-5 (1 representing ‘dislike a lot’ and 5 representing ‘like a lot’) with circular smiley faces used to represent the different points on the scale (See Appendix I). Given the low literacy rates in the selected chiefdoms, the data collection instruments were

administered by the research team. Each enumerator, using a single paper form per participant, asked each participant her opinion of the porridge as she was tasting it. Enumerators pointed to each face to explain the scale, then asked the participant to point to the face which best represented their opinion of the food in four areas: taste, smell, consistency and color. Participants were also asked to give their overall opinion of the food using the same scale.

A standardized observation form was used (See Appendix I) to observe the food preparation which recorded timing of cooking techniques, order of activities, volume of cooking ingredients and any related activities which occurred during the group’s cooking program.

The FGD guide was comprised of questions related to taste preference and comparability to similar foods that they may have been exposed to. Participants were also asked about cooking preparation in the home compared to cooking preparation during the demonstration as well as about common utensils. No more than eight women participated in each discussion, with two enumerators who served as a facilitator and notetaker.

Table I: Sample population and Phase Assignments - Pujehun District

Chiefdom	Town	Phase Designation	Food Type	Sample Population
Yakemo Kpukumo	Karlu	A	CSWB	16
Malen	Sahn	A	CSB+	16
Kpanga Kaibondeh	Gbondapi	A	SC+ with amylase	16
Kpanga Kaibondeh	Gbondapi	B	CSWB	16
Sowa	Bandajuma	C	SC+ with amylase	16
Sowa	Bandajuma	C	CSB+	16
Total				96

Data Analysis

Data were recorded with paper forms and input to a Microsoft Excel 2016 spreadsheet before being imported to STATA v14.1 for descriptive analysis. FGDs were analysed using an ecological theory approach, examining perception of the FBFs and cooking instructions in the context of different stimuli (i.e., social behavior change communication).¹¹ Conclusions were framed and analysed according to the thematic structure of the sensory test and cooking observation tools.

Results and Discussion

A total of 96 caregivers participated. The sample population and group assignments are displayed in Table I.

Sensory Evaluation

Reported taste preference was highest for CSWB and SC+ (average score: 5.0) and slightly less for CSB+ (average score: 4.9). Results for analysis of smell were similar to taste preference: SC+ and CSWB of equivalent average score (5.0) compared to CSB+ (4.9). Color was most favorable among groups who tasted CSWB (4.1) compared to CSB+ and SC+ which was slightly lower (average score: 4.0). Differences between reported favorability of the three porridges’

consistency were the most varied, with the highest favorability reported for SC+ (4.3) and the lowest favorability for CSWB (4.0).

Taste preference did not vary by town or by group designation. Other results from observations of the taste tests reported high-taste preference for CSWB where women volunteered to lick the pot and utensils before cleaning the utensils for both the demonstration and the self-made porridge activities. In contrast, enumerators noted that more CSB+ tended to be left over either in the pot or in the serving cups when compared with CSWB or SC+. Acceptability ratings by group designation and by food product type overall are displayed in Table 2.

Results of high acceptability were reported for the smell of the three porridges. In Bandajuma, again 87.5% of caregivers reported liking the smell of CSB+ “a lot” and 12.5% reported liking the smell “a little.” These were, in fact, the same two participants who reported a 4 on the Likert Scale with regard to taste. In Sahn, acceptability of smell mirrored those of taste with 100% of caregivers reporting liking the smell of the porridge “a lot” for an average rating of 5.0. Reported smell preferences for CSWB (Karlu: 5.0, Gbondapi: 5.0) and SC+ (Gbondapi: 5.0, Bandajuma: 5.0) were also high.

Color and consistency preferences were comparably less favorable and more variable than taste and smell. In Bandajuma, for example, where 93.75% of caregivers reported liking the color of CSB+ “a little” and 6.25% reported “neutral” feelings, in Sahn, though 93.75% also reported liking the pap “a little,” 6.25% reported liking it “a lot.” Reported color preference for SC+ averaged 4.0 in both Gbondapi and Bandajuma and were slightly higher for CSWB. Reported favorability of the consistency of CSB+ was highest in Bandajuma compared to Sahn and were similarly reported for CSWB. Consistency ratings were slightly higher for SC+.

Table 2: Acceptability of Enumerator Prepared Corn-Soy Blend (CSB+), Corn-Soy-Whey Blend (CSWB) and Super Cereal Plus (SC+) with amylase using the Sensory Evaluation Score

Chiefdom	Town	Phase Designation	Food Type	Average rating (Likert Scale 1-5)			
				Taste	Smell	Color	Consistency
Yakemo	Karlu	A	CSWB (n=16)	5.0	5.0	4.2	3.9
Kpukumo							
Malen	Sahn	A	CSB+ (n=16)	5.0	5.0	4.1	3.8
Kpanga	Gbondapi	B	CSWB (n=16)	5.0	5.0	4.0	4.0
Kaibondeh							
Sowa	Bandajuma	A	SC+ (n=16)	5.0	5.0	4.0	4.4
		C	SC+ (n=16)	5.0	5.0	4.0	4.2
		C	CSB+ (n=16)	4.9	4.9	3.9	4.2
All phases							
CSWB (n=32)				5.0	5.0	4.1	4.0
CSB+ (n=32)				4.9	4.9	4.0	4.0
SC+ (n=32)				5.0	5.0	4.0	4.3

* 1 represents strong dislike and 5 represents strong liking

Participants listed 'Bennimix,'¹² 'pap,' and 'rice-flour blend' as a locally-prepared porridge-like food served as a complementary food for young children. Though likability of the three FBFs was generally high across senses, specific differences in taste, smell, color, and consistency were most pronounced when compared with these three locally available foods. With regard to taste and smell, the caregivers involved in this study reported scores averaging the highest point of the Likert Scale or about 5.0 which were reinforced during FGDs where women reported positive attributes of the FBFs' taste and smell. When asked about the taste of the porridges, participants consistently responded favorably that the porridges were "fine" and "not bitter." There were, however, slight variations in taste preference that participants mentioned as positive qualities.

CSB+ was positively described as "sweet" in three of the four focus group discussions but was considered "tasteless" in one group, with participants recommending the addition of salt to improve the taste for children. When asked about the taste of CSWB specifically, participants were vague saying simply, "we liked it" or "it was fine." However, when asked how the food compared to porridges currently available such as Bennimix or rice flour blend, CSWB was described as being "tasteless" and "less sweet." This seemed to suggest that the taste of CSWB was acceptable but that when being prepared for children, the female caregivers may add sugar to improve the taste. In contrast, SC+ was described as being sweeter than either the Bennimix or the rice flour blend and tasted "like milk," a description that was mentioned and affirmed by multiple women in the FGDs as a favorable attribute.

In general, however, when asked to compare the taste of the three foods to other porridges more familiar to the female caregivers, there was no universal agreement, only majority opinions. Within FGDs for each food, some women expressed that the three FBFs were very similar in taste and smell to what they currently prepared at home, while others disagreed calling them "completely different." The only conclusion which could be drawn is that each woman prepares the porridge differently at home, with some liking bland porridge, some liking it sweet and others liking it salty, which then informed their different opinions during the FGDs. This was reinforced by female caregivers when asked how their preparation of the FBFs would differ had they been at home rather than participating in the day's activity: some said they would add nothing, some that they would add salt, others said they would add sugar, and others said they would add both.

Though participants reported high acceptability of the smell for all three porridges averaging about 5.0 on the Likert Scale, a general sense of neutrality persisted throughout FGDs. When asked about positive qualities of the smell specifically, participants answered with "fine" or "ok" or an observationally-recorded shrug. Similar responses of neutrality were recorded when probed for any negative qualities of the smell, with common responses of "there were none" or "nothing to mention" or similar. The CSB+ did have a reportedly stronger smell of corn, but this did not appear to alter preferences.

Similar to smell, during FGDs, color was not an aspect of verbalized concern for acceptability. Participants in all groups regardless of food type, when asked specifically about positive qualities of the color, stated simply "it was fine," "it looked good" or with an observationally-recorded shrug. One aspect worth noting, however, that may have contributed to the high acceptability

of the foods generally was that the porridges looked similar to local foods that were currently being prepared at the home. According to participants, Bennimix is similar—but not exact—to all three of the porridges used in this study. Such familiarity with porridge preparation may also have contributed to high rates of proper preparation techniques as detailed in the next section.

Consistency was discussed in greater detail during the FGDs with variations expressed by food. There were two areas of consistency that participants identified: viscosity and texture. With regard to viscosity, participants expressed that CSB+ had the culturally acceptable amount of “thickness.” However, participants in both groups expressed that CSWB was a bit too thick and SC+ with amylase was a bit too thin. As discussed in the next section, this feedback was also observed when the groups were self-preparing the porridge: participants added more water than was prescribed in the cooking directions for CSWB and reduced the amount of water recommended for SC+. In contrast, despite it being “too thin” for many participants, SC+ reportedly had the best texture in that it was less “lumpy” when compared to negative feedback about overall “feeling in the mouth” expressed in the FGDs for CSWB and CSB+.

In general, participants liked the three porridges, having found them both culturally acceptable to be fed to and tasty enough to be consumed by young children under the age of 5.

Food Preparation Observations

Participants’ accuracy in following the cooking instructions in the order depicted by the pictures varied between Phases A (verbal + demonstrations + picture) and Phases B (picture only), and C (verbal + picture) and additionally between subgroups within Phase B and subgroups within Phase C. For all three foods, 100% of participants in Phase A—regardless of assigned food—were able to prepare the foods exactly in the order prescribed by the cooking instructions with few observed variations in the preparation steps. Beginning with process: 0% of groups deviated from prescribed steps. That is, in all six subgroups in Phase A, regardless of food, enumerators observed no cases where participants either added a step, changed the order of steps, or ignored a step in the cooking process. Participants also followed the order of steps with no observed cases where participants deviated from the prescribed method.

As noted previously, subgroups in Phase B were asked to prepare CSWB without demonstration or explanation of the cooking instructions. Subgroup 1 in Phase B was given pictogram instructions which did not contain arrows but did contain numbers to illustrate the correct order; Subgroup 2 in Phase B was given pictogram instructions with the addition of arrows to illustrate proper ordering of tasks. Subgroup 1 in Phase B followed the order of tasks correctly, beginning with boiling water only in a pot before beginning to mix the porridge. Subgroup 2 in Phase B, however, started with the correct first step but then mixed the water, oil, and flour together in one single step instead of mixing the flour in cold water to reduce clumps before adding in oil. Regarding boiling time, Subgroup 1 in Phase B allowed the porridge to boil for five minutes while Subgroup 2 in Phase B allowed the porridge to boil for two minutes so neither group allowed the porridge to boil for the recommended 10 minutes.

Participants in Phase C were given either SC+ or CSB+ to prepare. Using feedback received from participants in Phase B and discussed in detail below, arrows were added to the cooking instructions to aid in the interpretation of cooking steps’ order. There was still variation in the first step for both groups in Phase C: Subgroup 3 (CSB+), for example, put a pot of water on

the stove to boil first where Subgroup 4 (CSB+) began mixing the flour and water first before putting the mixture on the pot to boil. As discussed in more detail in the next section, Subgroup 1 (SC+) added more water to the pot after it had already been set on the fire.

For the final steps in Phase C, Subgroup 3 was observed to allow the porridge to boil for two minutes, while Subgroup 4 allowed the mixture to boil for six minutes in Phase C. Enumerators' recording of boiling time was inconsistent among the two subgroups in Phase C preparing SC+: Subgroup 1 allowed the porridge to boil between three to five minutes where Subgroup 2 allowed the porridge to boil between three to eight minutes. A single observed difference in process: Subgroup 1 remained at the pot to ensure the porridge was constantly being stirred, while Subgroup 2 allowed the porridge to simmer with occasional checks to ensure it did not burn.

Similar patterns were observed with respect to ingredients' volume. Enumerators recorded no instances where group in Phase A used too little, too much or neglected to include any ingredients. In groups in Phase A preparing CSWB or CSB+ which required the addition of oil, enumerators recorded observations where women discussed and then corrected each other on the proper measurement of the oil. This illustrated their understanding of the facilitators' instructions and demonstrations.

In Phase B, Subgroup 1 also interpreted the picture representation for a cup of flour correctly, using the 125g cup as the utensil but filled the flour to the brim rather than to the indented line as indicated in the picture. In contrast, Subgroup 2 in Phase B interpreted the picture meant to represent spoons of oil as spoons of flour, measuring three "spoonsful" of flour instead of the one cup of flour, and one cup of oil instead of three tablespoons of oil. Anecdotally, Subgroup 2B was initially planning to pour an unmeasured amount of oil into the pot directly from the oil jug until one of the enumerators directed the group to reference the cooking instructions for confirmation that they were following the correct proportions. Subgroup 1 in Phase B added the correct amount of oil—three tablespoons—but both groups added one cup of water more than the recommended recipe. This was despite observational notes that both groups relied on for the porridge preparation cooking instructions. In Phase B, Subgroup 2B referred to the instructions an observed four times and Subgroup 1 referred to the instructions an observed seven times.

Among participants in the subgroups of Phase C who were provided SC+ for preparation, neither group used the correct amount of flour: Subgroup 1 used seven tablespoons and Subgroup 2 used the flour that was left in the open bag, which was recorded as being "much more" than the instructions prescribed. Both groups used too much water. Based on feedback during FGDs in the SC+ subgroups of Phase C, adjustments were made to the introductions and messaging for the CSB+ Group in Phase C. Enumerators spent less time discussing the steps of the cooking instructions and more time discussing what the picture representation of the ingredients were meant to depict, pointing to each picture and stating both the quantity and the ingredient. For example, while pointing to the cup of water, the enumerator would say, "This picture means water, one cup of water. If there were two cups, that would mean two cups of water. Do you see?" and ask for visual feedback from the women by nodding their heads that they understood. Using this method, both subgroups used the correct amount of flour when preparing the CSB+ porridge. This included filling the porridge to the indented line

in the cup and not to the brim. Subgroup 3 in Phase C used one cup too much water and both groups used the correct amount of oil.

Hygiene practices were also observed, though they were not explicitly illustrated in the instructions. Not all women in all groups washed their hands with soap prior to beginning food preparation, though all did rinse their hands with water at minimum. Though the utensils were cleaned by the research staff before each activity, about 50 percent of groups washed utensils with soap before beginning to mix or prepare the porridges. Across foods, none of the groups was observed to use a timepiece (e.g., a watch or cell phone) to record the amount of time the porridge was boiling. Enumerators recorded different lengths of boiling time ranging from one to eight minutes. None allowed the porridge to boil for the prescribed 10 minutes. Participants were less diligent about food hygiene during preparation: observational notes stated, for example, that Subgroup 2 of Phase B neglected to close the bag of flour when finished with the food's preparation.

Finally, the success of the pictogram images varied by group and introduction method. For groups in Phase A who received instructions and demonstrations, there were no recorded instances of women using the pictogram cooking instructions as a reference to aid in cooking the porridge. Enumerators reported that women appeared to prepare the porridge entirely from their memory of the demonstration. Use of the cooking instructions was similar among subgroups in Phase C, with Subgroup 1 observed to refer to the cooking instructions six times, Subgroup 2 11 times, Subgroup 3, five to six times, and Subgroup 4, eight times over the course of porridge preparation.

Focus Group Discussions

There are three domains of interest that arose through the combination of observed cooking preparation and FGDs. These are: literacy, context and normal cooking techniques.

Literacy: During the FGDs in Phase B, multiple women in both subgroups expressed that they were illiterate. Their literacy rate was low enough that numbers to indicate the order of steps were not interpretable nor did they know to follow the directions from left to right because they had not been trained to read from left to right. This manifested during cooking when enumerators observed deviations in preparation order when compared to the cooking instructions as well as a verbalized sense of confusion about the order which was expressed during the FGDs. Group dynamics also influenced how well groups were able to follow the order of the instructions.

As mentioned above, during the porridge preparation phase of the different activities, subgroups were given appropriate supplies in individual buckets (one bucket per group). However, because all eight women could not cook simultaneously, two to three women volunteered to lead the group through the preparation. For groups in Phase A, illiteracy had no observable effect on preparation techniques or process because caregivers had witnessed the demonstration and were able to follow the demonstration from memory. For groups in Phases B and C, the ability of the group to follow the instructions was dependent on the literacy level of the two to three women who volunteered to lead the group through the preparation. In the CSB+ Subgroup 1 of Phase C, for example, the woman who led the group through the preparation was a high school graduate. During the FGDs and anecdotal observations, she

helped those women who self-reported their low literacy status during the FGD to understand the order of the steps and the process the pictures were meant to depict. In contrast, SC+ Subgroup 2 in Phase C was led by three women who self-reported either no education or some amount of elementary education during the FGDs. Their ability to interpret the pictures and the process as intended was hindered and led to a porridge that, admittedly, was undercooked and “not very tasty.” For those women who self-reported illiteracy or low levels of education, there were two aspects of the instructions that were confusing: lack of literal images and the order of the images. It was not intuitive for these women to read from left to right. This led to confusion about which order to follow the actions depicted in the pictures. Also, it was not intuitive to interpret the pictures, which were renderings of images and not actual pictures of utensils, to mean “cup(s) of water” or “spoon(s) of oil.”

Context: There were two sets of pictures representing “cup of water” and “cup of flour.” The cups of water and flour for the SC+ packaging was developed by the World Food Programme, while those for the CSB+ and CSWB were prepared by a graphic artist at Tufts University based on those developed by both WFP and USAID. In addition, there was one picture depicting three “spoons of oil” designed at Tufts and used in the instructions for CSB+ and CSWB (See Appendix 2 for original images).

During the FGDs for Groups B and C, when asked what the pictures representing “cups of water” contained or meant, all six FGDs interpreted the cup initially as a cup of rice. They explained that within the context of the cooking preparation, they understood that the pictures were meant to represent water but that neither image was familiar to them as one of water. For those FGDs of Groups A, B, and C who prepared CSB+ or CSWB, participants expressed that the colors for oil and flour led to confusion. This manifested itself during the porridge preparation when Subgroup 2B, for example, used spoons of flour and a cup of oil.

With regard to the illustrations of the preparation steps, the reported low levels of literacy also influenced the way the pictures were interpreted. During the FDGs for Groups B and C, participants reported a lack of familiarity with renderings which were not literal. For example, in Image 3 of the cooking instructions in Appendix 2, there is a single cup of water being poured into a pot but two cups of water in the footer of the image meant to depict adding in “2 cups of water.” Participants expressed that they were confused whether to add a single cup of water or two cups of water or just water to taste. This manifested itself during cooking preparations when groups added more water than prescribed in the directions. A lack of familiarity with pictograms was also expressed as a reason for confusing the oil and flour. Red palm oil, the oil traditionally used in Sierra Leone cuisine, is closer to red or orange than the yellow used in the cooking instruction visuals.

Normal cooking techniques: Generally, the process and techniques depicted in the cooking instructions were familiar to participants. Not a single participant in any of the 12 FGDs expressed confusion with the cooking methods or the order in which they were expected to prepare the porridge. Confusion centered around using instructions, ideas of standard measurements, and the concept of preparing a single serving of the porridge at one time. Beginning with instructions, the women verbalized that they generally “just cook” and that they know that the porridge is done “when it’s done.” Concepts of following a recipe specifically were known to participants but were not part of their normal cooking life. While they could

understand the instructions' intention, they expressed that they probably would not refer to them after the first day's preparation. One woman expressed this by saying, "no serious steps followed at home" and others expressed that "measurement of the materials" was difficult.

Less familiar to participants were concepts of standard measurements and ingredient ratios. During the FGDs, although participants expressed that the standard "butter cup" and "metal spoon" were utensils they had at home, they tended not to use them as measurements as much as ways of getting ingredients from the bag or jug to the cooking pot. This was observed in the SC+ Subgroup 2C when the group poured the flour directly into the pot and also in Subgroup 2B when the enumerator stopped the group from pouring oil directly from the jug into the pot. Participants also expressed that while they understood that the instructions were meant to illustrate a single day's serving, they would normally prepare a larger portion at the beginning of the week and simply reheat it each day.

Conclusion and Recommendations

In conclusion, the sensory results revealed that the three FBFs that will be used in the Four-Foods Study are appropriate to local tastes and preparation techniques in the Pujehun District of Sierra Leone. With appropriate demonstration and explanation of the cooking instructions unique to each food, caregivers have the capacity to prepare the food correctly, but whether they choose to do so is outside the scope of this formative research. On their own, the instructions with pictures will not likely be interpretable to illiterate portions of the population without some changes to the pictures to make them more literal in nature. We also acknowledge the fact that the caregiver picking up the ration, receiving the cooking instructions and explanation of the picture instructions may not be the caregiver actually preparing the ration in the household, so interpretability of the printed instructions is important. Finally, we note caregivers expressed that they do not normally prepare a single serving and are more likely to make a whole pot and then reheat it in a normal mealtime setting. These themes will be explored further in the main research study.

Recommendations

- Development of preparation instructions with pictures or visual aids for food aid should be tested to ensure that they are understandable by the target population.
- Sensory and acceptability tests should be completed before introducing a new food aid product to a population.
- It is best to demonstrate each step of the preparation process for caregivers when distributing the foods during the main study, which is set to begin in 2017. If a complete demonstration is not possible (as in Phase B), then at minimum, the health worker distributing the food should verbally explain what each image in the instructions on the bag represents (as in Phase C).
- Further research is needed on the use of picture instructions and visual aids among the different handlers (e.g., caregivers, porridge preparers, educators) providing demonstrations on the preparation of the FBF products. It is important to understand if the desired behaviors with the FBF product are achieved most successfully through

pictures, demonstrations, verbal instructions or a mixture of techniques. Cost and time of these various techniques must also be assessed as well as the learning capabilities of the target population.

- Recommended changes to the pictures include:
 - Darken the yellow color of the oil to better represent the color of red palm oil.
 - Change the image used for water to one which is more literal or commonly used in Sierra Leone (e.g., dashed lines and waves).
 - Change the images of cooking preparation to be more literal. For example, if the image is meant to show two cups of water pouring into a pot, show two cups of water pouring into the pot.
 - In addition to numbers, add arrows to show the order in which the process should be carried out.

Appendix I: Tools

Instrument 01: Sensory Test

Name field worker: Code _____

Date of data collection: ____ / ____ / ____

Name Caregiver: Caregiver number:

Group: Type of porridge:

Porridge Prepared by:

				
Disliked it a lot 1	Dislike it a little 2	Neutral 3	Like it a little 4	Like it a lot 5

	(1)	(2)	(3)	(4)	(5)
Taste					
Smell					
Color					
Consistency					
Overall					

Additional comments made by caregiver

Instrument 02: Focus Group Discussion Guide

First let's talk about the taste of the food you just tried.

1. Tell me about the taste of the food.
 - a. What were aspects that you liked? (**Probe for specific characteristics if needed, such as the way it looks, smells, feels in the mouth, tastes in the mouth or after swallowing*)
 - b. What were aspects you didn't like? (**Probe for specific characteristics if needed, such as the way it looks, smells, feels in the mouth, tastes in the mouth or after swallowing*)
2. Do you think you would feed this to your child if you had it?
 - a. *Tell me a bit more about why you would or would not feed this food to your child.*
3. Tell me about other food like this that you have tried before, if any. (*probe: names of the foods, when they were distributed, for what purpose, consistency, what made them the same, what made them different*)
4. Tell me about other foods like this that you have fed to your baby before, if any. (*probe: names of the foods, when they were distributed, for what purpose, consistency, what made them the same, what made them different,*)

Now let's discuss a bit about the preparation.

5. Let's discuss how you would prepare this food at home (*probe: thicker, thinner, add sugar or salt, cook longer, serve cooler, add more oil/less etc*).
6. What types of cooking utensils would you use at home to prepare this porridge?
7. How was today different than how you might prepare the food at home?
8. Tell me about any difficulties you experienced when preparing the porridge today, if any.
9. Tell me about the pictures on the information sheet, what does the story tell you? (*probe: picture colors, amounts of water and flour and oil, length of time to cook, how to cook, whom to feed the porridge to?*)
10. What did the pictures on the information sheet tell you about how to prepare the porridge? Did you use them to help you prepare the porridge? Why / why not?
11. Is there anything else you would like to tell me about this food?

Thank participants for their participation. Follow up with any last comments

Instrument 03: PORRIDGE PREPARATION RECORD SHEET

Name field worker:

Date of data collection: ____ / ____ / ____

Name Caregiver:

Caregiver number: Group:



No		Observer 1
Name of caregiver		
Type of fuel		
Weight of cooking pot and spoon (g) before cooking		
Flour taken 	Cup (number)	
	Weight empty cup (g)	
	Weight cup and flour - added during cooking (g or cups)	
	Total amount of flour used (g or cups)	
Water taken 	Cup (number)	
	Weight empty cup (g)	
	Weight cup and water - added during cooking (g or cups)	
	Total amount of water used (g)	

Warming time (minutes)	
Boiling time (minutes)	
Record all steps in preparation process (start and end time)	
Record all times that the caregiver consults information sheet	
Max temperature (°C)	
Caregiver counting boiling time (YES, NO)? If YES, describe how:	