Anthrologica

Maternal and Infant Nutrition Trial (MINT)

Testing the impact of nutritional supplements for women in pregnancy in Nepal.

October 2018

Contents

Abbreviations

BEP	Balanced energy-protein
BMGF	Bill and Melinda Gates Foundation
BMI	Body Mass Index
DHS	Demographic Health Survey
GWU	George Washington University
IRB	Institutional Review Board
JHU	John Hopkins University
MINT	Maternal and Infant Nutrition Trial
NHRC	Nepal Health Research Council
NNIPS	Nepal Nutrition Intervention Project – Sarlahi
PAF	Product Acceptability Form
PRF	Product Ranking Form
RCT	Randomized controlled trial
SGA	Small-for-gestational-age
VDCs	Village Development Committees
WHO	World Health Organization
WVs	Ward Volunteers

Introduction

Background

According to the UN Maternal Mortality Estimation Inter-agency Group (MMEIG), the maternal mortality ratio (MMR) in 1990 declined from 901 per 100,000 live births to an estimated 258 per 100,000 live births in 2015 (WHO 2015). In contrast, the Maternal Mortality and Morbidity Study 2008/09, which was not a nationally representative survey, put the MMR at 229 per 100,000 (Pradhan et al. 2010).

Maternal mortality is difficult to estimate with certainty because a large number of births do not occur in hospitals and the cause of a woman's death may be unknown or unreported, especially in rural areas (Engel et al. 2013). According to the 2016 DHS, 44.2% of rural women in Nepal delivered in healthcare facilities, while 46.8% of rural births are attended by skilled birth attendants (SBA) (Ministry of Health 2017). Despite marked improvements, Nepal remains a country with one of the highest MMRs in the world (Ernst & Young 2017). The reasons for this are manifold and complex. Access to and use of antenatal care (ANC) has improved materially over the past 20 years, but the number of mothers who receive at least the recommended four ANC visits remains relatively low, particularly in rural areas and in those with a high percentage of individuals of low socioeconomic status (Price and Bohara 2013; Singh et al. 2017; Målqvist et al. 2017). Poor nutrition, including energy and micronutrient deficiencies, and a large number of adolescent pregnancies contribute to poor maternal outcomes (Acharya and Alpass 2004; Acharya et al. 2010).

Poor nutrition, including energy and micronutrient deficiencies, is known to contribute to poor birth outcomes (Gernand et al. 2016, da Silva Lopes et al. 2017, Fall et al. 2009). Women who enter pregnancy with low Body Mass Index (BMI) or short stature are at increased risk of adverse health outcomes (Rahman et al. 2015) as well as small-for-gestational age (SGA) births (Kozuki et al. 2009). According to the 2016 DHS, 17% of women of reproductive age are thin or undernourished, with BMI less than 18.5. Women in the Terai zone are nearly twice as likely to be thin as women living in Mountain or Hill zones (23% versus 12% respectively), and rural women are more likely to be thin than urban women (19.9% versus 15.6%) (Ministry of Health 2017). Eleven percent of Nepali women are shorter than 145 cm, the height below which women are at increased likelihood of difficulty during delivery and the risk of bearing low birth weight babies (Ministry of Health 2017). A full 30% of young women in the 15-19-year-old age group are thin (Ministry of Health 2017), and in this age group, 7.1% have already borne children (Government of Nepal and UNICEF 2015). Being underweight is a particular concern for young pregnant women. The young mothers are still growing themselves and thus both their bodies and those of their foetuses draw from available energy and nutrition, which may increase the incidence of low birth weight in young pregnant women (King 2003; Acharya and Alpass 2004).

Women's micronutrient needs increase during pregnancy to meet the needs of the growing foetus, and multiple rather than single micronutrient deficiencies affect women of reproductive age, particularly in low-income countries (Christian 2010). A 2005 study by Jiang et al. in the Sarlahi district of Nepal examined micronutrient status of women in early pregnancy and found deficiencies in Vitamins A, E, D, riboflavin, B-6, B-12, folate, zinc, iron, and copper. More than 80% of the women in the study were deficient in two or more micronutrients; the authors suggested that these deficiencies likely reflected dietary inadequacy prior to pregnancy (Jiang et al. 2005). Recent data from the Nepal DHS indicates that the prevalence of anemia among pregnant women decreased slightly from 2011 to 2016, which may be attributable, in part, to the government's universal iron-folic acid (IFA) supplementation program for pregnant women (Ministry of Health 2017).

Current World Health Organization (WHO) antenatal care guidelines recommend provision of balanced energy-protein (BEP) supplements in populations where the prevalence of undernourished pregnant

women (low BMI) is greater than 20% (WHO 2017). They also recommend provision of IFA supplements to all pregnant women (WHO 2016) but further note that some countries may decide to switch to the provision of multi-micronutrient (MMN) instead of IFA supplements. This is particularly the case where multiple deficiencies are the rule rather than the exception, as MMN supplements have been shown to result in better birth outcomes than IFA alone (Haider and Bhutta 2017). However, since the WHO antenatal care guidelines mention this as an option, rather than a recommendation, use of MMN instead of IFA supplements is not yet widespread. The Bill and Melinda Gates Foundation (BMGF) convened a consultation in September 2016 to discuss the content and possible forms of BEP supplements; the outcome was the recommended distribution of fortified BEP supplements and proposed macro- and micronutrient content for these food supplements.

Aims and objectives of research

BMGF commissioned the three-phase research study 'Maternal and Infant Nutrition Trial (MINT): Testing the impact of nutritional supplements for women in pregnancy in Nepal'. The overall study seeks to evaluate the preferred product type for the provision of fortified BEP supplements and its impact on pregnancy outcomes. In Phase 1, 11 products of different types and flavours were rapidly assessed in terms of short-term acceptability. In Phase 2, the most acceptable BEP supplements identified in Phase 1 will be tested for longer-term acceptability and home consumption for a period of eight weeks. The BEP supplement(s) selected from the formative research in Phase 2 will then be administered to pregnant women in Phase 3, a randomized controlled trial (RCT) designed to test the efficacy of the BEP supplement(s) during pregnancy and lactation on pregnancy and child health outcomes. The nutritional composition of the specific BEP supplements was established during the expert consultation convened by the BMGF in September 2016. The form of BEP supplements selected for Phase 3 may be modified if necessary according to the preferences of the target population. The research partners, including BMGF, have liaised with private sector partners to request supplements in the selected forms with the recommended nutrient composition for the formative research in Phases 1 and 2.

Report structure and outputs

This draft report synthesises findings from Phase 1 of the formative research study. The data collected comprised two related components: a quantitative survey and qualitative data collection using open and inductive methods. Adopting a mixed methods approach allowed for triangulation of results and for increased validity of findings. The Phase 1 study was able to provide insight to inform the selection of products for Phase 2 of the project.

Following the introduction, the study's methods are outlined in detail. The subsequent three chapters present the study's core findings: (1) the overall assessment of product preferences; (2) the detailed analysis of the products identified as the top five choices in the quantitative research; and (3) the detailed analysis of the remaining products. The final chapter presents the study's conclusions and key recommendations.

Prior to its finalisation, colleagues from Nepal Nutrition Intervention Project – Sarlahi (NNIPS), George Washington University (GWU), John Hopkins University (JHU), and Harvard University had the opportunity to provide written and verbal feedback, which was incorporated into the final report as appropriate. The report is structured to be of operational use in Phase 2 and Phase 3 of the MINT project.

Methodology

The research was conducted in line with prevailing ethical standards that seek to protect the rights and welfare of all participants (Graham et al. 2013). Ethical permission to undertake the study was granted by Nepal Health Research Council (NHRC) in Nepal, GWU Institutional Review Board (IRB), Johns Hopkins Bloomberg School of Public Health IRB, and the Harvard T.H. Chan School of Public Health IRB. The research was a collaboration between the George Washington Milken Institute School of Public Health, the Johns Hopkins Bloomberg School of Public Health and the Harvard T.H. Chan School of Public Health, working with Anthrologica. Phase 1 of the formative research study ran from October 2017 to September 2018, including a period of intensive data collection in Nepal in July-August 2018.

Research team

The overall research for Phase 1 was managed by Sheila Isanaka (SI) from Harvard, Saskia de Pee (SdP), and Juliet Bedford (JB), Leslie Jones (LJ) and Katie Moore (KM) from Anthrologica. The GWU team was led by James Tielsch and the JHU team was led by Drs. Subarna K Khatry, Joanne Katz, Luke Mullany, and Tsering Pema-Lama (TPL).

With technical oversight from the core team, LJ and KM led the qualitative research. They developed the qualitative research tools, analysed the qualitative data, synthesised it with the quantitative analysis, and drafted the Phase 1 report. The quantitative tools were designed by SI with input from the core team. GWU and Johns Hopkins School of Public Health collaborated with NNIPS, a long-running collaborative research effort headed by investigators in the Johns Hopkins Department of International Health, to conduct in-country data collection, transcription and translation. Their twelve-person research team was led by on the ground by NNIPS Director Dr. Subarna K. Khatry (SKK), TPL and two field coordinators, and included four supervisors, two quantitative interviewers and six members of the qualitative data collection team. LJ and KM provided project-specific training to the data collectors in Nepal who were then supported in the field by SKK and TPL. The analysis of quantitative data was undertaken by TPL under the guidance of SI.

Study sites

The NNIPS field office is based in Sarlahi district, and this is where data were collected. Sarlahi, in southern Nepal, is one of 75 districts in the country. The research sites were selected by GWU and JHU in collaboration with NNIPS, as both institutions had conducted previous research in the locale which was well accepted by the local community. Two VDCs were selected for inclusion in Phase 1 on the basis that they were of moderate size, centrally located and representative of the study district in terms of ethnicity, caste and religion. The VDCs were Pidari and Pipariya.

Participants and sampling

Local female NNIPS staff known as ward volunteers (WVs)worked with the research team to identify pregnant women in the catchment areas for potential inclusion in the research. Once the list of pregnant women was compiled, pregnant women aged between 15 and 40 years and of varying gestational age were then invited to participate. Exclusion criteria focused on food allergies (to soy, dairy products, eggs, gluten and nuts) but no other socio-demographic or marital characteristics due to the homogeneity of the context. All pregnant women in the study area who met the inclusion criteria were recruited by field supervisors and WVs and a list of 82 pregnant women was created from which 40 pregnant women were selected for the July to August data collection.

Data collection in Sarlahi was conducted over three weeks from 16 July to 1 August 2018. Data collection activities sought to:

- Assess the hedonic properties of eleven formulations of fortified BEP supplements amongst pregnant women in the target area;
- Identify the preferred product type(s) for the provision of fortified BEP supplements; and
- Assess the acceptability, general preferences, advantages and barriers across product types.

Of the eleven products, six were characterised as sweet and five as savoury. Nine were produced by Nutriset and two by Mars (see Table 1 below). Each product's nutrient content was fully or almost in line with the guidance for composition of fortified BEP supplements from BMGF . Depending on product selection for Phase 2, further development may be needed on the chosen supplements.

Table 1. Product types and manufacturers

Product Name and Type	**Product: sweet / savoury**	**Product manufacturer**
Plumpy Mum – lipid based paste	Sweet	Nutriset
Mango bar	Sweet	Nutriset
Vanilla filled sticks	Sweet	Nutriset
Vanilla biscuits	Sweet	Nutriset
Vanilla drink	Sweet	Nutriset
Cocoa drink	Sweet	Nutriset
Plumpy Mum - Tomato and Onion	Savoury	Nutriset
Masala bar	Savoury	Nutriset
Curry biscuit	Savoury	Nutriset
Seasoned pillow snack	Savoury	Mars
Unseasoned pillow snack	Savoury	Mars

In total, 85 data collection activities were conducted with 40 participants: 40 Product Acceptability Form (PAF) questionnaires (one per participant); 40 Product Ranking Form (PRF) questionnaires (one per participant); and five focus group discussions (eight participants per group discussion). The timeline for the administration of the tools is shown below in Table 2, and the tools are described in greater detail in the following sections.

Table 2. Schedule for administration of data collection tools

	Day 1: Sweet Product Tasting (Home visit)	**Day 2: Sweet Product Tasting (Home visit)**	**Day 3: Savoury Product Tasting and Focus Group Discussion (NNIPS field office)**
Morning Session	Group 1[1] PAF – Sweet products	Group 2 PAF - Sweet Products	Groups 1 and 2 PAF – Savoury Products
	Group 1 PRF – Sweet Products	Group 2 PRF – Sweet Products	Groups 1 and 2 PRF – Savoury Products
			Group 1 and 2 PRF - Overall Top 3 Ranking
Afternoon Session			Focus Group Discussion

[1] Group 1 and 2 consisted of 4 participants each, and the PAF and PRF for sweet products was administered to each group individually on days 1 and 2. Groups 1 and 2 were joined together on Day 3 for the Savoury Product PAF and PRF, the Overall Top 3 ranking, and the focus group discussion.

Consent

Informed consent was obtained prior to data collection. Researchers provided a full explanation of the study and emphasised the voluntary, confidential and anonymous nature of participation. Participants were told that the research involved development of a food supplement to be used during pregnancy and lactation in order to improve birth outcomes and infant growth. It was explained that participants would be given different formulations to taste and that they would be asked questions about their preferences. It was made clear that their participation would not affect any medical service required or provided during their pregnancy and after the birth of their child, and that they were free to withdraw at any time without giving a reason. The study's consent form was explained in detail in order to ensure that all participants, including illiterate women, understood the form before giving consent. All participants were given the opportunity to ask questions and seek further explanation. Participants willing to take part completed the consent form with a signature or thumbprint. At the conclusion of the fieldwork, all completed consent forms were retained in hard copy by NNIPS and stored in a secured location.

Data collection

Desk review and tool development

Anthrologica conducted a desk review of maternal nutrition, related programmes and research at the national level and in the broader Asia region. Material reviewed included analyses of qualitative and quantitative data, literature provided by GWU and JHU, and published and grey literature. Following this, a topic guide was developed to highlight key themes emerging from the literature. This formed the basis for the design of country-specific tools including quantitative product acceptability and product ranking forms and focus group frameworks for pregnant women. The tools were piloted by the NNIPS research team in Sarlahi during the team training with LJ and KM between 30 March to 7 April 2018, after which they were refined based on feedback received during the pilot test. Further revisions were made during the on-going testing of the tools with the national team between April and July 2018.

Quantitative Tools

- Product Acceptability Form

The hedonic testing tool administered to women was called the Product Acceptability Form (PAF). Developed in a questionnaire format, the tool asked each woman a series of questions about characteristics of each of the 11 products in turn, using a 7-point Likert scale to answer from 1 (Dislike it very much) to 7 (Like it very much). The women were then presented with a series of questions regarding their potential use of the product and willingness to consume it during pregnancy, and the responses were again scaled from 1 to 7, with response options that varied by question. Using a 7-point scale allowed participants to make more fine-grained distinctions between answer options (Krosnick and Presser, 2010). PAFs for sweet products were administered to the first four women (Group 1) on day one of data collection and to the second four women (Group 2) on day two of the data collection. Savoury products were administered to all eight women (Groups 1 and 2) on day three.

For the hedonic tasting, products were introduced only by their product number. Test portions for each product were calculated as 25% of the weight of a full portion. The products were pre-portioned by the field coordinators and provided to each data collector in a randomised sequence within product type (sweet or savoury) in order to avoid possible bias due to order of presentation. For the vanilla and cocoa beverage, the 25% test portion of the powdered mix was combined with 50 ml of cold water immediately prior to serving to the participant. The weight of the test portion of each product was again measured before the participant was invited to eat and after she was finished. For the first group of participants (group A), if the participant did not finish the test portion in 20 minutes, the uneaten remainder was weighed and the net weight consumed was calculated. The consumption time was measured by recording the time at the start and end of each taste session. The end was recorded when the participant finished

the product within 20 minutes, or at 20 minutes if the participant did not finish the test portion. For participants in groups B, C, D and E, the consumption time allowed for each product was shortened to 15 minutes and weighing and consumption time recording was otherwise the same. If the participant stated directly that she could not or would not eat the full portion of the product, the tasting session ended immediately and the uneaten remainder of the product was weighed. The PAF for each product lasted approximately 25 minutes in Groups B-E (15 minutes for product tasting and 10 minutes for administering the questionnaire). The PAF for participants in Group A lasted approximately 30 minutes, due to the longer consumption time allowed for that group. Facilitators took handwritten notes of observations and comments for reasons the women could not finish the sample products.

- Product Ranking Form

In addition to the hedonic scales of the PAF, participants were administered a Product Ranking Form (PRF) in which they were asked to rank products in order of preference from 'most liked' to 'least liked' for each of taste, texture, smell, colour, portion size, ease of use and overall preference. The PRF was administered to participants after the PAF had been completed for all sweet products on day one and two of the tasting, (with groups 1 and 2) and then following the completion of the PAF for savoury products on day three of tasting, thus presenting a 1-5 preference range for savoury products across seven variables, and a 1-6 preference range for sweet products across the same metrics. The PRF activity for each product group (savoury and sweet) took approximately 15 minutes. Following the tasting, evaluation and ranking of the sweet products on day one and two and the savoury products on day three, participants were also asked individually on day three to identify their overall 'Top 3' products out of all eleven products sampled. The overall ranking activity took approximately 5 minutes.

Qualitative tools

- Focus group discussions

Complementary qualitative data was also collected in a series of five focus group discussions, each comprising eight pregnant women. The aim of this activity was to better understand factors influencing acceptability and consumption of flavour profiles, as well as sharing dynamics, local food practices and (potential) supplement utilisation. Focus groups generated data that enabled viewpoints for understanding social norms to be compared. An additional ranking exercise was included in the focus group discussion to elicit further narratives around characteristics affecting the (potential) use of the products and how those characteristics related to each other. Participants were then asked to discuss and reach consensus on their top three products, as a group.

Each focus group was led by a facilitator, assisted by a moderator who took notes and helped to track the discussion. The research team ensured all key themes were covered in order to facilitate across-group analysis, but within each section of the focus group, participants led the direction of discussions. This allowed for the co-production of knowledge, whereby researchers and the community work together in the shared exploration of questions in order to obtain deeper and more collaborative understandings of experiences and context. Follow-up prompts and probes were used to obtain greater detail and clarity when necessary.

Efforts were made to ensure the space used for data collection activities was as private and neutral as possible. Administration of the PAF for sweet products was conducted at the participant's homes (on day one and two) and the remaining data collection activities were conducted at the NNIPS field office in Sarlahi (on day 3). The data collection activities were conducted in the local language, Maithili. The national research assistants were familiar with the local context and language. Each focus group discussion lasted between two and three hours, and all were audio recorded.

Data management, transcription and translation

PAF and PRF data were collected using a mix of both paper-based and electronic methods. Where data was collected on paper it was later entered in to the REDCap data management programme. The REDCap programme was also used for electronic tablet-based data collection. The programme is widely used for data entry, editing, tabulation, and dissemination of survey and questionnaire data. The data was saved in the programme and stored on password-protected computers used only by the research team. After data was entered into REDCap, the quantitative paper forms were stored in the field office in locked cabinets. Quantitative data collection and management using the programme was overseen in the field by the TPL. Through the programme, each individual was allocated a unique code for identification across each data collection session to ensure that participant anonymity was maintained.

Focus group discussions were audio recorded, and each data collection session was given a unique identification code to ensure that participant anonymity was maintained. During fieldwork, audio files were uploaded onto password-protected computers used only by the research team. The audio files, researchers' field notes and paper consent forms were stored securely and confidentially. On conclusion of data collection, the focus group discussions were transcribed by hand by the research team from Maithili into Nepali and a number of translation consultants translated the Nepali transcripts into English. TPL was responsible for overseeing the transcription and translation of data. LJ and KM reviewed each transcript for quality assurance and any inconsistencies were reviewed and resolved.

Data analysis

Preliminary analysis of qualitative data was conducted throughout the data collection process by LJ and KM. On conclusion of the data collection, full analysis of the qualitative data was conducted using thematic analysis. Dominant themes were identified through the systematic review of focus group discussions and field notes and a thematic framework was iteratively developed. Salient concepts were coded and their occurrence and recurrence labelled. KM coded the transcripts of the five focus group discussions in the Dedoose software programme. The emerging trends were critically analysed according to the research objectives to assess which product types and varieties were preferred and why, what factors affected women's choice of preferred products, how those products would be incorporated into the current local diet, the acceptability of snacking and sharing, and the acceptability of at-home consumption of products.

The analysis of quantitative data was conducted by TPL. The 7-point Likert scale used for quantification of product acceptability and perceptions was treated as continuous variable. The mean (± SD) was calculated for the themes 'acceptability', 'perception of product use' and 'willingness to use for 12 months'. Answers to the questions on the 'amount of money willingness to pay' and 'perception of portion size' were treated as categorical variables and displayed in numbers and relative percentages.

For the overall 'Top 3' ranking exercise, a product was awarded three points every time it was ranked first, two points every time it was ranked second, and one-point every time it was ranked third. If a product was not included in the top 3, it received zero points. The maximum possible score was therefore 120 points (40 participant's x 3 points maximum) and the minimum was 0 (for a product that was never ranked in the 'Top 3').

Ranking exercises were analysed in Excel using the sum of ranks method. This method gives the highest points to the product that is ranked first, the second highest points to the product that is ranked second etc. The points are then summed. The highest possible sum of ranks for the five savoury products was 200 and the highest possible sum of ranks for the six sweet products was 240. Because of the difference in the total sum of ranks, the percentage of possible points awarded to each product was also calculated, so as to allow comparisons between sweet and savoury product rankings.

Methodological limitations

It was possible that participants may have expressed answers they perceived to be appropriate or socially desirable. This is an inherent risk in rapid qualitative data collection. However, participants were encouraged to speak openly and honestly, and the frank and sincere dialogue elicited from participant discussions suggested that such socially desirable bias was minimised. Findings were also triangulated across participant groups to test the validity of answers.

To be responsive to the local environment, activities at the community level were conducted in the local language (Maithili). Risks associated with mistranslation or miscommunication were minimised by thoroughly briefing the research team, agreeing to use short phrases of speech, and repeating specific sections of narrative back to participants to ensure colloquialisms and meaning had been well captured.

The volume of products and the speed at which the facilitator moved through each of the product discussions led, in some cases, to quite long interactions. In pre-testing, the group discussions of up to nine product had lasted around two hours, but in the field the first discussion of all 11 products was closer to three hours in duration. As a result, a number of questions focusing on product sharing, intra-household food practices, method of incorporation of supplement into daily diet, and use and portability of product were removed from the focus group discussion framework. Instead, these questions were asked in broad strokes at the end of each focus group discussion, although the richness of the data collected did not warrant significant, in-depth analysis.

Further, answers to questions became shorter and more repetitive after each product as levels of fatigue rose. Despite the efforts of the facilitators, levels of participation engagement diminished as the discussion continued. Completing focus group discussions with women who were pregnant was challenging, as long periods sitting made many uncomfortable and tired. Observations from focus group facilitators included references to women yawning and sleeping during the sessions, and indications that there was a level of frustration amongst participants. As mentioned above, the focus group discussion tools were heavily edited following the first discussion to reduce the length of the sessions. This ensured that the facilitators could move more quickly through the key topics and to try and overcome issues of tiredness and fatigue amongst participants.

Findings: Overall assessment of product preferences

In order to assess product preferences study participants were asked to complete three individual product ranking activities: they were asked to rank the sweet products along a variety of characteristics and overall; they were asked to perform the same ranking for the savoury products; and they were asked to rank their top three preferred products (including both savoury and sweet products) in order of preference. In addition to these individual ranking activities, focus group participants were asked as a group to rank the top three products. Participants were also asked, as part of the administration of the product acceptability form, to assign a score on a 7-point Likert scale to each product along a number of factors including overall liking for the product.

The results for the top 5 products in any of the three overall rankings are presented in Table 3 below. These results will be discussed in detail in the following sections. As can be seen immediately, however, there is relative consistency across all measures of overall likeability as far as the top 5 products are concerned: All placed among the top 5 choices on every measure except the savoury Plumpy Mum, which was not selected as a 'Top 3' choice by any focus group. There is greater variability between the individual measures. The sweet Plumpy Mum was the top product according to both 'Top 3' rankings and was in a virtual tie with the seasoned pillows for first place in overall Likert scores, with a difference between them of only 0.03 points out of a possible 7. However, the overall measures yielded different rankings for the other four products, as will be discussed in detail below.

Table 3. 'Top 5 Products' across all metrics

	Sweet Plumpy Mum	**Seasoned Pillows**	**Vanilla Drink**	**Savoury Plumpy Mum**	**Vanilla Biscuit**
Individual Product Ranking Form ALL PRODUCTS 'Top 3' Ranking (points)	1 (51)	2 (43)	3 (37)	4 (34)	5 (28)
Focus Group Exercise ALL PRODUCTS Group 'Top 3' Ranking (points)	1 (14)	3 (4)	2 (8)	5 (0)	3 (4)
Product Appreciation Form ALL PRODUCTS Global appreciation ranking (Avg score on 7-point scale)	2 (6.32)	1 (6.35)	5 (5.85)	3 (6.15)	4 (5.98)

PRF and focus group discussions: overall product rankings

At the conclusion of tasting for each of the two product groups (sweet and savoury), participants were asked to rank all products in the group in terms of a variety of characteristics. Because the highest possible sum of ranks for savoury products was 200 and the highest possible sum of ranks for the sweet products was 240, comparisons between the product groups were done based on percentage of available points awarded. Thus, for example, in the sweet product individual ranking activity, the sweet Plumpy Mum received an overall score of 196 out of 240 points, for 81.7% of available points. The seasoned pillows received an overall score of 155 out of 200 points, for 77.5%. The results of the overall rankings by product group, and the percentage of available points obtained by each product, are presented in Table 4 below. The results of the sweet product group and savoury product group rankings by product characteristic are presented in Table 5 below.

Table 4. Day 1 (sweet) and Day 2 (savoury) overall ranking

Day 1 Products	Sum of Ranks (% of available points)	Day 2 Products	Sum of Ranks (% of available points)
Sweet Plumpy Mum	196 (81.7%)	Savory Plumpy Mum	159 (79.5%)
Sweet Vanilla Drink	161 (67.1%)	Savory Seasoned Mars Pillows	155 (77.5%)
Sweet Biscuit	150 (62.5%)	Savory Masala Bar	102 (51.0%)
Sweet Sticks	132 (55.0%)	Unseasoned Mars Pillow	96 (48.0%)
Mango Bar	103 (42.9%)	Savory Curry Biscuit	88 (44.0%)
Sweet Cocoa Drink	98 (40.8%)	-	-

On the second day of product tastings, after their ranking of the sweet products, participants from both groups were also asked to identify their 'top 3' overall products out of all eleven products tested. Points were again assigned to each rank and the points were summed. The results of this ranking exercise are presented in Table 6 below. The most preferred product, with 51 points, was the sweet Plumpy Mum, followed by the seasoned pillows (43 points), vanilla drink (37 points), savoury Plumpy Mum (34 points) and vanilla biscuit (28 points).

Participants were also asked to decide as a group on the 'Top 3' products overall during the focus group discussions and points were assigned to each position as described above. Only four products were ever named in the 'Top 3' in focus groups; three were sweet and one was savoury. In this ranking, the sweet Plumpy Mum finished first, with 14 points, followed by the vanilla drink with 8, and the vanilla biscuit and seasoned pillows, each of which had 4 points. Interestingly, the savoury Plumpy Mum was not selected by any focus group as a 'Top 3' product, although it finished in the top five products during the individual overall product ranking (34 points, fourth highest). It also finished highest among all savoury products during the savoury product ranking (159 points), and garnered the second highest percentage of available points among all products (79%), after the sweet Plumpy Mum (196 points, 81.% of available points). The results by discussion group of the focus group ranking activity are presented in Table 7 below.

Table 5. Product Rankings by Day (Sweet/Savoury), sum of ranks

	Taste	Texture	Smell	Colour	Portion	Ease	Overall
Sweet Products*							
Sweet Plumpy Mum	197	201	192	197	159	189	196
Vanilla Drink	151	153	161	162	141	171	161
Vanilla Biscuit	156	151	140	144	169	143	150
Filled Sticks	136	131	139	131	161	133	132
Mango Bar	107	107	110	102	115	108	103
Cocoa Drink	93	97	98	104	95	96	98
Savoury Products**							
Savoury Plumpy Mum	162	173	156	159	140	167	159
Seasoned Pillow	154	144	154	166	145	144	155
Masala Bar	104	99	103	89	106	87	102
Unseasoned Pillow	96	95	101	90	105	100	96
Curry Biscuit	84	89	86	96	104	102	88

**Sweet products were assigned points based on rankings, from 6 for a first place ranking to 1 for a last place ranking. Points for each product and each characteristic were then summed. For reference, the maximum score for a sweet product is 240 (6*40) and the minimum score is 40 (1*40). ** Savoury products were assigned points based on rankings from 5 for a first place ranking to 1 for a last place ranking. Points for each product and each characteristic were then summed. For reference, the maximum score for a savoury product is 200 (5*40) and the minimum score is 40 (1*40).*

Table 6. 'Top 3' Overall Product Ranking, Sum of Ranks*

	Sum of ranks*
All Products	
Sweet Plumpy Mum™	51
Seasoned Pillow	43
Vanilla Drink	37
Savoury Plumpy Mum™	34
Vanilla Biscuit	28
Filled Sticks	14
Mango Bar	12
Masala Bar	8
Cocoa Drink	6
Curry Biscuit	6
Unseasoned Pillow	1

*Products were assigned points based on rankings: 3 for the most preferred product, 2 for the second most preferred, 1 for the third most preferred. Points were then summed. For reference, the maximum score is 120 (3*40) and the minimum score is 0 (if the product was never named in the 'Top 3').*

Table 7. Focus Group Rankings of 'Top 3' Products

	1st CHOICE OVERALL	2nd CHOICE OVERALL	3rd CHOICE OVERALL
FGDA	Sweet Plumpy Mum	Vanilla drink	Vanilla biscuit
FGDB	Vanilla drink	Sweet Plump Mum	Vanilla biscuit
FGDC	Sweet Plumpy Mum	Seasoned pillow	Vanilla drink
FGDD	Sweet Plumpy Mum	Vanilla drink	Seasoned pillow
FGDE	Sweet Plumpy Mum	Vanilla Biscuit	Seasoned pillow
CUMULATIVE	**Sweet Plumpy Mum (14 points)**	**Vanilla drink (8 points)**	**Vanilla biscuit tied with seasoned pillow (4 points each)**

Hedonic testing: Likert scale mean scores and overall likeability

As outlined in the methodology, the PAF was based on a 7-point Likert scale designed to elicit reactions to a series of product characteristics and statements related to product use. The results of this analysis for the top 5 products and the remaining products are presented in chapters 2 and 3 below.

The results of an analysis of overall mean Likert scores are broadly aligned with the other two overall rankings, with all five of the top finishing products receiving the highest Likert scores for overall appreciation of the product and 0.5 points (out of 7.0) separating the first from the fifth ranked scores. The seasoned pillow had the highest overall mean Likert score at 6.35 (SD=1.4), just ahead of the second place sweet Plumpy Mum at 6.32 (SD=1.5). The savoury Plumpy Mum had the third highest mean Likert score at 6.15 (SD= 1.4), followed by the vanilla biscuit at 5.98 (SD=1.6). The vanilla drink was fifth with a Likert score of 5.85, as well as a higher standard deviation than the other products (SD=2.0).

The distribution of participants' responses to the 'overall likeability' question are presented in Table 8 below. In summary, 85% of participants liked the seasoned pillows very much or moderately and only 5% disliked it very much or moderately. The sweet Plumpy Mum had 82.5% moderately or strongly favourable

scores and 5% unfavourable. The savoury Plumpy Mum had slightly lower favourability, with 80% liking it very much or moderately and 5% disliking it very much or moderately. The vanilla biscuit had 77.5% favourable and 7.5% unfavourable scores. The vanilla drink had the highest percentage of negative responses: 74.5% liked it very much or moderately and 12.5% disliked it moderately or strongly.

As the above demonstrates, there is some consistency in responses though the individual metrics, considered independently, yield somewhat different rankings. There is no strong preference as between sweet and savoury products, as two of the top five products are savoury and three are sweet. Hedonic scores for the acceptability of sweet products are presented below in Table 9 and for savoury products in Table 10.

Table 8. Distribution of response on 7-point scale (overall likability), n=40

Overall likeability responses	Sweet Plumpy Mum	Mango Bar	Sweet filled sticks	Sweet vanilla Biscuit	Sweet drink (cocoa)	Sweet drink (vanilla)	Savoury Plumpy Mum	Savoury Bar	Savoury Biscuit	Seasoned Pillow	Unseasoned Pillow
Liked very much	75.0%	35.0%	45.0%	52.5%	32.5%	62.5%	57.5%	47.5%	30.0%	70.0%	35.0%
Liked moderately	7.5%	12.5%	25.0%	25.0%	12.5%	12.5%	22.5%	12.5%	22.5%	15.0%	22.5%
Liked slightly	7.5%	22.5%	20.0%	12.5%	17.5%	10.0%	12.5%	17.5%	10.0%	10.0%	22.5%
Neither like/dislike	5.0%	0%	0%	0%	0%	0%	2.5%	0%	0%	0%	2.5%
Dislike slightly	0%	2.5%	2.5%	2.5%	2.5%	2.5%	0%	0%	2.5%	0%	2.5%
Dislike moderately	0%	7.5%	0%	2.5%	5.0%	2.5%	0%	2.5%	0%	0%	2.5%
Dislike very much	5.0%	20.0%	7.5%	5.0%	30.0%	10.0%	5.0%	20.0%	35%	5.0%	12.5%

Table 9. Hedonic testing, acceptability of sweet products

	Sweet Plumpy Mum	Mango Bar	Filled sticks	Vanilla biscuit	Cocoa drink	Vanilla drink
	N=40	N=40	N=40	N=40	N=40	N=40
Net weight consumed (g)	21.4 (6.4)	10.7 (6.6)	19.2 (8.0)	15.4 (5.5)	45.6 (25.2)	61.0 (17.7)
Proportion of participants who consumed the full sample served (%) *	80.0%	55.0%	60.0%	70.0%	60.0%	87.5%
Duration of consumption of full sample served (min)	3.8 (1.4)	3.9 (1.0)	5.7 (2.1)	5.0 (2.1)	1.5 (1.2)	1.1 (0.6)
	Appreciation of Product (1= Dislike very much to 7= Like very much))					
Colour	6.4 (1.3)	5.1 (2.2)	6.4 (0.9)	6.2 (1.4)	5.3 (1.9)	6.2 (1.4)
Taste	6.3 (1.4)	4.8 (2.4)	6.1(1.5)	5.8(1.9)	4.3 (2.5)	5.8 (2.0)
Texture/consistency	6.3 (1.5)	4.8 (2.4)	6.1 (1.2)	5.9 (1.7)	4.3 (2.5)	5.8 (1.9)
Smell	6.4 (1.1)	4.8 (2.3)	5.9 (1.7)	6.0 (1.7)	5.1 (2.2)	5.9 (1.7)
Overall appreciation	6.3 (1.5)	4.8 (2.4)	5.8 (1.7)	6.0 (1.6)	4.4 (2.6)	5.9 (2.0)
Perceived child likeability	6.6 (1.1)	5.2 (2.2)	6.7 (0.8)	6.6 (0.9)	4.8 (2.2)	6.2 (1.4)
Perceived adult likeability	6.2 (1.3)	5.0 (2.1)	6.1 (0.9)	6.0 (1.5)	4.5 (2.0)	6.0 (1.4)
	Perception of product use (1=Very difficult to 7=Very easy)					
Product is convenient to eat	6.7 (0.6)	5.6 (1.8)	6.3 (1.1)	6.3 (1.1)	5.8 (1.6)	6.2 (1.3)
Product is convenient to eat between meals	6.7 (0.6)	5.4 (1.8)	6.2 (1.1)	6.5 (0.8)	5.6 (1.6)	6.1 (1.5)
	Consider product to be a medicine or food or both or neither, n (%)					
Medicine	9 (22.5%)	14 (35.0%)	8 (20.0%)	8 (20.0%)	18 (45.0%)	14 (35.0%)
Food	17 (42.5%)	17 (42.5%)	17 (42.5%)	18 (45.0%)	9 (22.5%)	13 (32.5%)
Both a medicine and food	14 (35.0%)	9 (22.5%)	15 (37.5%)	14 (35.0%)	13 (32.5%)	13 (32.5%)
Neither a medicine nor food	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	How full one would feel after eating full serving as a snack, n (%)					
Very full	14 (35.0%)	12 (30.0%)	18 (45.0%)	12 (30.0%)	16 (40.0%)	20 (50.0%)
Moderately full	17 (42.5%)	19 (47.5%)	13 (32.5%)	18 (45.0%)	17 (42.5%)	14 (35.0%)
Slightly full	9 (22.5%)	8 (20.0%)	8 (20.0%)	9 (22.5%)	7 (17.5%)	6 (15.0%)
Not full at all	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Don't know	0 (0%)	1 (2.5%)	1 (2.5%)	1 (2.5%)	0 (0%)	0 (0%)
	Likelihood of sharing product with others (1=Definitely would not share to 5=Definitely would share)					
Would share with others	1.9 (1.5)	2.3 (1.6)	1.9 (1.5)	2.0 (1.5)	2.2 (1.5)	1.8 (1.3)
	Willingness to use daily for 12 months (1=Definitely would not eat every day to 5=Definitely would eat every day)					
Would use daily if provided	4.8 (0.6)	4.0 (1.4)	4.8 (0.6)	4.5 (1.0)	4.1 (1.3)	4.5 (1.1)
	Would pay for this product for daily use up to 12 months, n (%)					
Would pay how much (NRs) - 0	0 (0%)	2 (5.0%)	0 (0%)	0 (0%)	2 (5.0%)	1 (2.5%)
1-10	18 (45.0%)	17 (42.5%)	9 (22.5%)	23 (57.5%)	14 (35.0%)	14 (35.0%)
11-20	11 (27.5%)	15 (37.5%)	20 (50.0%)	14 (35.0%)	18 (45.0%)	14 (35.0%)
21-30	8 (20.0%)	3 (7.5%)	9 (22.5%)	2 (5.0%)	6 (15.0%)	6 (15.0%)
31-50	3 (7.5%)	3 (7.5%)	2 (5.0%)	1 (2.5%)	0 (0%)	5 (12.5%)
	Acceptability of portion size (for a snack), n (%)					
Right amount for a daily snack	36 (90.0%)	33 (82.5%)	34 (85.0%)	37 (92.5%)	31 (77.5%)	28 (70.0%)
Less than I would want as a daily snack	0 (0%)	2 (5.0%)	1 (2.5%)	2 (5.0%)	0 (0%)	1 (2.5%)
More than I would want as a daily snack	4 (10.0%)	5 (12.5%)	5 (12.5%)	1 (2.5%)	9 (22.5%)	11 (27.5%)

Table 10. Hedonic testing, acceptability of savoury products

	Savoury Plumpy Mum	Masala Bar	Savoury curry biscuit	Seasoned pillow	Unseasoned pillow
	N=40	N=40	N=40	N=40	N=40
Net weight consumed (g)	18.3 (8.9)	10.1 (7.0)	6.2 (6.3)	11.4 (6.4)	8.4 (5.8)
Proportion of participants who consumed the full sample served (%) *	65.0%	45.0%	17.5%	57.5%	22.5%
Duration of consumption of full sample served (min)	3.3 (1.6)	4.1 (2.0)	5.1 (1.6)	4.6 (2.0)	5.8 (2.4)
	Appreciation of Product (1= Dislike very much to 7= Like very much)				
Colour	6.4 (1.2)	5.8 (2.0)	4.9 (2.4)	6.7 (0.6)	5.7 (1.9)
Taste	6.3 (1.2)	4.9 (2.4)	4.0 (2.6)	6.2 (1.6)	5.0 (2.2)
Texture/consistency	6.1 (1.6)	5.1 (2.3)	4.5 (2.4)	6.3 (1.1)	5.2 (2.1)
Smell	6.3 (1.3)	5.1 (2.3)	4.5 (2.6)	6.4 (1.2)	5.3 (1.9)
Overall appreciation	6.1 (1.4)	5.2 (2.3)	4.4 (2.6)	6.4 (1.4)	5.3 (2.0)
Perceived child likeability	6.5 (1.0)	5.4 (2.0)	4.7 (2.1)	6.5 (1.1)	5.7 (1.9)
Perceived adult likeability	6.3 (1.1)	5.6 (1.9)	4.5 (2.3)	6.3 (1.2)	5.5 (1.8)
	Perception of product use (1=Very difficult to 7=Very easy)				
Product is convenient to eat	6.5 (0.7)	6.3 (1.4)	5.5 (2.2)	6.8 (0.5)	6.2 (1.2)
Product is convenient to eat between meals	6.6 (0.7)	6.2 (1.4)	5.4 (2.2)	6.3 (1.1)	6.1 (1.2)
	Consider product to be a medicine or food or both or neither, n (%)				
Medicine	7 (17.5%)	6 (15.0%)	9 (22.5%)	7 (17.5%)	10 (25.0%)
Food	18 (45.0%)	18 (45.0%)	17 (42.5%)	21 (52.5%)	18 (45.0%)
Both a medicine and food	15 (37.5%)	16 (40.0%)	13 (32.5%)	11 (27.5%)	12 (30.0%)
Neither a medicine nor food	0 (0%)	0 (0%)	1 (2.5%)	1 (2.5 %)	0 (0%)
	How full one would feel after eating full serving as a snack, n (%)				
Very full	13 (32.5%)	14 (35.0%)	9 (22.5%)	14 (35.0%)	18 (45.0%)
Moderately full	16 (40.0%)	19 (47.5%)	24 (60.0%)	21 (52.5%)	17 (42.5%)
Slightly full	11 (27.5%)	6 (15.0%)	7 (17.5%)	5 (12.5%)	4 (10.0%)
Not full at all	0 (0%)	1 (2.5%)	0 (0%)	0 (0%)	1 (2.5%)
Don't know	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Likelihood of sharing product with others (1=Definitely would not share to 5=Definitely would share)				
Would share with others	1.9 (1.3)	1.9 (1.3)	2.3 (1.7)	1.9 (1.4)	2.1 (1.4)
	Willingness to use daily for 12 months (1=Definitely would not eat every day to 5=Definitely would eat every day)				
Would use daily if provided	4.6 (0.8)	4.3 (1.1)	4.0 (1.3)	4.6 (0.8)	4.3 (1.0)
	Would pay for this product for daily use up to 12 months, n (%)				
Would pay how much (NRs)					
0	0 (0%)	2 (5.0%)	4 (10.0%)	2 (5.0%)	1 (2.5%)
1-10	23 (57.5%)	20 (50.0%)	23 (57.5%)	21 (52.5%)	25 (62.5%)
11-20	13 (32.5%)	9 (22.5%)	10 (25.0%)	10 (25.0%)	9 (22.5%)
21-30	3 (7.5%)	6 (15.0%)	2 (5.0%)	6 (15.0%)	4 (10.0%)
31-50	1 (2.5%)	3 (7.5%)	1 (2.5%)	1 (2.5%)	1 (2.5%)
	Acceptability of portion size (for a snack), n (%)				
Right amount for a daily snack	35 (87.5%)	33 (82.5%)	33 (82.5%)	33 (82.5%)	35 (87.5%)
Less than I would want as a daily snack	0 (0%)	0 (0%)	5 (12.5%)	1 (2.5%)	2 (5.0%)
More than I would want as a daily snack	5 (12.5%)	7 (17.5%)	2 (5.0%)	6 (15.0%)	3 (7.5%)

Findings 2: Top Five Products

As noted above, there was relative consistency among overall metrics as far as which five products were most preferred by study participants. There was less consistency within the individual metrics, however. There was no strong preference for sweet versus savoury products; women liked each product type and appeared to rank them based on the individual product rather than a particular flavour profile (in contrast to the preferences expressed in the Burkina Faso study, where there was a strong preference for sweet products). In-depth analyses of the top five products are presented below according to product characteristics and use during pregnancy.

Sweet Plumpy Mum

Product Characteristics

The sweet Plumpy Mum finished highest in the individual 'Top 3' product ranking, with 51 points, and first in the focus group ranking exercise, with 14 points. It received or tied for the highest Likert scores of all products for taste (6.3, SD=1.4), texture (6.3, SD=1.5), and smell (6.4, SD=1.1), and tied with the savoury version of the product for the second highest score for color (6.4, SD=1.3), just behind the seasoned pillows. Its Likert score for overall appreciation was 6.3 (SD=1.5), second only to the seasoned pillow, which had an overall appreciation Likert of 6.4 (1.4)[2]. It similarly received the highest scores in the individual sweet product ranking exercise along all metrics (except portion size, where it was third), including overall appreciation (196/240, or 81.7%); this score was also the highest of all products. Eighty percent of participants consumed the entire test portions, which was the second highest of all products after the vanilla drink.

The strong quantitative scores received by the sweet Plumpy Mum were consistent with women's positive assessment of the product during the focus group discussions. There was strong consensus that the product was good overall; women liked its flavor, colour and texture. A participant in FGDC[3] stated: *'This one is the best of all, this is fantastic'.* Participants commented favourably on the product's sweet/salty flavor mix, and contrasted it to the savoury Plumpy Mum which, though well liked, was not as popular as the sweet version due to what some perceived as excessive salt.

Focus group participants compared the sweet Plumpy Mum to a variety of local foods: '*Halwa'*, a local dish usually made from semolina, ghee and sugar; Horlicks, Bournevita and Cerelac beverage mixes; *Satu* (a food prepared from roasted pulses, cereals, ghee or oil and salt); *'Parle-G'* glucose biscuits; chocolate; and ghee, milk and butter. All of these were positive associations. The women did not have any suggestions to modify the product. As a participant in FGDE stated, '*In our opinion it has been made well, that's why it is very tasty*'.

There was relative consensus[4] in the focus groups that both adults and children would like the product due to its taste/sweetness, appearance and smell. Although one participant in FGDE opined that some children would like the sweet Plumpy Mum and others might not, another participant stated, *'Children will like it as the taste is sweet. They will like its taste'.* Some women pointed specifically to its similarity to known foods

[2] Likert scores have been rounded to the nearest tenth of a point for purposes of this analysis. It is worth noting, however, that the sweet Plumpy Mum's unrounded score for Overall Appreciation was 6.32, versus the Seasoned Pillow's 6.35.

[3] Throughout the report, the five foucs groups discussions will be differientiated by letter and referred to as FGDA, FGDB, FGDC, FGDD and FGDE.

[4] In many of the focus group discussions only a handful of women answer questions about each product. Thoughout this report, the use of the word 'consensus' referes to agreement amongst those women who responded to the question rather than consensus from all participants.

as a reason why others would like the sweet Plumpy Mum. The Product's mean Likert scores for perceived adult likeability (6.2, SD=1.3) and child likeability (6.6, SD=1.1) were similarly very strong.

Use of product during pregnancy

Women across the five focus groups stated that there was a high probability that they would eat the product throughout pregnancy because '*it tastes good and it has benefits*'. Most agreed that they would eat it every day during pregnancy, though one woman in FGDA raised cost as a potential obstacle: *'If it is provided for free you can eat it [for 12 months] but cannot afford to buy it'.* In contrast, and as was the case with all other products, the sweet Plumpy Mum's Likert score for 'would use daily if provided' was less than 5 (4.8, SD=0.6), indicating a low likelihood to use the product every day. Ninety percent of participants said that a full serving was the correct amount for a daily snack, with 10% saying it was more than they would want on a daily basis.

The product's identical Likert scores for convenient to eat and convenient to eat between meals (6.7, SD=0.6) were the highest received by any sweet product and highest or second highest among all products. In FGDA, women did say that it would be easy to eat at home, alone, but suggested that it might be difficult to eat it when others are around: *'How to eat in front of many people, it does not look good, one person is eating and rest of others are looking'.* It was also suggested that it could be difficult to eat the product in front of children, who might expect them to share it. There was broad agreement among participants in FGDA that others would expect to share the product, but the Likert score for likelihood of sharing (1.9, SD=1.5) was among the lowest of all products. Participants in FGDA also agreed that being given the product would not limit their access to other food within the household.

Seasoned Pillows

Product characteristics

The seasoned pillows received the highest mean Likert score among savoury products on overall appreciation (6.4, SD=1.4), finishing just slightly ahead of the savoury Plumpy Mum (6.1, SD=1.4). The pillows received the highest Likert scores of all savoury products on every characteristic (smell, texture, odour) apart from taste, where it placed a close second to the savoury Plumpy Mum with a score of 6.2 (SD=1.6) to the Plumpy Mum's 6.3 (SD=1.2). The mean percentage of the test portion of the pillows consumed was 57.5%, the second highest percent consumed of all savoury products. The produce was consumed in the third shortest consumption time, 4.6 minutes (SD=2.0).

The favourable reaction to the seasoned pillows was confirmed in the PRF ranking exercise. The pillows were ranked highest among savoury products in terms of colour (166 points) and portion size (145 points) and second in terms of taste (154 points), texture (144 points), smell (154 points) and ease of consumption (144 points) (Table 5).

In the 'overall' ranking by product group, the seasoned pillows received the third highest percentage of possible points (77.5%/155 points), just behind the savoury Plumpy Mum (79.5%/159 points) and the sweet Plumpy Mum (81.7%/196 points). In the individual Top 3 ranking of all products however, the seasoned pillows placed second with 43 points, following the 51 points received by the sweet Plumpy Mum. In the focus group Top 3 ranking activity, the seasoned pillows product received 4 points in total and was tied with the vanilla biscuit for third place among all products.

These quantitative data were also supported in the focus group discussions where the product was uniformly liked; only a few women had negative reactions. Participants frequently referred positively to the product's taste, which many described as 'a little salty and a little sweet' but also 'a little spicy' too. A

large number of women also spoke positively about the other product characteristics (smell, colour and texture) in FGDE, women suggested, *'Its color is also nice and smell also It is good to eat too',* and in FGDC women agreed, '*Colour is also good, taste is also good and liked it while eating also'.*

Participants associated the seasoned pillows to a number of other familiar foods, particularly crisps and popcorn. In FGDA women found the product to be like '*Bikaji nimkii'*, a brand of Indian savoury snacks that are crunchy and made from refined flour which is then deep-fried. In FGDD and FGDE women recognised a resemblance to popcorn and to a local spicy and salty snack that comes in alphabet shapes and is known as '*ABCD*'. Women in FGDB and FGDC likened the seasoned pillows to crisp snacks, such as '*Khatta meetha*' (FGDC), '*Motu Patlu'* (FGDB) and '*Kurkure*' (FGDB and FGDC). Associations between the seasoned pillows and other products were uniformly positive and were found to favourably influence the women's decision to consume the product. One response from a woman in FGDA is illustrative: '*Yes, its sour and spicy type, that's why they would eat more during pregnancy*'. This was consistent with Likert data on willingness to use during pregnancy where the seasoned pillows scored in joint first place with the savoury Plumpy Mum, both with a score of 4.6 (SD=0.8).

The majority also said that both adults and children would like the product, for varying reasons including; because of its taste, its sweet, salty and spicy flavour, because themselves women like it, and because of its perceived health benefits. One woman in FGDD suggested that children, '*will like it… its tastes good and if the children eat it, it benefits them'*. Another in FGDC agreed that adults would also enjoy the product as much as children, and noted jokingly, '*Children will eat it then why won't the adults eat it'*. Likert data indicate that the perceptions of child and adult appreciation of seasoned pillows were high. Children's perceived appreciation scored a mean 6.5 (SD=1.1), which was tied for the highest across all products with savoury Plumpy Mum (6.5, SD=1.0). Both products also received the same score for adult appreciation (6.3), with a standard deviation of SD=1.2 for the seasoned pillows and SD=1.1 for the Plumpy Mum.

Use of Product During Pregnancy

A majority of focus group participants said that they would eat the seasoned pillows every day during pregnancy. Although they mentioned they would eat it because they liked it and enjoyed the taste and flavour, many also said that the health benefits of the product were a factor. The PAF data indicated that the seasoned pillows received the highest mean Likert score of all products for 'convenient to eat', with a mean score of 6.8 (SD=0.5), and it received the fourth highest score of all products (6.3, SD=1.1) for 'convenient to eat between meals'.

The portion size was widely viewed as being perfect; 33 women (82.5%) indicated that the two packet daily serving of the seasoned pillows were the right size for a snack, with only 2.5% (n=1) saying that the full serving size was too small and six women (15.0%) suggesting the size was too much. In the qualitative data women agreed that the seasoned pillows would be eaten as a snack either in the morning or the evening, and it was found that the serving size was enough to replace a normal daily snack --the portion was enough to '*make the stomach full'*. Notably, the seasoned pillows were the only savoury product that was primarily considered to be a food rather than a medicine: 52.5% (n=21) of participants said that it was primarily a food, and an additional 27.5% (n=11) considered it to be both. Only 17.5% (n=7) considered it to be a medicine.

Savoury Plumpy Mum

Product characteristics

The savoury Plumpy Mum ranked fourth amongst all products in the individual rankings, with 34 points out of a possible 120 points. This placed it three points behind the third-place vanilla drink and nine points

behind the second-place seasoned pillows, which had 43 points. In the Likert scale data, however, the savoury Plumpy Mum tied with the sweet Plumpy Mum for top Likert score (6.3, SD=1.4) for taste, tied with sweet Plumpy Mum and the filled sticks for second highest score on color, and placed third for texture and smell. It placed third for overall appreciation with a mean Likert score of 6.1 (SD=1.4) behind the first-place seasoned pillow (6.4, SD=1.4) and the sweet Plumpy Mum (6.3, SD=1.5). In focus group ranking exercises, the savoury Plumpy Mum never placed among the 'Top 3' in any of the five FGD groups. In the individual overall rankings by product category (sweet or savoury), the savoury Plumpy Mum received 159 out of 200 possible points, or 79.5% of the possible points, ahead of the seasoned pillow with 155 out of 200 possible points (77.5%). This is in contrast to the sweet Plumpy Mum, which received 196 out of 240 possible points, or 81.7%, and the vanilla drink, which received 161 out of 240 points, or 67.1%. 80% of the study participants liked the product 'very much' or 'moderately' (compared to 85% for the seasoned pillow and 82.5% for the sweet Plumpy Mum). Only 5% disliked it moderately or very much.

There were positive responses to the savoury Plumpy Mum in all focus group discussions, with reference made to the taste in all groups, and to the color and/or texture in FGDB, FGDC, and FGDD. As one woman in FGDD stated, the texture was '*soft to swallow',* which was perceived as positive. In all groups except FGDD, however, some participants commented negatively on the saltiness of the product and suggested reducing it. During the comparative discussion of the sweet and savoury versions of Plumpy Mum, one participant in FGDC mentioned that *'everyone liked [the savoury version] but…'* and another participant completed the thought: *'It has a lot of salt'.* During the product comparisons participants in all five FGDs preferred the sweet version of the Plumpy Mum over the savoury version when compaired head-to-head.

Participants found similarities between the savoury Plumpy Mum and a number of familiar foods, including peanut, chickpea and corn *Satu*; Bournvita and Horlicks drink mixes; *Lito* (a paste made from grinding different types of grain); and *Nimki* (small crispy fried dough snacks). Satu, in particular, was mentioned in three of the focus groups (FGDA, FGDC, FGDE). These associations with familiar foods were viewed in all groups as positive.

The savoury Plumpy Mum tied with the seasoned pillow for the highest scores of all savoury products for expected child appreciation (6.5, SD= 1.0) and adult appreciation (6.3, SD=1.1). It was also tied with the seasoned pillows for highest adult appreciation score amongst all products, and tied for fourth amongst all products for child appreciation. Focus group participants largely confirmed this, with many stating that children and adults would like the product for reasons related to taste, smell and appearance. The similarity to *Satu* and to *Halwa* and *Katora*, two Nepali confections, was cited as a reason they would like it. In FGDE, one participant suggested that adults would like the savoury Plumpy Mum because '*it's a little 'chatar patar' [salty, sour*]'. However, several participants said that the product's saltiness might have a negative impact on others' appreciation of it, as it did for some of the pregnant women themselves.

<u>Use of product during pregnancy</u>

The mean Likert response to 'would use daily if provided' (4.6, SD=0.8) indicates that women are slightly likely to eat it every day (4 being neither likely nor unlikely). During the FGDs, however, most women said that they would eat the product every day during pregnancy, both because they liked it and because it is good for mother and baby. As a participant in FGDD stated, '*If you eat this, nothing will happen to the mother and child, they won't be weak, it will be good'.* In FGDC, however, some women stated that the product was too salty to eat daily, as it would require them to drink water which would fill them up: '*half of a packet can be eaten, it's salty*'; '*even when you take a less amount, you have to drink a lot of water*'. The savoury Plumpy Mum was deemed easy to eat and to take with them elsewhere in the focus group where participants were asked about it (FGDA) because it is ready-to-eat; they discussed the fact that they might not eat daily if it required preparation. They also mentioned that they would need water afterwards. The perceived ease of use was confirmed in the savoury product ranking data, where the savoury Plumpy Mum came in first of all savoury products with 167 of a possible 200 points (83.5%).

Only one focus group (FGDA) was asked about when they would eat the product, and participants' responses varied; some said they would eat it at morning or afternoon snack time, but one said she would eat it any time except snack time. All who responded said that the serving of Plumpy Mum would be sufficient food for a snack and that they would not need any other food after eating it, perhaps indicating that it would replace a snack or other food they would otherwise eat.

Only FGDA was asked about likelihood of sharing the product, and there was a split of opinion. Some participants said that there would be no expectation that they'd share the product, because it will be seen as something good for pregnant women, but other participants said that household members would expect to share. One participant mentioned her mother-in-law in particular as someone who would expect to share the product, and others said that it would be difficult to eat it in front of children without giving them something to eat as well. Likert data for the Savoury Plumpy Mum indicate a low likelihood of sharing (1.9, SD = 1.3). All women in FGDA who expressed an opinion said that they would not be expected to reduce their share of household foods because of the product.

Vanilla Drink

Product characteristics

The Vanilla Drink ranked third in the individual 'Top 3' ranking, with 37 out of a possible 120 points, and second in the focus group ranking with 8 points; it was chosen in one focus group as the top product, in two as the second-liked product, and in one as the third most preferred. It was the second best liked of all products in the sweet product ranking, with 161 out of a possible 240 point (67.1%); that score put it in third place overall in terms of percentage of points awarded (behind sweet and savoury Plumpy Mum products with 81.7% and 79.5% respectively). The vanilla drink also had the highest percentage of people who consumed the full sample (87.5%) and it was finished the most quickly, with a mean time of 1.1 minutes. The product's Likert scores for all product characteristics put it in the middle of all products: it had the fifth-highest scores for color, taste, smell and overall and the sixth highest score for texture.

Analysis of the vanilla drink's Likert scores for overall likeability disclosed 75% of participants liked the product very much or moderately and 12.5% disliked it very much or moderately. The negative views of the product were not reflected in the focus group discussions, however. Over all focus groups only one participant expressed a primarily negative view of the product and two additional participants said the product smelled or tasted like medicine. In all focus groups, most participants said that they liked the color, smell and taste of the product. Its taste was likened to peanut *satu*, *Horlicks* malt powder, *Cerelac* and *Lactogen* (baby foods), and milk. In FGDB, the smell was said to resemble ice cream. These were all deemed positive associations. One participant in FGDC and one in FGDD said that the smell or taste reminded them of medicine. In FGDC the product was likened to Prop-PL, a powdered drink mix for pregnant women, which appeared to be a positive association. For the most part, participants liked the product as it was, without any changes, though in FGDB two women suggested that they would like it better if cashews and raisins were added to it, without specifying how that would be accomplished in a drink.

Children and adults were both expected by participants in all focus groups to like the product because of its color, taste, odour and similarity to the familiar products they had named. This is borne out by the Likert scores, where the product received a mean score of 6.3 (SD=1.1) for perceived adult appreciation – tied with the seasoned pillow for top score in this category. Regarding perceived child appreciation, the vanilla drink's score (6.2, SD=1.4) put it in sixth place among all products.

Use of Product during pregnancy

Women indicated a slightly more than neutral view of their likelihood to drink the product every day, with a Likert score of 4.5 (SD=1.1) that tied it for fifth place with the vanilla biscuit (4.5, SD=1.0). However, none of the products had a mean Likert score of more than 4.8 (the score shared by the savoury Plumpy Mum and the seasoned pillow). During the focus group discussions, women were positive about their likelihood to use the product throughout pregnancy, both because they liked its taste and because of its health benefits. In FGDD, for example, participants said they could drink the product every day for 12 months '*To be strong'* and because *'it has benefits'.* In FGDB, participants focused on the characteristics of the drink, saying they could drink it every day because *'Everything is good in this'.* In FGDC, women expressed the intention to eat the product every day, but stated that '*Sometimes it can be missed but will eat…'* and that *'It will be missed during fasting period and all otherwise it can be eaten regularly'.* The vanilla drink stands out among products, however, for the number of women (n=11, 27.5%) who said that the portion size was more than they would want for a daily snack. The serving sizes of most products were deemed the right amount by most women, with only the widely-disliked cocoa drink approaching this number of women who thought the serving size was too large (N=9, 22.5%)

Although the vanilla drink requires preparation (mixing the drink powder with water), this was not viewed as an obstacle by most focus group participants. In fact, in FGDA several participants said that the fact that the product was liquid might make it easier to eat in front of others; for example, one participant said '*Mix it and drink it like water. Nobody will even know. Will say drank water, and won't even know*'. Women in each focus group said that it was easy to put into their bags and to take it with them if they left the house. As a participant in FGDB stated, '*It's just one packet, I can put it anywhere and take it. If you have a pocket, you can put it in your pocket and go, some can put it in their hand purse and take it. If anyone [has] a big bag, they can take it in their bag'.* Similarly, a woman from FGDD emphasized, *'If in [an] emergency we have to go out, we can buy a water bottle and put it in'.* Two participants in FGDA noted, however, that the product might be difficult to carry and use outside the home. As one commented: '*It's because this is a mixing thing, we need to take water, take glass. If it's in home mix in water and no one will know. Now, while taking out, we need water, mix it and if someone will see, he/she will ask what you are eating'.* The vanilla drink's mean Likert score of 6.2 (SD=1.3) for 'convenient to eat' reflects general moderate agreement that the product is convenient, although its score was the fourth lowest of all products, perhaps reflecting the extra steps involved in preparation within and outside the home.

Participants in the one focus group (FGDA) that was asked about when they would eat the product agreed that they would eat it during their morning snack time and indicated that it would replace their normal snack: '*If eaten as a (morning) snack we don't have to worry till 10-11 AM in the morning'.*[5]

With respect to sharing, the participants in FGDA (the only group asked about sharing this product specifically) stated that people would not expect to share the vanilla drink: *'This is a medicine and for pregnant women, why to expect? They would not expect'.* This is confirmed in the Likert scores for sharing; the vanilla drink's mean Likert score of 1.8 (SD=1.3) for likelihood of sharing was the lowest of all products. Women in FGDA also said that their share of mealtimes would not be reduced as a result of receiving the product.

[5] In Nepal, a 'morning snack' is a light, pre-breafast snack that is consumed with tea. Breakfast consists of rice and daal and is usually eaten around 10am.

Vanilla biscuit

Product characteristics

The vanilla biscuit was ranked consistently high in the quantitative tools. It received the second highest score of all sweet products for overall appreciation with a mean Likert of 6.0 (SD=1.6), slightly ahead of the vanilla drink at 5.9 (SD=2.0). The 6.0 score put it in fourth place among all products on overall appreciation. An analysis of the distribution of overall likeability scores shows that 52.5% of participants said they liked the product very much, and another 25% liked it moderately. Only 7.5% disliked it very much or moderately. The vanilla biscuit also ranked highly on the individual product characteristics. Its mean score of 6.0 (s=1.7) on smell put it in second place amongst sweet products and fourth place amongst all products. It also tied with the vanilla drink for second place amongst sweet products for taste and colour, with a score of 5.8 (SD=1.9) for taste and a score of 6.2 (SD=1.4) for colour.

Product ranking data also indicated that the biscuit was ranked among the top three sweet products in all of the seven ranking categories. For size of portion, the sweet vanilla biscuit came in first place with 169 points. For taste, the biscuit ranked second, although its 156 points were 43 points less than the Plumpy Mum, which received 197 points. The overall sweet product ranking placed the biscuit third (with 150 points), behind the sweet Plumpy Mum (196 points) and the vanilla drink (161 points), whilst in the individual Top 3 ranking the product placed fifth with 28 points.

During the qualitative ranking exercise, the biscuits ranked in the 'Top 3' products in four of the five group discussions, and tied with the seasoned pillows for third overall. During the PAF, 70% (n=28) of the participants ate the full volume of the sample. The average consumption time, however, was the fourth longest of all products; it took participants a mean time of 5 minutes (SD=2.1) to finish the sample. In the group discussions, there was also relative uniformity in participants' comments on what they liked about the sweet vanilla biscuit. Women appeared to like the taste, colour and texture; they frequently noted, when asked what they liked most about the product, that they liked '*everything'*. One woman in FGDC suggested, '*I like everything, the taste, I liked it while [I was] eating it and and looking also'.*

A minority of women (in three of the five FGDs) did not like the product and reported negatively on its characteristics. In FGDC a large proportion of woman suggested that they did not like the taste nor the smell of the biscuit. During focus group discussions in FGDC and FGDD, participants also suggested that they did not like the taste of medicine in the biscuit. One woman in FGDC suggested the product was hard to eat and made her want to vomit, another agreed, '*it is unswallowable'.* One participant in FGDA noted '*I didn't like its smell, color and didn't like anything at all'.* The Likert data indicated that taste was the lowest ranking characteristic of the sweet vanilla biscuit. As outlined above, for taste it tied for third place among sweet products and tied for fifth place among all products, with a mean score of 5.8 (SD=1.9).

All women agreed that children would like to eat the vanilla biscuit. Reasons cited for why were primarily linked to the sweet taste. In the quantitative data, the vanilla biscuit tied for second highest score in terms of its appeal to children with a mean Likert score of 6.6 (SD=0.9). One woman in FGDE explained '*Children will not leave it. They will like its taste, then they will eat all at once… [because] it is sweet and tasty'*.

It was also suggested that the sweet taste was a key factor influencing the likelihood that adults would appreciate the vanilla biscuit however additional factors affecting perceived adult usage were also indicated in the group discussions. In addition to taste, participants suggested that adults would enjoy the appearance of the biscuits as well as the '*benefits'*. Further, greater heterogeneity in the tastes of adults was recognised, in FGDA one woman noted '*Some would like sweet, those who like sweet taste would like it. [Those] who like sour things would [like it] less'*.

Participants found a positive resemblance between the product and other biscuits with which they were familiar; in FGDA, FGDB and FGDD women suggested that the vanilla biscuit resembled a locally-known biscuit brand known as 'Parle G'. A negative resemblance however was identified in FGDC where women

found the taste to be similar to *'Kayam Churna'* a type of Ayurvedic medicine used for constipation. For this reason, women agreed, '[since its similar to Kayam Churna], no, I don't like.

Use during pregnancy

The majority of women reported that they would eat the product throughout pregnancy, although the factors that influenced why they would consume the product differed across focus groups. In FGDA, DFGB, FGDC, and FGDD, daily consumption in pregnancy was directly linked to the taste of the biscuit, whilst in FGDA, FGDB, FGDD, FGDE reasons cited were related to the fact the vanilla biscuit was perceived to be medicine with health benefits. In the Likert data, the vanilla biscuit was perceived as a food by 45% (n=18) of women, in contrast, only 8 women (20%) perceived the biscuits as a medicine. Thirty-five percent (n=14) perceived it as both.

Only in FGDA was the likelihood to eat the product during pregnancy linked to the ease at which it could be consumed and it was noted that the biscuit could be eaten while walking or on the move. In the quantitative Likert data for convenience of consumption, the vanilla biscuit was tied for second place amongst sweet products with a score of 6.3 (SD=1.1). In the ranking data, the biscuit placed third out of all sweet products (with 143 points) in the ease of consumption category.

A number of women in FGDC insisted that they would not eat the product during pregnancy, and suggested that the 'bitter' taste and the long time needed to chew the biscuit before swallowing were off-putting. One woman suggested, the portion '*has six pieces, I could hardly eat one*'.

Findings 3: Additional product feedback

The six remaining products (those that finished outside of the top 5) are presented below in order of their ranking in the 'Top 3' individual ranking exercise. These products all were ranked notably lower than the top five products and most received only a handful of points in the individual ranking. The highest ranked, the vanilla sticks, received a total of 14 points – relatively far behind the vanilla biscuit's 28 points. The lowest ranked, the unseasoned pillow, received just one point, meaning that a single participant chose it as her third most preferred product.

Filled sticks

Product Characteristics

The filled sticks received 14 points in the 'Top 3' overall product ranking, placing it in sixth place; it was chosen as the top product by 2 women, the second most preferred by 2 women, and the third most preferred by 4 women. Its other overall scores are consistent: Its sum of ranks score for the sweet product overall ranking was 132 out of a maximum of 240 points, or 55% of available points, and its Likert score for overall appreciation was 5.8 (SD = 1.7), both of which were the sixth highest scores overall. Its Likert scores for individual product characteristic were in many cases higher than some of the top five products. Its mean Likert score for colour (6.4, SD=0.9), for example, was tied for the second highest score of all products and its scores for taste (6.1, SD=1.5) and texture (6.1, SD=1.2) ranked well among all products. The distribution of responses for overall likeability show that 70% of participants liked the product very much or moderately, and 7.5% disliked it very much or moderately. Sixty percent of participants consumed the full sample, tied with the cocoa drink for the fifth highest percentage consumed.

Focus group comments reflect considerably more positive views of the filled sticks than is immediately apparent based on their ranking scores. Most participants liked the product, including its colour, flavour, smell and texture. The mix of salty and sweet was mentioned by several participants as a particularly positive factor. In FGDC, for example, one participant observed, *'The upper pipe tastes plain and salty and inner is sweet. When you eat mixing both then it is tasty'*. In FGDB, similarly, a participant said, *'It is delicious it is salty, spicy, it has everything'*. Nonetheless, a small number of women thought that the product was too sweet, and one commented that it tasted like a savoury potato snack called '*Phopi'* – apparently a negative association. No changes were suggested during the focus group discussions. The product was also positively associated with familiar biscuit and chocolate snacks including the *'Parle G', 'Tasty'* and *'Butter Gold'* biscuits and *'Ghailadu'*, a chocolate that has cream inside. Others said it was familiar to 'Khoa', a dairy product made from boiling milk, and *'Halwa'*.

Most participants agreed that children and adults would like the product, because it is similar to familiar biscuits and tastes good. This is consistent with the quantitative data showing that the filled sticks were expected to be one of the popular among children and adults. For perceived child likeability, its score was 6.7 (0.8), the highest of all products, and its adult likeability score was 6.1 (SD=0.9), the fourth highest ranking of all products.

Use during pregnancy

There was broad consensus among focus group participants that they would continue to eat the product every day during pregnancy; relevant drivers of use included the benefits to themselves and their child and their favourable opinion of the taste. In FGDC, for example, one participant said '*Baby will grow well and it will be good for the mother'.* The quantitative results confirmed an intention to use the product daily if it were provided, where the filled sticks had a mean Likert score of 4.8 (SD=0.6) – tied with the sweet Plumpy

Mum for the highest anticipated use score. The product was also perceived as easy to use among the women who were asked about the topic. In FGDA, participants confirmed that the filled sticks were *'the easier amongst all, because take a small amount, take in the Polta (pocket). We can eat while walking. It's very easy'*.

Mango bar

Product Characteristics

The mango bar ranked seventh in the 'Top 3' overall product ranking with 12 points. It sum of ranks score for the sweet product overall ranking was 103 (42.9%) – the second lowest of any product, just above the cocoa drink. Its mean Likert score for overall appreciation was 4.8 (SD=2.4), which was the second lowest of all products. Only 47.5% of participants liked the product very much or moderately, while 27.5% disliked it moderately or very much, the second lowest percentage of favourable rankings and the second-highest percentage of negative rankings. Fifty-five percent of participants finished the sample. Its mean Likert scores for individual characteristics were also low; for colour it received a mean score of 5.1 (SD=2.2) and for taste, texture, and smell its scores were 4.8 (with SDs ranging from 2.3 to 2.4), the same as its score for for overall appreciation.

Focus group data reflects a definite split of opinion about the mango bar. Some participants did not like anything about the product. Others singled out the smell and taste as unappealing, describing it both too bitter (FGDE) and too sweet (FGDA). One participant in FGDE thought the mango bar *'smells rusty'*. In FGDD a participant objected to the smell of green leaves she perceived in the product. In FGDB, half of the participants agreed that the taste of the product was not good (but noted parenthetically that the cocoa drink was even worse). Still, there were many participants who liked the product. Many mentioned its good colour, smell and taste; they liked the peanuts and mung (lentils) contained in the product and its sweetness. The only familiar product to which they found the bar similar was *'gazzak'*, a type of dessert made from boiled sugar and peanut pieces, although other participants recognized the ingredients in the product, particularly the peanuts. The women who did not like the smell of the product suggested it be changed, and one suggested that the bitterness (attributed to the *'til'* (sesame seeds) the product contains should be altered as well. No other changes were suggested.

Participants largely believed that children would like the products because of its sweetness and similarity to '*gazzak*', because of the product's peanuts and crunchiness, and, in the words of one, *'because children will eat anything'.* Adults were expected to like the product for many of the same reasons, though some participants thought that some adults might not like the product due to people's individual tastes. The Likert scores for child appreciation and adult appreciation were 5.2 (SD=2.2) and 5.0 (SD=2.1) respectively.

Use during pregnancy

Women in focus groups expressed a likelihood of eating the mango bar daily during pregnancy to the extent that they were able to tolerate the product. Some of those who said they were likely to eat it said they would do so because of the taste, but more referred to the health benefits of the product. Several participants said they would not be able to eat the product, however, because of aversion to its smell or taste. A woman in FGDB said, '*This food can be eaten if you take the taste away',* while a member of FGDE said she could not eat it during pregnancy because *'I feel like vomiting as soon as I keep it in mouth'.* The mango bar was tied with the curry biscuit for lowest mean Likert score on 'willingness to use daily if provided'. Its score of 4.0 (SD = 1.4) and relatively low standard deviation indicate that women are ambivalent about whether they would use the product every day. Only participants in FGDA discussed at any length ease of use of the product, and these women said that it was easy to eat at home as well as elsewhere: *'Put it inside the pocket, take out and eat'.* However, the mango bar had low Likert scores on ease of use: its score of 5.6 (SD=1.8) for 'convenient to eat' was the second lowest of all products, and its

score of 5.4 (SD=1.8) for 'convenient to eat between meals' was tied with the curry biscuit for the lowest of all products.

Masala Bar

Product Characteristics

The Masala bar ranked eighth of the eleven products in the individual Top 3 ranking, receiving 8 points in the individual top 3 ranking. It received scores on other measures that put it consistently in the middle to bottom half of the savoury products and in the lower half of products overall. Its individual overall likeability score of 102 (51%) in the savoury product ranking put it in seventh place among all products. Its Likert score for overall appreciation was 5.2 (SD=2.3); for comparison, the lowest score for a top five product was 5.85 (SD=2.0) (for the vanilla drink). In terms of the distribution of Likert scores for overall likeability, 60% liked the product moderately or very much, and 22.5% disliked it moderately or very much. Only 45% of participants consumed the entire sample serving, the third lowest of all products. Its Likert score for colour (5.8, SD=2.0) was its highest score on the hedonic characteristics and placed it seventh overall in that category (third among savoury products). Its scores for taste, texture and smell were second lowest of the savoury products.

In the focus group discussions, the responses were mixed and in many instances highly polarized. In FGDA, all of the women who responded said that they liked it, and that it has good taste and colour; no unfavourable characteristics were noted. Similarly, in FGDD the women didn't identify anything they didn't like about it, and said they liked the colour, taste, and everything else; only one woman said she didn't like the *'mung daal'* in it. In FGDB, participants mentioned disliking the taste and smell; the texture was also described negatively as something that feels *'rough'* and *'sticks to your teeth'*. It was mentioned that the product would taste better if it had less salt and more sugar. In FGDC, some participants liked the product while others did not; one said *'Colour and texture are okay but did not like it while eating'*, and another added *'It is not good while eating'*. The smell was mentioned as a negative as well. In FGDE, several women liked all aspects of it, including its colour, taste and smell, while one refused to eat it, *saying 'I do not like it…If I eat I will vomit'*.

A number of participants suggested that the masala bar reminded them of peanuts, mung daal, and other local foods composed of beans and pulses, though in FGDB participants did not identify any food that resembled the bar. The similarities were said in FGDA to make it easier to eat, and in other groups the similarities were perceived to make it likely for children and adults to like it. In FGDB and FGDE, the fact that the product contained peanuts was expected to make it particularly appealing to children and/or adults. The mean Likert score for adult appreciation for the masala bar was 5.6 (SD=1.9), and for children it was 5.4 (SD=2.0).

In the head-to-head comparison between the masala bar and the mango bar, nearly all preferred the sweet bar. They preferred the sweet taste of the mango bar; as one participant in FGDE noted, the savoury bar is *'salty-salty'*.

Use during pregnancy

In most of the focus groups, the participants' ability to eat the masala bar was closely tied to whether they liked (or could tolerate) the product. Participants who liked the product said that they could eat it every day because of its taste and colour, as well as because of its health benefits. As one participant in FGDD stated, it could be eaten during pregnancy because *'it benefits everything. The child will be good. If the mother eats, it does good for the mother too'.* It was further stated that the product could be eaten every day because '*it gives energy to the child and mother, benefits them'*. However, as might be expected, those who did not like the product's smell and taste said they would be unable to eat it regularly for twelve

months. Its mean Likert score for 'would use daily if provided' was 4.3 (SD=1.1) indicating only mild agreement that women would use the product. This is the third lowest mean Likert score of all products; as noted previously, however, there was less variation among mean scores for this metric than others, with the highest score for daily use only 4.8. In FGDA, women said that sharing would not be expected. The Likert score for expected sharing with others is among the lowest at 1.9 (SD=1.3).

Curry Biscuit

Product Characteristics

The curry biscuit tied for second-to-last place among all products in the individual 'Top 3' ranking with 6 points overall. It was not chosen as a 'Top 3' choice by any focus group. It had the lowest sum of ranks score for overall appreciation among the savoury products (88, 44% of available points) and the third-lowest of all products, just behind the mango bar (103, 42.9%) and the cocoa drink (98, 40.8%). It was tied with the cocoa drink for the lowest mean Likert score for overall appreciation (both products have scores of 4.4, SD=2.6)). It had the lowest scores of all savoury products on the individual Likert measures, except for likelihood of sharing, where it place at the top of all savouries (i.e., most likely to be shared of all savoury products), perhaps a partial reflection of its overall unfavourability rankings. When considering the distribution of overall likeability rankings among all products, the curry biscuit had the third-lowest percentage of women stating that they liked it moderately or very much (52.5%) and was tied with the cocoa drink for the highest percentage of respondents disliking it moderately or very much (35%). Only 17.5% of study participants finished the sample serving of the curry biscuit – the lowest of all products. It was behind the unseasoned pillow (22.5%) which was in turn notably far behind the third-last product, the masala bar (45%).

Participants in the focus group discussions did express some favourable impressions of the curry biscuit. In FGDA, some participants likened it to *'pachak'* and *'hamjola'*, both favourable associations, and in each of FGDB, FGDD, and FGDE, at least one participant liked aspects of the product. In FGDC, for example, a participant liked the smell, comparing it to that of *'Dalmoth'*, a local snack made from lentils. This was a positive association. The majority of other participants who expressed a view, however, did not like the biscuit. In FGDA, participants said they didn't like the colour, texture or the taste of the product: *'we also didn't like it, it does not feel good while eating, and the taste is not good*'. In FGDB participants made specific and negative reference to individual flavours in the product, such as cumin pepper, fenugreek, turmeric and *jawno* (thyme seed), and commented that it was too salty and tasted like medicine. Similar references were made in other FGDs, though whether the specific seasonings were negative or positive factors was not always clear. Other negative comments included: *'its bitter bitter', 'tastes like a tablet'*, and it's *'like goat poo'*. (FGDE). The main suggested improvements were to reduce the bitterness, reduce the turmeric and fenugreek, and make it sweeter.

The focus groups were similarly split about whether adults and children would like the curry biscuit, with the main view expressed being that some would like and some would not. In FGDC, where the perception of the product was mainly negative, participants said that children would not like it because *'It doesn't have a good taste while eating'* and that adults similarly would not like it *because 'there is no good taste, nobody will eat it'*. The curry biscuit's adult likeability score (4.5, SD=2.3) was the lowest of all savoury products by a full point and tied with the cocoa drink for the lowest of all products. Its perceived child likeability score was the lowest of all products as well at 4.7 (SD=2.1).

Use during pregnancy

As was the case with many products, the women who strongly disliked the taste of the product said they could not eat it every day; those who liked it said that they would eat it daily. In FGDC, the predominant

view was that they could not eat it daily*: 'It tastes very bad, now I have just a little and feel like vomiting, if it is taken daily then it will definitely cause me to vomit'*. In FGDD, where the view of the product was more positive, only one woman gave taste as the reason she could eat it during pregnancy; others said they said that they would eat it because it would benefit their child and it *'gives energy'*. In the quantitative measures, its mean Likert score for willingness to use daily if provided was 4.0 (SD=1.3). This was tied with the mango bar (SD=1.4) for lowest willingness to use daily of all products. The curry biscuit also had the lowest scores on convenient to eat (5.5, SD=2.2) and convenient to eat between meals (5.4, SD=2.2); for the latter measure it tied for lowest with the mango bar. Regarding sharing, the curry biscuit tied with the mango bar for the highest score for 'would share with others' at 2.3 (SD=1.7).

Cocoa Drink

Product Characteristics

The cocoa drink was not widely appreciated among the participants, a fact that is confirmed in both the quantitative and the qualitative data. In the 'Top 3' individual overall product ranking, it tied with the curry biscuit for the second lowest sum of ranks score of all products (6) and was not chosen by any focus group as a 'Top 3' product. In the savoury product individual overall ranking it received 98 points out of a possible 240 (40.8%); this was the lowest percentage of points received by any product. Its mean Likert score for overall appreciation was 4.4 (SD = 2.6), putting it in a tie with the savoury biscuit for lowest overall likeability. Its scores for individual product attributes (colour, taste, texture and smell) were also low; it received the third lowest score of any product for colour (5.3, SD=1.9) and smell (5.1, SD=2.2), the second lowest score for taste (4.3, SD=2.5), and the lowest of all products for texture (4.3, SD=2.5).

Some women responded positively to the product, remarking on its good taste, colour and smell. Those who liked it compared its taste to Horlicks or chocolate, as well as to a Nepali chocolate wafer product called *'Chocofun'*. Others, however, did not view the similarity to *'Chocofun'* as a good thing: *'This is inedible, neither its colour is good nor its smell, its taste is also not good it's like 'chocofun''*. (From a participant in FGDC.) Many women commented on the bitterness of the product. In FGDA it was said to taste like medicine and *'mungrail'* (black cumin seed, an ingredient in a mixture given to lactating women to increase milk production). In FGDC, women referred to the product's *'burnt taste'* and disliked its taste, colour and smell, although one woman compared it to coffee, which she likes and therefore likes the bitter taste. Some of the most negative comments came from participants in FGDB: *'It tastes bitter and it's black'. 'Just looking at the colour might make people feel like vomiting. It looks like sewage water'. 'It tasted weird as soon as I put it in my mouth. I wanted to throw it and run away that day'*. When asked how to improve the product, the most frequent response was to remove the bitterness and add sugar/sweetness.

Both the quantitative data and the qualitative results reflect participants' view that adults and children would react as they had to the product. In the focus groups where participants widely disliked the product, such as FGDB, children were expected to dislike it as well; in others the opinions were more mixed. The bitterness was repeatedly cited as the reason that neither adults nor children would like the product. The cocoa drink received the second lowest mean Likert score for perceived child likeability (4.8, SD=2.2) and tied with the curry biscuit for lowest score for adult likeability (4.5, SD= 2.0).

Use during pregnancy

As was the case with the vanilla drink, the cocoa drink was perceived as easy to prepare and eat at home and away, despite the fact that it requires mixing and access to clean water*: 'Because take it putting in the packet and fill the bottle with water and eat it, dissolving in it, and isn't it easy, it's very easy'* (FGDB). However, a number of women questioned the relevance of the product's ease of use given that they didn't

like it. As one woman in FGDB said*, 'it's easy to make but it's difficult to drink…It's quite easy to take with me, but what's the point of taking it with me if I don't drink it?'* Participants' dislike of the cocoa drink also appeared to affect to some degree their willingness to use it during pregnancy. Its mean Likert score for willingness to use daily if provided (4.1, SD=1.3) was the second lowest of all products, just above the curry biscuit and the mango bar, both of which had mean scores of 4.0. During the focus group discussions, however, some women said that they would consume it daily for 12 months*: 'If it gives energy to the baby, energy to the mother, then even if you don't like the taste we have to drink it'*. Others who said they disliked the product suggested that it should be treated like medicine and tolerated for its benefits. *'[W]e should give this to the pregnant woman if it is recommended for her. She should drink it as like a medicine. For example: if she becomes sick, she would go to the doctor and eat the medicine prescribed by doctor. Whatever the taste, it must be eaten…'*

Unseasoned Pillow

Product Characteristics

The unseasoned pillow scored the lowest of all products on the individual top three ranking; only one participant chose it among her top three (and that was in third place), giving it one point out of a possible maximum of 120. It was not chosen by any focus group among its top three choices. Its score on the savoury product individual sum of ranks (96, 48% of available points) put it in second-to-last place among the savoury products, and in eighth place out of all eleven products on a percentage (followed by the mango bar, the curry biscuit and the cocoa drink). It was third in Likert scores among the savoury products (following the top-five choices of the savoury Plumpy Mum and the seasoned pillow) for overall appreciation, taste, texture, and smell, but still below other products, particularly the sweet products: it was ranked seventh or eighth along all of hedonic characteristics when compared to all products. Focus group participants expressed a near-unanimous preference for the seasoned version of the pillows, suggesting, for example, that the unseasoned version was *'tasteless and bland'*. Only 22.5% of women consumed the test portion of the unseasoned pillow, the second lowest of all products. Its scores on the savoury product ranking put it in fourth place out of five products on all individual characteristics, and it placed fourth of the five savoury products on 'overall' as well.

In one focus group (FGDE) participants liked the product, particularly the colour and taste; they *'liked everything about* it' according to one participant. Participants in that group likened the product to popcorn, which was a positive association; they said that they taste and smell were similar to popcorn. Reactions in the other FGDs were less positive. In FGDA, most participants did not like the product, saying that it tasted like soybean and cornflour or white flour *'pitho'*. Comments included that the product was 'like soybean, bland, no salt nothing' and *'this has nothing good, has neither taste nor* colour'. Participants in FGDC also described the product as tasteless, or that it was just passable: *'it is a little good'*. In FGDD and FGDB, some women liked the product, commented that it was sweet and tasted like soybean, which was perceived as a positive association in this group. In those groups that suggested changes, it was to make the product either spicy or sweet or salty (FGDA, FGDB, FGDC) – in short, to add some flavour to what they perceived as mostly tasteless. FGDD did not suggest any improvements, and in FGDE (the group in which participants compared it to popcorn) one participant suggested adding sugar but others thought the product was good as it was.

Regarding whether adults and children would like the product, participants again had varying responses. Participants in some groups said that adults and children would like it; the similarity to popcorn was mentioned as a driver of this in FGDE, and the overall taste in FGDD. In FGDA, FGDB and FGDC, participants said that some children and adults would like the products and some wouldn't. The comments from FGDA are illustrative: *'some children might eat and some children might throw it'; 'individual people have different taste, that I understand, but this has no taste how people like it, nobody eat this'.*

Use during pregnancy

As was the case with other products, the women without an aversion to the product stated that they would eat the unseasoned pillows because of the health benefits: *'When you are sick, no matter how un-tasty the food is, you have to eat. For its benefit, vitamins you have to eat'*. In that focus group (FGDD), participants said they would eat the full two packets per day because of the benefit to the mother and child. Participants in FGDD and FGDE agreed they would eat the full dose of the product during their entire pregnancy for the same reason. In FGDA, however, the chance of pregnant women was deemed to be low by those who responded, though one participant allowed, *'we did not like it, some people might like it and they could eat'.* It was viewed as easy to eat because no preparation was required, and participants in FGDA would eat it in either morning or evening snack where it would make them full, not requiring any other snack foods. It would not reduce their share of household food allocation nor would it be expected that they'd share the product with family members.

Discussion

This section examines some of the overarching themes that appeared during analysis of the qualitative and quantitative data. Triangulating the quantitative findings with the qualitative data, this chapter examines several areas of relevance for product selection and use including perceptions on sharing and similarity to other products.

Perceptions on sharing

The likelihood to share a product with others in the household can represent a significant factor in intra-household food dynamics. During data collection, sharing dynamics were crucial for understanding the pregnant woman's perception of use of a product, especially whether the likelihood to share would affect daily consumption. Sharing was measured in the PAF using the 7-point Likert scale. Participants were asked to take into account the fact that the product was a nutritional supplement uniquely for women and were subsequently asked to what extent they were likely to share the product with other people, from 1=definitely would not share to 7=definitely would share. The lowest recorded mean score was registered for the vanilla drink at 1.8 (SD=1.3) and the highest score (2.3, SD=1.7) was for the curry biscuit and the mango bar (SD=1.6). Standard deviation measures across sweet and savoury products were high, indicating high levels of variation within the answers.

The focus group framework was designed with specific questions that sought to elicit in-depth information around household sharing, both on the expectation to share and the likelihood to share within the family. Due to time constraints following the first focus group discussion (FGDA), the product-focused questions around sharing were removed from the framework in lieu of a more general discussion about sharing (see methodological limitations), although the data gathered in the general discussions overlooked some of the issues highlighted in FGDA.

Although during FGDB, FGDC, FGCD and FGDE the broad discussion around sharing did not highlight specific intra-household dynamics that may effect product use and consumption, during FGDA (prior to product specific questions on sharing being removed) some interesting comparisons emerged. Women consistently agreed that it would not 'be easy' to eat products in the home setting and suggested that eating in front of others, without sharing, would be problematic. In many cases it was suggested that it may be preferable for women to 'hide' away from others so that they could eat the products alone. Participants also note, that it would be necessary to give something to others in the family to eat while they consume the nutritional supplement. This appeared to be especially important in households where there were children present.

The following excerpt from FGDA identifies a number of intra-household challenges around sharing conventions and is consistent with feedback for the sweet and savoury Plumpy Mum.

Participant 4: It is easy to eat in front of other family members, but for the children we either need to give biscuits or something else to distract them. Or we need to eat inside the house where there are no children, or need to eat when we will be alone…

Participant 8: They might think, "I have this food but she eats every day something separate", it won't be easy.

Participant 5: "She gave this to me, but she is eating something else", they might say. So it is not easy. If I gave biscuit to others and I would have 'Halwa' everyone would expect to have 'Halwa'.

Participant 6: It is easy to eat with adult and difficult to eat with children.

Participant 8: It is also not so easy to eat with adult. It is not easy if one person is eating and other people are looking at them, everybody expects to have a share. Both adults and children, they might say she is eating by herself and not sharing with us.

Participant 4: All people do not expect the same way…

Participant 8: In my house, if you see some people eating they say, you are eating but not sharing with us.

Participant 6: In some families' people might say that.

Participant 8: In my house, even if I take one drop of medicine my mother- in- law asks for it. One night I came from ultrasound and I was drinking milk, my mother-in –law said to me you are drinking milk but you do not give to me.

For a number of other products, including the seasoned pillows, the expectation around sharing was perceived to be different. Participants indicated that they would not be expected to share the product with other adults in the family because the product is made to be beneficial for pregnant women. One woman suggested, *'No, they won't expect, they consider the product is for pregnant women and beneficial for her and her baby. It helps them to be healthy, so they might not expect to share food'*. Similarly, during discussions around sharing the vanilla biscuit, women agreed *'Guardians would say, "it is for pregnant women's benefit, why should we expect to share?" Family members won't expect us to share'.* In the presence of children however, the likelihood of sharing appeared to increased and women indicated, *'adults might think it's a medicine but children will ask what mom is eating. An adult would know the value of the product, why she is eating this but children will not understand, so children will expect to share what mom is having'.*

In FGDB, FGDC, FGDD and FGDE participants consistently agreed that it would be 'easy' to eat all products in their household without pressure or expectations of sharing with adults. In FGDB and FGDC women did suggested that there was a higher likelihood that they would share the products with children. In FGDB, one woman stated *'If the children want it then we can give them some from the packet'.* Others in FGDC affirmed, *'We must give them a little to children'* and *'even if you don't give a lot, you have to give a little by breaking'.*

Resemblance to other known products

Participants consistently noted similarities between the supplements and other products with which they were familiar. In some cases, participants commented on the resemblance to brands such as *Parle G* (filled sticks, sweet Plumpy Mum, vanilla biscuit), *ABCD* (seasoned pillows) and *Horlicks* (sweet and savoury Plumpy Mum, vanilla drink, cocoa drink). In other instances, women likened the product to specific local foods and or flavours such as *Khoa* (filled sticks, sweet Plumpy Mum), fenugreek (curry biscuit), *peanut satu* (vanilla drink, savoury Plumpy Mum) and *mung daal* (mango bar, masala bar).

Although the facilitators heavily prompted the participants about the resemblance to other products, it was not always clear whether these associations were positive or negative. Across all discussion groups many women simply highlighted the similarity but did not elaborate on the impact of the association. In FGDC, for example, discussions about the seasoned pillows focused on what products the pillows resembled rather than on whether that resemblance would influence whether they liked the product, or their likelihood to eat it during pregnancy. Women simply stated, *'it is like 'cheese balls''*, *'it's like 'kurkure"* and *'it tastes like 'Khatta meetha''.*

In contrast, discussions about others perceptions of the product focused on the positive associations that could be drawn from the resemblance to other products, foods and flavours. It was suggested that children would like the mango bar because of its similarity to *gazzak* (a dessert made from boiled concentrated sugar and peanut pieces). In FGDC participants indicated that adults would like the sweet Plumpy Mum

because *'it's like ghee, butter that's why'*. In FGDE it was suggested that children would like the savoury Plumpy Mum's similarity to *'katora'* (a local food made from sugar), and it was agreed that adults would like its *'chatar patar'* (salty sour) taste.

Use of products during pregnancy

In FGDA and FGDB, participants raised concerns about being limited to use of one product for the duration of pregnancy. Some women suggested that they would *'get sick'* of eating the same product every day during their pregnancy, while others questioned, *'How can a person eat same thing always?'* (FGDA). It was suggested by these women that *'desires'* would not be fulfilled if the same products were eaten daily, and there was general agreement that products should be alternated weekly. One woman in FGDB explained, *'look, people just don't eat rice and daal every day, they sometimes eat vegetables and rice, don't they? It is possible to eat for one week* [then] *alternate'.* The majority of participants in both groups agreed that they could eat supplements throughout pregnancy, although it was highlighted that alternating between more than one supplement would be preferable. One woman in FGDA noted that a key factor would be the willingness of the manufacturer/supplier to offer additional options: '*Now, it's the willingness of the person who will give [the product, if they] give the same or different'*.

Amongst the small number of women for whom changing or alternating the products was less of a concern, a key factor affecting daily utilisation practices during pregnancy was whether the supplement would be provided free of charge. In FGDA one women suggested, *'If given we can eat. We would not miss a day without eating'*. Women in FGDB noted 'If it is provided for free can you eat it but cannot afford to buy it'; another agreed that *'If provided for free could eat for 12 months too but cannot eat if buying for 12 months…Those who can buy and eat will do so as per their ability. those who can't how would they eat?'.*

Conclusions and Recommendations

Based on the analysis of qualitative and quantitative data, two products were identified as the preferred fortified BEP supplements for use in Phase 2 of the study: the sweet Plumpy Mum and the seasoned pillows. An additional two products, the vanilla drink and the vanilla biscuit, were identified as the next tier of favoured products for use in Phase 2, with the vanilla drink appearing to be the marginal favourite of the two.

The savoury Plumpy Mum was among the top five products and would probably place as third choice overall. It placed fourth in the individual Top 3 rankings (34 points) but was not chosen by any focus group as a top 3 product. It had the third highest overall Likert score, the second highest overall sum of ranks percentage, and ranked between first and third for nearly all of the individual Likert and sum of ranks scores for product characteristics. However, it is understood that the third product should be a different format from the other two so is not presented here.

Examination of Phase 1 top products

Sweet Plumpy Mum is the clear top product according to quantitative data: it scored highest in both Top 3 rankings (individual and FGD) and in the overall sum of ranks data reflected in the sweet/savory PRF. It also had the second highest mean Likert for 'overall' liking of the product (6.32, which was 0.03 points behind the first place seasoned pillow (6.35)). Ninety percent of women liked it very much, moderately or slightly and only 5% disliked it to any degree – tied for the second highest approval and tied for the lowest disapproval of any product. Seventy-five percent of participants said they liked the sweet Plumpy Mum 'very much', the highest of all products.

FGDs indicated a high likelihood of eating it daily during pregnancy because women liked all aspects of it, because it has positive associations with other foods they like (Horlick's, Khoa, ghee, Halwa, others), and because it has health benefits. There was broad consensus that adults and children would like it as well. No aspect of the product was disliked and no changes were suggested.

In FGDA issues were raised around eating it while others are around and not sharing it: *'How to eat in front of many people, it does not look good, one person is eating and rest of others are looking'.* Particular concerns were raised about eating it in front of children and it was suggested that they'd have to eat it alone or sharing might be required. There was broad consensus within the FGDs that sharing would be expected.

However, this was the first product tasted in FGDA, which may have impacted the discussion of sharing. Likert scores for 'likelihood of sharing' showed low scores with little variation among all of the products; scores ranged from a low of 1.8 for the vanilla drink to a high of 2.3 for the mango bar and curry biscuit (with 1 being 'definitely would not share').[6]

The seasoned pillows scored well on the quantitative tools and appears to be the second choice product, though the results are not as consistent as for the sweet Plumpy Mum. The pillows finished second in the individual Top 3 ranking, but third in the FGD Top 3 ranking (the vanilla drink was second), and third among all products in the sum of ranks for overall preference (the savoury Plumpy Mum was second). Its mean Likert for 'overall' was the highest of all products, though just 0.03 points ahead of the sweet Plumpy Mum. 95% of women liked it very much, moderately or slightly and only 5% disliked it to any degree – the highest

[6] The high likelihood to share the mango bar and curry biscuit may have been partly related to the low overall likeability of the products, with a greater willingness to share perhaps indicative of women not wanting to eat all of the product.

approval and tied for the lowest disapproval of any product. Seventy percent of participants liked it very much, the second highest of all products.

During the FGDs a few women indicated that they disliked the product, though most did like it and all of its aspects. It was described as similar to a large number of known snack foods, including '*Chatpate'*, '*Kurkure'*, popcorn and cheeseballs. Participants said that it would be easy to use in the home and outside, as it could be carried in a pocket. However, some commented that it would not be easy to eat in front of others. It was agreed among most participants that both adults and children would like it. Most women in FGDs said they could eat it daily during the entire pregnancy; as one said, 'we can eat as much as you tell us'. They focused on the benefits to the unborn child, the vitamins, nutrition and energy for the mother, and the taste. Women in FGDA did not believe that sharing would be expected nor that their normal share of food would be reduced. The Likert score for sharing was the same for Seasoned Pillows as for the Sweet Plumpy Mum.

In short, the quantitative results, although not definitive, indicate a mild preference for the seasoned pillow over the other three remaining products in the top 5. The qualitative data confirms the overall positive opinion of nearly all women, and the other contextual information in the FGDs does not indicate any reason that the Seasoned Pillow is a poor choice.

The **vanilla drink** and the **vanilla biscuit** round out the top products and had scores that were very similar along all quantitative metrics. The vanilla drink scored better in both top 3 rankings and in the sum of ranks overall score. The vanilla drink had the third-highest individual Top 3 ranking score (37); the biscuit was fifth (28). The vanilla drink had 8 points (second place) in the FGD ranking; the biscuit placed third with 4 points. The vanilla drink's sum of ranks for overall preference was 161 (67.1%); the vanilla biscuit's sum of ranks was 150 (62.5%). The biscuit scored higher than the drink in the mean Likert overall score, however: the biscuit's mean Likert was 5.98 (SD=1.6) and the drink's was 5.85 (SD=2.0), a difference of 0.13.

The sweet biscuit and the vanilla drink had very similar individual Likert scores across nearly all individual metrics. They were tied for color, taste, adult likeability, and willingness to use daily. The biscuit scored .1 point better on texture, smell, and convenience to eat. The drink scored better (i.e., lower) on sharing, though as noted the distinctions between sharing scores across all products were minimal. The sum of ranks data for individual characteristics was also similar between the products. The biscuit scored slightly better on taste (156 vs. 151) and portion size and the drink scored better on texture, smell, colour, and ease of use. 87.5% of participants consumed the full sample serving of the vanilla drink, versus 70% of the sweet biscuit. On the question of how full one would feel after eating a full serving, more participants indicated that they would feel very full after having a full serving of the drink than the biscuit: 50% (n=20) of the participants expected that they would be very full after finishing the drink vs. 30% (n=12) who expected to feel very after eating the biscuits. An additional 35% (n=14) thought they'd feel moderately full after the drink vs. an additional 45% (n=18) who expected to feel moderately full after the biscuit. The distribution of Likert responses for overall likeability did show small differences: 85% of participants liked the drink to some degree (very much, moderately or slightly), versus 90% for the biscuit. Seventy-five percent of the participants liked the drink very much or moderately, versus 77.5% for the biscuit. On the dislike side, 15% disliked the drink to some degree (12.5% disliked very much or moderately); 10% disliked the biscuit to some degree (7.5% very much or moderately).

In short, the quantitative data show a slight preference for the drink, though the distribution of responses indicates that more women liked the biscuit (and fewer disliked it) than the drink.

The qualitative data provide some richer information to help understand the quantitative results, though that data is limited due to the reduced scope of focus group discussion in FGDB, C, D and E. In all focus groups, the reaction to the vanilla drink was positive and no aspects were disliked. It was compared to a number of familiar foods, including Horlick's, Cerelac and Prop-PL drink mixes which the women liked, and to '*Satu'*, another local product that was viewed favourably. This seems not to fully reflect the negative views of the product shown in the Likert overall responses. In contrast, women in three of the five focus

groups made negative comments about the biscuit, with half of FGDC participants reporting that they disliked it. It was said to be bitter and to smell and taste like medicine by some participants. Conversely, most participants likened it to other popular biscuits such as 'Good Day' and 'Tasty'. This familiarity was overall viewed as very positive.

Regarding use of the products, the qualitative data provide some information to better understand the quantitative data. Although the drink requires preparation, this was not viewed as an obstacle by most women in the focus groups, and this is consistent with the very similar Likert scores on 'convenient to eat' as between the two products: The vanilla drink's Likert score was 6.2 (SD=1.3), while the biscuit was 6.3 (SD=1.1). The need to carry water and a glass in order to use the product away from home was referenced as an inconvenience in one FGD, but other FGD participants stated that it was easy to make and use at home and away: '*It's just one packet, I can put it anywhere and take it. If you have a pocket, you can put it in our pocket and go, some can put it in their hand purse and go…*'. '*If in emergency we have to go out, we can buy a water bottle and put it in*'. The biscuit, of course, requires no preparation and was viewed as easy to eat at home and elsewhere. Several women noted that the biscuit could even be eaten while walking. Women also noted that they would need to follow the biscuit with water (something that was mentioned with respect to a number of products), so it appears that whether eating either product at home or away they would need access to water.

There is little distinction between the two products in terms of quantitative data on sharing or daily use. The vanilla drink had the lowest quantitative scores for likelihood to share, but those scores are, as noted, tightly clustered around '2-slightly likely' for all products and only 0.2 points on the Likert scale separate the sweet biscuit (2.0, SD=1.5) from the vanilla drink (1.8, SD= 1.3). Both products were viewed as appealing to children, with the biscuit somewhat more so (6.6, SD=0.9 for the biscuit vs. 6.2, SD=1.4 for the drink).

One factor of note is the observation among women in FGDA that the vanilla drink is easy to eat in front of people because the product, once mixed, is indistinguishable from water unless others look closely at it (it seems that Nepali households customarily use opaque, often metal, cups/glasses for beverages). As one participant in FGDA stated, '*Nobody will even know. Will say drank water, and won't even know*'. As a consequence, sharing of the drink might be minimized as women will be subjected to less pressure to do so. The limited FGD data on sharing make it difficult to reach a firm conclusion, however.

Product recommendations for Phase 2

As a result of the above analysis, it is recommended that the sweet Plumpy Mum and the seasoned pillows be selected for Phase 2.

The choice of a third product is less clear, though the vanilla drink compared to the vanilla biscuits appears to be the marginally stronger choice based on the quantitative research as it finished higher among most quantitative measures. However, their quantitative scores are quite similar. The limited qualitative data do not suggest a significant basis to prefer one product over the other, except the suggestion in FGDA that the drink product might be less susceptible to sharing and the greater number of negative comments about the biscuit among FGD participants. Additional considerations have been raised following conclusion of this phase of the research, most notably concerns about participants' reliable access to potable water, which may impact the ultimate choice of a third product.

Data gathered during Phase 2 can be expected to provide additional insights into factors affecting product use as well as any product modifications that may be needed before the commencement of Phase 3 of the NIPS study.

References

Acharya, Dev R., Jacqueline S. Bell, Padam Simkhada, Edwin R. van Teijlingen, and Pramod R. Regmi. (2010). 'Women's autonomy in household decision-making: a demographic study in Nepal.' *Reproductive Health* 7 (1):15. doi: 10.1186/1742-4755-7-15.

Acharya, Pratima Poudel, and Fiona Alpass. (2004). 'Birth outcomes across ethnic groups of women in Nepal.' *Health care for women international* 25 (1):40-54. doi: 10.1080/07399330490253210.

Christian, P. (2010). 'Micronutrients, birth weight, and survival'. Annual review of nutrition 30: 83-104.

Da Silva Lopes, K., E. Ota, P. Shakya, et al. (2017). 'Effects of nutrition interventions during pregnancy on low birth weight: an overview of systematic reviews'. *BMJ global health* 2, no. 3: e000389.

Engel, Jakob, Jonathan Glennie, Shiva Raj Adhikari, Sanju Wagle Bhattarai, Devi Prasad Prasai, and Fiona Samuels. (2013). 'Nepal's story: understanding improvements in maternal health.' *London: Overseas Development Institute*.

Ernst & Young. (2017). *Evaluation of UNICEF Nepal Country Programme Action Plan (2013-17).* India: Ernst & Young.

Fall, C., D.J. Fisher, C. Osmond et al. (2009). 'Multiple micronutrient supplementation during pregnancy in low-income countries: A meta-analysis of effects on birth size and length of gestation'. *Food and nutrition bulletin* 30 (4 suppl 4):s533-s546.

Gernand, A.D., K.J. Schulze, C.P. Stewart, et al. (2016). 'Micronutrient deficiencies in pregnancy worldwide: health effects and prevention'. *Nature Reviews Endocrinology* 12, no. 5: 274.

Government of Nepal Central Bureau of Statistics and UNICEF Nepal. (2015). *Multiple Indicator Cluster Survey 2014: Final Report.* Kathamandu, Nepal: Government of Nepal and UNICEF.

Haider B.A. and Bhutta Z.A. (2017). Multiple-micronutrient supplementation for women during pregnancy. *Cochrane Database of Systematic Reviews* Issue 4. Art. No.: CD004905. DOI: 10.1002/14651858.CD004905.pub5

Jiang, T. N., P. Christian, S. K. Khatry, L. Wu, and K. P. West. (2005). 'Micronutrient deficiencies in early pregnancy are common, concurrent, and vary by season among rural nepali pregnant women.' *Journal of Nutrition* 135 (5):1106-1112.

King, Janet C. (2003). 'The Risk of Maternal Nutritional Depletion and Poor Outcomes Increases in Early or Closely Spaced Pregnancies.' *J. Nutr.* 133: 5 1732S-1736S.

Kozuki,N., J. Katz, S. LeClerq et al. (2015). 'Risk factors and neonatal/infant mortality risk of small-for-gestational-age and preterm birth in rural Nepal'. *The Journal of Maternal-Fetal & Neonatal Medicine* 28, no. 9: 1019-1025.

Krosnick, J. A., S. Presser. (2010). In J. D. Wright & P. V. Marsden (Eds.), Handbook of Survey Research (Second Edition). West Yorkshire, England: Emerald Group.

Målqvist, Mats, Asha Pun, Hendrikus Raaijmakers, and Ashish KC. (2017). 'Persistent inequity in maternal health care utilization in Nepal despite impressive overall gains.' *Global Health Action* 10 (1):1356083.

Ministry of Health (Nepal), New ERA and ICF. (2017). Nepal Demographic and Health survey 2016: Key Indicators. Kathmandu, Nepal: Ministry of Health.

Price, J. I., and A. K. Bohara. (2013). 'Maternal health care amid political unrest: the effect of armed conflict on antenatal care utilization in Nepal.' *Health Policy Plan* 28 (3):309-19. doi: 10.1093/heapol/czs062.

Pradhan, A., B. Suvedi, S. Barnett, S. Sharma, M. Puri, P. Poudel, S. R. Chitrakar, N. Pratap K.C. and L. Hulton. (2010). *Nepal Maternal Mortality and Morbidity Study 2008/2009*. Kathmandu, Nepal: Government of Nepal. http://nhsp.org.np/wp-content/uploads/2016/08/MMMS-Final-Report.pd

Singh, J. K., S. Evans-Lacko, D. Acharya, R. Kadel, and S. Gautam. (2017). 'Intimate partner violence during pregnancy and use of antenatal care among rural women in southern Terai of Nepal.' *Women Birth*. doi: 10.1016/j.wombi.2017.07.009.

World Health Organization. (2017). WHO e-Library of Evidence for Nutrition Actions (eLENA), 'Vitamin A Supplementation.' http://www.who.int/elena/titles/full_recommendations/vitamina_supp/en/

World Health Organization. (2016). 'WHO recommendations on antenatal care for a positive pregnancy experience'. World Health Organization.

World Health Organization. (201)5. *Trends in maternal mortality: 1990 to 2015: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division*. Geneva: WHO http://apps.who.int/iris/bitstream/10665/194254/1/9789241565141_eng.pdf?ua=1