Acceptability and Effectiveness of a Locally-Produced Ready-to-Use Supplementary Food (RUSF) for Prevention of Undernutrition in Children Under Two Years in Cambodia

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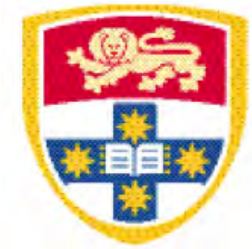
MA, MICD

A thesis with publications submitted in fulfillment of the requirements for the degree of Doctor of Philosophy



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Statement of Originality

This is to certify that to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

Bindi Borg
PhD Candidate
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Date: 18 June 2019

Supervisor's statement

As a supervisor of doctoral work, I certify that I consider Bindi Borg's thesis titled "Acceptability and Effectiveness of a Locally-Produced Ready-to-Use Supplementary Food (RUSF) for Prevention of Undernutrition in Children Under Two Years in Cambodia" to be suitable for examination.

Dr Seema Mihrshahi
Senior Research Fellow
Sydney School of Public Health

Date

Candidate's statement

I, Bindi Borg, hereby declare that this submission is my own work and that it contains no material previously published or written by another person except where acknowledged in the text. Nor does it contain material which has been accepted for the award of another degree.

I, Bindi Borg, understand that if I am awarded a higher degree for my thesis titled "Acceptability and Effectiveness of a Locally-Produced Ready-to-Use Supplementary Food (RUSF) for Children Under Two Years in Cambodia" being lodged herewith for examination, the thesis will be lodged in the University library and be available immediately for use. I agree that the University Librarian (or in the case of a department, the Head of the Department) may supply a photocopy or microform of the thesis to an individual for research study or to a library.

Bindi Borg
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Date: 18 June 2019

Authorship statement

This thesis consists of two related trials which were part of a larger project. The protocols and results for each study, as well as a lessons learned paper, were initially prepared as manuscripts that have now been published in a peer-reviewed journals. I was the primary author of all five of these manuscripts. Under my supervisors' guidance, I was responsible for the following in each study:

Study 1: Acceptability trial (Chapters 4 and 5)

I took the key role in conducting the literature review, designing the trial, writing the protocol, registering the trial, preparing and submitting the ethics applications, designing and piloting the data collection tools, training data collection staff, undertaking field preparation and logistics, recruiting and enrolling participants, supervising data collection, designing the data entry tools, supervising data entry, cleaning the data, extracting, analysing and interpreting the data, and drafting the manuscripts.

Chapter 4 of this thesis is published as:

Borg B, Mihrshahi S, Griffin M, Chamnan C, Laillou A, Wieringa FT. Crossover trial to test the acceptability of a locally produced lipid-based nutrient supplement (LNS) for children under 2 years in Cambodia: a study protocol. BMJ Open 2017;7(9).

Chapter 5 of this thesis is published as:

Borg B, Mihrshahi S, Griffin M, Sok D, Chhoun C, Laillou A, Wieringa FT. Acceptability of locally-produced Ready-to-Use Supplementary Food (RUSF) for children under two years in Cambodia: A cluster randomised trial. Maternal & Child Nutrition. 2019;15(3).

Study 2: Effectiveness trial (Chapters 6 and 7)

I took the key role in conducting the literature review, designing the trial, writing the protocol, registering the trial, preparing and submitting the ethics applications, designing and piloting the data collection tools, training data collection staff, undertaking field preparation and logistics, recruiting and enrolling participants, supervising data collection, designing the data entry tools (including Kobo Toolbox program), supervising baseline data entry, cleaning the data, extracting, analysing and interpreting the data, and drafting the manuscripts.

Chapter 6 of this thesis is published as:

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Chapter 7 of this thesis will be published as:
Borg B, Sok D, Mihrshahi S, Griffin M, Chhoun C, Berger J, Laillou A, Roos N, Wieringa FT. Effectiveness of a locally-produced ready-to-use supplementary food (RUSF) in preventing growth faltering and improving micronutrient status for children under two years in Cambodia: a randomised controlled trial. Maternal & Child Nutrition. 2019; (*forthcoming*).

Process analysis and lessons learned (Chapter 8)
The trials above were part of a larger project that developed two ready-to-use foods, a therapeutic food for treating severe acute malnutrition, and a supplementary food for preventing undernutrition. The trials above were on the supplementary food. A paper outlining the lessons learned from the overall project was also written as a part of the process evaluation. I took the key role in reviewing project implementation records, conducting semi-structured interviews with key informants, extracting, analysing and interpreting the data, and drafting the manuscript.

Chapter 8 of this thesis is published as:
Borg B, Mihrshahi S, Laillou A, Sigh S, Sok D, Peters R, Chhoun C, Berger J, Sophonneary P, Roos N, Griffin M, Wieringa FT. Development and testing of locally-produced ready-to-use therapeutic and supplementary foods (RUTFs and RUSFs) in Cambodia: Lessons learned. . BMC Public Health. 2019; 19(1).

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As supervisor for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

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This PhD took twenty-five years to complete! That is, if you go back to 1994 when I briefly enrolled as a PhD candidate, in another field, in another millennia! In every sense, this PhD has been the journey of a lifetime, germinating as it has for so long. So many people before and since then have encouraged and supported me, in large and small ways, that I can't possibly acknowledge them all. At this, the pointy end, I give my heartfelt thanks:

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Publications arising from this thesis and publications arising during candidature

Papers in peer-reviewed journals

Borg B, Mihrshahi S, Griffin M, Chamnan C, Laillou A, Wieringa FT. Crossover trial to test the acceptability of a locally produced lipid-based nutrient supplement (LNS) for children under 2 years in Cambodia: a study protocol. BMJ Open 2017;7(9).

Borg B, Mihrshahi S, Griffin M, Sok D, Chhoun C, Laillou A, et al. Randomised controlled trial to test the effectiveness of a locally-produced ready-to-use supplementary food (RUSF) in preventing growth faltering and improving micronutrient status for children under two years in Cambodia: a study protocol. Nutrition Journal. 2018;17(1):39.

Borg B, Mihrshahi S, Griffin M, Sok D, Chhoun C, Laillou A, Wieringa FT. Acceptability of locally-produced Ready-to-Use Supplementary Food (RUSF) for children under two years in Cambodia: A cluster randomised trial. Maternal & Child Nutrition. 2019;15(3).

Borg B, Mihrshahi S, Laillou A, Sigh S, Sok D, Peters R, Chhoun C, Berger J, Sophonneary P, Roos N, Griffin M, Wieringa FT. Development and testing of locally-produced ready-to-use therapeutic and supplementary foods (RUTFs and RUSFs) in Cambodia: Lessons learned. BMC Public Health. 2019; 19(1).

Borg B, Sok D, Mihrshahi S, Griffin M, Chhoun C, Berger J, Laillou A, Wieringa FT. Effectiveness of a locally-produced ready-to-use supplementary food (RUSF) in preventing growth faltering and improving micronutrient status for children under two years in Cambodia: a randomised controlled trial. Maternal & Child Nutrition. 2019; (*forthcoming*).

Published abstracts, conference proceedings and poster presentations

Borg B, Sok D, Mihrshahi S, Griffin M, Chhoun C, Laillou A, Roos N, Berger J, Wieringa FT. Does a locally-produced ready-to-use supplementary food (RUSF) prevent undernutrition in Cambodian children aged 6 – 17 months? Abstract accepted for presentation at Nutrition and Nurture in Infancy and Childhood:

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Borg B, Sok D, Mihrshahi S, Griffin M, Chhoun C, Laillou A, Roos N, Berger J, Wieringa FT. Efficacy of a locally-produced multiple micronutrient-fortified ready-to-use supplementary food (RUSF) for children under two years in Cambodia (144/1808). International Congress of Nutrition (IUNS ICN), Buenos Aires, Argentina, 2017.

Borg B, Sok D, Mihrshahi S, Griffin M, Chhoun C, Laillou A, Berger J, Wieringa FT. Acceptability of a locally-produced multiple micronutrient-fortified ready-to-use supplementary food (RUSF) for children under two years in Cambodia (144/1728). International Congress of Nutrition (IUNS ICN), Buenos Aires, Argentina, 2017.

Borg B, Sok D, Chhoun C, Laillou A, Wieringa FT. Acceptability and efficacy of locally-produced ready-to-use foods in Cambodia. Presentation at Acute Malnutrition: Improving Treatment Through Research training, Kampala, Uganda, 14 – 18 November 2016.

Borg B, Sok D, Chhoun C, Laillou A, Wieringa FT. Acceptability and efficacy of a locally-produced multiple micronutrient-fortified lipid-based nutrient supplement (LNS) for pregnant and lactating women and children under two years in Cambodia. Poster presentation at National Nutrition Conference, Phnom Penh, Cambodia, 3-4 March 2015.

Sigh S, Roos N, Sok D, **Borg B,** Chamnan C, Laillou A, Prak S, Berger J, Wieringa FT. Can fish replace milk powder in products for the treatment of severe acute malnutrition in Cambodia? Poster presentation at The International Food Policy Research Institute (IFPRI) and the Food and Agriculture Organization of the United Nations (FAO) Global Event on "Accelerating Progress on Ending Hunger and Malnutrition", Bangkok, Thailand, 2018.

Sok D, **Borg B,** Roos N, Chamnan C, Laillou A, Berger J, Dijkhuizen M, Prak S, Wieringa F. NumTrey: a fish-based locally-produced product for malnutrition prevention and treatment in Cambodia. Poster presentation, Global Workshop on Nutrition-Sensitive Fish Agri-Food Systems. WorldFish. Siem Reap, Cambodia, 2017.

Publications arising during candidature but not included in the thesis

Sigh S, Roos N, Sok D, **Borg B,** Chamnan C, Laillou A, Dijkhuizen, MA, Wieringa FT. Development and acceptability of locally made fish-based, ready-to-use products for the prevention and treatment of malnutrition in Cambodia. Food and Nutrition Bulletin. 2018; 39(3), 420-434.

Abstract

Introduction

Undernutrition (underweight, stunting and wasting) affects hundreds of millions of children globally. Cambodia's progress in combatting undernutrition has stalled. In 2014, 32% of children under five were stunted, 24% were underweight and 10% were wasted. There is consensus on the urgency of finding effective interventions for preventing undernutrition. Therefore, this project developed an innovative, locally-produced multiple micronutrient fortified lipid-based nutrient supplement (LNS) snack for use as a ready-to-use supplementary food (RUSF) using fish rather milk as the animal-source food.

Context and aim

We conducted two trials with the novel RUSF. The first assessed the RUSF's acceptability as a snack or mixed with *borbor* (white rice porridge) compared to Corn-Soy Blend Plus Plus (CSB++) and *borbor* fortified with micronutrient powders (MNP). The second assessed its effectiveness in reducing growth faltering in comparison to CSB++, MNP, and an unsupplemented control group.

Methods

The acceptability trial was a non-blinded, 4 x 4 crossover design. Healthy children aged nine to twenty-three months (n = 92) ate each of four foods for three consecutive days. Outcomes measured were children's consumption, caregivers' assessment of children's preferences and caregivers' ranking of the foods. The effectiveness trial was a non-blinded, cluster-randomised control trial. Healthy children aged six to seventeen months (n = 485) were allocated to one of three intervention groups or the control group for six months. The main outcome was anthropometric status measured as weight-for-age (WAZ), height-for-age (HAZ), weight-for-height (WHZ), and mid-upper arm circumference (MUAC).

Results

In acceptability testing, the median percentage consumed of the test food servings ranged from 21 - 50% ($p = 0.003$). The odds of children consuming over 50% were greatest for *borbor* fortified with MNP versus RUSF snack (unadjusted OR = 6.79, CI = 2.80 - 16.47, $p < 0.001$). However, the median energy children received when consuming the RUSF with *borbor* (57 kcal) or as a snack (48 kcal) was greater than with CSB++ (15 kcal) or *borbor* fortified with MNP (18 kcal), ($p < 0.001$). Therefore, although children ate less RUSF, it provided approximately three times more kilocalories. Caregivers reported that their children had the highest preference for *borbor* fortified with MNP, and the second highest preference for the RUSF

snack. Caregivers themselves ranked the novel RUSF snack highest. Thus, the innovative RUSF was considered sufficiently acceptable to proceed to an effectiveness trial.

Analysis of the effectiveness of the RUSF in preventing undernutrition shows that growth faltered from baseline to endline, with no significant differences between the intervention and control. In unadjusted analysis, the RUSF group had greater increases in MUAC (0.04cm, SE = 0.01, p = 0.008) than CSB++ or the control (0.03cm, SE = 0.01, p = 0.027; and 0.02cm, SE = 0.01, p = 0.010 respectively). For other outcomes, the RUSF did not differ significantly from the control, which had decreased WAZ and HAZ (-0.02, SE = 0.01, p = 0.001; and -0.07, SE = 0.01, p < 0.001 respectively) and no significant change in WHZ. In adjusted analysis, high consumers of RUSF had increased MUAC (0.08cm, SE = 0.03, p = 0.003) in comparison to the control, but no statistically significant differences to CSB++ or MNP for any outcome. Low consumers of RUSF had increased WAZ, WHZ and MUAC (0.03, SE = 0.01, p = 0.006; 0.04, SE = 0.02, 0.026; and 0.05cm, SE = 0.02, p = 0.004 respectively). Low consumers of RUSF had statistically significantly increased HAZ compared to CSB++ (0.06, SE = 0.03, p = 0.031), but otherwise had no differences to CSB++ or MNP for any other anthropometric measures. Birthweight, sex, iron status, and diarrhoea significantly affected anthropometric status. Bottle feeding and maternal body mass index (BMI) also had significant effects on anthropometric status.

Discussion

Our trial showed that the RUSF slowed but did not prevent growth faltering in a representative population that included non-moderately acutely malnourished in a food secure setting. In similar trials, growth generally continued to falter for all or some anthropometric outcomes, as was the case in our trial.

One possible explanation for continued growth faltering is the high prevalence of diarrhoea in our population (32% at baseline). Another is that supplementary foods in medium to large quantities (40-110g/day in the RUSF and CSB++ groups) displaced normal intakes of food and breastmilk.

In addition to displacing breastmilk and family foods, supplementary foods may disempower and deskill caregivers, increase consumption of processed foods, and divert funding from other potentially effective nutrition interventions. Thus, there may be potential risks of using supplementary foods to prevent undernutrition amongst children who are not moderately acutely malnourished, in food secure settings, and over the long term.

Conclusion and contribution to policy, practice, and research

Our acceptability trial demonstrated that the novel, fish-based RUSF is acceptable as a supplementary food. However, neither our novel RUSF nor the other specialised products tested prevented undernutrition in our target group in the quantities provided. Thus, more research is needed to identify interventions that prevent undernutrition in Cambodian children. Since child undernutrition is multifactorial, isolated nutrition-specific interventions are unlikely to suffice. Rather, an integrated, life course approach that addresses the multiple causes of undernutrition is necessary. These findings are highly relevant to undernutrition prevention programming in low and middle-income countries.

List of abbreviations

AGP	Alpha-2 acid glycoprotein
BMI	Body mass index
BP-100™	Ready-to-Use therapeutic food (RUTF) in the form of a compressed biscuit/bar
BSFP	Blanket Supplementary Feeding Programmes
BSID	Bayley Scales of Infant Development
CARD	(Cambodian) Council for Rural and Agricultural Development
CI	Confidence interval/s
CDHS	Cambodian Demographic and Health Survey
cm	Centimetre/s
CRP	C-reactive protein
CSB	Corn-Soy Blend (original formulation)
CSB+	Corn-Soy Blend Plus, now called Supercereal (improved vitamin and mineral profile)
CSB++	Corn-Soy Blend Plus Plus, now called Supercereal Plus (CSB++ with added soybean oil, sugar and milk powder)
DHS	Demographic and Health Surveys
DFPTQ	(Cambodian) Department of Fisheries Post-harvest Technologies and Quality
DSM	Dutch State Mines (producer of multiple micronutrient powders)
EBF	Exclusive breastfeeding
EDTA	Ethylenediamine tetraacetic acid
ENN	Emergency Nutrition Network
FAO	United Nations Food and Agriculture Organization
FGD	Focus group discussion
g	Grams
GDP	Gross domestic product
HAZ	Height-for-age z score
Hb	Haemoglobin
HEBI	High Energy Bar for Integrated Management of Acute Malnutrition
HIC	High-income country/ies
HIV	Human immunodeficiency virus
IFPRI	International Food Policy Research Institute
iLiNS	International Lipid-Based Nutrient Supplements Project
IMAM	Integrated Management of Acute Malnutrition

IQR	Interquartile range
IRD	French National Research Institute for Sustainable Development
IUNS ICN	International Union of Nutritional Sciences International Congress of Nutrition
IYCF	Infant and young child feeding
kcal	Kilocalorie/s
kg	Kilogram/s
l/L	litre/s
LiST	Lives Saved Tool
L/HAZ	Length/height-for-age z-score
LNS	Lipid-based nutrient supplement
LMIC	Low- and middle-income country/ies
MAM	Moderate acute malnutrition
MDD	Minimum dietary diversity
MFF	minimum food frequency
mg	Microgram/s
ml/s	Millilitre/s
MoH	(Cambodian) Ministry of Health
MNP	Micronutrient powders
MUAC	Mid-upper arm circumference
NECHR	National Ethics Committee for Health Research
NGO	Nongovernmental organisation
OR	Odds ratio
RACHA	Reproductive and Child Health Alliance
RBP	Retinol binding protein
RCT	Randomised controlled trial
RR	Relative risk
RUF	Ready-to-Use Food
RUSF	Ready-to-Use Supplementary Food
RUTF	Ready-to-Use Therapeutic Food
SAM	Severe acute malnutrition
SD	Standard deviation
SE	Standard error
SQ-LNS	Small quantity lipid-based nutrient supplements
SUN	Scaling up Nutrition Movement

UN	United Nations
UNICEF	United Nations Children's Fund
WAZ	Weight-for-age z score
WFP	United Nations World Food Program
WHO	World Health Organization
WHZ	Weight-for-height z-score
WLZ	Weight-for-length z-score
μg	Microgram/s
μmol	Micromole/s

Ethics clearance

Ethics approval for the various trials was received from the University of Queensland Medical Research Ethics Committee (2014001070) and from Cambodia's National Ethics Committee for Health Research (03/8 NECHR; 120 NECHR; 402 NECHR). Written informed consent was obtained from all the caregivers or parents of the participating children before recruitment into the study. Ethics approvals can be found in Appendix 1.

The trials were registered at ClinicalTrials.Gov (LNS-CAMBINFANTS, NCT02257437; LNS-CAMB-INFANTS-EFF, NCT02257762).

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Chapter 1: Rationale and description of the project

The context in which the project was developed

By 2013, progress in combatting undernutrition had stalled in Cambodia. Given that a great proportion of undernutrition is accrued from six to twenty-three months of age due to the inadequacy of complementary feeding, providing supplementary food to prevent growth faltering seemed a promising solution. The products that were being used for the prevention of undernutrition, namely Corn-Soy Blend Plus Plus (CSB++) and Sprinkles multiple micronutrient powders (MNP), were relatively expensive to procure and ship to Cambodia. Ruptures in stock and spoilage due to poorly managed warehousing and distribution were common. Moreover, the acceptability of these products was questionable. The situation was similar for BP-100™, the therapeutic food that was being used to treat severe acute malnutrition (SAM) (1). Plumpy'Nut™, another therapeutic food, had been tested but had limited acceptability (2). Existing specialised food products that had been used or trialled in Cambodia are shown in Figure 1.1.

Low acceptability of CSB++

Globally, CSB++ is widely used to treat and prevent moderate acute malnutrition (MAM). A fortified blended flour that is cooked to make a porridge, it is primarily distributed by the United Nations World Food Program (WFP) to children aged six to twenty-three months with the aim of preventing undernutrition. In Cambodia, despite performing well in acceptability tests (3), it was not well accepted in practice (4). In June 2014, the WFP in Cambodia phased out CSB++ distribution.

Limited effectiveness of MNP in preventing undernutrition

MNP are powdered food supplements containing essential vitamins and minerals that are added to prepared food. They were being distributed through the Cambodian health system to children aged six to twenty-three months, but coverage was limited (5). Although they proved acceptable and effective at reducing anaemia, in keeping with experience elsewhere, they had not improved growth (6).

Low acceptability of Plumpy'Nut™

Plumpy'Nut™ is a ready-to-use therapeutic food (RUTF) based on peanuts that is produced by Nutriset in France. It was trialled in Cambodia in 2008 and was not well accepted (2). This has been taken as evidence that there may be low acceptability of peanut-based ready-to-use foods (RUFs) in South-East Asia. However, this study (2) was not an acceptability trial in the usual sense but a qualitative, socio-anthropological study that drew on grey literature and interviews, and reflected implementation or effectiveness issues more than acceptability. Since then, two other studies in Cambodia and Vietnam have found peanut-based pastes (Eezypaste and Plumpy'Nut™) quite acceptable, at least to children though possibly not to caregivers (7, 8). Therefore, the perceived lack of acceptability of peanut-based products in South-East Asia is questionable. Nevertheless, given that the rate of aflatoxin contamination of peanuts in the region is quite high and quality control capacity rather low (9-11), it would be advisable to avoid a locally-produced peanut-based product.

Figure 1.1: Existing specialised food products that had been used or trialled in Cambodia. Left to right: CSB++, BP-100™, Plumpy'Nut™, and Sprinkles MNP.

Limited use of commercial supplementary foods

Commercial baby foods, mostly the products of companies such as Nestle but also some created by GRET, a French nongovernmental organisation (NGO), are available in Cambodia. However, a recent study estimated that only 20% of Cambodian caregivers purchase this kind of supplementary food for their children (12).

A local alternative to existing products

Given the limited success of the existing supplementary and therapeutic products, the Cambodian Ministry of Health (MoH), was seeking an alternative. The aim was to produce a food locally, based on locally available ingredients, containing macro and micronutrients. Locally-produced products are more likely to be acceptable than imported products. Whether they would be cheaper and would contribute money and capacity to the local economy is debatable (13-15). A 2013 systematic review on specially formulated foods for treating children with MAM in low- and middle-income countries concluded that it was vital to develop and test foods with a high energy and nutrient density that would be acceptable to the target population. The review also noted that most research on supplementary foods was from Africa, and that evidence on the acceptability and effectiveness of supplementary foods elsewhere would be useful (16).

Using the experience from Vietnam

In 2009 in Vietnam, UNICEF, along with the French National Research Institute for Sustainable Development (IRD) and the National Institute of Nutrition of Vietnam, developed an RUTF from mainly local ingredients including rice, soy, mungbeans, sugar, milk powder, oil, and multiple micronutrients. It was called HEBI, meaning High Energy Bar for Integrated Management of Acute Malnutrition (IMAM). This product proved more acceptable than and as effective as Plumpy'Nut™ (7) and is now used in eleven provinces in Vietnam (8).

In mid-2013, IRD in Cambodia partnered with a local NGO, the Reproductive and Child Health Alliance (RACHA), to conduct an acceptability trial of various products, including CSB++, BP-100™, HEBI, and Eezypaste, a peanut lipid-based nutrient supplement (LNS) made in India (8). The Vietnamese RUTF and even the Eezypaste were found more acceptable than CSB++ and BP-100™, confirming that acceptability of CSB++ and BP-100™ was low.

Rationale for our project

Based on this trial, and in the absence of any other affordable, acceptable, effective, locally-produced Cambodian RUTF or ready-to-use supplementary food (RUSF), the MoH, in partnership with UNICEF, IRD and the Cambodian Department of Fisheries Post-harvest Technologies and Quality (DFPTQ), began developing a novel RUF, based on the same concept as the Vietnamese product. The product used local ingredients and was developed in two formulations. The first was an RUTF for the treatment of severe acute malnutrition, and the second was an RUSF to be used for the prevention of undernutrition. The trials involving the RUSF are presented in this dissertation.

Objectives of the trials

The objectives of the trials described in this dissertation were twofold. First, we aimed to assess the acceptability of the locally-produced Cambodian RUSF for children under two years and their caregivers, in comparison to existing supplements and supplementary foods that were being used in Cambodia to prevent undernutrition. Second, we aimed to establish the novel RUSF's effectiveness in preventing undernutrition in Cambodian children under two years in comparison to MNP, CSB++, and an unsupplemented control group.

Acceptability trial

Regardless of how effective a product may be, it is vital to determine its acceptability in a given setting. In other words, children must be willing to eat the product and caregivers must be prepared to feed it to them. Acceptability to children can be measured by how much they eat and how readily, while acceptability to caregivers is measured in terms of their sensory perception of the organoleptic qualities of the food, that is, of the smell, colour, consistency, and taste (17). Other factors in acceptability may include price and convenience of preparation.

In June 2015, the RUSF was tested for acceptability with children aged nine months to two years and their caregivers. It was compared to CSB++, and MNP mixed with *borbor*, a white rice porridge which is the traditional weaning food. Consumption in terms of portion of serving consumed, the caregiver's

perception of the child's preference, and acceptability to caregivers were the main outcomes. These outcomes indicated how well accepted the RUSF is by children and caregivers, and how likely they would be to eat it if it were provided in the context of programming for the prevention and treatment of undernutrition.

Effectiveness trial

The next step was to assess the effectiveness of the RUSF in preventing undernutrition and promoting optimal growth and development. A six-month effectiveness trial was conducted where the impact of the RUSF on children aged six to seventeen months was compared to the impact of CSB++, MNP, and to a control group consuming an unsupplemented diet, typically *borbor* at an early age (e.g. six to nine months) and thereafter, family foods. The main outcomes were anthropometric changes in weight-for-age z-score (WAZ), height-for-age z-score (HAZ), weight-for-height z-score (WHZ), and mid-upper arm circumference (MUAC).

This dissertation

This dissertation describes the RUSF and the two trials, conducted in 2015 and 2016, that tested its acceptability and effectiveness in preventing growth faltering among children under two years in Cambodia.

My role in this research project

My role in the wider research project (of which this dissertation forms one part), was to coordinate and conduct the acceptability and effectiveness trials for the RUSF. This included conducting a literature review, writing the trial protocols, applying for ethical approval, and registering the trials. Once the trials were approved by the relevant ethics committees (see Appendices 1.1 – 1.3), it was my task to write and field test the data collection and data entry tools, hire and train data collectors, select study sites and randomise them to the trial arms. I collaborated on finalising the development and packaging of the RUSF, procured the CSB++, MNP and other study materials and equipment. I organised the

recruitment and enrolment of participants, supervised the data collection and entry including translation and transcription, and organised logistics. I cleaned the data and conducted the analysis, and prepared presentations, publications, and donor reports.

Outline of this dissertation

Chapter 2 describes the background to the trials, including the prevalence of undernutrition globally and in Cambodia, and the aetiology of undernutrition. It outlines a framework for understanding undernutrition, including contributing factors and consequences, and a framework for addressing undernutrition. A review of the literature identifies gaps and how this research addresses those gaps. Chapter 3 describes the novel RUSF. Chapters 4 and 5 describe the methodology and the results of the acceptability trial, while Chapters 6 and 7 describe the methodology and results of the effectiveness trial. Chapter 8 recounts the policy and programmatic environment and the decision-making process behind the development and trialling of the RUSF. Chapter 9 discusses the significance of trials and the contribution of this research to the literature on prevention of undernutrition. Chapter 10 summarises the findings of the trials and makes recommendations for future research.

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Chapter 2: Background and literature review

Introduction

Globally, undernutrition affects over 150 million children under five years (1). A significant proportion of global morbidity and mortality is linked, directly or indirectly, to undernutrition. However, efficacious interventions exist and could significantly reduce the burden of undernutrition if implemented at scale. Of the ten interventions recommended in the 2013 Lancet Series, the prevention of undernutrition and growth faltering was considered one of the most promising and cost-effective in terms of reduced mortality (2). In Cambodia, progress on combatting child undernutrition has stalled in the past decade, with inadequate complementary feeding being an important contributor to the problem (3). Our project sought to improve complementary feeding by developing a locally-produced, ready-to-use supplementary food (RUSF) for the prevention of growth faltering.

Malnutrition – the global context

Malnutrition encompasses undernutrition, overnutrition and micronutrient deficiency. Undernourished children can be stunted (short for their age), wasted (thin), or both. Underweight is a composite measure which may reflect wasting, stunting or a combination of the two. These various forms of undernutrition are defined by anthropometric indicators calculated using World Health Organisation (WHO) 2006 Child Growth Standards (ANTHRO version 3.2.2 January 2011) and expressed as z-scores for weight-for-height (WHZ), length/ height-for-age (L/HAZ) and weight-for-age (WAZ), along with mid-upper arm circumference (MUAC). For detailed definitions of malnutrition, see Appendix 2.1.

Prevalence of malnutrition globally, with particular reference to South-East Asia

Asia and Africa continue to be the regions most affected by all forms of malnutrition. In 2019, more than half of all stunted children (55%) were in Asia, and more than a third (39%) were in Africa (1). Over two thirds of all wasted children (68%) were in Asia and over a quarter (28%) were in Africa (1). At the same time, almost half of all overweight or obese children (47%) were in Asia and a quarter

(24%) were in Africa (1). In South-East Asia, the prevalence of stunting is high, with fourteen million, or 25% of children under five years affected (1). Wasting affects five million (9%) – half of whom are severely wasted - and over four million children (8%) are overweight (1). Stunting can occur simultaneously with wasting or overweight, but there are no current estimates of the number of children suffering from more than one form of malnutrition (1).

Prevalence of undernutrition is underestimated

These numbers are underestimations. Because nutrition surveys are cross sectional, with measurements taken at one point in time, a proportion of wasting cases that are seasonal or short duration may be missed (4). Many more millions of children suffer from growth faltering without being identified as wasted or stunted (5).

The prevalence of malnutrition in Cambodia

Cambodia made strides in reducing malnutrition in the earlier part of the millennium. From the first Demographic and Health Survey (DHS) in 2000 to 2005, prevalences of stunting, wasting and underweight were reduced. However, despite the fact that Cambodia is transitioning to a middle-income country, its progress in combatting undernutrition has stagnated, as shown by the DHSs since 2005 (3). While stunting among children under five years has continued to decline, wasting and underweight have changed little since 2005, as seen in Figure 2.1.

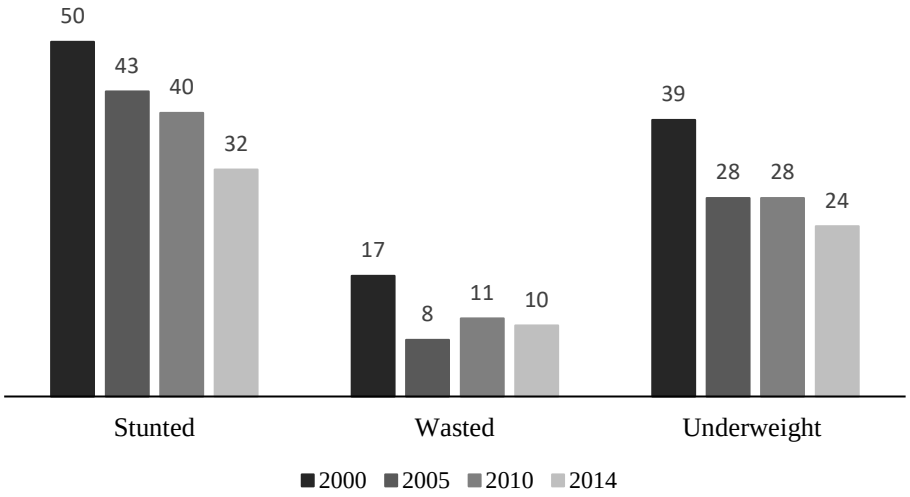

Figure 2.1: Trends in nutritional status of children under 5 years (percentage), 2000 to 2014. Source: Cambodian Demographic and Health Survey, 2015.

Prevalence of stunting

The 2014 Cambodia DHS (3) reported that one-third of all children under five years were stunted (HAZ < -2). Stunting was apparent even in infants under six months. Stunting increased with age, peaking at 36-47 months, with almost half (40%) of children in that age group being stunted.

Prevalence of wasting

A high prevalence of wasting (WHZ < -2) persisted in 2014 (3). In children aged twelve to seventeen months (the age of our subjects at the end of the trial), wasting was 14.5%, which is effectively the threshold (15%) that would trigger universal supplementary feeding in an emergency (6). There was no consistent relationship between wasting prevalence and age.

Prevalence of underweight

In 2014, one-quarter of all Cambodian children under five years were underweight (3). Overall, the prevalence increased from birth to a peak at 40-42 months. The age-related prevalence of underweight

mirrors the age-related prevalence of stunting, which strongly suggests inadequate diet during the complementary feeding period.

Prevalence of overweight

The prevalence of overweight and obesity amongst Cambodian children was low in 2014 and had neither increased nor decreased since 2010 (3). However, the prevalence of concurrent stunting and overweight is rising (7), suggesting that overweight, obesity and non-communicable diseases may become a public health problem for children in Cambodia. This is relevant given that overweight (body mass index, BMI ≥ 25.0) and obesity is increasing rapidly among Cambodian women of reproductive age (3). Table 2.1 shows comparative malnutrition rates among Cambodian children taken from the 2014 Cambodian Demographic and Health Survey (CDHS) (3).

Cambodian Demographic and Health Survey 2014	**Stunting % (HAZ)**		**Wasting % (WHZ)**		**Underweight % (WAZ)**		**Overweight % (WHZ)**
Age:	< -3	< -2	< -3	< -2	< -3	< -2	> 2
6-8 months (n = 252)	1.2	13.1	2.3	6.5	1.9	8.5	4.8
9-11 months (n = 225)	3.9	16.6	2.3	14.2	3.0	15.4	3.1
12-17 months (n = 515)	6.4	28.1	3.1	10.6	2.6	21.2	3.5
Under 5 years, nationally (n = 4,893)	8.9	32.4	2.3	9.6	4.7	23.9	2.0
Under 5 years, Phnom Penh (n = 391)	4.9	17.9	1.0	8.4	2.2	12.9	3.7

Table 2.1: Prevalence of malnutrition in Cambodia. Percentage of children classified as malnourished according to height-for-age (HAZ), weight-for-height (WHZ), and weight-for-age (WAZ).
Source: Cambodian Demographic and Health Survey 2014.

Prevalence of micronutrient deficiency

Until the inclusion of a micronutrient module in the 2014 CDHS, there was limited information on the micronutrient status of women of reproductive age and children under five years in Cambodia (8-10). Anaemia has been considered a critical public health problem and affects approximately half of all Cambodian children under five years. Confirmed iron deficiency (ferritin < 12 μg/L) affects 9% of children aged six to eleven months (3). Iodine deficiency is an urgent public health problem, with almost half of Cambodian children in urban areas having urinary iodine insufficiency (3, 11). Also of significant concern is vitamin A deficiency which affects over 10% of children aged six to eleven months (3).

Cambodian children continue to suffer from undernutrition

Continued economic progress in Cambodia has not contributed to improved nutrition for children. This project aimed to address that situation.

Aetiology of stunting and wasting

Wasting and stunting have generally been thought to reflect different health and nutrition insults over different periods. Historically, wasting has been viewed as a short-term, acute response to recent illness or reduced food intake and generally as less prevalent than stunting (12), although potentially fatal. Stunting has been considered chronic, the long-term result of persistent undernutrition or inadequate feeding, micronutrient deficiency, and/or repeated illness. While irreversible if not addressed immediately, stunting has generally not been considered fatal. Wasting tends to be higher in younger children, and to decline by two years of age, while stunting follows a converse trajectory, increasing until two years (13). That wasting precedes stunting is unsurprising, as a child's body responds to its environment by privileging linear growth at the expense of weight in the first instance, but ultimately, sacrifices linear growth to survival (4, 12).

Wasting and stunting have been viewed separately

Thus, wasting has tended to be considered in terms of mortality in emergency settings, whereas stunting has been viewed in terms of its negative impact on individual health over the longer term. Consequently, there has been a separation in policies and programming, with wasting seen as the remit of emergency responses, and stunting as the responsibility of development programming. This separation has been reinforced in recent years, as stunting has come to be considered the primary indicator of inadequate nutrition. It is thought to reflect long-term undernutrition and has important consequences for broader health and national development (5, 14). A focus on the economic outcomes of stunting aims to galvanise policy support and encourage a focus on the basic and underlying as well as the proximate causes of undernutrition (13, 15).

Wasting and stunting are related

Increasingly, however, there is recognition of the significant overlap between these different manifestations of undernutrition (4). Most wasting does not occur in emergency settings; wasting in emergencies is the tip of the iceberg, and given the underlying burden of undernutrition, it takes very little to push a child into severe undernutrition (6). It has become evident that stunting, like wasting, contributes significantly to morbidity and mortality (2, 16). Mortality hazard ratios, or the likelihood of dying, increases as children become more stunted or wasted. In comparison with children who are not undernourished, moderately stunted or wasted children are (respectively) 2.3 or 3.4 times more likely to die, and severely stunted or wasted children are (respectively) 5.5 or 11.6 times more likely to die (4). However, children who are both stunted and wasted - even moderately stunted and moderately wasted - have a mortality hazard ratio of 12.3, which is higher than severely wasted children (17). The impact of individual and multiple anthropometric deficits on mortality is shown in Table 2.2.

Anthropometric deficit	**Hazard ratio (95% CIs)**
Moderately stunted (HAZ < -2)	2.3 (1.9 – 2.7)
Moderately wasted (WHZ < -2)	3.4 (2.9 – 4.0)
Severely stunted (HAZ < -3)	5.5 (4.6 – 6.5)
Severely wasted (WHZ < -3)	11.6 (9.8 – 13.8)
Wasted and stunted (HAZ and WHZ < -2)	12.3 (7.7 – 19.6)

Table 2.2: Mortality analysis of individual and multiple anthropometric deficits.
Source: Khara & Dolan (2014). Technical briefing paper: Associations between wasting and stunting, policy, programming, and research implications. Emergency Nutrition Network

Growth faltering should be viewed comprehensively

The previously used terms - acute and chronic undernutrition – can therefore be viewed as ambiguous and ill-defined, implying short-termism (in the case of “acute”), and not accurately reflecting the nutritional and biological processes that are happening (4, 6, 18). A focus on either wasting or stunting risks entrenching the artificial and inefficient policy and programmatic divide in undernutrition programming (4). Nutritional deficits should be dealt with comprehensively, rather than separating stunting and wasting in policy and programming. For that reason, this dissertation focuses on growth faltering, including stunting and wasting, that is, linear and ponderal growth faltering respectively.

Framework for understanding undernutrition

The factors contributing to undernutrition are multiple, overlapping, and intergenerational. The context, contributing factors and impacts of undernutrition were outlined in the 1990 UNICEF framework on the causes and consequences of maternal and child undernutrition (Figure 2.2). This framework, which describes the basic, underlying and immediate causes of undernutrition (13, 19), has been used and adapted over the years.

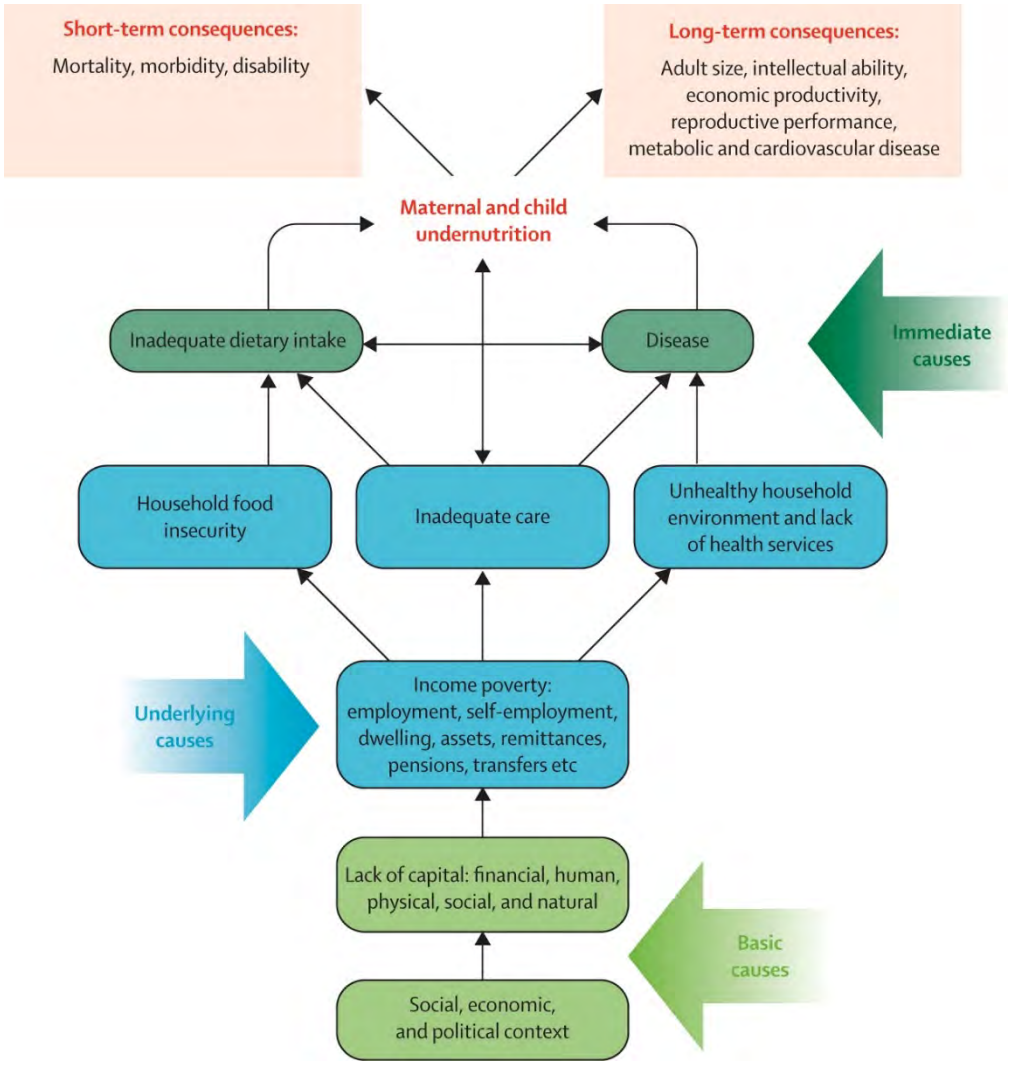

Figure 2.2: UNICEF framework of the relations between poverty, food insecurity, and other underlying and immediate causes to maternal and child undernutrition and its short-term and long-term consequences.
Source: Black et al, 2008.

Basic causes

At the most fundamental level there is the political, social, economic and community context that delivers, or fails to deliver, access to health care and education; food and agriculture systems that make

quality food available; adequate water and sanitation systems; employment and livelihood security. At this level, one can include the social and cultural norms and beliefs that support and empower women and caregivers, thereby promoting the protection of children. Delivery of these social goods requires an enabling environment for improved nutrition.

Underlying causes

At the intermediate level, poverty, food insecurity, and lack of health services combine to create or ameliorate an unhealthy living environment (in terms of water, sanitation and hygiene), and household food insecurity; and family factors such as poor maternal health (including mental health) and nutrition, early and closely spaced pregnancies, and inadequate child care and stimulation. These intermediate causes can be ameliorated with nutrition sensitive interventions that ensure adequate incomes, social safety nets, family planning and health services, education for women and children, and adequate decision-making power for women to provide sound parenting.

Immediate causes

The preceding factors give rise to the immediate causes of undernutrition, namely, dietary inadequacy and disease. The former requires nutrition specific interventions aimed at ensuring healthy mothers and gestations, breastfeeding and complementary feeding, treatment of undernutrition, and responsive feeding practices. Such interventions may be aimed at adolescent and preconception health and nutrition; birth spacing; maternal and child dietary supplementation as well as broader micronutrient supplementation and food fortification; improving breastfeeding, complementary feeding, dietary diversity and feeding practices; and treatment of severe acute malnutrition (SAM). The impact of inadequate nutrition may persist over several generations, primarily through the maternal line, although women who were undernourished as girls but improve their pre-conception health and nutrition significantly can go on to have nearly normal length babies (20). Therefore, the first 1,000 days of life from conception through pregnancy to the child's second birthday, are a critical window of opportunity (21). Additional interventions are needed in that period to ensure optimal nutrition, reduce the burden of infection, and improve caring and parenting practices.

What follows is a more detailed description of these immediate causes and potential solutions, particularly those that are most relevant and promising in the Cambodian context.

Factors contributing to undernutrition, with specific reference to Cambodia

The immediate causes of undernutrition in Cambodia are sub-optimal infant and young child feeding and repeated infection due to underlying unhealthy water, sanitation and hygiene facilities and practices, the combination of which results in a nutrient balance that is inadequate for achieving optimal growth outcomes and micronutrient status (3).

Optimal infant and young child feeding (IYCF)

Suboptimal infant feeding practices jeopardise a child's health and nutritional status. The first twenty-four months of a child's life are crucial, since most stunting occurs by the age of two years (22), after which the likelihood of catching up is low (23). The critical interventions in this period are early initiation of breastfeeding (within an hour of birth), exclusive breastfeeding (EBF) for the first six months, and adequate complementary feeding from six months with continued breastfeeding until at least two years (24, 25). Despite global consensus on these interventions, optimal infant feeding indicators are far from being met.

Breastfeeding globally

Scaling up breastfeeding could prevent the deaths of over 800,000 children each year, as well as protecting against morbidity in later life (26). Between 22 – 44% of neonatal deaths could be avoided if infants were breastfed within the first hour of life (25, 27, 28). Globally, lost productivity and health care costs due to lack of breastfeeding amount to over 300 billion US dollars per year, yet less than half of all newborns are breastfed within an hour of birth or are breastfed exclusively for the first six months (26). In developing countries, continued breastfeeding is declining, with only half of all children are still breastfed at two years (29).

Breastfeeding in Cambodia

Breastfeeding indicators showed promising improvements from 2005 to 2010, but most of these were not sustained, particularly in Phnom Penh, as can be seen in Figure 2.3 (3, 8, 30). Timely initiation of breastfeeding after birth decreased, and prelacteal feeding increased in Phnom Penh. Exclusive breastfeeding to six months declined, as did continued breastfeeding to two years. The median duration of breastfeeding fell from 4.3 months in 2010 to 3.7 in 2014. Bottle feeding, usually of infant formula or canned milk (often sweetened), among children of all ages has grown rapidly since 2005. The increased availability and pervasive promotion of breastmilk substitutes may explain the decline in breastfeeding indicators, particularly in Phnom Penh (31, 32).

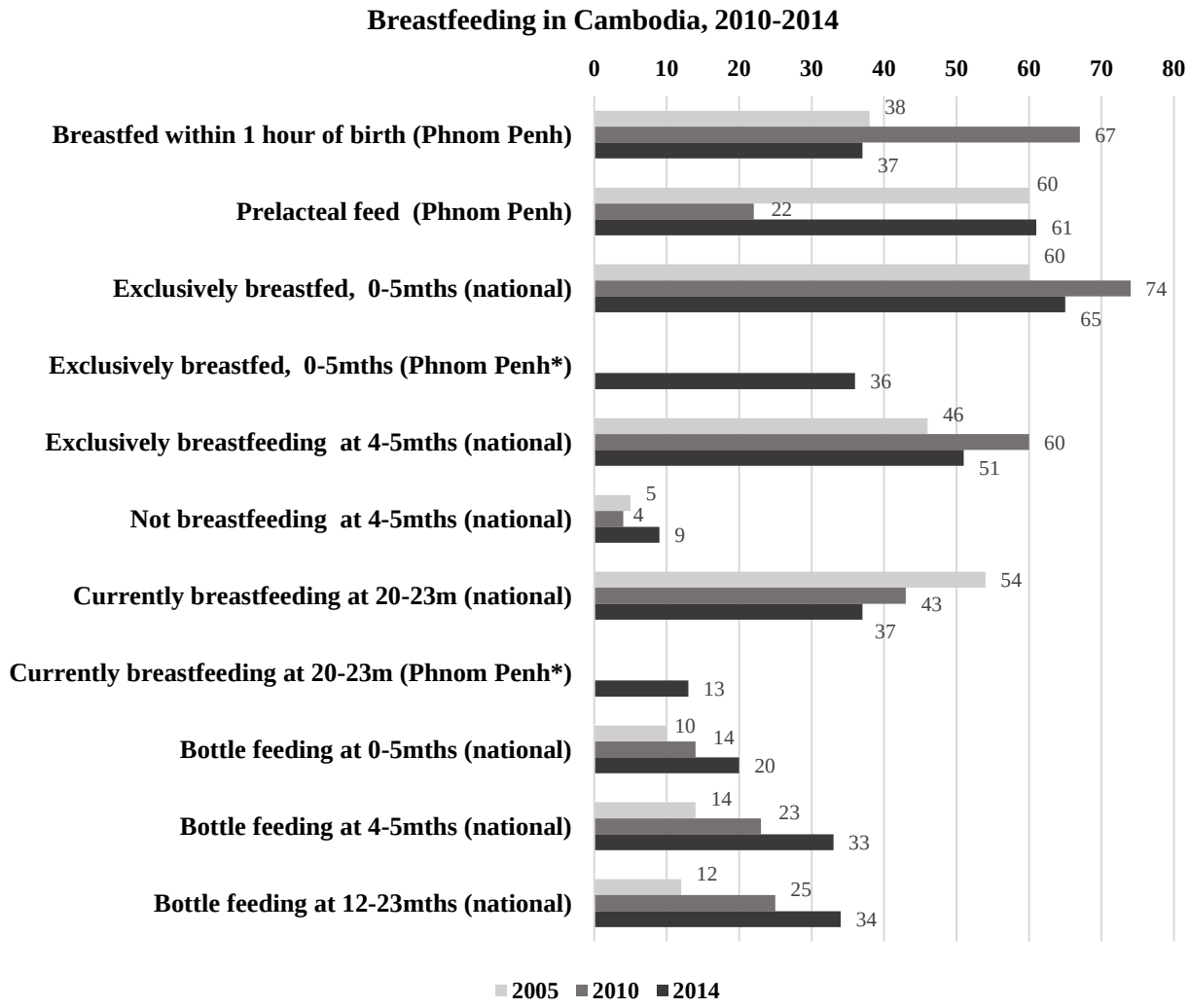

Figure 2.3: Selected breastfeeding trends in Cambodia, 2005 to 2014.
*Adapted from Cambodian Demographic and Health Surveys, 2005, 2010 and 2014. * From Pries et al., 2016.*

Complementary feeding

The transition from breastmilk only to the introduction of complementary foods at around six months of age is nutritionally sensitive, and growth faltering may occur if the diet is inadequate at this time. Poor complementary feeding can result in inadequate energy and nutrient intakes to achieve optimal growth and micronutrient status (33). Most growth faltering occurs by the age of two years, with the period from six to eleven months being particularly risky (34). Appropriate complementary feeding entails a minimum dietary diversity (MDD), that is, eating from at least four food groups each day, and minimum food frequency (MFF) (35). Deficits in the quantity and quality of complementary food can be due to insufficient quantities of food, infrequent feedings, and inadequate dietary diversity, resulting in diet that fails to provide the necessary macro and micronutrients required by the rapidly growing child (36). Traditional complementary foods, or weaning foods, are often porridges or gruels based on the staple cereal of the society. For example, *borbor*, a white rice porridge made on water with added salt or sugar, is the traditional weaning food in Cambodia and through much of South-East Asia. Such porridges are high volume in relation to energy and nutrient density, filling small baby stomachs and displacing breastmilk and nutritious foods, without providing the macro and micronutrients needed to sustain the child's high growth velocity during the first two years of life (37). In addition, the phytates in cereal-based porridges may inhibit the absorption of iron and zinc, making it even more difficult to meet essential nutrient requirements (38).

Less than a third of the world's children aged six to twenty-three months meet the requirements for minimum dietary diversity and only about half meet minimum meal frequency. For infants six to eleven months, these rates are even lower, with dietary diversity being a particular issue (37). While adequate minimum meal frequency is associated with a lower risk of underweight, adequate dietary diversity is associated with a lower risk of underweight and a lower risk of stunting.

Complementary feeding in Cambodia

Table 2.3 describes infant and young child feeding practices in Cambodia in 2014. Most Cambodian infants aged six to eight months had begun consuming complementary food, although this age group

was the least likely to meet minimum standards in complementary feeding. Nationally, less than one-third of children aged six to twenty-three months met minimum standards, while in Phnom Penh, two-thirds met minimum standards (3). Feeding practices did not vary with the sex of the child. Children in the highest wealth quintile, and those whose mothers had completed secondary education or higher, were more likely to meet minimum standards (3).

	Among all children(breastfed and non-breastfed) 6-23 months, percentage fed:			
	Breast milk, milk, or milk products[1]	**4+ food groups[2]**	**Minimum meal frequency (MMF)[3]**	**With 3 IYCF practices[4]**
Age in months				
6-8	98	18	72	16
9-11	98	39	70	27
12-17	92	55	77	38
6-23, Nationally	84	48	72	30
6-23, in Phnom Penh	97	83	92	61
Mothers education:				
None	80	34	67	20
Primary	85	44	71	27
Secondary or higher	84	58	76	39
Wealth quintile				
Lowest	79	33	65	19
Middle	83	44	73	26
Highest	92	69	82	49

Table 2.3: Infant and young child feeding (IYCF) practices of youngest children aged 6-23 months (breastfed and non-breastfed) living with their mother.

[1] Breastfeeding, or not breastfeeding and receiving two or more feedings of milk products

[2] Food groups: a. milk products; b. grains, roots, and tubers; c. vitamin A-rich fruits and vegetables; d. other fruits and vegetables; e. eggs; f. flesh foods; g. legumes and nuts.

[3] For breastfed children 6-8 months: semi/solid food at least twice daily for infants and at least three times daily; for breastfed children 9-23 months semi/solid food at least three times a day; for non-breastfed children 6-23 months: semi/solid food or milk feeds at least four times daily.

[4] For non-breastfed children 6-23 months: milk products at least twice a day, MMF, and semi/solid foods from at least four food groups not including milk products.

Feeding styles

Over the past twenty years, there has been growing recognition that the way infants and young children are fed can have an impact on their current and future nutritional status (39-41). Three feeding styles – controlling, laissez-faire, and responsive have been identified (42). Responsive feeding is a style that is neither too forceful nor too indulgent but utilises positive verbal and non-verbal communication and gestures to encourage the child to eat, while feeding to cues of hunger and satiety (41). The immediate

outcome of responsive feeding is that the child eats sufficient amounts of nutritious (as opposed to unhealthy) foods with appropriate frequency. The evidence indicates that responsive feeding is associated with increased energy intake and improved child growth (43, 44). In the long term, responsive feeding helps children to learn to recognise hunger and satiety and acquire healthy eating habits (40). In settings where caregivers have limited time, or possibly limited competency (as in the case of siblings caring for younger children), responsive feeding can be compromised (39). Laissez-faire, or highly permissive feeding styles, are anecdotally observed in Cambodia, although no literature exists.

Commercial snacks and beverages

Feeding styles will be of increasing importance in the nutrition transition underway in Cambodia (39), as Cambodian children are increasingly exposed to unhealthy snacks, sugary beverages, and foods high in salt, sugar, fat, and excess protein (41). Junk foods contribute to overweight and obesity and potentially to micronutrient deficiency by displacing breastmilk and nutritious food (45, 46). Laissez-faire feeding styles in the context of high availability of commercial snacks that are low in nutrients but attractive to children can compound poor nutritional outcomes (40, 41).

Illness and infection contribute to undernutrition

A vicious cycle exists between undernutrition and infectious disease (47). Infection and disease can lead to undernutrition in several ways (48). Combatting infection can demand a considerable increase in energy and nutrient requirements, which diverts nutrients away from growth. Young children may not be able to consume the additional food necessary, especially since infection often suppresses appetite. At the same time, infectious disease can impair the absorption and use of energy and nutrients. Repeated exposure to intestinal diseases can lead to a permanent reduction in absorptive capacity (49). Moreover, caregivers sometimes withhold food from sick children in the mistaken belief that restricting food intake will speed recovery (36). Conversely, undernutrition increases a child's risk of contracting disease, and prolonging its duration (48). Thus, an unfortunate synergy exists between infection and

undernutrition, resulting in the undernutrition-infection complex. Additionally, limited access to health care and inadequate health seeking behaviour compound both infection and undernutrition (50).

Inadequate water, sanitation and hygiene contribute to illness and infection

Infectious diseases that are commonly and closely associated with undernutrition include diarrhoea, respiratory disease, malaria, measles, tuberculosis, and human immunodeficiency virus (HIV) (47). Unclean water, inadequate sanitation and poor hygiene practices expose children to disease, particularly diarrhoea and intestinal parasites. Up to 50% of the disease burden of undernutrition could be related to poor water, sanitation and hygiene which expose children to water-related diseases, especially diarrhoea, and helminth infestation (47, 51). Handwashing with soap, drinking potable water, and appropriate disposal of faeces could reduce the risk of diarrhoea by half (2).

Water, sanitation, hygiene and illness and infection in Cambodian children

Water-borne disease is a major cause of infection in young Cambodian children (52). In Cambodian urban centres, including Phnom Penh where our study took place, water and sanitation facilities are adequate. Most urban households (92%) use the same water source all year round, and most of those water sources (75%) are located on the household premises. Almost all urban households (95%) use an improved, or potable, water source. In addition, 69% of urban households use an appropriate method of treating their water prior to drinking it. With respect to sanitation, 83% of urban households have access to improved, not shared sanitation facilities. Hand hygiene has improved almost twenty percentage points since 2010, with nearly all urban households (94%) having a place for handwashing with soap and water (3).

Despite improvements in water, sanitation, and hygiene practices in Phnom Penh, in the two weeks prior to the 2014 DHS, approximately 20% of children under aged six to twenty-three months had had diarrhoea, and 2% had had bloody diarrhoea. The prevalence of diarrhoea was surprisingly high in

Phnom Penh, at 17% for children under five years (3). Hookworm and other intestinal parasites affected 19% of mothers and 10% of children, particularly in rural areas (3, 53). Acute respiratory infection, another major cause of morbidity and mortality in children under five years, affected between 6-7% of Cambodian children aged 6-35 months (3).

Maternal age at first birth in Cambodia

Pregnancy in adolescence can result in poorer growth and nutritional status, as well as greater risk of birth complications for mothers and babies (13, 54). Since 2010, there has been an increase in teenage fertility in Cambodia. Although mean age for first births in Phnom Penh was 24 years in 2014, 6% of women aged 15-19 who were interviewed for the 2014 DHS were pregnant or were already mothers (3). Of all women responding, 11% and 28% had delivered their first child by the age of eighteen or twenty years respectively (3).

Birth order and birth spacing in Cambodia

Birth order and spacing have an impact on child undernutrition (13, 55). Among Cambodian children, first-born infants, and those of birth order six or higher (in total, 23% of all children) were more likely to be low birthweight (3). The prevalence of stunting was high (37%) when the space between births was less than 24 months. In 2014, 12% non-first births in Phnom Penh occurred less than 24 months after the preceding birth (3).

Maternal anthropometric status in Cambodia

Maternal anthropometric status has important implications for birth outcomes, birthweight, and future child nutritional status (54). In 2014, 14.0% of women in Phnom Penh were underweight, meaning they had a body mass index (BMI) of less than 18.5 (3). Children of underweight mothers compared to children of normal weight mothers were more likely to be stunted (44% versus 32%), wasted (19% versus 9%), and underweight (11% versus 4%).

Birthweight in Cambodia

There is a close association between low birthweight and poor nutritional status (56). In Cambodia, high prevalences of low birthweight contribute to persistently high prevalence of undernutrition (3). Almost one in ten babies (8%) had low birthweight (defined as < 2.5kg). Two-thirds (63%) of children who were born with low birthweight or were reported small at birth were stunted. Low and very low birthweight babies were also more likely to be wasted (17% and 24% respectively) compared to of average or higher birth weight babies, 9% of whom were wasted (3).

Rural versus urban children in Cambodia

According to the 2014 CDHS (3), rural children were more likely to be stunted than urban children (34% versus 24%). Prevalences varied from 18% in Phnom Penh to 44% in the most remote provinces. However, the prevalence of stunting has decreased more in rural than in urban areas since 2010 when rural and urban stunting were 56% and 25% respectively (8). In terms of wasting, rural children generally had a prevalence that was only slightly higher than urban children (10% versus 8%), although some rural provinces reached 15%. The prevalence of underweight was higher among rural than urban children (25% versus 15%).

Poverty and wealth in Cambodia

The prevalence of stunting was much higher among children in the poorest compared to the richest households (42% versus 19%). Similarly, the prevalence of underweight was more than twice as high for children in the lowest versus the highest wealth quintile (31% versus 13%). Wasting was highest (11%) in the lowest two wealth quintiles but was still present (7%) in the highest wealth quintile (3).

Mother's educational status in Cambodia

The 2014 CDHS (3) found that mothers with no education compared to secondary education or higher were more likely to have stunted children (39% versus 27%) and twice as likely to have severely stunted children (13% versus 7%). While maternal secondary education compared to no education was associated with slightly lower prevalence of wasting overall (10% versus 12%), it made little difference

in the prevalence of severe wasting (3). The prevalence of underweight did not vary greatly with mother's education, but the prevalence of severe underweight was twice as high in children whose mothers had no education versus mothers with a secondary education or more (7% versus 4%).

Sex and undernutrition in Cambodia

There was little to no sex differential in stunting, wasting or underweight (3).

Consequences of undernutrition

Undernutrition is associated with increased morbidity and mortality both in the short and long term. It is estimated that undernutrition is implicated in some 45% of deaths in children under five years resulting in at least three million child deaths each year (14). As seen in Table 2.2, the mortality risk for children suffering from severe wasting, severe stunting, or even moderate stunting and wasting is five to twelve times greater than it is for non-malnourished children (4). Undernourished children who survive may have impaired physical and cognitive development and reduced educational potential (23). They may grow into adults with lower earning and productive capacity, which may render them poorer and more vulnerable to the living conditions that engender ill-health and poor nutrition for them, their household, and their offspring over the longer term (23). At a larger scale, this translates to impaired national productivity and limits economic and social growth (57). Thus, in addition to the individual ill-health it causes, undernutrition leads to poverty and vulnerability, which in their turn, increase the risk of children being undernourished. The cycle of undernutrition thus created jeopardises the achievement of broader development goals (58).

Cost of malnutrition with particular reference to Cambodia

Malnutrition impacts social and economic development, as shown previously in Figure 2.2 The cost of malnutrition - including undernutrition, overnutrition, and micronutrient deficiency - to the global economy is calculated at US$3.5 trillion (58). Improvements in nutrition tend to lag behind economic growth, and anticipated improvements are not necessarily realised (59). Decreasing poverty does not automatically lead to decreased undernutrition (60).

As seen previously, the rapid economic growth that is transforming Cambodia into a middle-income country has not been accompanied by concomitant improvements in nutrition. Instead, Cambodia has stalled in its progress on undernutrition. The prevalence of childhood stunting and wasting remain unacceptably high, as well as persistent micronutrient deficiencies and growing prevalence of overweight. Sixty percent of child mortality in Cambodia is attributable to undernutrition suffered in utero or in the first five years of life (61).

An evaluation of the cost of malnutrition was conducted in Cambodia in 2014. This assessment considered a number of pathways through which malnutrition contributes to economic burden, including of the loss of future workforce resulting from child mortality and disability; child cognitive deficits leading to poor school performance and diminished adult productivity; decreased productivity in current adult workers; and excess use of healthcare and welfare services. Malnutrition was estimated to account for a loss of between 1.5-2.5% of gross domestic product (GDP) or US$250-400 million annually (61).

Framework for addressing undernutrition, with specific reference to Cambodia

There is sufficient evidence on interventions that could be effective in preventing maternal and child undernutrition if they were implemented at scale (2, 22, 62). The 2013 Lancet Maternal and Child Undernutrition series, using the UNICEF framework, developed the "Framework for Actions to Achieve Optimum Foetal and Child Nutrition and Development" (55), shown in Figure 2.4 below.

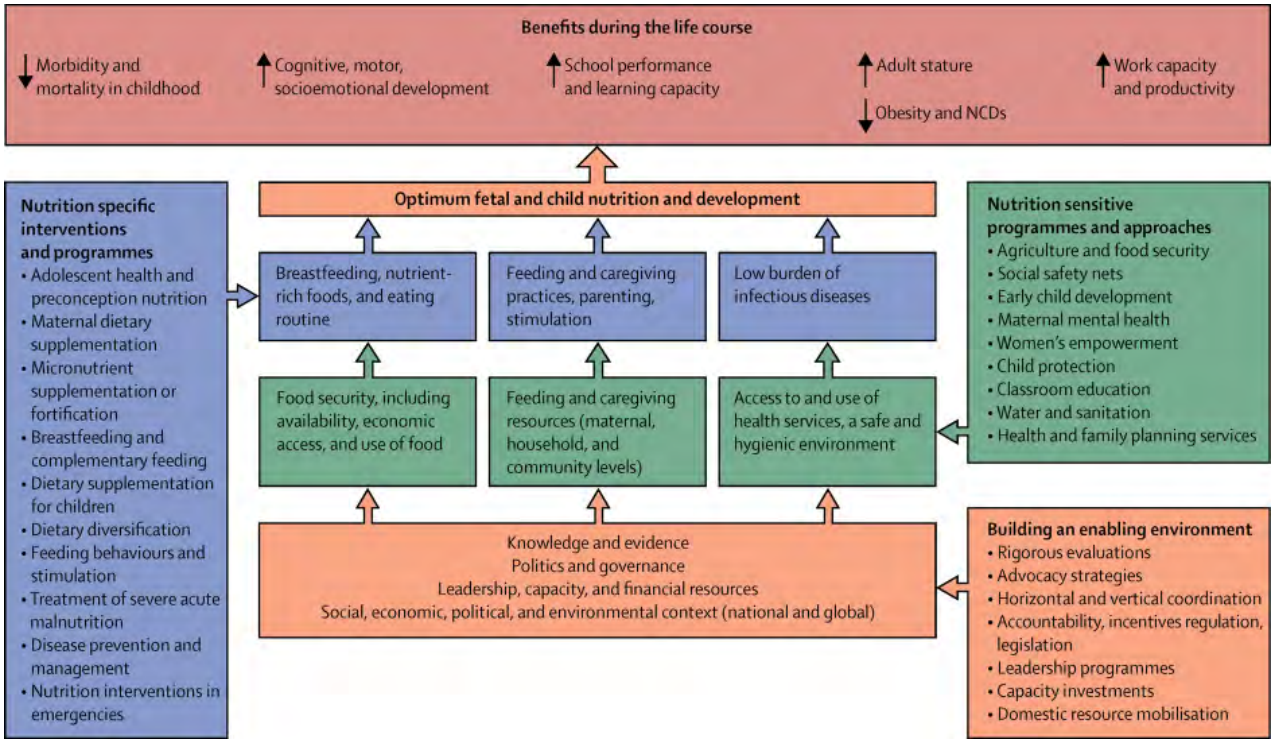

Figure 2.4: Framework for actions to achieve optimum foetal and child nutrition and development.
Source: Black et al, 2013.

Ideally, nutrition interventions would take place at all points in the life-cycle to ensure optional growth. However, when resources are limited, the pragmatic approach is to identify the point when interventions have the greatest potential impact. In Cambodia, most growth faltering accrues from six to twenty months, during the complementary feeding period (54), which suggests that this is the optimal target age for addressing undernutrition.

Improving complementary feeding

It is possible to broadly attribute the relative contribution of each phase of the life cycle to nutrition status, at least in terms of stunting. Dewey and Huffman (54), comparing growth curves for Cambodian children to the WHO Child Growth Standard, found that by three years of age, Cambodian children have a 6cm height deficit, with 17% of growth faltering occurring by the age of six months, 67% by twelve months, and the final 33% being incurred from one to three years of age (Figure 2.5).

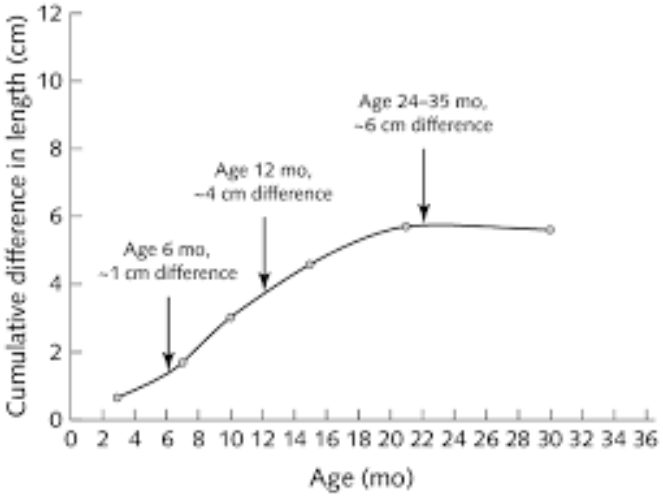

Figure 2.5: Cumulative difference in stature (length or height) between Cambodian children (both sexes) and the median of the WHO Child Growth Standard (for girls).
Source: Dewey and Huffman, 2009.

Thus, the majority of growth faltering in Cambodia occurs from six to twenty months. This knowledge is useful in deciding how to address childhood undernutrition and allocate nutrition resources. Given Dewey and Huffman's analysis, it is reasonable to focus on improving complementary feeding as a strategy for preventing undernutrition in Cambodian children, bearing in mind that complementary feeding refers to continued breastfeeding while introducing complementary foods (54).

Adequate complementary feeding can reduce and prevent undernutrition (2). Interventions aimed at ensuring adequate complementary feeding include improving the existing diet, providing micronutrient supplements, or providing supplementary food with or without micronutrients (63).

Improving the existing diet

In the long-term, it is important to improve diets for the whole population, in Cambodia and globally. The logistically and environmentally sustainable food-based approaches that are described by the EAT-Lancet Commission on Food, Planet, Health are more likely to avoid the potential negative outcomes that could result from provision of a limited range of macro and micronutrients (64). Thus far, however, attempts to improve upon traditional diets have yielded only moderate success in terms of micronutrient status or growth, particularly for the poorest people (63). Dietary modelling prior to 2014 based on

foods that were currently consumed in Cambodia suggested that traditional diets were unlikely to provide all the micronutrients required. Thus, it was thought unlikely that interventions aimed at enhancing complementary feeding using existing (unprocessed or minimally processed) foods would succeed in addressing child undernutrition in a timely manner or on the scale necessary, particularly for the most vulnerable children (65, 66).

Since two-thirds of the undernutrition suffered by Cambodian children occurs during the complementary feeding period (54), focussing on improving complementary feeding, through provision of micronutrient supplements or supplementary food, was thought more likely to be effective.

Micronutrient supplements

Provision of micronutrient supplements is a common nutrition intervention, which is relatively inexpensive and logistically feasible. Supplements can be individual micronutrients such as iron syrup, or multiple micronutrients, often in the form of individually-packed powders such as Sprinkles micronutrient powders (MNP) that are added to food, or tablets that can be crushed and mixed with food (67). Since co-occurring micronutrient deficiencies are more likely than specific deficiencies, provision of multiple micronutrients is more beneficial and cost-effective than supplementation with individual micronutrients (68-72) .

However, while micronutrient supplements can address specific micronutrient deficiencies, there is no evidence that micronutrient supplementation alone, in the absence of a diet with sufficient energy, protein and lipids, contributes to sustained improvements in linear growth (2, 22, 63, 69, 73-80). Thus, micronutrients are more likely to contribute to positive outcomes when they are provided as multiple micronutrients and in combination with macronutrients (68, 73).

Supplementary foods

Providing a supplementary food with macro- and micronutrients is more likely to improve nutritional status than providing either macronutrients or micronutrients alone (2, 22, 68). Specially formulated

supplementary foods with a high energy and nutrient density can be used to enhance complementary feeding, thereby preventing growth faltering, and promoting improved linear growth, weight gain and micronutrient status. These energy-dense supplementary foods contain both macro and micronutrients and include a source of protein and lipids such as powered milk, soy or peanuts, and usually multiple micronutrients (81, 82). Until recently, prevention of undernutrition relied on fortified blended products, such as Corn-Soy Blend Plus (CSB++, now called Supercereal Plus). These require preparation; CSB++ is mixed with water to make a porridge. Other specialised foods, like BP-100™ biscuits, are ready to eat with no preparation. Increasingly, ready-to-use foods (RUFs) are being formulated as lipid-based nutrient supplements (LNSs) which are often pastes, such as the peanut-based products, Plumpy'Nut™ (a therapeutic food) or Plumpy'Doz™ (a supplementary food). These new lipid-based products are proving more effective than fortified blended foods (18). By comparison, LNSs are higher in energy, have a longer shelf life, and, since they require no preparation, are more convenient (81, 83, 84).

Supplementary foods, especially LNSs, have proved effective in treating moderate acute malnutrition (MAM) (18). The provision of supplementary food in food insecure settings has been shown to have a significant, if small, impact on linear and ponderal growth (85). Our trial tested whether a supplementary food would have a similar impact in food secure setting with a representative population of children (including a prevalence of MAM comparable to the national prevalence).

Review of recent studies related to supplementary foods

Most studies are with SAM or MAM children in food insecure settings

To date, the majority of trials of supplementary foods for the prevention or treatment of undernutrition have been conducted on children with SAM or MAM and in food insecure settings. The effectiveness of the WHO protocol for SAM treatment has been demonstrated. Furthermore, a number of systematic reviews have concluded that specially formulated foods can improve growth for children with MAM, and that LNSs tend to be slightly more effective than fortified blends (86-88), suggesting that for MAM

children, providing supplementary food, preferably LNS, is better than doing nothing. However, the evidence is somewhat limited and not high quality (18, 87). Even for MAM children, growth may still be suboptimal (89), especially with respect to wasting prevention (84).

Few studies include representative populations in food secure settings

Relatively few studies have assessed the impact of providing supplementary foods on the growth of a representative population of children (with MAM and non-MAM children, i.e. WHZ > -3 and < +3, and/or MUAC > 11.5cm) in a food secure setting. Due to the different terminology (for example, prevention of undernutrition versus treatment of MAM), study designs, methodologies, settings, and participants, it is difficult to compare trials.

The tables below summarise selected literature and systematic reviews, as well as effectiveness trials that are most relevant to our research, in other words, those trials that provided supplementary foods to a representative population of children aged six to twenty-three months. Table 2.4 describes the relevant narrative and systematic reviews, while Table 2.5 summarises the individual trials. The latter are organised in order of decreasing similarity to our trial, beginning with studies that were most similar to our trial in that they had untreated control groups and representative populations. Next, studies with untreated control groups but non-representative populations are summarised, followed by studies with no control or a treated control group.

Evidence from the literature and systematic reviews

The literature and systematic reviews considered a range of feeding interventions including micronutrient supplements, cereal and protein (usually legume) blends, small quantity lipid-based nutrient supplements (SQ-LNSs), ready-to-use therapeutic foods (RUTFs), and local foods. The reviews which considered similar interventions, namely specially formulated supplementary foods, are most relevant to our trial. Matsungo et al. (90), looking at a representative (non-SAM) population, found that SQ-LNSs had no clear impact on linear growth. The studies in the review by Dewey et al. included severely acutely malnourished children (63). Although malnourished children sometimes had

improved ponderal growth, Dewey concluded that the overall impact of supplementary feeding on child growth was mixed. Panjwani et al. (85) and Lassi et al. (91) looked at representative populations in food secure and insecure settings. In food insecure environments, provision of supplementary food had a small positive effect on linear and ponderal growth. However, none of the studies considered provision of supplementary food in food secure environments. The reviews by Kristjansson et al. (92) and Sguassero et al. (93) were of provision of supplementary foods that were not specially formulated and were therefore less comparable to our trial. The former concluded that the impact of supplementary feeding was positive while the latter found the impact negligible. Both noted that a positive impact was more likely with younger and less well-nourished children.

Thus, the evidence from the literature and systematic reviews (Table 2.4) is mixed. Where improvements in anthropometric measures were noted, they were generally small to negligible.

Systematic reviews					
Author (year)	**Study design and methods**	**Aim**	**Setting**	**Age and nutritional status at recruitment**	**Outcomes**
Matsungo et al. (2017)	Narrative literature review (7 studies)	To assess the efficacy of SQ-LNS in prevention of growth faltering.	Malawi, Ghana, Burkina Faso, Haiti	6–23 months Representative population i.e. not SAM	Inconclusive evidence on the efficacy of SQ-LNSs for improving linear growth. Two studies showed no differences and five studies showed differences in growth and stunting between intervention and control groups.
Panjwani & Heidkamp (2017)	Systematic review and meta-analysis (16 studies)	To review and synthesize the current literature for the impact of CF interventions on linear and ponderal growth, with the specific goal of updating intervention-outcome linkages in the Lives Saved Tool (LiST).	Global, 11 LMICs	6–23 months Representative population i.e. blanket supplementation or studies including mildly/moderately underweight children; excluded studies that only enrolled children with WAZ, HAZ or WHZ < -3	Nutrition education/counselling had a small significant impact on HAZ in food-secure populations [standardized mean difference (SMD): 0.11; 95% CI: 0.01, 0.22] but not on WHZ. CF with or without nutrition education had a small, significant effect in food-insecure settings on both HAZ (SMD: 0.08; 95% CI: 0.04, 0.13) and WHZ (SMD: 0.05; 95% CI: 0.01, 0.08).
Kristjansson et al. (2015)	Systematic review and meta-analysis (32 studies)	To assess the effectiveness of SF interventions for improving physical and psychosocial health.	Global, 21 LMICs and 3 HICs	3-59 months Socio-economically disadvantaged groups (nutritional status was not an in/exclusion criteria)	- Weight gain: 0.12kg more than control over 6 months (95%CI 0.05 – 0.18) - Height gain: 0.27cm more than control over 6 months (95%CI 0.07 – 0.48) - WAZ: MD 0.15, 95%CI 0.05 - 0.24 - HAZ: MD 0.15, 95%CI 0.06 - 0.24 - WHZ: MD 0.10 95%CI -0.02 - 0.22 SF had positive effects on growth in LMICs, especially for younger and poorer/ less well-nourished children.

Systematic reviews, *continued*					
Author (year)	**Study design and methods**	**Aim**	**Setting**	**Age and nutritional status at recruitment**	**Outcomes**
Lassi et al. (2013)	Systematic review and meta-analysis (16 studies)	To assess the impact of CF education and provision of CF with or without education on growth and morbidity.	Global, 15 LMICs	6–23 months Representative population i.e. excluded studies of food given for therapeutic purposes	In food secure setting, CF education improved: - HAZ (SMD: 0.23; 95% CI: 0.09, 0.36) - WAZ (SMD 0.16, 95% CI: 0.05, 0.27) - Stunting (RR 0.71; 95% CI: 0.56, 0.91). In food insecure setting: - CF education improved growth (increased height, weight, HAZ, WAZ, but stunting rates not reduced) - Provision of CF improved HAZ, WAZ
Sguassero et al. (2012)	Systematic review (8 RCTs)	To evaluate the effectiveness of community-based SF for promoting physical growth.	Global, 9 LMICs	0-59 months Nutritional status was not an in/exclusion criteria, some studies included malnourished children	In children < 12 months, MD in length 0.19 cm; 95%CI 0.07 - 0.31 SF has a negligible impact on child growth.
Dewey & Adu-Afarwuah (2008)	Systematic review (42 studies, 5 on food provision alone)	To review the efficacy and effectiveness of CF interventions in developing countries.	Global, 25 LMICs	6–23 months Nutritional status not an in/exclusion criteria	The impact of CF intervention (food alone) on child growth was mixed. Two studies showed improved growth; three studies showed no impact.

Table 2.4: Selected reviews investigating the impact of the provision of supplementary foods on growth of infants and young children.
CF, complementary feeding or complementary food/s; CI, confidence interval/s; HAZ, height-for-age z-score; HIC, high-income country/ies; LiST, Lives Saved Tool; LMIC, low- or middle-income country/ies; LNS, lipid-based nutrient supplement/s; MD, mean difference; RR, relative risk; SAM, severe acute malnutrition; SF, supplementary feeding; SMD, standardized mean difference; SQ-LNS, small-quantity lipid-based nutrient supplement/s; WAZ, weight-for-age z-score; WHZ, weight-for-height z-score.

Evidence from the individual trials

Table 2.5 summarises the individual trials (some of which were included in the literature and systematic reviews) that aimed to prevent undernutrition using supplementary foods. The individual trials that were most similar to our trial were those with untreated control groups and representative populations (94-98). The trial in a food insecure setting (96) improved WHZ and reduced stunting considerably. Children in one trial very similar to ours had modest improvements in HAZ and WAZ (95). Other similar trials showed no improvement in HAZ (94) or in any anthropometric outcome (98). Lutter et al. noted that despite increases in HAZ and WAZ in the intervention group, growth faltering was not prevented (97).

Interestingly, the largest positive impacts were seen in the next two trials with untreated control groups and representative populations. These used foods that were not specially formulated, namely eggs or meat, as the supplementary food and demonstrated improvements of far greater magnitude than the previous trials that provided specially formulated supplementary foods (99, 100).

Two short (twelve-week) trials comparing untreated control groups with moderately acutely malnourished children had mixed results. In one, WHZ increased (101), whereas in the other (102), there were no statistically significant differences between the control and intervention groups.

The next group of studies compared supplementary foods to each other but not to a control. Again, the results were mixed. WHZ increased in one of the trials (103), but not another (104), and in a third (105) WHZ, WAZ and HAZ all improved. No significant differences were seen for two trials (106, 107) and in one of them, growth faltering was not prevented (107). In one trial, WHZ increased but HAZ decreased, and overall, growth was considered suboptimal (89).

The outcomes from the individual trials in Table 2.5 suggest that specially formulated supplementary foods had only a modest impact in preventing undernutrition. Where there were increases in z-scores for WAZ,

HAZ or WHZ, they were usually less than 0.25 as a result of interventions that were often six months or more. In some cases, the prevalence of underweight, stunting or wasting decreased, suggesting that even those small effects on anthropometric outcomes may have prevented progression to undernutrition. However, the summary of the relevant literature demonstrates that specially formulated supplementary foods have had limited clinical significance on children's growth.

Studies with untreated control group and representative population					
Author (year)	**Study design and methods**	**Aim**	**Setting**	**Age and nutritional status at recruitment**	**Outcomes**
Maleta et al. (2015)	RCT (N = 1,932) 12-month trial	To test if the change in mean LAZ would be greater in LNS than control group.	Semi-urban, Malawi	6-18 months Representative population, WLZ ≥-2	No statistically significant differences between groups for any anthropometric outcome (LAZ, WAZ, WLZ, MUAC).
Mangani et al. (2015)	RCT (N = 840) 6-month trial	To test if LNSs promote linear growth and reduce severe stunting.	Rural Malawi	6-18 months Representative population, weight for length ≥80% of WHO reference median	From 9-12 months of age, mean change in HAZ was -0.15, -0.02, -0.12 and -0.18 (P = 0.045) for control, milk–LNS, soy–LNS and CSB groups, respectively. No statistically significant differences in stunting between groups. Impact smaller than expected. No evidence that LNS supplementation lowers stunting incidence.
Iannotti et al. (2014)	RCT (N = 589) 6-month trial	To test efficacy of daily LNS for increased linear growth.	Urban slum, Haiti	6–11 months Representative population, WHZ>-3	Compared with the control group the 6-month LNS group had increased HAZ by 0.13 ± 0.05 and WAZ by 0.12 ± 0.05.
Isanaka et al. (2009)	Cluster randomised trial (N = 3,533) 3-month trial	To evaluate the effect of 3-month distribution of RUTF on nutritional status of children aged 6 to 60 months.	Niger, food insecure	6-59 months Representative population, weight-for-height ≥ 80% National Centre for Health Statistics reference median	Difference in WHZ between intervention and control groups from baseline to endline 0.22 z (95% CI, 0.13 to 0.30). Significant reduction in all wasting of 36% (95%CI 17 - 50) and 58% (95%CI 43 - 68) in severe wasting.
Lutter et al. (2008)	Program evaluation, nonrandomly chosen control (N = 319) 11-month trial	To evaluate the effectiveness of a CF provided through health system in reducing prevalence of underweight	Poor peri-urban and rural Ecuador	9–25 months Representative population, open to all children in village	Positive and significant differences for HAZ, WAZ, and prevalence of underweight for intervention compared to control group. However, growth faltering was not halted.

Studies with untreated control group and representative population using supplementary foods that were not specially formulated					
Author (year)	**Study design and methods**	**Aim**	**Setting**	**Age and nutritional status at recruitment**	**Outcomes**
Iannotti et al. (2017)	RCT (N = 163) 6-month trial	To test the efficacy of giving 1 egg per day to children beginning at ages 6 to 9 months.	Rural Ecuador, indigenous population with high stunting.	6-15 months Representative population, all healthy children in target area.	Intervention group had significantly increased: - HAZ (0.63, 95%CI 0.38–0.88) - WAZ (0 61, 95%CI 0.45–0.77) - WHZ (0.33, 95%CI 0.14–0.51) Stunting was reduced by 47%. Underweight was reduced by 74%
Tomedi et al. (2012)	Quasi-experimental design (N = 276) 7-month intervention	To assess feasibility and effectiveness of using locally available foods to prevent malnutrition and improve child growth.	Rural Kenya high rates of malnutrition, food insecure	6–20 months Representative population, open to all children WHZ > -2	Significant difference between intervention and control groups: - Difference in change in mean WAZ (0.82) - Difference in change in mean WHZ (1.19) - wasting prevalence (0% v. 8.9%) - underweight prevalence (6.3% v. 23.0%). - HAZ decreased in both groups.
Studies with untreated control group and non-representative population (moderately acutely malnourished)					
Author (year)	**Study design and methods**	**Aim**	**Setting**	**Age and nutritional status at recruitment**	**Outcomes**
Thakwalak-wa et al. (2012)	RCT (N = 299) 12-week trial	To compare CSB to LNS in terms of improving weight gain of moderately underweight children.	Malawi (lean season, food insecure)	6–15 months Underweight, WAZ < -2 but WHZ > -3	LNS group's WHZ increased by 0.22 z-scores in comparison to control (p = 0.049)
Kuusipalo et al. (2006)	RCT (N = 125) 12-week trial	To assess growth in moderately underweight ambulatory infants given fortified spread.	Rural Malawi	6–17 months Underweight, WAZ < -2 but WHZ > -3	No statistically significant differences between groups for any anthropometric outcome

Studies with no control group or treated control group					
Author (year)	**Study design and methods**	**Aim**	**Setting**	**Age and nutritional status at recruitment**	**Outcomes**
Choudhury et al. (2016)	Matched intervention trial (N = 980) Treated control group 5-month trial	To compare weight and height gain between underweight children receiving micronutrient powders and food supplement and well-nourished children receiving micronutrient powders only.	Urban slum, Dhaka, Bangladesh	6–23 months Intervention group: WAZ < -2 Control: well-nourished	Suboptimal weight and height gain were observed among intervention and control groups. WHZ increased for intervention group. HAZ decreased similarly for both groups.
Sayyad-Neerkorn et al. (2015)	Prospective intervention trial (N = 1,967) 15-month trial	To compare long-term supplementation of LNSs and CSB++ on the incidence of acute malnutrition and stunting in young children.	Rural Niger, non-lean season	6–23 months Representative population, SAM children referred for treatment.	No significant differences in MAM, SAM or stunting for the two products.
Skau et al. (2015)	Randomised trial (N = 419) 9-month trial	To evaluate the efficacy of 2 novel CF foods (WinFood and WinFood-Lite) compared to CSB+ and CSB++.	Food insecure setting, rural Cambodia	6–15 months Representative population, all children WHZ > -3	WAZ, HAZ and WHZ decreased for all groups. No statistically significant differences between groups.
Purwestri et al. (2012)	Longitudinal intervention study (N = 99) 6-week intervention	To compare outcomes of daily and weekly distribution of Nias biscuit.	Nias island, Indonesia	6-59 months Mildly acutely malnourished, WHZ -2 to -1.5	WHZ increased in both groups (0.61 ± 0.56; 0.37 ± 0.41)

Studies with no control group or treated control group, *continued*					
Author (year)	**Study design and methods**	**Aim**	**Setting**	**Age and nutritional status at recruitment**	**Outcomes**
Lin et al. (2008)	Randomised trial (N = 240) 12-month intervention	To compare the effect on growth of peanut-/soy-based fortified spread and corn porridge fortified with fish powder as CFs.	Rural Malawi	6–18 months Representative population, all children without SAM	Children receiving the fortified spread gained 110 g (95% CI 220 - 10) more than children receiving the fish powder from 6–12 months. No other significant differences between groups. Growth still not normal compared to international standards.
Ruel et al. (2008)	Cluster randomised trial (N = 1,481) 9- or 18-month intervention	To compare the effect of a preventive and a recuperative approach of food-assisted nutrition program on child growth.	Haiti	Recuperative: underweight (WAZ <–2), 6-59 months, for 9 months Preventive: all children, 6–23 months, for 18 months	Children from preventive model had significantly higher HAZ (+0·14), WAZ (+0·24), and WHZ (+0·24) than the recuperative group.

Table 2.5: Selected effectiveness trials investigating the impact of the provision of supplementary foods on growth of infants and young children.
CF, complementary feeding or complementary food/s; CI, confidence interval/s; CSB, corn-soy blend; CSB+, corn-soy blend plus; CSB++, corn-soy blend plus plus; HAZ, height-for-age z-score; HIC, high-income country/ies; LAZ, length-for-age z-score; LMIC, low or middle-income country/ies; LNS, lipid-based nutrient supplement/s; MAM, moderate acute malnutrition; MD, mean difference; RCT, randomised controlled trial; RR, relative risk; RUTF, ready-to-use therapeutic food; SAM, severe acute malnutrition; SF, supplementary feeding; SMD, standardized mean difference; SQ-LNS, small-quantity lipid-based nutrient supplement/s; WAZ, weight-for-age z-score; WHO, World Health Organisation; WHZ, weight-for-height z-score; WLZ, weight-for-length z-score.

Gaps in the literature and significance of this research

The development and comparison of new supplementary foods with current fortified blends and existing RUSFs, in terms of their potential for preventing and treating undernutrition, responds to a need noted by various researchers (14, 81, 86, 102, 108, 109) as well as to an existing programmatic need in Cambodia (110). Such products need to be affordable, effective, and acceptable in terms of preparation as well as taste (111).

Some critical gaps have been identified in the literature related to the composition of the supplementary food, the underrepresentation of Asian populations, and the lack of trials comparing the effectiveness of multiple micronutrient supplements with multiple micronutrient fortified supplementary foods. An additional gap, as noted in the literature review above, is the related to the effectiveness of providing supplementary products to representative populations of children in food secure settings for the prevention of undernutrition. This research addresses some of these gaps.

Supplementary foods using meat, fish, or eggs rather than milk

In our RUSF, milk was replaced with fish as a source of protein. Few studies compare milk versus non-milk animal-source foods in supplementary foods.

In terms of acceptability, one study in Kenya compared a novel food (containing fish and termites) with CSB+ and found that the novel food was preferred (112). However, most acceptability studies conducted with supplementary foods containing meat have generally concluded that when presented with novel foods, mothers prefer their traditional food, even if their children consumed equal amounts of the supplementary food or liked the supplementary food (111, 113). Children may be willing to eat new foods, but ultimately, it is caregiver acceptance that determines whether a child will be given a particular food and will develop a taste for it (112).

With respect to effectiveness, two studies have compared supplementary foods containing fish with other supplementary foods. One, in Malawi, compared a peanut- and soy-based fortified spread to a

corn porridge fortified with fish powder. It found that children consuming the porridge with fish powder gained less weight from 6-12 months, but from 12-18 months, the two supplementary foods performed similarly in terms of weight gain and linear growth (104). The other, in Cambodia, compared a rice- and fish-based supplementary food, called Winfood, with CSB++ (which contains milk) and CSB+ (which does not contain any animal-source food). It found that the products with animal-source foods promoted linear growth better than the product with no animal-source food (107).

As the majority of the evidence is on milk-based products, our research fills a gap on the acceptability and effectiveness of supplementary foods containing non-milk animal-source foods.

Geographical focus

Most studies on supplementary foods are from sub-Saharan Africa, particularly Malawi (102, 104, 114-120). Asia, especially South-East Asia, is underrepresented (18, 86). While there are a number of studies on micronutrient supplementation from South and South-East Asia (80, 121-124) including Cambodia (9, 74, 125-127), there are relatively few studies on the use of supplementary foods in Asia (63, 86, 93, 128-130). In Cambodia, there are only a handful of studies, including an acceptability study that compared CSB++ and Wheat-Soy Blend++ (131); an effectiveness trial of a fish-based food (107), and a study on the peanut-based product, Plumpy'Nut™ (132).

Multiple micronutrient supplements versus micronutrient-fortified supplementary foods

Our research deepens the understanding of the effectiveness of multiple micronutrients provided with or without macronutrients, by comparing the RUSF and CSB++, both of which combine macronutrients and multiple micronutrients, with MNP which contain no macronutrients. Only one study, in Ghana, compared multiple micronutrient supplements directly with supplementary foods. That study compared Nutributter, a multiple micronutrient-fortified, peanut-based spread, with MNP and the multiple micronutrient tablets, Nutritabs (77), and found that Nutributter, with its combination of macronutrients and micronutrients, was the most efficacious in promoting growth and motor development. To the best of our knowledge, ours is the first study comparing CSB++ to MNP.

Prevention versus treatment

Although it is widely agreed that it is more effective to prevent undernutrition, and as early as possible (82), there are few studies on prevention (18, 133). Researchers and programmers have had to rely on studies that conducted with children with SAM or MAM, or that are in emergency or food insecure settings. As seen in Tables 2.4 and 2.5 above, identification of the participants by their nutritional status is not always precise and terminology may differ substantially between trials.

What this research contributes

This research contributes to the existing literature by addressing the evidence gaps discussed above. It extends the nascent literature on the acceptability and effectiveness of supplementary foods containing a non-milk animal-source food and expands the knowledge on supplementary foods in South-East Asia, particularly Cambodia. In addition, it deepens the existing research on the impact of multiple micronutrients alone or in combination with macronutrients. It also contributes to our understanding of what it means and what is required to prevent undernutrition. More broadly, it informs the development of locally-produced supplementary foods.

From a programmatic standpoint, this research will help to expand the options for development and provision of supplementary foods, particularly in South-East Asia, where milk is neither produced nor consumed on a large scale. It also assists in making important decisions such as whether to invest in multiple micronutrient supplements like Sprinkles MNP, versus supplementary foods containing both macronutrients and micronutrients. Finally, our locally-produced RUSF has the potential to make a significant impact on child undernutrition in Cambodia and similar settings. It might also help to simplify interventions in maternal and child nutrition; for example, it could potentially be used with pregnant and lactating women as well as children aged six to twenty-three months.

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Chapter 3: Description of the RUSF

The Cambodian ready-to-use supplementary food (RUSF) was conceived as an lipid-based nutrient supplement (LNS) containing an animal-source food, protein, lipids, energy, and multiple micronutrients.

Animal-source foods

Animal-source foods are high in protein, energy, and micronutrient availability, and have been associated with improved micronutrient status, linear growth, and non-fat mass gain compared to non-animal-source foods (1, 2). Therefore, the World Health Organisation (WHO) recommends daily consumption of animal-source foods (3). Usually, milk or whey powder is the animal-source food used in supplementary foods including Corn-Soy Blend Plus Plus (CSB++) and various RUSFs (4, 5). However, milk powder is an expensive ingredient that is not produced locally and must be imported. Therefore, we aimed to replace it with a cheaper, local source of animal protein that is widely accepted by the target population. There are precedents for replacing milk in supplementary foods for cost effectiveness (6), but until now, only a few supplementary foods have used meat, fish, or eggs (7-12).

Fish as an alternative to milk

In Cambodia, fish is inexpensive, readily available, and highly acceptable. Globally, Cambodians are the largest consumers of freshwater fish per capita and even poor Cambodians have access to fish, especially small freshwater species (13). Fish is served in a variety of ways, including as paste and sauce. Fish was therefore used as the animal-source food to replace milk in our supplementary food.

Protein, lipids, energy, and multiple micronutrients

Additional sources of protein came from soy and mung beans, which are widely produced and consumed in Cambodia. Rice, the Cambodian staple, provided energy, along with oil as the lipid source, and sugar for palatability. The twenty micronutrients added were calcium, copper, folic acid, iron,

magnesium, phosphorus, potassium, selenium, vitamins A, B1, B2, B3, B5, B6, B7, B12, C, D, E, and zinc (see Appendix 3.1). The resulting product was expected to be less expensive and more acceptable to Cambodians, while still meeting the recommendations for specially formulated foods (14-16).

First version –paste

The French National Research Institute for Sustainable Development (IRD) developed the first version of this product in paste form in early 2013. It was compared to BP-100™, and found to be equally acceptable in younger children, although older children preferred BP-100™'s milky taste to the fishy flavour of the RUSF (17).

Second version - stock cube

The product was adapted to reduce the fish smell and make it into a drier, compact, stock cube-sized snack. The cube was difficult to press into a standard shape and to package, and given the consistency of the paste, at least one researcher considered it a potential choking hazard.

Figure 3.1: Filling the cylindrical wafer with LNS paste

Final version – snack

It was therefore reformulated into a snack comprised of a crisp hollow wafer cylinder filled with the paste, as seen in Figure 3.1 above. The unfilled wafers, made of rice flour, eggs, water, sugar, salt, and coconut, with small amounts of vanilla or sesame seeds as added flavour, are a common Cambodian snack food. The final product can be seen in Figure 4.1 in the next chapter.

Ingredients of the RUSF

Table 3.1 below describes the ingredients of the RUSF. More details can be found in Appendix 3.1 and in the acceptability protocol and results in Chapters 4 and 5.

Ingredients	**g/100g**
Small indigenous fish	5.9
Mung beans	9.6
Rice	4.2
Soy beans	12.2
Icing sugar	10.3
Maltodextrin	9.3
Canola oil	3.7
Palm vegetable shortening	14.0
Desiccated coconut	1.5
Rice bran	2.2
Vitamin and mineral mix	0.9
Rice flour	9.0
Duck eggs	2.5
Refined sugar	7.2
Coconut	7.2
Salt	0.0
Flavour (vanilla or sesame seeds)	0.1
Oil for cooking	0.4

Table 3.1: Ingredients of RUSF snack (paste and wafer)

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Chapter 4: Methods of the acceptability trial

This chapter describes the methodology of the acceptability trial. Part of this chapter is published as:

- **Borg B**, Mihrshahi S, Griffin M, Chamnan C, Laillou A, Wieringa FT. Crossover trial to test the acceptability of a locally produced lipid-based nutrient supplement (LNS) for children under 2 years in Cambodia: a study protocol. BMJ Open. 2017;7(9).

This chapter begins by explaining the rationale for conducting the acceptability trial. The next section is the published acceptability protocol. The final section describes departures from the protocol and changes made to the product after the acceptability trial.

Rationale for acceptability trial

As described in Chapter 1, existing supplementary foods did not prove acceptable or effective in Cambodia. Several reviews have recommended the development of locally-produced supplementary foods that are acceptable to the target population and appropriate for the local context (1-3). It has been suggested that where possible, supplementary foods should use local ingredients in order to be more acceptable, and to limit costs. For example, milk could be replaced with local protein (3). That is what we attempted to do with our locally-produced ready-to-use supplementary food (RUSF).

An essential step in developing specially formulated foods is testing acceptability. Regardless of how effective a product may be, it still needs to be acceptable in a given setting. In other words, children must be willing to eat the product and caregivers, to feed it to them. Most trials of ready-to-use foods (RUFs) have been conducted in Africa (1, 2, 4). Our trial assessed the novel RUSF's acceptability to Cambodian children and caregivers.

The following published protocol describes the planned methodology for the acceptability trial.

BMJ Open

Crossover trial to test the acceptability of a locally produced lipid-based nutrient supplement (LNS) for children under 2 years in Cambodia: a study protocol

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ABSTRACT

Introduction The acceptability and efficacy of existing ready-to-use supplementary and therapeutic foods has been low in Cambodia, thus limiting success in preventing and treating malnutrition among Cambodian children. In that context, UNICEF and IRD have developed a locally produced, multiple micronutrient fortified lipid-based nutrient supplement. This food is innovative, in that it uses fish instead of milk as the animal source food. Very few supplementary foods have non-milk animal source foods, and in addition they have not been widely tested. This trial will assess the novel food's acceptability to children and caregivers.

Methods and analysis This is a cluster-randomised, incomplete block, 4×4 crossover design with no blinding. It will take place in four sites in a community setting in periurban Phnom Penh. Healthy children aged 9–23 months (n=100) will eat each of four foods for 3 days at a time. The amount they consume will be measured, and at the end of each 3-day set, caregivers will assess how well their child liked the food. After 12 days, caregivers themselves will do a sensory test of the 4 foods and will rank them in terms of preference.

Ethics and dissemination Ethical clearance was received from the University of Queensland Medical Research Ethics Committee (2014001070) and from Cambodia's National Ethics Committee for Health Research (03/8 NECHR).

Registration ClinicalTrials.gov, identifier: LNS-CAMB-INFANTS; NCT02257437. Pre-results.

Strengths and limitations of this study

- This trial will contribute to the literature comparing supplementary foods using animal source foods other than milk.
- It will also provide information on the kinds of supplementary foods acceptable to a Southeast Asian population.
- Testing over 3 days in an unfamiliar setting may not be an indication of how caregivers and children would accept the food over a longer period. However, should the food prove acceptable in trial, a 6-month efficacy trial will follow. The latter trial will give additional information on long-term acceptability.

BACKGROUND AND RATIONALE

It is estimated that undernutrition is implicated in some 45% of deaths in children under 5 years.[1] In Cambodia, progress in combatting malnutrition has stalled. In 2014, 32% of all children under 5 years (and 40% of children aged 3–4 years old) were stunted, 10% were wasted and 24% were underweight[2] indicating, respectively, chronic and acute malnutrition, and a combination of the two. This malnutrition may be attributed in large part to poor complementary feeding,[2] which remains inadequate for achieving optimal growth outcomes and micronutrient status.

Adequate complementary feeding can reduce and prevent malnutrition.[3] In Cambodia, the traditional weaning food is *borbor*, white rice porridge with added salt or sugar, which is low in nutrient density. Improvements to complementary feeding may be achieved with supplements, such as micronutrient powders, and supplementary foods. The latter include fortified blended products that are mixed with water to make a porridge (eg, corn-soy blend++ or CSB++, now called Supercereal Plus), biscuits that can be eaten directly (such as BP100) or ready-to-use supplementary foods (RUSFs). RUSFs are usually lipid-based nutrient supplements (LNSs), which are often pastes such as the peanut-based Plumpy'Nut. Although until fairly recently, prevention of malnutrition has relied on fortified blended products, these new LNSs are proving very effective, both as RUSFs and ready-to-use therapeutic foods (RUTFs). Compared with the existing products, LNSs are higher in energy,

have a longer shelf life and are convenient since they require no preparation.[4 5]

Regardless of how effective a product may be, it still needs to be acceptable in a given setting. In other words, children must be willing to eat the product and caregivers must be willing to feed it to them. Acceptability to children can be measured by how much they eat and how readily, while acceptability to caregivers is measured in terms of their sensory perception of the food, that is, of the smell, colour, consistency and taste.[6] Other important factors affecting acceptability are price and convenience of preparation.

In Cambodia, various supplements and supplementary or therapeutic foods, including Sprinkles micronutrient powders, CSB++, BP100 and Plumpy'Nut, have been used or trialled. However, they have met with low levels of acceptability and success, either in trial or in practice.[7–9] Moreover, they are relatively expensive to procure and ship to Cambodia. For these reasons, and due to budget constraints, the United Nations World Food Program (WFP) in Cambodia phased out CSB++ distribution in 2014. A recent study estimated that only 20% of Cambodian caregivers purchase supplementary foods for their children.[10] Hence, the Cambodian Ministry of Health sought a locally produced ready-to-use food (both therapeutic and supplementary versions) containing macronutrients and micronutrients that can be adapted for use in Cambodia. It is expected that locally produced products are more likely to be acceptable and cheaper than the imported products. They also have the advantage of contributing money and capacity to the local economy.[11]

In 2009 in Vietnam, UNICEF, the Institut de Recherche pour le Développement (IRD) and the National Institute of Nutrition had developed a supplementary food from local ingredients including rice, soy, mungbeans, sugar, milk powder, oil and multiple micronutrients.[9 12] This product proved acceptable and effective and is now widely used. Drawing on that successful experience, UNICEF and IRD created a Cambodian ready-to-use food (in both supplementary and therapeutic versions) in early 2014, using fish, rice, soy, mungbeans, oil and sugar. Based on promising initial results, the product was finalised as a micronutrient-fortified snack.

OBJECTIVES AND HYPOTHESIS

This trial aims to establish the acceptability of the locally produced Cambodian RUSF for children under 2 years and their caregivers. Its acceptability will be compared with other supplementary foods that are or have been used in Cambodia, namely CSB++ and Sprinkles micronutrient powders.

DESIGN AND METHODS

Trial design

The trial is a cluster-randomised, incomplete block, 4×4 crossover design. The allocation ratio is 1:1. This will be an open trial with no blinding, because the 4 foods will be visibly different to participants and data collectors. The trial will take place in 2 parts over 2 weeks:

1. substudy 1: acceptability by children, 3 days × 4 foods for a total of 12 days
2. substudy 2: acceptability by caregivers, 13th day.

Foods and preparation

Four foods will be tested. The RUSF in snack form, and the RUSF added to plain *borbor*, will be compared with CSB ++ porridge, and Sprinkles added to plain *borbor*.

CSB++ is the United Nations WFP's standard supplementary food to prevent malnutrition in children aged 6–23 months. Sprinkles have been promoted and distributed by the Cambodian Ministry of Health to improve the micronutrient status of children aged 6–23 months.

CSB++ contains milk and is considered to be creamy, sweet and smooth.[13] It requires 10 minutes of cooking. Sprinkles are added to food after cooking or heating and do not have a taste.[14]

Study site

The study will be conducted in periurban Phnom Penh. This population has been selected because the urban poor comprise about one quarter of the Phnom Penh's residents, or approximately one-quarter of a million people,[15] who experience high rates of child underweight and stunting (35.6% and 29.1%, respectively).[16] Furthermore, the populations are large and dense enough to yield the required sample size.

The study will be conducted in four test-feeding sites such as pagodas or health centres identified based on convenience. There will be two teams of data collectors working at two test-feeding sites each. In this way, all children at a given site will be eating the same food, which will reduce bias related to social interaction and varied responses to different foods. Children and caregivers will come at the same time each day for the 12 days, which will reduce bias related to feeding times.

The four test-feeding sites will be randomly allocated to begin on one of the foods as shown in figure 1 below, using an Excel random number table and a randomised incomplete block design. The principal researcher will generate the allocation sequence. Children will not be randomised to a food, since all children at a given test-feeding site will be eating the same food.

Study participants

Participants will be recruited by convenience from the village/s close to the four sites. Village Health Support Group members (local health volunteers) will assist with recruitment. It is expected that there will be approximately equal numbers of female and male children and that the children's caregivers will be mostly female. Caregivers and children may be recruited if they meet the following inclusion and exclusion criteria:

- To facilitate child feeding, only singletons will be eligible for inclusion.

Site	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12
1	LSN + *borbor*			Sprinkles + *borbor*			CSB++			LNS snack		
2	Sprinkles + *borbor*			LSN + *borbor*			LNS snack			CSB++		
3	CSB++			LNS snack			LSN + *borbor*			Sprinkles + *borbor*		
4	LNS snack			CSB++			Sprinkles + *borbor*			LSN + *borbor*		

Figure 1 Food sequence schedule. CSB++, corn-soy blend++; LNS, lipid-based nutrient supplement.

- Children aged 9–23 months who have been eating solids for at least 3 months will be eligible for inclusion. This is to ensure that subjects are familiar with solids and will not reject the food simply because they are not yet familiar with solids. In addition, the target group for these kinds of products is children aged 6–23 months.
- Only normally nourished or moderately malnourished children (mid-upper arm circumference (MUAC) >115 mm, z-score for weight-for-height (WHZ) >−3) who have been in good health for the past 3 days will be eligible for inclusion. This is to ensure that subjects are not experiencing any loss of appetite associated with malnutrition or illness and to be able to refer sick or severely acutely malnourished children for treatment.
- Likewise, only caregivers who have no medical complications or illness will be eligible in order to avoid any associated appetite loss and to refer for treatment.
- Children who have been using Sprinkles, CSB++ or similar supplementary foods or supplements will be excluded, in order to ensure that the interventions are equally unfamiliar and that children will not be likely to reject or accept based on their unfamiliarity/familiarity with a given food.
- Children with known food intolerances will be excluded.
- Any caregivers or children who become ill during the trial will be excluded and referred for treatment.
- Only children of caregivers who have provided signed or fingerprinted consent will be eligible for inclusion.

Sample size

The main outcome of interest is the amount of food the children consume. We define acceptability as mean consumption of at least 50% of the food offered, and high acceptability as consumption of 75% or more, assume an SD of 30% and aim to detect a difference in consumption of 20%.[9 17] To ensure a precision of 0.05, power of 0.8 and p<0.05, the required sample size is 20 children. Assuming 20% attrition, we need to enrol 24 children and caregivers. This sample size is the same as a similar acceptability study, and the attrition assumed is similar.[17]

The sample size was calculated using G*Power (V.3.1.9.2). The four clusters and repeated measures were taken into account in the calculation. The four sites were purposefully chosen to represent urban poor populations and were similar. Since this is effectively a pilot study inasmuch as we have no data on the acceptability of two of four of the foods, we have no knowledge about variability within or between cluster sizes, nor of how baseline covariates would affect the sample size. Thus, baseline covariates were not taken into account in sample size calculation.

However, with such a small sample size, it may not be possible to perform regressions. Therefore, we will recruit a sample of 100 caregivers and children, which is considered a typical sample size for a hedonic test[18] and is larger than most of the samples for similar studies.[9 13 17 19 20] Attrition rates in those studies have been less than 10%; therefore, our sample size of 100 should be more than adequate. We expect to recruit 20–30 participants per cluster.

Data collection

Baseline and anthropometric data

On the day before the start of the trial, potential participants will be assessed for eligibility at the test-feeding site, using an exclusion form, and through the collection of baseline data, including demographic, anthropometric, morbidity and dietary data (breastfeeding, food frequency and dietary diversity).

Anthropometric measures include weight to the nearest 0.1 kg (with SECA scale), recumbent length to the nearest 0.1 cm (with wooden UNICEF height boards) and MUAC to the nearest 1 mm (with a UNICEF flexible insertion tape).

Substudy 1: acceptability to children

On the 12 days of substudy 1, data will be collected daily including time of arrival and of last feeding or breast feeding, and morbidity data pertaining to the previous 24 hours. Caregivers will be asked to bring their child to their designated test-feeding site. They will be asked not to feed their child for the preceding hour, if possible. The same food will be given 3 days in a row, to allow averaging of results and reduce the effect of chance findings.

Children will receive the four foods, namely the RUSF snack, RUSF added to *borbor*, CSB++ porridge and Sprinkles added to *borbor*, for 3 days each over 12 days. Children in each group will taste each food in a different sequence (to balance for carryover effects), as in figure 1 below.

A woman from each of the four sites will be hired and trained to prepare an appropriate quantity of the food each day, under the study team's supervision.

The prepared food will be served into small bowls (labelled with the child's code). Clean preweighed napkins will be given to the caregiver to clean the child's mouth and catch spits and spills. Each bowl will contain one of the following:

- 100 g of CSB++,
- 2 pieces of RUSF (approximately 32 g) added to *borbor* to make 100 g,
- Sprinkles (approximately 1 g) added to *borbor* to make 100 g,
- 2 pieces of RUSF (approximately 32 g).

The bowl, spoon (not used for RUSF snack), napkins and food will be weighed on an electronic kitchen scale to the nearest 0.1 g.

The caregivers will be asked to feed their child for 15–30 minutes or until the child refuses to eat any more. The amount of food consumed within 15–30 minutes or until the child stops eating and twice refuses attempts to feed will be recorded in grams and percentage of total.[17] The bowl with remaining food, spoon and napkins will be weighed after the child has finished eating.

Children will not be separated from their caregivers at any point. Children will not be forced to eat the foods. If they become excessively distressed, they will be given the option of taking a break or withdrawing.

After eating the food for 3 days, each caregiver will be asked to assess how he or she thinks the child liked the food, taking into account the amount eaten and the child's reactions and emotional state during feeding. Responses will be recorded by staff on a data collection form, using a five-point hedonic scale (1=disliked a lot, 2=disliked a little, 3=neither liked nor disliked, 4=liked a little and 5=liked a lot). The hedonic scale is a standard tool for measuring food acceptability, that is, how much a consumer likes or dislikes a product.[18]

Substudy 2: acceptability to caregivers

On the 13th day, caregivers will be asked to come to the test-feeding site, alone if possible. Baseline data will be collected from caregivers, including their pregnancy status, and morbidity data pertaining to the previous 3 days.

First, in a sensory test, the foods will be presented to caregivers one at a time. No weighing is necessary, and caregivers will not be expected to eat a whole bowl. Between foods, the caregiver will be asked to rinse his/her mouth out with water. Caregivers will rate them with respect to colour, consistency, smell, taste and their overall opinion. Responses will be recorded by staff on a data collection form, using the five-point hedonic scale (1=very bad, 2=bad, 3=neither bad nor good, 4=good and 5=very good). A score of 3=neither bad nor good will be considered the threshold for acceptance of the food.

Then the foods will be presented at the same time, and caregivers will be asked to rank them. Responses will be recorded by staff on a data collection form (1=best, 2=second best, 3=third best and 4=least good or worst).

Finally, a smaller number of caregivers[8–12] will be asked to stay for a focus group discussion related to infant feeding practices and more detailed reasons for preference ranking. Caregivers will be asked if they would use or buy the novel RUSF and their reasons for doing so, including the perceived benefits and value (monetary) of using such a product. The discussion will be led in the Khmer language by facilitator. A notetaker will be responsible for electronic recording, as well as taking notes, especially about non-verbal communication. The recording will be transcribed and translated into English.

Outcomes and their measurement

The main outcome of interest is how much the children consume. In the absence of clear guidelines on acceptability for supplementary food, we define acceptability as mean consumption of at least 50% (50 g of the porridges or 16 g of the snack) of the food offered in approximately 15–30 min and consumption of 75% (75 g or 24 g, respectively) or more as high acceptability. This is in keeping with similar acceptability studies.[9 17]

The secondary outcome is caregivers' assessment of their child's preference for the food. It is likely that caregivers' assessment of their child's preference is strongly correlated to the child's consumption; thus, this subjective maternal/caregiver assessment is considered an appropriate method of determining acceptability of a food to a child.[19]

A third outcome is caregivers' ranked preference for the food, as preference of the caregiver also determines in large part whether a new food will be used or not.[19 21]

These outcomes indicate how well accepted the food is by children and caregivers and how likely they would be to eat the food or feed it to their children if it were provided in the context of programming for the prevention of malnutrition.

Statistical analysis

All data will be double-entered in Excel and will be analysed in the statistical software STATA V.13.1.

Since repeated measures are being taken, the assumption of independence is not satisfied, and all statistical tests will be for dependent samples. For all tests, significance levels will be considered $p<0.05$.

Consumption: percentage and kilocalories consumed of the serving offered

The main outcome of interest is how much the children consume in terms of percentage and kilocalories. The independent variable is the food, and the dependent variable is consumption. Thus, multiple means of consumption will be compared.

The consumption data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in consumption of the different foods. A mixed effects model has been chosen (in preference to analysis of variance) because it deals well with missing values in repeated measures.[22]

Preference: children

The secondary outcome is caregivers' assessment of their child's preference for the food. The independent variable is the food, and the dependent variable will be the mean of preference ratings on the hedonic scale.[1–5] The preference data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in preferences for the different foods.

Ranking: caregivers

A third outcome is caregivers' ranked preference for the food. The independent variable is the food and the dependent variable will be the mean of the rankings of the foods. The ranking data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in the ranking of the different foods.

Enrolment data

Enrolment data describing the characteristics of the recruited children (eg, sex, age, anthropometric measures, morbidity and breastfeeding status) and caregivers (eg, age, morbidity and breastfeeding status) will be reported as means±SD for continuous measures. Anthropometric indices will be calculated using WHO 2006 standards (ANTHRO V.3.2.2, January 2011) and expressed as z-scores for weight-for-height (WHZ), weight-for-age (WAZ) and height-for-age (HAZ).

Any missing data will be treated as 'missing at random' and accounted for using mixed model and multiple imputation. However, the immediate nature of data collection, on-site presence of a supervisor and follow-up methods should limit protocol non-adherence and missing data.

DISCUSSION

The comparison of new supplementary foods with current fortified blends and existing RUSFs in terms of their potential for preventing malnutrition responds to a need noted by various researchers.[5 6 11 23 24] It also responds to a specific need expressed by the policy makers and implementers in the Cambodian Ministry of Health. Such products need to be affordable, effective and acceptable.[20] This locally produced Cambodian RUSF attempts to respond to those needs.

The comparators chosen, CSB++ and Sprinkles, have been used in Cambodia with limited success. CSB++ proved acceptable in trials but not in practice.[7 13] Sprinkles appeared to be acceptable and did improve the micronutrient status of Cambodian children in one trial. However, there was no improvement in anthropometric measures, and the improved micronutrient status did not persist beyond the 18-month duration of supplementation.[25]

Since there is no evidence that micronutrient powders alone contribute to growth,[26–31] it was decided that the novel food should contain both macronutrients and micronutrients and be energy dense, in order to promote linear growth and weight gain as well as improved micronutrient status.[5 32] Moreover, since peanut-based RUSFs have not proved acceptable in Cambodia,[8 9] and because local production standards may not be adequate to safeguard against aflatoxin contamination,[33–35] peanut-based products will not be used.

The WHO recommends daily consumption of animal source foods for their high protein, energy and micronutrient availability and for their contribution to micronutrient status, linear growth and non-fat mass gain.[36–38] Usually, milk or whey powder is the animal source food used in supplementary foods including CSB ++ and various RUSF/RUTFs.[9 17] However, milk powder is expensive and imported. For this food, it was replaced with fish, which is inexpensive, readily available and more adapted to Cambodian tastes. While there are precedents for replacing milk in supplementary foods for cost-effectiveness,[23] until now, very few have used meat, fish or eggs, and they have generally not been tested for efficacy on a wide scale.[19 20 39–41] Not surprisingly, given the novelty of the foods, the results of the acceptability studies have concluded that although caregivers prefer their traditional food, the children consumed equal amounts of the supplementary food or liked the supplementary food.[19 20] By comparing a supplementary food with fish and one with milk (CSB++) to Sprinkles with *borbor* (a food traditionally given to infants but also consumed by the wider population), our trial will contribute much-needed data on the food preferences of Cambodian caregivers and children. This will potentially open the way for further development of locally produced supplementary foods with an animal source food other than milk.

Finally, since most studies on supplementary foods are from Africa, this trial will be an important contribution to the body of evidence from Asia.[24]

Based on WFP's experience[7] and earlier acceptability studies,[12 42] it is expected that the locally produced Cambodian RUSF will be more acceptable than CSB++ and Sprinkles. If it does prove acceptable, a 6-month efficacy trial will follow.

If the novel RUSF proves efficacious in trial, UNICEF hopes to scale up production, with the aim of producing a local product that is cheaper than imported RUSFs. A variety of distribution methods will be considered, including free distribution to malnourished children (and possibly to pregnant women) as well as commercialisation.

Contributors BB developed the original research design and refined it with FTW, SM, MG, CC and AL. BB wrote the initial draft, and all authors subsequently contributed to and commented on the manuscript and approved the final version.

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Competing interests None declared.

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Crossover trial to test the acceptability of a locally produced lipid-based nutrient supplement (LNS) for children under 2 years in Cambodia: a study protocol

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Departures from acceptability protocol and subsequent modifications

The trial was conducted according to the protocol, with a minor variation made to the weight of the snack. The snack was later modified based on feedback from the acceptability trial.

Weight of RUSF

The actual weight of two pieces of RUSF snack was 42g not 32g as noted in the protocol. Each piece was approximately 20-21g, comprised of 16-17g of paste plus 4-5g of wafer.

Modification of the RUSF based on the acceptability trial

The 20g snack was a rather thick cylinder. Feedback from caregivers and observations by the researchers and data collectors during the acceptability trial suggested that the snack was too thick, with each bite delivering too much paste to chew and swallow easily, especially for smaller children. Therefore, the snack was modified slightly. The diameter of the wafer was decreased and consequently the amount of paste in each bite was less, making it easier to chew and swallow. The final specifications of the snack were a 7.5cm long wafer weighing 3-4g, containing 7g of paste, for a total weight of 10-11g. Because the wafers were rolled and filled by hand, there was slight variation in dimensions and weight. Six wafers were packed in a sachet. This version of the snack (Figure 4.1) was used for the effectiveness trial.

Figure 4.1:Final version of RUSF. Left: RUSF snack, wafer filled with LNS paste; right: RUSF packaging.

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Chapter 5: Results of the acceptability trial

Part of this chapter has been published as:

- **Borg B**, Mihrshahi S, Griffin M, Sok D, Chhoun C, Laillou A, Wieringa FT. Acceptability of locally-produced Ready-to-Use Supplementary Food (RUSF) for children under two years in Cambodia: A cluster randomised trial. Maternal & Child Nutrition. 2019;15(3).

This chapter describes the rationale, results, contribution, and implications of the acceptability trial. It begins by outlining the need and justification for an acceptability trial, then briefly describes the main results. This is followed by a description of what the acceptability study adds to the literature, and the implications for programming. The final section is the publication.

The justification for an acceptability trial

Regardless of how effective a specially formulated food product may be, it must be acceptable to the target population if it is to deliver nutritional benefits (1, 2). Existing products that have been trialled or used in Cambodia proved unsuccessful, primarily due to limited acceptability rather than limited effectiveness (3-7). This is perhaps unsurprising, as most research and development on specially formulated foods is done in Africa, particularly Malawi (8-18), rather than South-East Asia (19-21) where food preferences are likely to differ. There have been relatively few studies on the use of locally-produced specially formulated foods in Asia (22-25) and very few in Cambodia (6, 26-29). This study will help to fill the gap in the research pertaining to supplementary foods in Asia generally, and in Cambodia and South-East Asia in particular.

Main results of the trial

Our trial aimed to assess the acceptability of the novel ready-to-use supplementary food (RUSF) as a snack or mixed with *borbor* (white rice porridge), compared to Corn-Soy Blend Plus Plus (CSB++), and *borbor* fortified with micronutrient powder (MNP). The foods in their prepared form are pictured

in Figure 5.1. This non-blinded, randomised 4 x 4 crossover trial recruited ninety-five children aged nine to twenty-three months in peri-urban Phnom Penh, and took place over two weeks in June-July 2015. The test foods were offered for three consecutive days at testing sites. Main outcomes were children's consumption, caregivers' assessment of children's preferences, and caregivers' ranking of the foods. Median percentages of the test foods consumed differed, with percentages consumed ranging from 21 - 50% ($p = 0.003$). The odds of children consuming over 50% were greatest for *borbor* fortified with MNP versus RUSF snack (unadjusted OR = 6.79, CI = 2.80 - 16.47, $p < 0.001$). However, the median energy children received when consuming the RUSF with *borbor* (57 kcal) or as a snack (48 kcal) was greater than when consuming CSB++ (15 kcal) or *borbor* fortified with MNP (18 kcal), ($p < 0.001$). Therefore, although children ate less RUSF, it provided approximately three times more kilocalories. Caregivers reported that their children had the highest preference for *borbor* fortified with MNP. Caregivers themselves ranked the novel RUSF snack highest. Thus, the RUSF was considered sufficiently acceptable to proceed to an effectiveness trial.

Figure 5.1: The four test foods compared in the acceptability trial. Left to right: RUSF snack; RUSF mixed with borbor*; CSB++;* borbor *fortified with MNP.*

What this trial contributes to the literature

This trial demonstrates that fish is a promising substitute for milk in a locally-produced Cambodian RUSF. Even consumed in smaller quantities, the novel RUSF provided more energy than existing options. The novel RUSF snack was far more acceptable to caregivers than the existing supplementary food and supplements used in Cambodia.

Implications for programming

Our acceptability trial confirmed that CSB++ has very low acceptability in Cambodia, and that our novel RUSF has high acceptability to caregivers. Pending the results of the effectiveness trial, this finding will be very useful when selecting strategies for undernutrition prevention programming.

The following published paper describes the results of the acceptability trial in detail.

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ORIGINAL ARTICLE

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Acceptability of locally-produced Ready-to-Use Supplementary Food (RUSF) for children under two years in Cambodia: A cluster randomised trial

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Abstract

In Cambodia, existing food products for treating or preventing undernutrition have met with limited success. Therefore, in 2014, alternative ready-to-use foods were developed. This trial aimed to assess the acceptability of the novel ready-to-use supplementary food (RUSF) as a snack or mixed with *borbor* (white rice porridge), compared with corn–soy blend plus plus (CSB++) and *borbor* fortified with micronutrient powder (MNP). The nonblinded, randomised 4 × 4 crossover trial recruited 95 children aged 9–23 months from communities in peri-urban Phnom Penh. Small quantities (100 g for porridges, 42 g for snack) of each food were offered for three consecutive days at testing sites (homes of health volunteers). Main outcomes were children's consumption, caregivers' assessment of children's preferences, and caregivers' ranking of the foods. Median percentage consumed of the test food servings ranged from 21 to 50% (p = 0.003). The odds of children consuming over 50% were greatest for *borbor* fortified with MNP versus RUSF snack (unadjusted OR = 6.79, CI = 2.80–16.47, p < 0.001). However, the median energy children received when consuming the RUSF with *borbor* (57 kcals) or as a snack (48 kcals) was greater than with CSB++ (15 kcals) or *borbor* fortified with MNP (18 kcals; p < 0.001). Therefore, although children ate less RUSF, it provided approximately three times more kilocalories. Caregivers reported that their children had the highest preference for *borbor* fortified with MNP. Caregivers themselves ranked the novel RUSF snack highest. Thus, the innovative RUSF was considered sufficiently acceptable to proceed to an effectiveness trial.

KEYWORDS

Acceptability, Corn Soy Blend Plus (CSB++), Lipid-based nutrient supplement (LNS), Ready-to-use supplementary food (RUSF), Sprinkles micronutrient powders, Test feeding

1 | INTRODUCTION

Although Cambodia is transitioning to a middle-income country, progress in combatting undernutrition has slowed. In 2014, 32% of children under 5 years were stunted, 10% were wasted, and 24% were underweight (National Institute of Statistics, 2015). Undernutrition can be partly attributed to poor complementary feeding. The energy and nutrient density of traditional complementary foods, particularly *borbor* (white rice porridge, the traditional weaning food in Cambodia), is too low to sustain the high growth velocity during the first 2 years of life.

The various supplements and supplementary or therapeutic foods that have been used or tested in Cambodia have met with low levels of acceptability and success, in trial or in practice. In 2009,

Plumpy'Nut® was trialled in Cambodia and was poorly accepted (Boudier, 2009), as was the case elsewhere in the region (Nga et al., 2013). The United Nations World Food Programme (WFP) had found corn–soy blend plus plus (CSB++, also known as Supercereal Plus) less acceptable and effective than expected (WFP, 2014a). Anecdotally, BP-100™, the therapeutic food that was used to treat severe acute malnutrition had also had limited acceptability (Wieringa, 2014). The limited acceptability of CSB++ and BP-100™ was confirmed in a taste trial (Ketsana, 2013). Meanwhile, the Vietnamese National Institute of Nutrition, with UNICEF and the French National Research Institute for Sustainable Development (IRD), had developed a ready-to-use food (RUF) called (RUF) called HEBI (High Energy Bar for IMAM – Integrated Management of Acute Malnutrition) in 2009 (Nga et al., 2013). HEBI was locally produced with rice, soy, mungbeans, and imported milk powder. It resembled the popular Vietnamese delicacy, "mooncake." It proved more acceptable than, and as effective as, Plumpy'Nut® and is now widely and successfully used in Vietnam's Integrated Management of Acute Malnutrition programming (Peters, 2014; Phuong et al., 2014). Based on the low acceptability and effectiveness of these imported products, it was determined that a local product was needed.

At the behest of the Ministry of Health (MoH), UNICEF, IRD and the Cambodian Department of Fisheries Post-harvest Technologies and Quality began collaborating on the development of a locally produced, culturally acceptable, multiple micronutrient-fortified RUF, in therapeutic and supplementary versions. The resulting product is unique in that it is one of the few RUFs using an animal source food other than milk. Milk powder, an expensive, imported ingredient, has been replaced with small freshwater fish. The latter are inexpensive, readily available and more adapted to local tastes, since Cambodians are the world's largest consumers of freshwater fish (Vilain, Baran, Gallego, & Samadee, 2016). Combined with rice, soy, mungbeans, oil, and sugar, this novel RUF should be less expensive and more acceptable to Cambodians. This trial tested the acceptability of the ready-to-use supplementary food (RUSF), whereas a separate trial tested the acceptability of the ready-to-use therapeutic version of the food with severely acutely malnourished children (Sigh et al., 2018).

1.1 | The role of RUSFs

It is widely accepted that specialised fortified products have a place in supplementing the traditional diet, thereby preventing growth faltering amongst children (S. de Pee, 2015; S. de Pee, Bloem, MW, 2009; Dewey & Young Child Nutrition Working Group: Formulation, 2009; Golden, 2009; Michaelsen, Grummer-Strawn, & Begin, Michaelsen, Grummer-Strawn, & Begin, 2017). RUFs that are formulated as lipid-based nutrient supplements (LNSs) are particularly promising, as they have a long shelf life and require no preparation (S. de Pee, Bloem, MW, 2009; S. de Pee, Manary, Mark, Ashorn, Per, de Pee, Manary, & Ashorn, 2011). There is an acknowledged need for the development of novel RUFs and their comparison with existing products (S. de Pee, Bloem, MW, 2009; Kuusipalo, Maleta, Briend, Manary, & Ashorn, 2006; Lazzerini, 2013; Manary, 2006; WHO, 2013). In the past decade, numerous studies have aimed to contribute to an understanding of the use of locally produced specialised foods (Ackatia-Armah et al., 2015; Ahmed et al., 2014; Anderson, Bediako-Amoa, & Steiner-Asiedu, Anderson, Bediako-Amoa, & Steiner-Asiedu, 2014; Arimond et al., 2015; Bauserman et al., 2015; Bogard et al., 2015; Flax et al., 2009; Hy Ta & Martinaud, 2014; Iuel-Brockdorf et al., 2015; Lagrone, Cole, Schondelmeyer, Maleta, & Manary, 2010; Lagrone et al., 2012; Skau et al., 2015; Weber et al., 2017).

Key messages

- Fish is a an organoleptically promising substitute for milk in a locally produced Cambodian ready-to-use supplementary food (RUSF).
- Even consumed in smaller quantities, the novel RUSF provided more energy than existing options.
- The novel RUSF snack was far more acceptable to caregivers than the existing supplementary food and supplements used in Cambodia.

Regardless of how effective a product may be, it must be acceptable in a given setting if it is to deliver nutritional benefits (Dibari et al., 2013; Iuel-Brockdorf et al., 2016). Because most research on supplementary foods is from Africa, this study is an important contribution to the body of evidence on food preferences from Asia (Lazzerini, 2013). As an early step in the product development and testing, we conducted an acceptability trial on the fish-based RUSF, to test whether the new product was acceptable to children and their caregivers. The RUSF was compared with products that are currently used to improve the nutritional status of young children, namely CSB++ and a MNP (Sprinkles), which are used as a home fortificant. Acceptability was assessed in terms of children's consumption (in percentage of the serving and calories consumed), caregivers' assessment of children's preferences, and caregivers' own ranking of the foods.

2 | METHODS

This trial aimed to establish the acceptability of the locally produced Cambodian RUSF for children under 2 years and their caregivers, with a view to proceeding to an effectiveness trial. The methods have been described in the protocol published previously (Borg et al., 2017).

2.1 | Trial design

The study was a cluster randomised, 4 × 4 crossover design comparing four food types. Each child tested each of the four foods. This was an open study with no blinding, since the four foods were visibly different to participants, data collectors, and the principal investigator (who was present during data collection).

TABLE 1 Energy and nutrient profile and characteristics of novel RUSF and comparators

	RUSF	CSB++	MNP
Recommended daily serving size	40–110 g depending on age of child	100 g dry CSB++ (made into porridge with added water)[a]	1 sachet (1 g)
Main ingredients of supplementary foods and supplements, not including *borbor* (g/100 g)[b]			
Ingredients	Rice 13.2 Soy and mungbeans 21.8 Fish 5.9 Sugar 26.8 Oil/shortening 18.1 Micronutrient mix 0.9 Coconut 8.7 Rice bran 2.2 Egg 2.5 Flavouring 0.1	Corn 58.3 Soy beans 20.0 Skim milk powder 8.0 Sugar 9.0 Oil/shortening 3.0 Micronutrient mix 0.2 Dicalcium phosphate anhydrous 1.23 Potassium chloride 0.27	Micronutrients only
Nutrient profile per 100 g of product (Dry CSB++)[b]			
Energy (kcal/100 g)	484	410	
Protein (g/100 g)	13.1	16	
Carbohydrates (g/100 g)	51.6		
Lipids (g/100 g)	24.4	9	
Fibre (g/100 g)	1.6	3	
Added multiple micronutrients per 100 g (dry for CSB++)[b]			
Vitamin A	1,080 µg	540 µg	400 µg
Vitamin D	58.4 µg	4.6 µg	5 µg
Vitamin B1 (thiamine)	0.28 mg	0.47 mg	0.5 mg
Vitamin B2 (riboflavin)	0.78 mg	0.84 mg	0.5 mg
Vitamin B6	0.65 mg	2.1 mg	0.5 mg
Phosphorus	246 mg	530 mg	-
Calcium	302 mg	260 mg	-
Pantothenic acid	0.75 mg	7.3 mg	-
Copper	0.75 mg	-	0.56 mg
Vitamin E	10.7 mg	9.8 mg	5 mg
Folic acid	94.2 µg	115 µg	150 µg
Iron	6.0 mg	8.9 mg	10 mg
Magnesium	48.4 mg		-
Vitamin B3 (niacin)	7.3 mg	7.2 mg	6 mg
Vitamin C	52.8 mg	100 mg	30 mg
Zinc	7.5 mg	7.5 mg	4.1 mg
Potassium	194.8 mg	990 mg	-
Vitamin B12	10.7 µg	2.3 µg	0.9 µg
Biotin	105.6 µg	-	-
Selenium	89 µg	-	17 µg
Iodine	-	60 mg	90 µg
Vitamin K	-	115 µg	-
Other characteristics/considerations			
Taste	Fishy	Creamy, sweet (Skau et al., 2012)	Should not have a taste (Salam et al., 2013)
Preparation	Ready to use	10 min cooking	Add to cooked food
Acceptability in Cambodia	To be tested	Acceptable in trial (Skau et al., 2012), but not in practice (WFP, 2014a)	Yes (Jack et al., 2012)
Effectiveness in reducing malnutrition	To be tested	Not inferior to peanut-based RUSFs, which are the most effective in promoting linear growth and weight gain (LaGrone et al., 2012, Manary & Yang, 2012)	Improves micronutrient status but not linear growth or weight gain (de Pee & Bloem, 2009; Dewey & Adu-Afarwuah, 2008; Jack et al., 2012)

(Continues)

TABLE 1 (Continued)

	RUSF	CSB++	MNP
Intra-household sharing	Unknown	Yes (LaGrone et al., 2012)	None noted (Jack et al., 2012)
Packaging	Unknown	Packaging may encourage sharing (de Pee & Bloem, 2009, Nackers et al., 2010)	Looks like "medicine," thus may discourage sharing (de Pee & Bloem, 2009, Nackers et al., 2010)
Local production capacity	Unknown	None (de Pee & Bloem, 2009)	None
Cost	To be determined. Goal is <US$0.10/day	Less expensive than peanut-based RUSFs if produced locally (Manary & Young, 2012), but also have to consider logistics, time to treat, and relapse (Nackers et al., 2010)	Very cheap to produce at US$0.025/daily dose (Zlotkin, 2009), but also have to consider logistics

Nutrient profile of daily serving in acceptability trial[abc]	RUSF with *borbor*	CSB++ porridge	*Borbor* with MNP	RUSF snack
Serving size of test meal	42 g RUSF +60 g *borbor*	100 g (17% dry CSB++)	1 sachet (1 g) + 99 g *borbor*	42 g RUSF
Energy (kcal/serving)	184	70	41	160
Protein (g/100 g)	5.9	2.7	1.1	5.2
Carbohydrates (g/100 g)	23.4	12.1	15.7	14.0
Lipids (g/100 g)	9.1	1.5	0.1	9.0
Fibre (g/100 g)	0.6	0.5	0.1	0.5

Note. CSB++: corn–soy blend plus plus; MNP: micronutrient powder; RUSF: ready-to-use supplementary food.

[a]World Food Programme (2014b).

[b]Manufacturers.

[c]2007 Vietnamese food composition tables.

2.2 | Comparators—The four foods

The first version of the novel RUF was developed in 2014 (Peters, 2014) by a local, quality-certified food factory, Vissot, which produced the food using readily available Cambodian ingredients—rice, freshwater fish, soy, and mungbeans—as well as oil, sugar, and micronutrient premix. Based on initial acceptability testing, the product was refined to improve the smell and form. Snack consumption, even amongst young children, is common in Cambodia (Pries et al., 2016; WFP, 2014b; World Vision, 2015). Therefore, to improve the likelihood of acceptability (Nga et al., 2013), we took a Cambodian snack, a wafer approximately 9 cm long with an internal diameter of 0.5 cm, and filled it with the RUF paste.

The RUSF was compared with other supplementary foods or supplements, which have been used in Cambodia. The first was CSB++, which is the United Nations World Food Programme's standard supplementary food to prevent undernutrition in children aged 6–23 months. The second was MNPs, supplements that have been promoted and distributed by the MoH to improve the micronutrient status of children aged 6–23 months. The novel RUSF was served in two different ways—as a snack or mixed with *borbor*. One objective was to ascertain which way of serving was more acceptable. The characteristics of each food, including energy and nutrient profile, and a description of the test food serving, are described in Table 1.

2.3 | Study site, subjects, and sample size

The study took place over 2 weeks in June–July 2015 in four test-feeding sites selected for convenience in peri-urban Phnom Penh (see Figure 1). Sites were the homes of health volunteers who invited caregivers and children from the community to participate.

Our protocol defined acceptability as a mean consumption of at least 50% of the test food serving. Thus, our sample size was calculated based on the main outcome, consumption of more than 50% of the serving. Based on a recent similar study in Cambodia (Skau, Sok, & Wieringa, 2012), we assumed an *SD* of 30%, and aimed to detect a difference in consumption of 20%. To ensure a precision of 0.05, power of 0.8, and $p < 0.05$, the required sample size was 44 children, or 53 children if we assumed 20% attrition. A typical commercial hedonic test sample is 75–150 consumers (Stone, Bleibaum, & Thomas, 2012), and recent crossover trials of acceptability had samples of 50–100 children (Anderson et al., 2014; Konyole et al., 2012; Nga et al., 2013; Skau et al., 2012; Weber et al., 2017). Therefore, we aimed to recruit 100 caregiver-child pairs, and ultimately recruited 95.

Only healthy singletons aged 9–23 months who were not severely acutely malnourished (mid-upper arm circumference (MUAC) greater than 115 mm, weight-for-height z-score, (WHZ) greater than −3) and with no known food intolerances who had been eating solids for at least 3 months were included. Thus, subjects were less likely to reject the food simply because they were not yet familiar with solids, or because they were experiencing any lack of appetite due to illness or undernutrition.

The four sites were randomly allocated to begin on one of the foods using an Excel random number table generated by the principal researcher. Thus, children were not individually randomised to a food, and all children at a given site were eating the same food over the same period. This reduced bias related to social interaction and varied responses to different foods. Each site tasted each food in a different

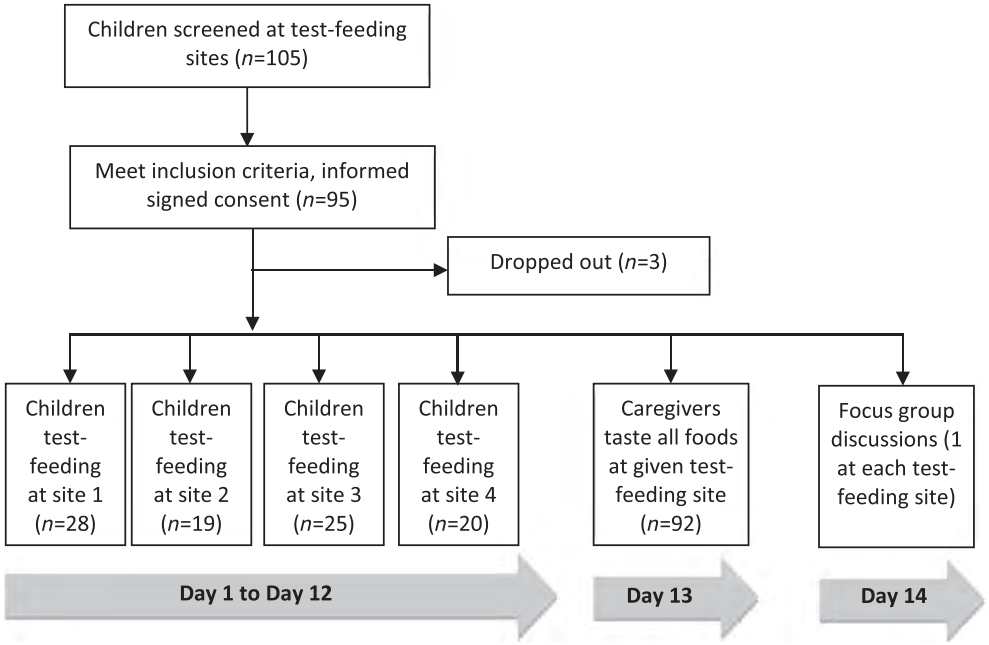

FIGURE 1 Enrolment in acceptability trial

sequence to balance for carry-over effects, as in Supplementary Figure 1.

Following recruitment, caregivers were asked to bring their child to their designated test-feeding site for the next 12 days. Children and caregivers came at the same time each day (either at 8 a.m. or 10 a.m.), which reduced bias related to feeding times. They were asked not to feed their child for the preceding hour, if possible. All children at a given site ate the same food for three consecutive days to allow averaging of results and to reduce the effect of chance findings.

2.4 | Children's consumption and caregiver assessment of acceptability

The health volunteers had been trained to prepare the *borbor* and the CSB++ porridges according to instructions to ensure consistency. They prepared the porridges in their homes, just before the children and caregivers arrived. The prepared food was served in small bowls (labelled with the child's code). Each bowl contained 100 ± 1 g of CSB++ porridge (17% dry CSB++ with water added), RUSF (two pieces weighing approximately 22 g per piece, or ~42 g total) added to *borbor (~58 g)*, or MNP (1 g sachet) added to *borbor (99 g)*. When served as a snack, the two pieces of RUSF weighed approximately 42 g.

The bowl, spoon, napkins, and food were weighed on an electronic kitchen scale to the nearest 0.1 g. The test food was added (100 g of the porridges, or two pieces of the snack) and the weight was recorded. Caregivers were asked to feed their child for 15–30 minutes or until the child refused to eat any more. After the child has finished eating, the bowl with remaining food, spoon, and tissues (used to clean the child's mouth and catch spits and spills) were weighed to the nearest 0.1 g. The difference gave the number of grammes consumed.

During statistical analysis, the consumption in grammes was converted to the percentage of serving consumed, in order to be able to compare the servings of the different foods, which were of different initial weights. The kilocalories consumed per serving were calculated using information provided by the manufacturer and the 2007 Vietnamese food composition tables.

After 3 days eating the same food, caregivers were asked to assess how they thought the child liked the food, taking into account the amount eaten and the child's reactions and emotional state during feeding. This subjective caregiver assessment of child preference is considered an appropriate method of determining acceptability of a food to a young child (Pachón, et al., 2007). Responses were recorded using a five-point hedonic scale (1 [*Disliked a lot*], 2 [*Disliked a little*], 3 [*Neither liked nor disliked*], 4 [*Liked a little*], and 5 [*Liked a lot*]), a standard tool for measuring food acceptability (Stone et al., 2012). A score of 3 or more was considered acceptance of the food.

2.5 | Caregivers' ranking and focus group discussions

On the 13th day, the caregivers were asked to rank all four foods (1 [*best*], 2 [*second best*], 3 [*third best*], and 4 [*least good or worst*]) based on their own perception of each product. On the 14th day, four focus group discussions (FGDs) were conducted (one at each feeding site) with a smaller number of caregivers (usually 8–12). Discussions were led in Khmer language by a Cambodian facilitator. A Cambodian notetaker made a written and audio record, which was transcribed and translated into English.

2.6 | Outcomes

The main outcome of interest was how much the children consumed of each test food. In the absence of clear guidelines on acceptability for supplementary food, our protocol defined acceptability as mean consumption of at least 50% of the food offered. Because

TABLE 2 Baseline characteristics of enrolled children

Characteristic at baseline	Total *N* = 92[a]	Site 1 *n* = 28[a]	Site 2 *n* = 19[a]	Site 3 *n* = 23[a]	Site 4 *n* = 20[a]	*P* value
Sex (*N* = 90[a])						
Female, *n* (%; 95% CI)	48 (53.3%; 43.1–63.5)	16 (57.1%; 47.0–67.2)	10 (52.6%; 42.4–62.8)	13 (56.5%; 46.4–66.6)	9 (45.0%; 34.8–55.2)	0.845
Age in months, mean and *SD*	15.4 ± 4.6	15.2 ± 5.0	13.9 ± 2.7	16.3 ± 5.1	15.9 ± 4.8	0.370
Anthropometry						
WAZ (*N* = 90[a]), mean and *SD*	−1.1 ± 1.1	−1.1 ± 1.1	−1.1 ± 1.3	−0.8 ± 1.1	−1.4 ± 0.6	0.350
HAZ (*N* = 90[a]), mean and *SD*	−0.9 ± 1.4	−0.9 ± 1.5	−1.0 ± 1.2	−0.5 ± 1.6	−1.3 ± 1.4	0.309
WHZ (*N* = 90[a]), mean and *SD*	−0.8 ± 1.0	−0.9 ± 0.9	−0.8 ± 1.3	−0.7 ± 1.0	−1.0 ± 0.6	0.843
MUAC, cm (*N* = 91[a]), mean and *SD*	14.1 ± 1.0	14.0 ± 1.0	13.9 ± 1.5	14.5 ± 0.8	14.1 ± 0.6	0.294
Breastfeeding status (*N* = 90[a])						
None, *n* (%; 95% CI)	55 (61.1%; 51.0–71.2)	18 (64.3%; 54.4–74.2)	12 (63.2%; 53.2–73.2)	16 (69.6%; 60.1–79.1)	9 (45.0%;34.7–55.3)	0.387
Some, *n* (%; 95% CI)	35 (38.9%; 28.8–49.0)	10 (35.7%; 25.8–45.6)	7 (36.8%; 26.8–46.8)	7 (30.4%; 20.9–39.9)	11 (55.0%; 44.7–65.3)	0.387
Age starting complementary feeding (*N* = 87[a])						
<6 months, n (%; 95% CI)	26 (29.9%; 20.3–39.5)	11 (40.7%; 30.4–51.0)	5 (26.3%; 17.1–35.6)	4 (19.0%; 10.8–27.4)	6 (30.0%; 20.4–39.6)	0.422
≥6 months, n (%; 95% CI)	61 (70.1%; 60.5–79.7)	16 (59.3%; 49.0–69.6)	14 (73.7%; 64.5–83.0)	17 (81.0%; 72.8–89.2)	14 (70.0%; 60.4–79.6)	0.422
Prior use of supplements or supplementary foods (*N* = 88[a])						
No, *n* (%; 95% CI)	77 (87.5%; 80.6–94.4)	22 (78.6%; 70.0–87.2)	18 (94.7%; 90.0–99.4)	18 (81.8%; 73.7–89.9)	19 (100.0%; 100–100)	0.097
Yes, *n* (%; 95% CI)	11 (12.5%; 5.6–19.4)	6 (21.4%; 12.8–30.0)	1 (5.3%; 0.62–10.0)	4 (18.2%; 10.1–26.3)	0 (0.0%; 0.0–0.0)	0.097

HAZ: height-for-age z-score; MUAC: mid-upper arm circumference; WAZ: weight-for-age z-score.

[a]Of the 92 children that completed the study, a small number had incomplete data or responded "don't know" for some variables. *P* values were computed by comparing sites. For continuous variables (reported as mean and *SD*), comparison between food types was made using one-way analysis of variance. For categorical variables, (reported as *n* and %) comparison was made using chi-squared test.

consumption was not normally distributed, it was recoded as low or high acceptability (less than or more than 50%, respectively) for the mixed-effects logistic regression. The secondary outcomes were caregivers' assessment of their child's preference for each food, caregivers' ranking of each food, and mean kilocalorie intake. Caregivers were asked to assess their child's preferences for different foods on a scale of 1 (*disliked a lot*) to 5 (*liked a lot*). Preferences were then recoded as low (1,2) or high (3-5), for the mixed effects logistic regression. Caregivers were asked to rank the foods according to their own preference from 1 (*liked most*) to 4 (*liked least*). Caregiver rankings were then recoded as a high (1,2) or low (3,4) for the mixed effects logistic regression. Because a measure of consumption in grammes or percentage of serving does not take into account the nutrient density of the different foods, we also calculated kilocalorie intake.

2.7 | Covariates

Data was collected on the following covariates, which were screened for inclusion in the analytical models: sex and age of the child; previous use of supplements and supplementary foods such as CSB++ or MNP; breastfeeding status (still breastfeeding or not); age at which complementary feeding was started (before or after 6 months); anthropometric measures at baseline, ie, weight-for-age z-score, height-for-age z-score, WHZ, and mid-upper arm circumference; the child's illness; and the child's last breastfeeding/eating (less or more than an hour before the consumption test).

2.7.1 | Statistical analysis

All data were double-entered in Excel and analysed in the statistical software STATA version 13.1. Outcome variables were recoded to categorical, binary variables to deal with non-normality and/or for easier interpretation. Mean and median consumption (grammes, percentage of serving, and kilocalories) were analysed. For all outcomes, initial univariate screening of covariates was conducted at $p \leq 0.2$ level using simple logistic regression, and collinearity assumptions were checked, in order to determine which covariates to include in the model. A complete mixed effects logistic regression was then fitted to the data. Manual, thematic analysis was used to analyse the FGDs.

2.7.2 | Ethical approval and trial registration

Ethical clearance was received from the University of Queensland Medical Research Ethics Committee (2014001070) and from Cambodia's National Ethics Committee for Health Research (03/8 NECHR). Written informed consent was obtained from all the caregivers before recruitment. The trial was registered at ClinicalTrials.Gov (identifier: LNS-CAMBINFANTS; NCT02257437).

3 | RESULTS

3.1 | Baseline characteristics

Of 105 children presenting, 95 were recruited. One child was excluded and referred for treatment because of severe acute malnutrition (WHZ < −3). Nine children were excluded because they were less than 9 months or more than 2 years of age. Ninety-two children completed the study. The caregivers of the three children who dropped out said they were too busy to attend daily for 2 weeks, despite having been informed of the study duration at recruitment. The baseline characteristics are presented in Table 2. There were slightly more female than male children, and the average age was 15.4 months. There were no significant differences in the anthropometric measures or feeding indicators across the four sites.

3.2 | Children's consumption of foods

Consumption was non-normally distributed, therefore only median consumption is shown in Table 3. Grammes consumed are provided for information but cannot be compared, as serving sizes differed. Children had the highest median consumption of *borbor* fortified with MNP at 50.4% (IQR = 24.2–84.5) and the lowest of the CSB++ at 21.3% (IQR = 7.8–67.4). The difference in the proportion of test foods consumed was statistically significant ($p = 0.003$). Kilocalorie intake showed a slightly different picture, with median kilocalorie intake lowest for CSB++ and *borbor* fortified with MNP at 14.9 kcals (IQR = 5.4–47.2) and 18.2 kcals (IQR = 8.7–30.4), respectively. Kilocalorie intake was highest for the RUSF with *borbor* or as a snack at 56.9 kcals (IQR = 21.5–117.5) and 48.1 kcals (IQR = 26.8–79.6), respectively. The difference in the kilocalories consumed for each test food was statistically significant ($p < 0.001$).

TABLE 3 Consumption in terms of median grammes, percentage, and kilocalories consumed per serving

Food consumed (serving size, kcals/serving)	Grammes consumed median (IQR)	% serving consumed median (IQR)	Kilocalories consumed median (IQR)
Borbor with MNP (100 g, 41 kcals/serving)	50.4 (24.2–84.5)	50.4 (24.2–84.5)	18.2 (8.7–30.4)
RUSF with *borbor* (100 g, 184 kcals/serving)	30.9 (11.7–63.9)	30.9 (11.7–63.9)	56.9 (21.5–117.5)
CSB++ (100 g, 70 kcals/serving)	21.3 (7.8–67.4)	21.3 (7.8–67.4)	14.9 (5.4–47.2)
RUSF snack (42 g, 160 kcals/serving)	12.6 (7.0–20.9)	30.1 (16.7–49.2)	48.1 (26.8–79.6)
P values		0.003*	<0.001**

Note. CSB++: corn–soy blend plus plus; MNP: micronutrient powder; RUSF: ready-to-use supplementary food. *P* values computed using Kruskal–Wallis test. No *p* value shown for grammes consumed because test foods were different serving sizes. Asterisks highlight significant *p* values.

*$p < 0.01$. **$p < 0.001$.

The odds of children consuming more than 50% of the test foods are presented in Table 4. The unadjusted odds of children consuming more than 50% of *borbor* fortified with MNP were higher than the odds of them consuming more than 50% of RUSF snack, RUSF with *borbor* or CSB++ (OR = 6.79; 95% CI = 2.80–16.47; $p < 0.001$; OR = 3.91; 95% CI = 1.71–8.96; $p = 0.001$; OR = 3.59; 95% CI = 1.58–8.16; $p = 0.002$, respectively). The odds of children consuming more than 50% of RUSF snack compared with the odds of them consuming more than 50% of CSB++, and the odds of children consuming more than 50% of RUSF with *borbor* in comparison with the odds of them consuming more than 50% of RUSF snack or CSB++ were not statistically significant.

The results for the adjusted model were very similar, with the odds of children consuming more than 50% of *borbor* fortified with MNP being higher than the odds of them consuming more than 50% of any of the other foods. The only predictor variable that was statistically significant was sex. Girls had much lower odds than boys of eating 50% or more of any food (OR = 0.27; 95% CI = 0.09–0.85; $p = 0.25$). None of the other covariates that were adjusted for in the model made a statistically significant difference to the odds of eating 50% or more of any food.

3.3 | Caregiver assessment of child preference for foods

Table 4 shows that the unadjusted odds that caregivers reported that their children had a high preference for *borbor* fortified with MNP was almost three times the odds of them reporting that their children had a high preference for RUSF with *borbor* or CSB++ (OR = 2.99; 95% CI = 1.42–6.28; $p = 0.004$; and OR = 2.92; 95% CI = 1.40–6.08; p = 0.004, respectively). The odds that caregivers reported that their children had a high preference for the RUSF snack were twice the odds of them reporting a high preference for RUSF with *borbor* or CSB++ (OR = 2.19; 95% CI = 1.07–4.48; $p = 0.033$; and OR = 2.13; 95% CI = 1.05–4.34; $p = 0.037$, respectively). The results for the adjusted model were fairly similar, although the odds of caregivers reporting that their children had a high preference for the RUSF snack compared with the odds of reporting a high preference for CSB++ were not quite statistically significant. None of the covariates made a statistically significant difference to the odds of caregivers reporting that their children had a high preference for any of the foods. As seen in Table 5, there were significant differences in hedonic ratings of the test foods ($p = 0.003$). Most caregivers felt that children liked *borbor*

TABLE 4 Odds ratios of children's consumption, caregiver assessment of child preference, and caregiver rankings of foods

	Children's consumption			Caregiver assessment of child preference			Caregiver rankings of foods		
Unadjusted	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**	**OR**	**95% CI**	***P* value**
Borbor-MNP vs. RUSF snack	6.79	2.80–16.47	<0.001***	1.37	0.65-2.88	0.408	0.08[a]	0.04–0.19	<0.001***
Borbor-MNP vs. RUSF-*borbor*	3.91	1.71–8.96	0.001**	2.99	1.42-6.28	0.004**	1.25	0.70-2.23	0.458
Borbor-MNP vs. CSB++	3.59	1.58–8.16	0.002**	2.92	1.40-6.08	0.004**	3.37	1.76-6.46	<0.001***
RUSF snack vs. RUSF-*borbor*	0.58	0.25–1.35	0.202	2.19	1.07–4.48	0.033*	14.92	6.47-34.41	<0.001***
RUSF snack vs. CSB++	0.53	0.23–1.23	0.140	2.13	1.05–4.34	0.037*	40.34	16.67-97.61	<0.001***
RUSF-*borbor* vs. CSB++	0.92	0.41–2.07	0.835	0.98	0.49–1.94	0.942	2.70	1.41–5.20	0.003**
Adjusted									
Borbor-MNP vs. RUSF snack	7.12	2.84–17.84	<0.001***	1.63	0.75-3.53	0.218	0.08	0.04–0.19	<0.001***
Borbor-MNP vs. RUSF-*borbor*	4.27	1.82–10.00	0.001**	3.59	1.65-7.79	0.001**	1.18	0.65-2.13	0.591
Borbor-MNP vs. CSB++	3.40	1.47–7.87	0.004**	3.35	1.56-7.20	0.002**	3.54	1.82-6.88	<0.001***
RUSF snack vs. RUSF-*borbor*	0.60	0.25 1.42	0.245	2.21	1.06–4.60	0.035*	14.20	6.13 – 32.88	<0.001***
RUSF snack vs. CSB++	0.48	0.20–1.14	0.096	2.06	0.99–4.27	0.052	42.65	17.38–104.65	<0.001***
RUSF-*borbor* vs. CSB++	0.80	0.35–1.82	0.591	0.93	0.46–1.89	0.849	3.00	1.54–5.86	0.001**
Adjusted for									
Sex	0.27	0.09–0.85	0.025*	0.99	0.46-2.13	0.970	0.99	0.60–1.61	0.952
Age	1.02	0.90–1.15	0.785	0.96	0.88–1.05	0.377	0.99	0.94–1.05	0.822
Mid-upper arm circumference (MUAC)	0.58	0.31–1.08	0.085	0.88	0.60–1.29	0.523	1.01	0.79–1.29	0.914
Illness	1.50	0.57–3.94	0.413	0.90	0.41–2.01	0.803	0.75	0.39–1.43	0.384
Last eating/breastfeeding before test (<1 hr ago)	0.51	0.16–1.66	0.266	1.07	0.39–2.91	0.895	1.30	0.59–2.90	0.514
Site									
Site 2	0.51	0.10–2.56	0.416	0.87	0.30–2.54	0.804	1.04	0.51–2.11	0.910
Site 3	1.12	0.25–4.97	0.878	2.73	0.94–7.92	0.065	1.03	0.53–2.00	0.942
Site 4	1.11	0.25–5.00	0.892	2.37	0.79–7.08	0.122	1.05	0.52–2.10	0.893

Note. CSB++: corn–soy blend plus plus; MNP: micronutrient powder; RUSF: ready-to-use supplementary food.

[a]Expressed as RUSF snack versus *borbor*-MNP, OR = 11.97, 95% CI = 5.20–27.52, $p < 0.001$. Unadjusted and adjusted mixed-effects regression models were fit for the primary outcome (consumption) and the secondary outcomes (caregiver assessment of child preference and caregiver rankings of foods). Asterisks highlight significant *p* values.

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

TABLE 5 Caregiver assessment of child preference and caregiver rankings of test foods

Caregiver assessment of child preference for test foods	*Borbor*-MNP *n* = 90[a]	RUSF-*borbor* *n* = 87[a]	CSB++ *n* = 91[a]	RUSF snack *n* = 90[a]
(1) Disliked a lot, *n* (%)	15 (16.7%)	18 (20.7%)	24 (26.4%)	9 (10.0%)
(2) Disliked a little, *n* (%)	6 (6.7%)	21 (24.1%)	16 (17.6%)	19 (21.1%)
(3) Neither liked nor disliked, *n* (%)	14 (15.6%)	12 (13.8%)	13 (14.3%)	19 (21.1%)
(4) Liked a little, *n* (%)	28 (31.1%)	22 (25.3%)	16 (17.6%)	30 (33.3%)
(5) Liked a lot, *n* (%)	27 (30.0%)	14 (16.1%)	22 (24.2%)	13 (14.4%)
*p = 0.003**				
Odds of low (1 + 2) vs high (3 + 4 + 5) ranking	0.30	0.81	0.78	0.45
Caregiver ranking of test foods (*N* = 92[a])	***Borbor*-MNP**	**RUSF-*borbor***	**CSB++**	**RUSF snack**
(1) Like most, *n* (%)	12 (13.0%)	10 (10.9%)	6 (6.5%)	64 (69.6%)
(2) Like 2nd best, *n* (%)	31 (33.7%)	28 (30.4%)	13 (14.1%)	20 (21.7%)
(3) Like 3rd best, *n* (%)	25 (27.2%)	33 (35.9%)	31 (33.7%)	3 (3.3%)
(4) Like least, *n* (%)	24 (26.1%)	21 (22.8%)	42 (45.7%)	5 (5.4%)
*p < 0.001***				
Odds of high (1 + 2) vs. low (3 + 4) ranking	0.88	0.70	0.26	10.49

Note. CSB++: corn–soy blend plus plus; MNP: micronutrient powder; RUSF: ready-to-use supplementary food.

[a]Caregiver assessment of child preference for test foods was conducted every 3rd day. Therefore, n reflects attendance on the given day/s. Caregiver ranking was conducted on day 13, and N reflects attendance on that day. P-values computed using chi-squared. Asterisks highlight significant p-values: *$p < 0.01$. **$p < 0.001$.

fortified with MNP a lot or a little (61.1%) and disliked RUSF with *borbor and* CSB++ a lot or a little (44.8% and 44.0%, respectively). Almost half the caregivers (47.7%) said that their children like the RUSF snack a lot or a little.

3.4 | Caregiver ranking of foods

Table 4 shows that caregivers had far greater odds of giving the novel RUSF snack a high ranking compared to giving CSB++, RUSF with *borbor* (OR = 40.34; 95% CI = 16.67–97.61; $p < 0.001$; and OR = 14.92; 95% CI = 6.47–34.41; $p < 0.001$; respectively) or *borbor* fortified with MNP a high ranking (OR = 11.97; 95% CI = = 5.20–27.52; $p < 0.001$, which is the other way of expressing OR = 0.08, CI = 0.04–0.19, $p < 0.001$ for *borbor* fortified with MNP versus RUSF snack). Caregivers had slightly greater odds of giving *borbor* fortified with MNP or RUSF with *borbor* a high ranking compared with giving CSB++ a high ranking (OR = 3.37; 95% CI = 1.76–6.46; $p < 0.001$; OR = 2.70; 95% CI = 1.41–5.20; $p = 0.003$). The odds of caregivers giving *borbor* fortified with MNP and RUSF with *borbor* different rankings were not statistically significant. The odds that caregivers gave foods a high ranking were not significantly affected by any predictor variables. As seen in Table 5, there were significant differences in caregivers' rankings of the test foods ($p < 0.001$). The majority of caregivers (69.6%) liked the RUSF snack the most, and almost half (45.7%) liked CSB++ the least.

3.5 | Focus group discussions

The analysis of the FGDs confirms that caregivers liked the CSB++ least, and the RUSF snack best. Generally, caregivers agreed that the taste, smell, colour, and presentation of the snack were acceptable, although a number of caregivers mentioned that the snack had a fishy smell. They liked the wafer, saying that it is familiar, and that their children liked to hold the snack, which then encouraged them to eat more. A number of caregivers mentioned that their children's appetite seemed improved after eating the snack. Some caregivers mentioned that the wafer was thick and the filling got stuck to their children's palate. This led to the reformulation of the snack in a thinner wafer. Many caregivers said that they would consider feeding the snack to their children two or three times a day, citing improved and weight gain as incentives. Others felt their children would get bored with the snack if they ate it so frequently.

4 | DISCUSSION

4.1 | Consumption—Percentage of serving

Children in our trial consumed significantly more *borbor* fortified with MNP in comparison to other foods. This is probably because *borbor* is very familiar, and MNP is not thought to change the taste or smell. In comparison, they did not eat as much of the RUSF snack. This is understandable; even though each food was provided over 3 days to reduce food neophobia, it typically takes repeated exposures to increase acceptance of unfamiliar foods (Gibson & Cooke, 2017; Konyole et al., 2012).

Compared with similar trials, children in our trial consumed a smaller percentage of all food servings (Adu–Afarwuah et al., 2011; Ahmed et al., 2014; Konyole et al., 2012; Nga et al., 2013; Pachón et al., 2007; Phuka et al., 2011; Weber et al., 2017), although a Cambodian trial with fortified blended foods had similar rates of consumption (Skau et al., 2012). Low rates of consumption may be related to laissez-faire feeding styles (Wondafrash, Amsalu, & Woldie, 2012), which are

observed in Cambodia, although no literature exists. It may also be related to the unfamiliar environment, as children are likely to eat more during home feeding (Konyole et al., 2012), and to the fact that caregivers did not model consumption of the foods during the test feeding (Blissett & Fogel, 2013; Dovey, Staples, Gibson, & Halford, 2008; Wardle & Cooke, 2008).

4.2 | Consumption—Energy intake

Few acceptability studies have considered energy consumed as an outcome (Ahmed et al., 2014; Dibari et al., 2013), possibly because in most studies, the foods or servings were isocaloric (Adu-Afarwuah et al., 2011; Dibari et al., 2013; Pachón et al., 2007; Weber et al., 2017). The larger portion size required for fortified blends to deliver calorific content has been noted (Iuel-Brockdorf et al., 2015; Nackers et al., 2010). Research on small-quantity LNSs is explicit that, given the small gastric volume of young children, smaller portions of more nutrient dense foods are preferable in order to avoid displacement of breastmilk and local foods that enhance dietary diversity, including animal-source foods, fruits, and vegetables (Arimond et al., 2015; Matsungo, Kruger, Smuts, & Faber, 2017).

Thus, if we take energy consumption into consideration, we note that even the smaller amounts of RUSF snack or RUSF with *borbor* that children consumed, provided about three times more energy than the CSB++ or *borbor* fortified with MNP consumed. This is not surprising, because *borbor* is low in energy and nutrient density, and even CSB++ is high in volume relative to energy and nutrient density. Therefore, even children consuming large amounts of *borbor* fortified with MNP or CSB++ will not consume the quantity of macronutrients (kilocalories, protein, or fat) as children consuming a food that is high in energy and nutrient density, such as our novel RUSF.

4.3 | Caregiver assessment of child preference for foods

It is useful to ascertain caregivers' perceptions of their child's food preference, as has been done in some other studies (Ali et al., 2013; Iuel-Brockdorf et al., 2015; Pachón et al., 2007). Although caregivers assessed that their children liked *borbor* fortified with MNP slightly more than the RUSF snack, they still thought that their children had a fairly high preference for the RUSF snack, especially in comparison with CSB++ and RUSF with *borbor*. However, it is also important to acknowledge that this outcome may not be conclusive, as caregivers may hesitate to express negative opinions (Bauserman et al., 2015; Iuel-Brockdorf et al., 2015).

4.4 | Caregiver ranking of foods

The attitude and practices of caregivers are paramount in determining whether children will ultimately accept a novel food (Konyole et al., 2012). In our study, ranking forced caregivers to make choices, which is more conclusive than preference scales, and may help to mitigate the socially acceptable responding encountered in other studies (Bauserman et al., 2015; Iuel-Brockdorf et al., 2015). Caregivers ranked our novel RUSF snack very highly. The unusually high odds ratio of the caregiver ranking the RUSF snack highly versus ranking CSB++ highly (OR = 40.34, CI = 16.67–97.61, $p < 0.001$) demonstrates how much more caregivers liked the RUSF snack than CSB++. We can therefore expect that they would give the RUSF snack to their children, and in doing so, that their children would come to accept the snack. Moreover, high consumption of fish, soy, and mungbeans in Cambodia, including during pregnancy and lactation, exposes newborns and young children to these flavours via amniotic fluid and breastmilk (Ventura & Worobey, 2013) and may thus predispose children to accepting those flavours in the novel RUSF.

It is also noteworthy for programming purposes that caregivers ranked CSB++ very low. This confirms the field observations that CSB++ had low acceptability (WFP, 2014b).

4.5 | Focus group discussions

The FGDs supported the quantitative findings. As in some other studies, caregivers emphasised the health benefit of the snack (Ashorn et al., 2015; Weber et al., 2017). Interestingly, as in another study, caregivers reported that after eating the RUSF, their children had more appetite for eating other foods offered, which pleased caregivers (Cohuet et al., 2012). As in other studies (Phuka et al., 2011; Segrè et al., 2015; Weber et al., 2017), caregivers stated that they would be willing to pay for the RUSF snack. Caregivers indicated that they would be willing to pay between 300 and 1,000 riel (US$0.07–0.25) for the RUSF, which is similar to what they currently pay for snacks (Pries et al., 2016; World Vision, 2015).

4.6 | Snack or porridge

Despite a Cambodian (indeed global) preference for soft, porridge-like foods for younger children, our study found that caregivers would be more likely to give their child the RUSF snack than to mix the RUSF with *borbor*. This may be because, when mixed with warm *borbor*, the fish smell of the RUSF became stronger. Also, it was noted that even the younger children had no difficulty holding the snack themselves to suck on it, if not bite and chew it. Some caregivers broke the snack into smaller pieces to help the younger children eat it. Given this finding, future caregivers will be encouraged to use the RUSF as a snack, although it will be noted that the RUSF can be mixed with *borbor* or other foods, especially for younger children, as is suggested with some other LNSs (Arimond et al., 2015). This also concurs with evidence that consumption of snacks is very common amongst infants and young children in Phnom Penh even in the lowest wealth tercile (Pries et al., 2017; Pries et al., 2016; WFP, 2014b; World Vision, 2015).

4.7 | Strengths and limitations of this study

This trial contributes to the literature comparing supplementary foods using animal-source foods other than milk and foods acceptable to a South East Asian population. Having said that, the study was limited to peri-urban Phnom Penh and may not be representative of rural areas or of neighbouring countries.

The large sample size and high retention combined with the cross-over design and cluster randomisation, along with the use of ranking, make this study robust. Nevertheless, despite attempting to avoid bias toward any of the foods, unintentional interviewer and respondent bias may have favoured the novel RUSF in caregiver assessments.

5 | CONCLUSIONS

This trial contributes much-needed data on the acceptability of a novel RUSF to Cambodian caregivers and children. Moreover, it sheds light on the acceptability of supplementary foods with an animal-source food other than milk. Although children ate less of the RUSF snack than of the other, more familiar foods, the RUSF (whether eaten as a snack or with *borbor*) provided more energy than CSB++ or *borbor* fortified with MNP. Moreover, caregivers ranked the RUSF snack very highly, demonstrating that our locally produced RUSF, using fish instead of milk, is more acceptable to Cambodian caregivers than the commonly used MNP and CSB++. In view of these results, the research team felt confident to proceed to a 6-month trial to test the RUSF's effectiveness in preventing growth faltering. Given that testing over 3 days in an unfamiliar setting may not be an indication of how caregivers and children would accept the food over a longer period, we note that the subsequent 6-month effectiveness trial will also give additional information on long-term acceptability.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

CONTRIBUTIONS

BB developed the research protocol, trial design, and questionnaires, and refined these with FTW, SM, MG, DS, CC, and AL. AL and FTW secured funding. BB managed data collection with support from DS. BB conducted the statistical analysis with support from MG. BB wrote the manuscript and all authors subsequently commented on the manuscript and approved the final version.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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Site	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12
1	RUSF + *borbor*			Sprinkles + *borbor*			CSB++			RUSF snack		
2	Sprinkles + *borbor*			RUSF + *borbor*			RUSF snack			CSB++		
3	CSB++			RUSF snack			RUSF + *borbor*			Sprinkles + *borbor*		
4	RUSF snack			CSB++			Sprinkles + *borbor*			RUSF + *borbor*		

Supplementary Figure 1: Food sequence schedule

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Chapter 6: Methods of the effectiveness trial

This chapter describes the methodology of the effectiveness trial. Part of this chapter has been published as:

- **Borg B,** Mihrshahi S, Griffin M, Sok D, Chhoun C, Laillou A, Berger J, Wieringa FT. Randomised controlled trial to test the effectiveness of a locally-produced ready-to-use supplementary food (RUSF) in preventing growth faltering and improving micronutrient status for children under two years in Cambodia: a study protocol. Nutrition Journal. 2018;17(1):39.

The chapter begins by outlining the rationale for conducting the effectiveness trial. This is followed by the published effectiveness protocol. The final section describes departures from the protocol.

Rationale for the effectiveness trial

Having determined that the ready-to-use supplementary food (RUSF) was acceptable to children and caregivers, we proceeded to design the effectiveness trial. Until then, most studies had been conducted with severely and moderately acutely malnourished children. The effectiveness of using specially formulated ready-to-use therapeutic foods (RUTFs) for treating severe acute malnutrition (SAM) was well-established. The focus had tended to be on creating locally-produced foods, especially lipid-based nutrient supplements (LNSs) and comparing their effectiveness to fortified blends (1-4). It was widely acknowledged that the evidence was limited to the African context (3, 4), something which has not changed greatly since (5). Research with small quantities of LNSs (as opposed to medium or large/therapeutic doses) had just begun (6). Potential risks of specially formulated supplementary foods and the importance of assessing their impact on body composition had been noted (4). The evidence the use of RUSFs for prevention of childhood undernutrition in representative populations, and even with children that were already moderately acutely malnourished, was mixed (2). There was limited evidence on provision of supplementary foods in food secure settings (7). Only one systematic review had expressly considered whether the setting was food secure or food insecure (8). Our project was developed in that context.

Effectiveness trial versus efficacy trial

The acceptability protocol refers to a subsequent efficacy trial. However, the researchers decided to proceed to an effectiveness trial. The justification for that decision is explained here.

This was a long trial (six months). The enrolled children were not considered to be suffering from a clinical condition, inasmuch as most children were not moderately acutely malnourished. In any case, treatment for moderate acute malnutrition is not provided in Cambodia. This was a supplementary, not a therapeutic product. It was not expected to cause harm, and "overdose" was considered unlikely. For these reasons, it was considered neither possible nor necessary to maintain the ideal and controlled circumstances required for an efficacy trial. Moreover, the trial budget was limited, and did not allow for the intensive follow up of the consumption of the food that would have been required for an efficacy trial. Since any possible future treatment for moderate (and often even severe) acute malnutrition would be provided in the home, in real world and not clinical conditions, such intensive, expensive follow up does not seem justified. Therefore, it was considered reasonable to proceed to an effectiveness trial.

Comparability to other effectiveness trials

The design of our project was comparable to that of effectiveness trials of other supplementary foods. For example, most were prospective and had an allocation ratio of 1:1 (9-14). Some trials were cluster randomised (15, 16). The age of children in the studies ranged from six months to five years. Trials were typically eight to sixteen weeks' duration (4), with two trials following children for nine months (9, 17). Trials were usually unblinded although some were investigator-blinded (10, 12, 17). Although most trials did not state whether they aimed to establish superiority, equivalence, or non-inferiority, two trials explicitly assessed non-inferiority (10, 12). Most of the studies in the literature reviewed prior to the development of this trial protocol compared a version of Corn-Soy Blend (CSB) or micronutrient powders (MNP) with another food (9-12, 14, 16, 18).

The following published protocol describes the planned methodology for the effectiveness trial.

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Nutrition Journal

STUDY PROTOCOL Open Access

Randomised controlled trial to test the effectiveness of a locally-produced ready-to-use supplementary food (RUSF) in preventing growth faltering and improving micronutrient status for children under two years in Cambodia: a study protocol

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Abstract

Background: Existing ready-to-use supplementary and therapeutic foods (RUSFs and RUTFs) have had limited acceptance and effectiveness in Cambodia. This has hampered the treatment and prevention of child malnutrition. An innovative, locally produced, multiple micronutrient fortified lipid-based nutrient supplement (LNS) has been developed for use as an RUSF. Unlike most RUSFs, which contain milk, this product contains fish as the animal protein. Few RUSFs have been formulated using non-milk animal-source foods and they have not been widely tested. An acceptability trial that was conducted on this novel RUSF in June 2015 demonstrated that children will eat the RUSF and that caregivers will feed it to their children. The current trial aims to evaluate the effectiveness of the RUSF in preventing growth faltering and improving micronutrient status in Cambodian children.

Methods and analysis: This trial is a six-month, prospective, cluster randomised, non-blinded controlled trial among infants in peri-urban Phnom Penh. The trial aims to establish the superiority of the novel RUSF, compared to three alternatives (Corn-Soy Blend Plus Plus (CSB++) and Sprinkles micronutrient powders as active comparators, and the unimproved diet as a control). The allocation ratio is 1:1. Healthy children (N = 540) aged six to eleven months will be recruited. Data will be collected at baseline, and monthly thereafter for a period of six months. Participants will be provided with a monthly supply of the food to which their village has been allocated.
(Continued on next page)

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Discussion: There is an urgent need to develop locally produced and culturally acceptable RUSFs, and to compare these with existing options in terms of their potential for preventing malnutrition, in Cambodia and elsewhere. This trial will contribute much-needed data on the effectiveness of supplementary foods with an animal-source food other than milk, by comparing a novel RUSF based on fish to one that uses milk (CSB++). Moreover, it will deepen the understanding of the impact of multiple micronutrients provided with or without macronutrients, by comparing the novel RUSF and CSB++, which combine macronutrients with multiple micronutrients, to Sprinkles, which contains no macronutrients. In addition, it will augment the body of evidence from Asia.

Trial registration: ClinicalTrials.gov, Identifier: LNS-CAMB-INFANTS-EFF; NCT02257762.

Keywords: Ready-to-use supplementary food (RUSF), Lipid-based nutrient supplement (LNS), Childhood malnutrition, Growth faltering, Corn-Soy Blend Plus Plus (CSB++), Supercereal Plus, Sprinkles micronutrient powders, Cambodia

Background and rationale

Undernutrition is an underlying cause in almost half of all deaths in children under five years [1]. In Cambodia, rates of malnutrition remain stubbornly high [2] with 32% of all children under five years (and 40% of three to four year-olds) stunted, 10% wasted, and 24% underweight [2]. Suboptimal infant feeding practices, in particular, poor complementary feeding, result in inadequate energy and nutrient intakes to achieve optimal growth and micronutrient status, and consequently, childhood malnutrition.

Adequate complementary feeding can prevent malnutrition [3]. In Cambodia, the traditional weaning food is a white rice porridge called *borbor,* which has very low nutrient density. Special supplementary foods, containing a source of protein and lipids such as powered milk, soy or peanuts, and multiple micronutrients, can be used to improve complementary feeding. Supplementary foods can be either foods requiring preparation e.g. fortified blended products, such as Corn-Soy Blend++ (CSB++, now called Supercereal Plus), that is mixed with water to make a porridge; or ready-to-use e.g. biscuits, such as BP5. Until fairly recently, prevention of malnutrition relied on fortified blended products. However, increasingly, ready-to-use foods are lipid-based nutrient supplements (LNSs) which are often pastes, such as the peanut-based Plumpy'Doz™. These energy-dense ready-to-use supplementary foods (RUSFs) contain both macro and micronutrients [4, 5]. These new RUSFs are proving effective, as they have a higher energy content, and have a longer shelf life, and, since they require no preparation, are more convenient [5, 6]. Another common nutrition intervention is multiple micronutrient supplements such as Sprinkles, used solely to combat micronutrient deficiencies. These are individually-packed powders that can be added to food. Micronutrients are more likely to achieve growth outcomes when they are combined with energy, for example, in lipid-based nutrient supplements; there is no evidence that micronutrient powders alone contribute to sustained improvements in linear growth [7–12].

In Cambodia, various supplements and supplementary or therapeutic foods, including micronutrient powders, CSB++, BP100, and Plumpy'Nut™ have been used or trialled. The United Nations World Food Program (WFP) in Cambodia distributed CSB++ to children under two years to prevent malnutrition. Micronutrient powders (Sprinkles) have also been distributed through the public health system, though coverage is limited. These products are relatively expensive to procure and ship to Cambodia and in the case of Sprinkles, are not as effective as foods that contain macronutrients [9, 10]. Plumpy'Nut™, which is produced in France by Nutriset, was trialled in Cambodia in 2009 and was not well accepted [13]. Nor was CSB++ very well accepted in practice [14]. Due to lack of acceptability, and also due to budget constraints, WFP phased out distribution of CSB++ in Cambodia in June 2014. In addition, BP100, which is currently used in Cambodia to treat severe acute malnutrition, has not been well accepted [15].

For these reasons, the Cambodian Ministry of Health sought a ready-to-use food (in both therapeutic and supplementary versions) containing macro and micronutrients that was locally-produced and therefore more likely to be acceptable and cheaper than imported products.

In 2009 in Vietnam, UNICEF, IRD (Institute of Research for Development) and the National Institute of Nutrition developed a supplementary food from mainly local ingredients including rice, soy, mung beans, sugar, milk powder, oil and multiple micronutrients (called HEBI). This product proved more acceptable and as effective as Plumpy'Nut™ and is now widely used in Vietnam [16]. In mid-2013, IRD, partnering with UNICEF and the Cambodian Department of Fisheries Post-harvest Technologies and Quality (DFPTQ), began developing a novel RUSF based on the same concept as the Vietnamese product.

WHO recommends daily consumption of animal-source foods for their high protein, energy, and micronutrient availability, which plant-based complementary food alone cannot provide [17]. Animal-source foods have

been associated with greater micronutrient status, linear growth and non-fat mass gain compared to non-animal-source food [18, 19]. Usually, milk or whey powder is the animal-source food most commonly used in supplementary foods including CSB++ and various RUSFs [20, 21]. However, milk powder is an expensive (and often imported) ingredient. Therefore, it could perhaps be replaced with a cheaper, local source of animal protein that is widely accepted by the target population. There are precedents for replacing milk in supplementary foods for cost effectiveness [22], but until now, only a handful of supplementary foods have used meat, fish or eggs and they have generally not been tested for effectiveness on a wide scale [23–27]. The only known effectiveness study involving a supplementary food with fish compared a peanut and soy-based fortified spread to a corn porridge fortified with fish powder with six to eighteen month old children, and found that children consuming the porridge with fish powder gained less weight from six to eleven months, but otherwise the two supplementary foods performed similarly in terms of weight gain from twelve to eighteen months and linear growth [28]. In a number of studies, supplementing with meat or milk (as opposed to a supplementary food product containing no meat or milk), the nutritional improvement was less than expected, and sometimes was only the slowing of growth faltering [29, 30]. A study in Kenya is the only one to have compared milk and meat, and found meat had a greater impact, perhaps because milk inhibited iron and zinc uptake [29]. In all of these studies, the limited impact of meat or milk may have been because the additional food did not contain a sufficient range or quantity of micronutrients to overcome deficiencies.

In Cambodia, fish is inexpensive, readily available and highly acceptable to local tastes, and could therefore replace milk in a supplementary food. Combined with rice, soy, mung beans, oil and sugar, the resulting product should be less expensive and more acceptable to Cambodians. IRD developed the first version of this product in paste form in early 2014. It was compared to BP100, and found to be equally acceptable in younger children, although older children preferred BP100's milky taste to the fishy flavour of the RUSF.

The product was revised to reduce the fish smell and make it into a snack. It was then tested for acceptability in comparison to CSB++ and Sprinkles with *borbor* in June 2015. That trial demonstrated that children will eat the RUSF and that caregivers will feed it to their children. The next step is to assess the effectiveness of the food in preventing malnutrition, and promoting optimal growth and development. Therefore, a six-month effectiveness trial will be conducted. The impact of the product on children aged six to seventeen months will be compared to the impact of CSB++, Sprinkles, and to a control group consuming an unsupplemented diet, typically *borbor* at an early age (e.g. six to nine months) and thereafter, family foods.

RUSF formulation

The RUSF has been formulated and produced locally, using local inputs. Small freshwater fish were cleaned, dried, roasted and ground. Soy and mung beans were roasted and ground, then mixed with the fish and coconut. This mix was extruded, then combined with multiple micronutrient premix (DMS), icing sugar, maltodextrin and canola oil to create the RUSF paste. Wafers were hand-made from rice flour, eggs, water, sugar, salt and coconut with small amounts of vanilla or sesame seeds for added flavour. The wafer is a hollow cylinder between 8.5-9 cm long with an internal diameter of 0.4–0.5 cm. Such wafers, unfilled, are a popular Cambodian snack. The ingredients of the RUSF are detailed in Table 1.

Although there are no definitive guidelines for supplementary foods, the RUSF was developed with the recommended guidelines for the nutritional composition of RUTFs in mind [31]. RUTFs should provide 520-550 kcal/100 g with 10–12% and 45–60% of the total energy coming from proteins and lipids respectively. Our RUSF contains 484 kcal/100 g, with 11% and 45% of the total energy coming from proteins and lipids respectively. The energy content of the paste is 499 kcal/100 g. The wafer, filled with the RUSF paste, yields a final snack weighing approximately 10-11 g, including 7 g of paste and 3-4 g of wafer, with an energy content of approximately 48 kcal/piece.

Table 1 Ingredients of RUSF snack (paste and wafer)

Ingredients	g/100 g
Small indigenous fish	5.9
Mung beans	9.6
Rice	4.2
Soy beans	12.2
Icing sugar	10.3
Maltrodextrin	9.3
Canola oil (g)	3.7
Palm vegetable shortening	14.0
Desiccated coconut	1.5
Rice bran	2.2
Vitamin and mineral mix	0.9
Rice flour	9.0
Duck eggs	2.5
Refined sugar	7.2
Coconut	7.2
Salt	0.0
Flavour (vanilla or sesame seeds	0.1
Oil for cooking	0.4

All processing has been conducted in quality-certified facilities. The novel RUSF will be tested for microbiological safety (first five batches and every fifth batch thereafter) at the Pasteur Institute in Phnom Penh.

Design and methods

Objective and Hypothesis

This trial aims to evaluate the effectiveness of the locally produced RUSF on children aged six to seventeen months in preventing growth faltering and improving micronutrient status. The impact of the product will be compared to CSB++, Sprinkles, and to a control group consuming an unsupplemented diet.

Based on trials with other RUSFs, and the Cambodian experience with CSB++ [14], it is expected that this novel RUSF will be as effective as CSB++, and more effective than Sprinkles or the standard diet in promoting growth and preventing stunting [32, 33].

Trial Design

The trial is a prospective, cluster randomised, non-blinded controlled trial among infants six to seventeen months of age. The trial aims to establish the superiority of the novel RUSF, using CSB++, and Sprinkles as active comparators and the unimproved diet as a control. The allocation ratio is 1:1. The study will take place over six months.

Comparators

The RUSF will be compared with:

1. CSB++: CSB++ has been chosen as a comparator because it is currently the standard supplementary food. WFP usually provides CSB++ for children aged six months to two years to prevent malnutrition.
2. Sprinkles: Sprinkles micronutrient powders have been chosen since they are a commonly provided supplement in developing countries, such as Cambodia, with low dietary diversity, and complementary foods with low nutrient density [34].
3. Control: An unsupplemented diet, typically *borbor* and family foods, has been chosen as a control because this is the standard diet in Cambodia. *Borbor* is the traditional food for weanlings (children transitioning from exclusively milk diets to diets that include complementary foods) and is often the only food given until about nine months.

The active comparators comply with WFP and UNICEF standards for supplementary foods, and have been used and tested in Cambodia and elsewhere [18, 33, 35]. They have been found to be safe and to have no unintended side-effects. The table below contrasts the characteristics of the RUSF and comparators (Table 2).

The potential comparators that will not be used are BP100 (because it is designed to treat severe acute malnutrition) and peanut-based RUSFs. The latter will not be included because they are thought to be less acceptable, and are too expensive from current producers. Moreover, including peanuts in a locally produced Cambodian RUSF is not advisable as local production standards may not be adequate to safeguard against aflatoxin contamination, given that the rate of aflatoxin contamination of peanuts in South-East Asia is probably quite high [36–38].

Outcomes and their measurement

The main outcome of interest is anthropometric status, i.e. length/height-for-age (L/HAZ), weight-for-height (WHZ) and weight-for-age (WAZ), calculated through monthly weight and height measurements. A HAZ < -2 indicates stunting, a WAZ < -2 indicates underweight, and a WHZ < -2 indicates wasting. A secondary outcome is children's body composition. Body composition, like linear growth, gives an indication of the quality of nutritional recovery, inasmuch as non-fat or lean tissue growth requires balanced nutrition while fat gain requires only calories [39]. Body composition will be calculated using triceps and subscapular skinfolds [40, 41]. Another secondary outcome is biochemical status, including iron status and anaemia, infection measured by C-reactive protein (CRP) and alpha-2 acid glycoprotein (AGP), and parasite infestation. An additional outcome is cognitive development and achievement of developmental milestones.

Blinding

This will be an open trial with no blinding, since the three foods will be visibly different to data collectors, caregivers and children. The principal investigator (who will do supervision in the field) and the staff administering the intervention will know which food has been allocated to a given village.

Study setting

The study will be conducted in northern peri-urban Phnom Penh (Khan Russey Keo, Mekong Health District). This area has a large population of urban poor whose children experience higher than average rates of underweight and stunting [42, 43].

Allocation sequence generation and concealment

Randomisation of the interventions will occur at site level. Using UNICEF data on health centre coverage, potential villages and their populations (including the expected population of children aged 6–11 months) will be listed. Villages receiving Sprinkles or CSB++ will be excluded based on information provided by UNICEF, WFP and the

Table 2 Characteristics of the RUSF and comparators

CHARACTERISTIC	RUSF	CSB++	Sprinkles
Daily serving size	40-110g*	100 g dry CSB++	1 sachet (1 g)
Animal-source food	Fish	Milk	–
Energy (kcal/100 g)	484	410	–
Protein (g/100 g)	13	16	–
Carbohydrates (g/100 g)	52	67	–
Lipids (g/100 g)	24	9	–
Fibre (g/100 g)	1.6	3	–
Vitamin A	1080 μg	540 μg	400 μg
Vitamin D	60 μg	4.6 μg	5 μg
Vitamin B1 (thiamine)	0.59 mg	0.47 mg	0.5 mg
Vitamin B2 (riboflavin)	0.89 mg	0.84 mg	0.5 mg
Vitamin B6	0.84 mg	2.1 mg	0.5 mg
Phosphorus	474 mg	530 mg	–
Calcium	366 mg	260 mg	–
Pantothenic acid	1.75 mg	7.3 mg	–
Copper	1.6 mg	–	0.56 mg
Vitamin E	10.9 mg	9.8 mg	5 mg
Folic acid	230 μg	115 μg	150 μg
Iron	8 mg	8.9 mg	10 mg
Magnesium	137 mg		–
Vitamin B3 (niacin)	9.63 mg	7.2 mg	6 mg
Vitamin C	53.4 mg	100 mg	30 mg
Zinc	8.4 mg	7.5 mg	4.1 mg
Potassium	806 mg	990 mg	–
Vitamin B12	10 μg	2.3 μg	0.9 μg
Biotin	0.37 mg	–	–
Selenium	90 μg	–	17 μg
Iodine	–	60 mg	90 μg
Vitamin K	3 μg	115 μg	–
Taste	Fishy	Creamy, sweet, smooth [52]	Should not have a taste [53]
Preparation	No	10 mins cooking	No
Acceptability in Cambodia	Yes	Acceptable in trial [52], but not in practice [14]	Yes [35]
Effectiveness in reducing malnutrition	To be tested	Not inferior to peanut-based RUSFs, which are the most effective in promoting linear growth and weight gain [18, 33]	Improves micronutrient status but not linear growth or weight gain [5, 12, 35]
Intra-household sharing	To be tested	Yes [33]	None noted [35]
Packaging	To be determined	Packaging may encourage sharing [5, 39]	Looks like "medicine" thus may discourage sharing [5, 39]
Local production capacity	Unknown	None [5]	None
Cost	To be determined. Goal is <US$0.10/day	Less expensive than peanut-based RUSFs if produced locally [18], but also have to consider logistics, time to treat, relapse [39]	Very cheap to produce at US$0.025/daily dose [11], but also have to consider logistics

*RUSF daily serving size depends on the child's age, i.e. 6-8 m – 4 pieces, 40 g; 9-11 m – 6 pieces, 60 g; 12-17 m – 11 pieces, 110 g

Ministry of Health. Small villages that are close to each other may merged into one site, or large villages split into multiple sites, in order to create sites of similar sizes. Sites will then be randomised to one of the arms.

Thus, participants will not be individually randomised. All subjects in a given site will be in the same intervention group to avoid potentially confounding social interaction, such as inter-household sharing of different foods, and to ensure better compliance [44]. Sites will be randomly allocated to one of the foods, using an Excel random number table and a randomised incomplete block design. The principal researcher will generate the allocation sequence. At least three sites will be allocated to each food.

Sample size

The main outcome of interest is anthropometric status (WHZ, WAZ and L/HAZ), calculated through changes in weight and length/height for the novel RUSF in comparison to the CSB++, Sprinkles, and the control after six months of the interventions. An overall required sample size of 424 subjects, or 106 subjects per group, was calculated, based on the assumptions of a difference in mean z-scores of 0.1 between the groups (95%CI), an SD = 0.8, and an assumption that subjects provide five measurements (out of a possible total of seven), with a precision of 0.05, power of 0.8. This is in keeping with similar effectiveness studies which have aimed to detect a difference in mean z-scores of 0.16 between groups, assuming SD = 0.8 [45], or a difference in mean z-scores of 0.1 and SD = 0.8 [20]. Therefore, detection of difference in mean z-scores of 0.1 between groups is reasonable.

In similar studies, retention has been high at [22, 28, 35]. Therefore, we can assume a maximum attrition of 25% with confidence. The total number of subjects enrolled will therefore be 530, or approximately 133 children in each group. This will be rounded up to 135 children/group for a total of 540 subjects, which should be adequate. See Fig. 1 for the planned site selection, recruitment and enrolment of children.

Eligibility criteria

Children must be between six to eleven months of age at enrolment. It is expected that there will be approximately equal numbers of female and male children. Subjects must be normally nourished or only moderately malnourished (mid-upper arm circumference, MUAC> 115 mm, WHZ score > − 3), and healthy. Their iron status should be normal or only moderately anaemic; children with severe anaemia (haemoglobin, Hb < 70 g/l) will be referred for treatment. Any children who have been using Sprinkles or CSB++, are regularly consuming or receiving other food or micronutrient supplementation, are enrolled in any other research or supplementary feeding program, or have received therapy for acute malnutrition within one month prior to recruitment, will be excluded. Children with

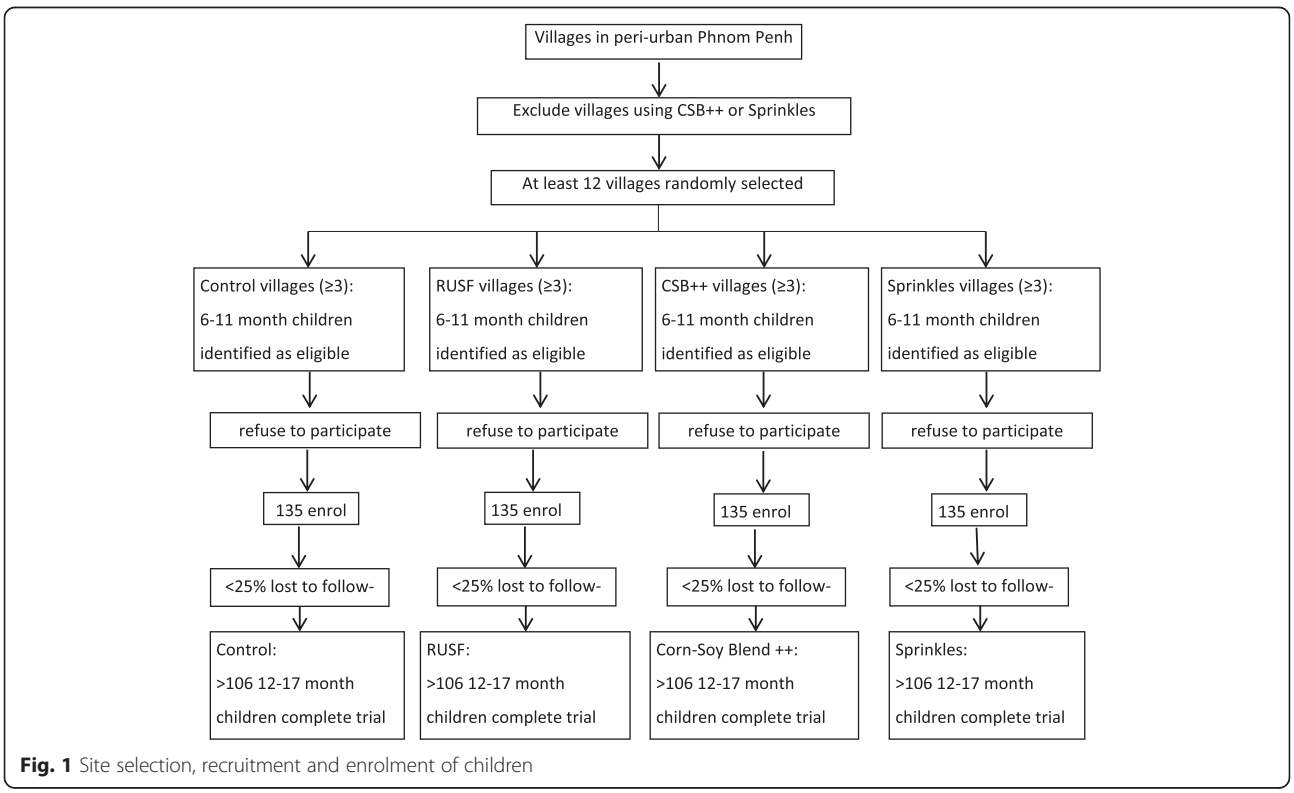

Fig. 1 Site selection, recruitment and enrolment of children

known food intolerances will also be excluded. Caregivers must be healthy, and must give informed signed consent for their children to be included.

Recruitment, Enrolment and Consent

Village Health Support Group members (local health volunteers) will assist with recruitment, initially by inviting potential caregivers and children to participate in the trial. The data collection team will use a screening form to assess initial eligibility of participants. Some participants may be excluded at this point (e.g. on the basis of age or unwillingness to participate). Those who are excluded for severe acute malnutrition, anaemia or illness will be referred for treatment.

Those who are eligible will be provided with written and verbal information about the trial in Khmer language. If the participant is willing to continue, they will be asked to provide their verbal and signed (or fingerprinted) consent for them and their children to participate. It will be made clear that potential participants have the option of not joining the study. If they consent to participate, it will be made clear that they can ask questions, make complaints, or withdraw at any time.

Data collection

After informed consent and enrolment, baseline data will be collected. This will include demographics, morbidity, anthropometry (weight, height, MUAC, skinfolds), biochemical samples (blood, stool), dietary data (breastfeeding, food frequency and dietary diversity), and developmental milestone achievement. Participants may still be excluded if they are malnourished (MUAC< 115 mm, WHZ score < – 3) or severely anaemic.

Participants in the intervention groups will then be provided with a one-month supply of the food to which their site has been allocated. Thereafter, participants will be provided with food on a monthly basis, and they will continue to consume the food over a six-month period. Data will be collected monthly (anthropometry, morbidity, developmental milestones), and/or at endline (biochemical).

Staff will inform the Village Health Support Group members in advance of monthly data collection sessions, and the latter will arrange for participants to be present. If caregivers are not present, they will be followed up by mobile phone and/or by the Village Health Support Group members and home visits will be conducted.

Anthropometric data

Anthropometric measurements will include weight to the nearest 0.1 kg, recumbent length to the nearest 0.1 cm, skinfolds to the nearest 1 mm, and MUAC to the nearest 1 mm. Weight will be measured with a SECA scale, length will be measured on wooden UNICEF height boards, MUAC will be measured with a flexible UNICEF insertion tape and skinfolds will be measured with a standard caliper (Holtain, United Kingdom). Anthropometry will be measured monthly. Children with MUAC < 115 mm and WHZ < – 3 at enrolment or at any time during the study will be excluded from the study and referred to the health centre for treatment.

Morbidity data

Data on diarrhoea and respiratory infections will be collected at the beginning of the study and monthly thereafter. Children with serious illnesses or severe malnutrition will be excluded from the study and referred to the health clinic for treatment.

Biochemical samples

Blood samples (4mls) will be drawn at baseline and endline by trained nurses who are skilled and experienced in taking paediatric blood samples. One to two drops will be used immediately to measure haemoglobin (using a HemoCue HB301 photometer). Of the remaining blood, 2mls will be placed in a trace element sodium heparin vacuette for further micronutrient analysis. The remaining blood will be placed in Ethylenediamine tetraacetic acid (EDTA) tubes for fatty acid analysis, then 40 μl will be pipetted onto pre-treated chromatography paper to be analysed as a dried blood spot. Blood samples will be stored, transported and analysed appropriately to avoid contamination and deterioration. Analysis will be conducted for micronutrient status including haemoglobin (g/l), ferritin (μg/l), transferrin receptor (mg/l), retinol-binding protein (vitamin A status) (μmol/l), zinc (μmol/l), C reactive protein (mg/l), using internationally accepted indicators [46].

Stool samples will be taken and tested for parasites. Stool containers will be distributed to caregivers and collected the following day. Analysis will be conducted using FLOTAX method.

Cognitive data and developmental milestones

The mental and motor development and behaviour of the participants will be tested monthly using the Bayley Scales of Infant Development (BSID), an internationally recognised standard of determining children's developmental progress. In addition, a more detailed assessment will be conducted at endline.

Compliance data

Data on consumption, sharing, and adherence will be gathered monthly. Subjects will be provided with a month's supply of food at this time.

Dietary data

Dietary data including breastfeeding status, food frequency and dietary diversity for caregivers and children will be

collected monthly, using the Cambodian Demographic and Health Survey (CDHS) questionnaires as a model.

Endline data

Endline data will be collected on infants aged twelve to seventeen months at the end of the study.

Timeline

The study will take place in 2016–2017 (see Table 3).

Statistical analysis

All data will be double-entered in Excel. Data will be analysed in the statistical software required by the PhD candidates' respective universities. Thus, anthropometric data will be analysed by one PhD candidate in the statistical software STATA version 13.1, and biochemical and cognitive/developmental data will be analysed by another PhD candidate in SPSS and R.

Since most of the measures being taken are repeated on a monthly basis, the assumption of independence is not satisfied. Therefore, a mixed effect model, which is appropriate for repeated measurements, will be used. Predictor variables will be checked for normality and linearity, and manipulated and recoded as necessary. Outcome variables will be manipulated and recoded if necessary to deal with non-normality and/or for easier interpretation. Initial univariate screening will be conducted at $p \leq 0.2$ level using simple logistic regression to screen for variables that could have an effect, and collinearity assumptions will be checked, in order to determine which covariates to include in the model. A complete mixed effects logistic regression will then be fit to the data. Significance levels will be considered $p < 0.05$. Any missing data will be treated as "missing at random" and accounted with the mixed effect model.

Anthropometric status

The main outcome of interest is change in anthropometric status. The independent variables are the food, sex and age, and the dependent variables are the mean weight-for-height (WHZ), height/length-for-age (H/LAZ) and weight-for-age (WAZ). Anthropometric indices for children will be calculated using World Health Organisation (WHO) 2006 standards (ANTHRO version 3.2.2 January 2011) and expressed as z-scores for weight-for-height (WHZ), height/length-for-age (H/LAZ) and weight-for-age (WAZ). Thus, multiple means will be compared, and changes will be analysed using a mixed effects model to determine whether there are statistically significant changes in WHZ, H/LAZ and WAZ of participants consuming the different foods.

Body composition

A second outcome is body composition measured by skinfold thickness. The independent variable is the food and the dependent variable will be the mean of skinfold thickness. The data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in the body composition of participants eating the different foods.

Enrolment data

Enrolment data describing the characteristics of the recruited participants (e.g. sex, age, anthropometric and biochemical status, morbidity, breastfeeding status) will be reported as means ± SD for continuous measures.

Ethics and consent

Ethics approval was received from the University of Queensland Medical Research Ethics Committee and the National Ethics Committee for Health Research (NECHR)

Table 3 Schedule of enrolment, interventions and assessments

	STUDY PERIOD					
	Enrolment	Allocation	Post-allocation			Close-out
TIMEPOINT	*Feb 2016*	*Feb 2016*	*Feb 2016*	*Mar-Sept 2016*	*Oct 2016*	*Early 2017*
ENROLMENT:	X					
Eligibility screen	X					
Informed consent	X					
Allocation		X				
INTERVENTIONS:						
Baseline			X			
Monthly data collection				X		
Endline					X	
DOCUMENTATION:						
Anthropometry						X
Micronutrients						X

in Cambodia. Written informed consent will be obtained from all the caregivers or parents of the participating children before recruitment into the study. Based on the experience of similar trials [20, 22, 28, 45], and given the inclusion and exclusion criteria, no harm is expected from trial participation. However, morbidity data will be collected every month, and this will record any harm (nausea, etc.) that could come from participation in the trial.

Discussion

The development and comparison of new supplementary foods with current fortified blends and existing RUSFs in terms of their potential for preventing growth faltering and malnutrition responds to a need noted by various researchers [5, 22, 47–49] as well as to a programmatic need. Such products need to be affordable, effective, and acceptable in terms of preparation as well as taste [23]. The novel RUSF has proved acceptable and this trial will test its effectiveness, in terms of the main outcomes, namely, anthropometric measures, body composition and biochemical status.

Six months is sufficient time to see changes in the main outcome, that is, in anthropometric measures. Similar effectiveness studies (considering weight and length outcomes) have ranged from as little as four weeks [20], with many studies taking twelve weeks to compare three to eight food supplementation regimes [18, 22, 29, 32, 33, 50], and others taking six months [39]. The INCAP study in Guatemala provided supplementary food to children for up to seven years, but nevertheless noted a detectable difference after three and six months of supplementation [10]. With respect to linear growth, healthy infants grow approximately 1.25 cm each month from six to eleven months [51]. Golden notes that although the maximum rate of height gain is as yet unknown, catch-up growth can easily be three times the rate of normal growth. Thus, a malnourished child less than one year of age can gain one z-score in two to four weeks if receiving adequate nutrition [4]. The mean HAZ-score for a Cambodian child of six months is − 0.5, for twelve to seventeen month-olds is − 1.3 and for eighteen to twenty-three month-olds is − 1.8 [2]. Therefore, s/he loses around 0.8 z-score in six to eleven months, or approximately 0.07 z-score per month. In our trial, if the intervention stops or slows growth faltering, we could see a difference in HAZ-scores of up to 0.42 over six months between intervention and control groups.

Since it is not uncommon nowadays to find stunted but overweight individuals [4], a recent Cochrane review recommended that future research report results on body composition [49]. Among stunted, non-wasted children, prevention is preferable to treatment [5]. In either treatment or prevention of malnutrition, the aim is to increase non-fat mass (bones, muscles) in preference to fat mass, and one should therefore see linear growth as well as increased weight, since linear growth is a better indicator of nutritional recovery than weight gain [4]. Therefore, body composition will also be an important outcome of our trial.

The effectiveness trial of our novel RUSF will determine how a ready-to-use, fish-based, supplementary food compares with CSB++, Sprinkles, and an unsupplemented diet in terms of preventing of growth faltering and improving micronutrient status. This trial will contribute much-needed data on the effectiveness of supplementary foods with an animal-source food other than milk, by comparing a supplementary food with fish (the RUSF) and one with milk (CSB++). Moreover, it will deepen the understanding of the impact of multiple micronutrients provided with or without macronutrients, by comparing the RUSF and CSB ++, which combine macronutrients with multiple micronutrients, and Sprinkles, which contains no macronutrients. Moreover, most studies on supplementary foods are from Africa, so this research will be an important contribution to the body of evidence from Asia [49].

There are two limitations of this trial. First, the data on consumption and compliance is based on self-reporting, and therefore risks response bias. It could be expected that any response bias would favour over-reporting of consumption, which may suggest lower effectiveness of the interventions. Similarly, sharing of foods with family members would likely be under-reported, again leading to underestimation of effectiveness. The second limitation is related to the generalisability of the findings to non-urban Cambodian populations, and to other South East Asian populations. Rural areas of Cambodia experience higher levels of malnutrition and poorer infant and young child feeding practices than urban [2]. Therefore, in rural settings, it would be difficult to predict if the interventions would appear more efficacious, or less.

From a programmatic point of view, if the novel RUSF proves successful, not only would it provide an acceptable, effective product for preventing childhood malnutrition. It might also simplify interventions in maternal and child nutrition in Cambodia and in countries where similar products could be produced, since, because of its composition, it could be used with pregnant and lactating women as well as children aged six months to two years.

Abbreviations

AGP: Alpha-2 acid glycoprotein; BSID: Bayley Scales of Infant Development; CDHS: Cambodian Demographic and Health Survey; CRP: C-reactive protein; CSB++: Corn-Soy Blend Plus Plus, now called Supercereal Plus; DFPTQ: (Cambodian) Department of Fisheries Post-harvest Technologies and Quality; EDTA: Ethylenediamine tetraacetic acid; Hb: Haemoglobin; L/HAZ: Length/height-for-age z-score; LNS: Lipid-based nutrient supplement; MUAC: Mid-upper arm circumference; NECHR: National Ethics Committee for Health Research; RUSF: Ready- to-use supplementary food; RUTF: Ready- to-use therapeutic food;

SD: Standard deviation; WAZ: Weight-for-age z-score; WFP: United Nations World Food Program; WHO: World Health Organisation; WHZ: Weight-for-height z-score

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Availability of data and material
The datasets generated and/or analysed during the current study will be made available from the corresponding author after the publication of major outputs, upon reasonable request.

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Authors' contributions
BB developed the original research design, and refined it with FTW, SM, MG, DS, CC, JB and AL. BB wrote the initial draft protocol and all authors subsequently contributed to, commented on, and approved the final version.

Ethics approval and consent to participate
Ethics approval was received from the University of Queensland Medical Research Ethics Committee (2014001070) and from Cambodia's National Ethics Committee for Health Research (402 NECHR). Written informed consent will be obtained from all the caregivers or parents of the participating children before recruitment into the study.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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Departures from effectiveness protocol

The trial was conducted for the most part according to the protocol, with departures indicated below.

Sample size

The required sample size was 424 subjects, or 106 subjects per group. Assuming an attrition of approximately 25%, we aimed to recruit 540 subjects or 135 children/group. In fact, recruitment proved more difficult than expected, and a second round of recruitment was conducted. Ultimately, 485 subjects were recruited, with 128, 127, 124 and 106 subjects in the control, RUSF, CSB++ and MNP groups respectively.

Duration of trial

The planned duration of the trial was six months or 182 days. In some cases, scheduling constraints (usually due to weekends or public holidays) reduced or extended this duration. The shortest period that any child was in the trial was 168 days and the longest was 220 days.

Inclusion/exclusion criteria - age

Two children were recruited at only five completed months of age. One was five months and twenty-seven days, and the other was five months and thirty days. At the point that the error was discovered, the children had already completed baseline data collection, including anthropometry and blood collection. Therefore, it was decided that it was not ethical to exclude them.

At the end of the trial, nine children were less than one full year of age (ranging from 350 to 364 days old). Six children were older than eighteen months (by one to eleven days).

Inclusion/exclusion criteria – WHZ and MUAC

Children with a WHZ $\leq$ -3 or $\geq$ 3 were excluded and the former were referred for treatment. Children with a MUAC < 11.5cm were excluded and referred for treatment. In the field, the data collectors responsible for anthropometric measurements used the paper-based WHO simplified field tables for

WHZ for boys and girls aged birth to two years (z-scores). When children seemed very close to a WHZ of ±3, the researcher checked the WHZ, using a z-score calculator smartphone app (S-Cubus, Inc.) However, when WHZ was calculated using weight, height, age, and sex in the database, two children had a WHZ of less than -3 (-3.61 and -3.09 respectively) and one child had a WHZ of 3.32. One child with MUAC 11.45cm was also enrolled. It is unclear how these errors occurred.

At the same time as our RUSF trial, a trial was being conducted on the ready-to-use therapeutic food (RUTF) version of the food. This trial was having difficulty recruiting children with WHZ ≤-3 and began recruiting children with WHZ ≤-2.8 and below. Our project began referring children with WHZ ≤-2.8 and below to that project.

Inclusion/exclusion criteria - MNP

Some participants were familiar with MNP. However, MNP had not been distributed or used systematically. Therefore, it was decided to include rather than exclude those participants.

Loss of one cluster

Cluster 24 recruited only one participant who dropped out after baseline, resulting in twenty-seven instead of twenty-eight clusters at endline.

Data collection format and data entry

Baseline data collection was paper-based. However, from the first month of follow up, data collection was shifted to hand-held tablets, using KoBo Toolbox (http://www.kobotoolbox.org/). Therefore, only the baseline data was double entered in Excel. All other data was entered directly in KoBo Toolbox.

Post hoc analysis of consumption

Post hoc analysis of consumption was conducted, with children who ate less than 75% of the monthly food supplied being considered to have low consumption, and those who ate 75% or more having high consumption.

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Chapter 7: Results of the effectiveness trial

Part of this chapter has been accepted for publication as:

- **Borg B,** Sok D, Mihrshahi S, Griffin M, Chhoun C, Berger J, Laillou A, Roos N, Wieringa FT. Effectiveness of a locally-produced ready-to-use supplementary food (RUSF) in preventing growth faltering and improving micronutrient status for children under two years in Cambodia: a randomised controlled trial. Maternal & Child Nutrition. 2019;(*forthcoming*).

This chapter describes the justification, results, contribution, and implications of the effectiveness trial. It begins by discussing the justification for an effectiveness trial. Then it goes on to describe the main results, and to outline what the trial adds to the literature. The final section is the current proof of the forthcoming publication.

Justification for the effectiveness trial

The main objective of the broader project, as articulated by the Cambodian Ministry of Health (MoH), was to develop a locally-produced ready-to-use therapeutic food (RUTF) as an alternative to the existing therapeutic product that was being used to treat severe acute malnutrition (SAM), namely BP-100™. The development and testing of a ready-to-use supplementary food (RUSF) for the prevention of undernutrition was a secondary objective, made more pressing when the World Food Program (WFP) ceased distribution of their standard supplementary food for children aged six months to two years, Corn-Soy Blend Plus Plus (CSB++).

As described in Chapter 6, the literature at the time focused on treating severe and moderate acute malnutrition (SAM and MAM) with lipid-based nutrient supplements (LNSs) or fortified blends, in food insecure settings in Africa (1-4). Little had been published about prevention of childhood

undernutrition, particularly in representative populations that included non-MAM children in food secure settings (2, 5).

Figure 7.1: A monthly supply of the intervention products. Left to right: CSB++ (1 bag, 3kg, 100g/day), MNP (~35 sachets, 35g, 1g/day), RUSF (box of 120-380 pieces, 1.2-3.8kg, 4-11 pieces/day depending on child's age).

Main results

Our six-month trial enrolled 485 children aged six to eleven months compared the RUSF to CSB++, micronutrient powders (MNP), and an unsupplemented control group. Figure 7.1 shows a monthly supply of each of the intervention products.

Growth continued to falter in all groups from baseline to endline. In adjusted analysis, high and low consumers of RUSF had increased mid-upper arm circumference (MUAC) in comparison to the control, as did high and low consumers of CSB++, and high consumers of MNP. Low consumers of RUSF had increased weight-for-age z-scores (WAZ) in comparison to the control, as did high consumers of CSB++ and MNP. Low consumers of RUSF also had increased weight-for-height z-scores (WHZ) compared to the control, as did high and low consumers of CSB++. Height-for-age z-scores (HAZ) decreased in all groups, especially amongst low consumers of CSB++.

Thus, the results of our trial, as others, are mixed. RUSF and CSB++ protected against the wasting and underweight experienced by the control group, but none of the interventions protected against stunting.

Interestingly, low doses of RUSF seem to be effective, which indicates that future trials with small quantities of the RUSF may be warranted. Overall, however, the impact was of limited clinical significance, highlighting the importance of considering additional factors and strategies for prevention of undernutrition in Cambodian children.

What this trial contributes to the literature

There have been some important changes in the five years since the study was designed, particularly with respect to the use and effectiveness of small quantity LNSs (SQ-LNSs) (6-8) and the inclusion of unsupplemented controls. However, the focus has tended to remain on Africa, on moderately acutely malnourished children in food insecure settings, and on comparing specially formulated food products to each other rather than to other food or non-food interventions, such as dietary improvement with unprocessed foods, or nutritional counselling (9-13). Our effectiveness trial provides evidence from a representative population of children, including an unsupplemented control, in a food secure setting in South-East Asia. In that respect, it contributes significantly the literature on prevention of childhood undernutrition.

Our trial shows that fish is a potential replacement for milk in specially formulated supplementary food. It has proved consistent with the finding that in the absence of adequate macronutrients, micronutrients do not contribute to growth (14-20). In our trial as in others, WAZ, WHZ and MUAC increased for some one of the interventions, whereas HAZ was less likely to improve (21-23). Our trial, like others, found that the impact of supplementary feeding interventions on undernutrition has been slight, mixed, or of limited clinical significance. This suggests that specially formulated supplementary food may play only a small role in undernutrition prevention programming among a representative population of children in food secure settings.

The following proof of the forthcoming publication describes the results of the effectiveness trial in detail.

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ORIGINAL ARTICLE

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Effectiveness of a locally produced ready-to-use supplementary food in preventing growth faltering for children under 2 years in Cambodia: a cluster randomised controlled trial

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Abstract

This cluster randomised controlled trial tested the effectiveness of a locally produced, fish-based, ready-to-use supplementary food (RUSF) to prevent growth faltering (decline in z-scores). Cambodian infants (n= 485), aged 6 to 11 months, were randomised by site to receive the RUSF, Corn-Soy Blend++ (CSB++), micronutrient powders (MNP), or no supplement (control). The intervention was for 6 months. In unadjusted analysis, the control group had statistically significantly decreased weight-for-age z-scores (WAZ; -0.02, 95%CI = -0.03 - -0.01, P= 0.001) and height-for-age z-scores (HAZ; -0.07, 95%CI = -0.09 - -0.05, P < 0.001), and increased mid-upper arm-circumference (MUAC; 0.02cm, 95%CI = 0.01 - 0.04, P = 0.010), but no statistically significant change in weight-for-height z-scores (WHZ). The RUSF group did not differ significantly from the control for WAZ, HAZ or WHZ (in other words, WAZ and HAZ decreased and WHZ did not change), but had increased MUAC in comparison to the control (0.04cm, 95%CI = 0.01 - 0.06, P = 0.008). There were no statistically significant differences between the RUSF group and the CSB++ or MNP groups with respect to WAZ, HAZ, WHZ or MUAC. Interestingly, in adjusted analysis, low consumers of RUSF had increased WAZ, WHZ and MUAC (0.03, 95%CI = 0.01-0.06, P = 0.006; 0.04, 95%CI = 0.01-0.08, P = 0.026; and 0.05cm, 95%CI = 0.02-0.09, P = 0.004, respectively) compared with the control. The novel RUSF, particularly in small quantities, protected against ponderal growth faltering, but the improvements were of limited clinical significance.

KEYWORDS

childhood malnutrition, fish, growth faltering, lipid-based nutrient supplement (LNS), ready-to-use supplementary food (RUSF)

1 | BACKGROUND AND RATIONALE

Undernutrition contributes to almost half of all deaths in children under 5 years (Black et al., 2013). In Cambodia, despite impressive economic growth, high rates of undernutrition persist (NIS et al., 2015). In the 2014 Cambodian Demographic and Health Survey (DHS), almost one-third (32%) of children under 5 years were stunted, 10% were wasted and 24% were underweight (NIS et al., 2015). The majority of growth faltering, indicated by a decline in z-scores (Victora, de Onis, Hallal, Blössner, & Shrimpton, 2010) in Cambodia occurs from 6 to 20 months (Dewey & Huffman, 2009; NIS et al., 2015). Poor complementary feeding practices are often implicated in the growth faltering observed in low- and middle-income countries (Ferguson et al., 2018). *Borbor* (white rice porridge, the traditional weaning food in Cambodia) has inadequate energy and micronutrient nutrient density to sustain adequate growth velocity in the first 2 years of life (Black et al., 2008; Ferguson et al., 2018). Nutrition-specific interventions aimed at improving complementary feeding seem warranted (Black et al., 2013; Pham et al., 2012). High energy, nutrient dense specialised foods can be used to prevent growth faltering and promote improved linear growth and weight gain among children (Bhutta et al., 2013; Pee & Bloem, 2009; Golden, 2009).

The development of affordable, acceptable and effective specialised foods, and their comparison with existing products in terms of their potential for preventing growth faltering responds to a need noted by researchers (de Pee & Bloem, 2009; Lazzerini, 2013). In Cambodia prior to 2013, various supplementary or therapeutic foods had been used or trialled. Corn-Soy Blend Plus Plus (CSB++, also called SuperCereal Plus, the standard supplementary food that WFP provides to children aged 6 months to 2 years to prevent undernutrition), BP-100™ and Plumpy'Nut™ had limited acceptability or effectiveness (Boudier, 2009; WFP, 2014; Wieringa, 2014). Micronutrient powders (MNP), while acceptable and effective at improving micronutrient status, did not have any impact on growth (Jack et al., 2012). Therefore, in mid-2013, UNICEF engaged the French National Research Institute for Sustainable Development (IRD), and the Cambodian Department of Fisheries Post-harvest Technologies and Quality (DFPTQ), to develop a locally produced ready-to-use supplementary food (RUSF). The aim was to develop an RUSF that would be more acceptable, effective and affordable than previously tested or used products (Sigh et al., 2018).

Many specialised foods, including CSB++, use milk or whey powder as the animal-source food (Adu-Afarwuah, Lartey, Zeilani, & Dewey, 2011; Nga et al., 2013), but in Cambodia, milk is an expensive, imported ingredient. Thus, it was decided to replace milk with fish, which is inexpensive, readily available and highly acceptable in Cambodia (Vilain, Baran, Gallego, & Samadee, 2016). It had previously been demonstrated that fish protein supported linear growth to the same extent as milk protein in a locally produced complementary food in Cambodia (Skau et al., 2015). Since lipid-based nutrient supplements (LNSs) are particularly promising (de Pee & Bloem, 2009; de Pee, Manary, & Ashorn, 2011), the novel ready-to-use supplementary food (RUSF) was formulated as an LNS snack. In June 2015, the RUSF was tested for acceptability in comparison to CSB++ and MNP. The acceptability trial demonstrated that children would eat the RUSF and that caregivers ranked it highly (Borg et al., 2019). Here, we report on the effectiveness of the RUSF in preventing growth faltering for children aged 6 to 17 months, in comparison to CSB++, MNP, and an unsupplemented control group. The main outcomes of interest are weight-for-age z-score (WAZ), height -for-age z-score (HAZ), weight-for-height z-score (WHZ), and mid-upper arm circumference (MUAC).

2 | METHODS

2.1 | Study design and setting

The design and methods are detailed in the published protocol (Borg et al., 2017) and briefly described here. The trial took place from February to October 2016. It was a prospective, non-blinded, cluster randomised controlled trial among infants that were 6 to 11 months of age at inclusion. It aimed to establish the superiority of the novel RUSF, using CSB++, and MNP as active comparators and the standard diet as a control. The trial was conducted in peri-urban Phnom Penh (Mekong Operational District), which has a large population of urban poor. Peri-urban children under 5 years experienced higher rates of underweight (36%) and stunting (29%) than the 25% and 19% reported for Phnom Penh, respectively (UNICEF & People In Need, 2014; NIS et al., 2011). Twenty-eight sites were allocated to one of the RUSF, CSB++, MNP, or control groups.

2.2 | RUSF formulation

The RUSF was based on the recommended nutritional guidelines for ready-to-use therapeutic foods (Dewey, 2009; FAO/WHO, 2016). It was produced locally, using local ingredients including small freshwater fish, soy, mung beans and coconut. The RUSF paste was piped into hollow, cylindrical wafers which are a popular Cambodian snack. All processing was conducted in certified facilities, and microbiological safety testing was conducted regularly. The ingredients of the RUSF and the comparators are detailed in Tables A1 and A2, and in the acceptability and effectiveness protocols (Borg et al., 2017; Borg et al., 2018). The RUSF was provided as a medium quantity supplementary food, that is, providing 50-100% of the child's daily energy requirements (i.e. 250 to 500 kcal) excluding breastfeeding (Gera, Pena-Rosas, Boy-Mena, & Sachdev, 2017). This was 40-110g of RUSF per day, depending on the child's age. The nutrient profiles of all the supplements were similar in terms of multiple micronutrients. The RUSF and CSB++ were similar in terms of energy, protein, carbohydrate, and lipid content.

2.3 | Outcomes and their measurement

The main outcomes of interest were anthropometric indicators calculated using World Health Organisation (WHO) 2006 standards (ANTHRO version 3.2.2 January 2011) and expressed as z-scores,

namely WAZ, HAZ, and WHZ, along with MUAC in centimetres (cm). Data was collected by a dedicated anthropometrist, supported by a dedicated anthropometric data collector, both of whom received initial and follow up training.

2.4 | Randomisation and allocation concealment

Participants were not individually randomised. Randomisation of the interventions occurred at site level to ensure better compliance by avoiding potentially confounding social interaction, such as inter-household sharing of different foods (Van Hoan, Van Phu, Salvignol, Berger, & Trèche, 2009). Using UNICEF data on health centre coverage, potential sites and their populations were listed. Sites were then randomly allocated to one of the foods, using an Excel random number table and a randomised incomplete block design. The principal researcher generated the allocation sequence. Seven sites were allocated to each arm, for a total of 28 sites. One site yielded only one participant, who dropped out, leaving 27 sites at the end of the study.

2.5 | Sample size

Based on the assumptions of a difference in mean z-scores of 0.1 between the groups (95%CI), a standard deviation (SD) of 0.8, and of children providing five measurements (out of a possible total of seven), with a precision of 0.05 and power of 0.8, an overall required sample size of 424 children, or 106 children per group, was calculated. We assumed an attrition of 25%, for a total sample of 530 or 133 children per group. This sample size was comparable to similar effectiveness studies (Jack et al., 2012; Kuusipalo, Maleta, Briend, Manary, & Ashorn, 2006; Lin, Manary, Maleta, Briend, & Ashorn, 2008; Nga et al., 2013; Pham et al., 2012).

2.6 | Eligibility criteria, recruitment, enrolment and consent

Healthy singletons aged 6 to 11 months were enrolled. Village health volunteers invited potential caregivers and children to participate. The data collection team used a screening form to assess initial eligibility (e.g. based on age, singleton status, and willingness to participate). Most caregivers had a birth certificate or immunisation card with the child's date of birth, or if not, they were asked if they knew the child's birthdate or age. Children who were ill, severely acutely malnourished (WHZ <-3 and/or MUAC<11.5cm), obese (WHZ >3), severely anaemic (Hb<70g/l), or had known food intolerances, were excluded and referred for treatment as necessary. Caregivers of eligible participants signed or fingerprinted consent for their children to participate.

2.7 | Data collection

Baseline data including demographics; morbidity; anthropometric measures; biochemical samples (blood, stool); dietary data; and developmental milestone achievement was collected. Baseline and monthly follow up data were collected at community sites (e.g. health volunteers' homes, pagodas) or health centres by a team of trained data collectors. Participants in the intervention groups were provided with a 1-month supply of the food or supplement to which their site has been allocated. Thereafter, data collection and food distribution were conducted monthly for 6 months. Anthropometric measurements included weight to the nearest 0.1 kg (SECA scale), recumbent length to the nearest 0.1 cm (wooden UNICEF height board), and mid-upper arm circumference (MUAC) to the nearest 1mm (flexible UNICEF insertion tape).

Caregivers were given incentives to participate, including cost of transport, and/or a small gift such as a towel or baby item. Health promotion messaging was not an explicit part of the project. Every month, at the end of data collection, all caregivers were reminded to continue if breastfeeding; to feed their baby normally, three to five times daily; and to maintain adequate hygiene (safe stool disposal, handwashing after defaecation and before eating/feeding). Caregivers in the intervention arms were reminded to feed their baby the supplement or supplementary food in the recommended dosage. Caregivers in the RUSF and CSB++ groups were reminded that the supplementary foods were an extra snack in addition to regular feeding.

2.8 | Statistical analysis

Data was analysed in STATA version 13.1. Comparisons between food types for children enrolled at baseline (n = 485) were made using one-way ANOVA for continuous variables (reported as mean and SD), Kruskal-Wallis rank test for non-normally distributed continuous variables (reported as median and interquartile range, IQR), and chi-squared for categorical variables, (reported as n and %). These results are reported in Table 1.

Comparisons between baseline and endline anthropometric measures for the different food types for children with baseline and endline data (n = 292) were made using one-way ANOVA for continuous variables, and Kruskal-Wallis rank test for continuous variables for which homogeneity of variance was not observed. Changes in proportion from baseline to endline (%) were calculated by subtracting baseline proportion from endline proportion, and *P*-values were calculated using Pearson's chi-squared test. These results are reported in Table 2.

A mixed effects linear regression model was fit for each anthropometric outcome for children who had baseline and endline data to determine whether there were statistically significant differences in the changes in anthropometric outcomes from baseline to endline for the interventions compared to each of the other groups. The model adjusted for clustering by person and site, and month as an interaction term to account for monthly follow-up measures. Baseline values were account for in the mode within each food group. The model included parameters for the slope of the line in the control group with respect to time, and the change in the slope between the intervention versus the control group. Children who ate less than 75% of the monthly food supplied were considered to have low consumption, while 75% or more was high consumption. These results are reported in Table 3.

TABLE 1 Baseline Characteristics of Enrolled Children and Their Caregivers

Characteristics at baseline	Total (N=485[a])	Control (n=127, 26%)	RUSF (n=128, 26%)	CSB++ (n=123, 25%)	MNP (n=107, 22%)	*P*-value[b]
Age in months at baseline, mean (SD)	8.5 (1.7)	8.4 (1.7)	8.4 (1.8)	8.6 (1.8)	8.5 (1.7)	0.754
Female, n (%)	233 (48.0%)	73 (57.5%)	53 (41.4%)	50 (40.7%)	57 (53.3%)	0.014*
Weight in kg, mean (SD)	7.71 (1.05)	7.76 (1.09)	7.69 (0.95)	7.69 (1.07)	7.67 (1.09)	0.912
Length in cm, mean (SD)	68.7 (3.8)	68.8 (3.9)	69.1 (3.9)	68.6 (3.9)	68.3 (3.4)	0.478
Weight-for-age Z-score (WAZ), mean (SD)	-0. 80 (1.06)	-0.66 (1.09)	-0.83 (0.97)	-0.92 (1.05)	-0.81 (1.14)	0.283
Underweight (<-2), n (%)	62 (12.8%)	17 (13.4%)	15 (11.7%)	17 (13.8%)	13 (12.2%)	0.955
Height-for-age Z-score (HAZ), mean (SD)[c]	-0.70 (1.17)	-0.53 (1.18)	-0.58 (1.15)	-0.89 (1.19)	-0.81 (1.11)	0.040*
Stunted (<-2), n (%)	61 (12.6%)	15 (11.8%)	12 (9.4%)	18 (14.6%)	16 (15.0%)	0.516
Weight-for-height Z-score (WHZ), mean (SD)	-0.48 (1.01)	-0.40 (1.05)	-0.60 (0.98)	-0.48 (0.93)	-0.42 (1.09)	0.399
Wasted, moderately acutely malnourished (<-2), n (%)	23 (4.7%)	4 (3.2%)	9 (7.0%)	6 (4.9%)	4 (3.8%)	0.486
Mid-upper arm circumference (MUAC) in cm, mean (SD)	14.2 (1.1)	14.2 (1.1)	14.2 (1.0)	14.2 (1.0)	14.3 (1.1)	0.860
Low MUAC (<12.5cm), n (%)	20 (4.1%)	6 (4.7%)	4 (3.1%)	5 (4.1%)	5 (4.7%)	0.915
Birthweight, kg, mean (SD)	3.00 (0.47)	2.96 (0.50)	3.04 (0.46)	3.00 (0.47)	2.99 (0.46)	0.608
Low birthweight (<2.5kg), n (%)	62 (13.1%)	19 (15.3%)	13 (10.2%)	16 (13.7%)	14 (13.3%)	0.670
Iron status						
Iron deficient at baseline (ferritin ≤15μg/L), n (%)	85 (20.1%)	17 (15.2%)	29 (25.9%)	20 (19.1%)	19 (20.0%)	0.250
Iron replete at baseline (ferritin ≥ 50μg/L), n (%)	104 (24.6%)	35 (31.3%)	20 (17.9)	27 (25.7%)	22 (23.2%)	0.133
Diarrhoea in past 2 weeks, n (%)	154 (31.8%)	42 (33.1%)	43 (33.6%)	32 (26.0%)	37 (34.6%)	0.464
Prelacteal feeding, n (%)	236 (49.1%)	61 (48.0%)	55 (43.3%)	63 (51.6%)	57 (54.3%)	0.237
Exclusive breastfeeding < 3 months, n (%)	276 (57.4%)	76 (60.3%)	60 (47.2%)	73 (59.4%)	67 (63.8%)	0.107
Started complementary feeding <3 months, n (%)	51 (10.6%)	13 (10.5%)	11 (8.6%)	13 (10.6%)	14 (13.2%)	0.728
Still breastfeeding at baseline, n (%)	306 (63.5%)	81 (63.8%)	84 (66.7%)	79 (64.2%)	62 (58.5%)	0.631
Drank from bottle with nipple in past 24hrs, n (%)	401 (83.7%)	101 (80.8%)	110 (85.9%)	105 (85.4%)	85 (82.5%)	0.660
Minimum dietary diversity in past 24hrs, n (%)	144 (29.7%)	35 (27.6%)	46 (35.9%)	36 (29.3%)	27 (25.2%)	0.296
Mother's BMI, mean (SD)	22.5 (4.2)	21.9 (3.6)	23.0 (4.3)	22.3 (4.4)	23.1 (4.2)	0.099
Underweight at baseline (BMI <18.5), n (%)	72 (17.9%)	21 (18.8%)	16 (15.4%)	25 (25.0%)	10 (11.6%)	0.101
Caregiver:						
Never attended school, n (%)	56 (11.6%)	10 (7.9%)	10 (7.8%)	17 (13.8%)	19 (17.8%)	0.106
Attended primary school, n (%)	231 (47.6%)	62 (48.8%)	68 (53.1%)	51 (41.5%)	50 (46.7%)	0.106
Attended high school or higher, n (%)	198 (40.8%)	55 (43.3%)	50 (39.1%)	55 (44.7%)	38 (35.5%)	0.106

(Continues)

TABLE 1 (Continued)

Characteristics at baseline	Total (N=485[a])	Control (n=127, 26%)	RUSF (n=128, 26%)	CSB++ (n=123, 25%)	MNP (n=107, 22%)	P-value[b]
Shared toilet, n (%)	81 (17.2%)	26 (20.5%)	22 (17.9%)	21 (18.0%)	12 (11.7%)	0.353
Unsafe stool disposal, n (%)	351 (72.7%)	97 (76.4%)	92 (71.9%)	74 (60.7%)	88 (83.0%)	0.001**
Poor card holder, n (%)	77 (15.9%)	12 (9.5%)	23 (18.1%)	25 (20.3%)	17 (15.9%)	0.102
Household income, $, median (IQR)[d]	225 (150-300)	245 (200-375)	200 (150-300)	200 (150-300)	225 (150-300)	0.141

Asterisks highlight significant *P*-values:
*<0.05, **< 0.01, ***<0.001.
[a]Not all children provided complete information for each variable.
[b]P-values were computed by comparison of different food types. For continuous variables (reported as mean and SD), comparison between food types was made using one-way ANOVA. For categorical variables, (reported as n and %) comparison was made using chi-squared.
[c]Histogram of all four arms of HAZ at baseline shows sufficient overlap. Therefore, the mixed effect model will be able to account for baseline difference.
[d]Non-normally distributed, therefore quoted median (IQR), *P*-value calculated using Kruskal-Wallis rank test.

3 | RESULTS

Of 514 children who were screened as eligible, 485 were recruited. Among 29 children excluded, one was excluded due to food intolerances, one due to severe anaemia, and 27 due to severe acute malnutrition (MUAC <11.5 and/or WHZ < -3) or overnutrition (WHZ > 3). Excluded children were referred for treatment as appropriate. See Fig. 1 for the site selection, recruitment and enrolment of children, and trial completion.

A total of 192 children (39.7%) did not attend endline. Loss to follow up ranged from 24.5% in the MNP group to 52.0% in the CSB++ group. There were differences in loss to follow up between the groups. The MNP group had the lowest loss, while the control, CSB++ and RUSF groups had significantly higher loss to follow up. Older children had slightly higher odds of being lost to follow up. Children whose caregivers had attended high school or higher had lower odds of being lost to follow up, as did children whose family were poor card holders. Details on loss to follow up can be found in Tables A3a and A3b.

3.1 | Baseline characteristics

Table 1 describes the baseline characteristics of children and caregivers. For most characteristics, there were no significant differences between groups. However, the control and MNP groups had significantly more females. The CSB++ and MNP groups had significantly lower HAZ at baseline (however, the histogram showed sufficient overlap for the mixed effect model to account for this baseline difference). Infant feeding indicators were poor. Prevalence of prelacteal feeding was high, but lower than the Phnom Penh prevalence in the 2014 DHS (NIS et al., 2015). The prevalence of bottle feeding was very high while prevalence of continued breastfeeding at baseline was very low in comparison to the national prevalence (NIS et al., 2015). Rates of low birthweight (<2.5kg) were high in comparison to the national prevalence (NIS et al., 2015). Most children were iron replete, i.e. ferritin concentrations corrected for inflammation ≥ 15μg/L (Thurnham et al., 2010) at baseline. One-third of children had experienced diarrhoea in the past 2 weeks. Unsafe disposal of children's faeces (left in the open or thrown in a drain or the garbage) was very high and was significantly different between groups.

3.2 | Anthropometric outcomes

Table 2 shows the change in anthropometric measures from baseline to endline for children with baseline and endline measurements (n = 292). There were no statistically significant differences between the groups for any of the anthropometric changes. Mean height increased between 6.4-6.7cm for all groups. Mean weight increased between 1.20 and 1.30kg for all groups. Mean WAZ, HAZ and WHZ decreased overall and for each group. Mean MUAC increased overall and for each group. The proportion of children underweight at endline was

TABLE 2 Change in Anthropometric Measures from Baseline to Endline for Children with Baseline and Endline Measurements

Change in anthropometric measures, baseline to endline	Total (N=292)	Control (n=77, 26%)	RUSF (n=76, 26%)	CSB++ (n=59, 20%)	MNP (n=80, 27%)	*P*-value
Height in cm, mean (SD)						
At baseline, mean (SD)	68.5 (4.0)	68.9 (4.0)	69.1 (4.0)	67.9 (4.3)	68.1 (3.6)	0.198
At endline, mean (SD)	75.0 (3.8)	75.4 (4.0)	75.5 (3.7)	74.3 (4.2)	74.6 (3.2)	0.208
Difference baseline to endline, mean (SD)	6.5 (1.6)	6.7 (1.7)	6.6 (1.4)	6.4 (1.8)	6.5 (1.6)	0.717[a]
Weight in kg, mean (SD)						
At baseline, mean (SD)	7.64 (1.02)	7.74 (1.04)	7.67 (0.91)	7.54 (1.07)	7.59 (1.07)	0.669
At endline, mean (SD)	8.89 (1.16)	9.00 (1.28)	9.00 (1.13)	8.81 (1.16)	8.80 (1.05)	0.642
Difference baseline to endline, mean (SD)	1.25 (0.59)	1.23 (0.62)	1.30 (0.58)	1.26 (0.64)	1.20 (0.52)	0.779
Weight-for-age Z-score (WAZ), mean (SD)						
At baseline, mean (SD)	-0.84 (1.02)	-0.67 (1.03)	-0.85 (0.93)	-1.03 (0.98)	-0.88 (1.11)	0.245
At endline, mean (SD)	-0.93 (1.04)	-0.81 (1.09)	-0.87 (1.05)	-1.08 (1.01)	-1.00 (0.99)	0.432
Difference baseline to endline, mean (SD)	-0.08 (0.58)	-0.14 (0.57)	-0.01 (0.55)	-0.05 (0.66)	-0.11 (0.56)	0.541
Underweight (WAZ < -2), n (%)						
At baseline, n (%)	36 (12.3%)	10 (13.0%)	8 (10.5%)	7 (11.9%)	11 (13.8%)	0.936
At endline, n (%)	39 (13.4%)	8 (10.4%)	8 (10.5%)	9 (15.3%)	14 (17.5%)	0.479
Difference baseline to endline[b], %	1.0%	-2.6%	0.0%	3.4%	3.8%	0.870
Height-for-age Z-score (HAZ), mean (SD)						
At baseline, mean (SD)	-0.74 (1.19)	-0.48 (1.21)	-0.60 (1.13)	1.09 (1.20)	-0.87 (1.15)	0.012
At endline, mean (SD)	-1.04 (1.20)	-0.85 (1.28)	-0.84 (1.17)	-1.38 (1.26)	-1.16 (1.06)	0.021
Difference baseline to endline, mean (SD)	-0.30 (0.76)	-0.37 (0.93)	-0.24 (0.70)	-0.29 (0.81)	-0.29 (0.58)	0.896[a]
Stunted (HAZ < -2), n (%)						
At baseline, n (%)	41 (14.0%)	8 (10.4%)	8 (10.5%)	11 (18.6%)	14 (17.5%)	0.326
At endline, n (%)	66 (22.6%)	17 (22.1%)	12 (15.8%)	18 (30.5%)	19 (23.8%)	0.241
Difference baseline to endline[b], %	8.6%	11.7%	5.3%	11.9%	6.3%	0.877
Weight-for-height Z-score (WHZ), mean (SD)						
At baseline, mean (SD)	-0.50 (0.99)	-0.45 (1.03)	-0.62 (0.93)	-0.45 (0.93)	-0.46 (1.09)	0.657
At endline, mean (SD)	-0.59 (1.02)	-0.55 (1.02)	-0.65 (1.07)	-0.55 (0.96)	-0.61 (1.03)	0.914
Difference baseline to endline, mean (SD)	-0.10 (0.73)	-0.10 (0.79)	-0.03 (0.68)	-0.10 (0.79)	-0.16 (0.68)	0.770
Wasted (WHZ < -2), n (%)						
At baseline, n (%)	13 (4.5%)	4 (5.2%)	4 (5.3%)	2 (3.4%)	3 (3.8%)	0.926
At endline, n (%)	25 (8.6%)	7 (9.1%)	5 (6.6%)	4 (6.8%)	9 (11.3%)	0.709
Difference baseline to endline[b], %	4.1%	3.9%	1.3%	3.4%	7.5%	0.826

(Continues)

TABLE 2 (Continued)

Change in anthropometric measures, baseline to endline	Total (N=292)	Control (n=77, 26%)	RUSF (n=76, 26%)	CSB++ (n=59, 20%)	MNP (n=80, 27%)	*P*-value
Mid-upper arm circumference (MUAC) in cm, mean (SD)						
At baseline, n (%)	14.2 (1.0)	14.3 (1.0)	14.1 (1.0)	14.1 (1.0)	14.2 (1.1)	0.678
At endline, n (%)	14.4 (1.1)	14.4 (1.1)	14.3 (1.2)	14.4 (1.1)	14.3 (1.1)	0.990
Difference baseline to endline, %	0.2 (0.8)	0.1 (0.8)	0.2 (0.9)	0.3 (0.8)	0.1 (0.9)	0.467
Low MUAC, (<12.5cm), n (%)						
At baseline, n (%)	10 (3.4%)	1 (1.3%)	4 (5.3%)	2 (3.4%)	3 (3.8%)	0.603
At endline, n (%)	10 (3.4%)	1 (1.3%)	3 (4.0%)	2 (3.4%)	4 (5.0%)	0.633
Difference baseline to endline[b], %	0.0%	0.0%	-1.3%	0.0%	1.3%	0.963

P-values were computed by comparison of different food types. For continuous variables (reported as mean and SD), comparison between food types was made using one-way ANOVA.
[a]In the case of HAZ and change in mean height from baseline to endline, homogeneity of variance was not observed, therefore Kruskal-Wallis method was used. For categorical variables, (reported as n and %, or %) comparison was made using chi-squared.
[b]Changes in proportion from baseline to endline (%) were calculated by subtracting baseline proportion from endline proportion, and *P*-values were calculated using Pearson's chi-squared test. Errors are due to rounding.

variable; it was unchanged in the RUSF group, increased in the CSB++ and MNP groups, and decreased in the control group. The proportions of children stunted and wasted increased in all groups. The proportion of children with low MUAC at endline compared with baseline decreased for the RUSF group, whereas for the other groups it increased or remained unchanged. There were no statistically significant differences between any of the changes in anthropometric measures. Figure A1 graphs the change in monthly mean anthropometric measures from baseline to endline.

A linear mixed effects model that took into account measures at each follow-up was fitted for each anthropometric measure. The results of these models are shown in Table 3.

In unadjusted analysis, the control group had statistically significantly decreased WAZ and HAZ, and increased MUAC, but no statistically significant changes in WHZ. The RUSF group did not differ significantly from the control for WAZ or HAZ but had increased MUAC in comparison to the control. There were no statistically significant differences between the RUSF group and the CSB++ or MNP groups with respect to WAZ, HAZ, WHZ or MUAC. The CSB++ group did not differ significantly from the control for WAZ, HAZ or WHZ, but had a statistically significantly increased MUAC. The MNP group did not differ significantly from any group for WAZ, HAZ, WHZ or MUAC.

In the adjusted model, missing data in the covariates resulted in a smaller n (n = 235). The control group (Month) had statistically significantly decreased WAZ, HAZ, and WHZ, and no statistically significant change in MUAC. High consumers of RUSF did not differ significantly from the control for WAZ, HAZ or WHZ, but had statistically significantly increased MUAC. There were no significant differences between high consumers of RUSF and the CSB++ or MNP groups with respect to WAZ, HAZ, WHZ or MUAC. In comparison to the control, low consumers of RUSF had statistically significantly increased WAZ, WHZ and MUAC, but no statistically significant difference in HAZ. In comparison to the CSB++ group, low consumers of RUSF had statistically significantly increased HAZ, but no differences in other anthropometric measures. There were no statistically significant differences between low consumers of RUSF and the MNP group.

High consumers of CSB++ had statistically significantly increased WAZ, WHZ and MUAC in comparison to the control group, increased WHZ in comparison to the RUSF group, and increased WAZ and WHZ in comparison to the MNP group. Low consumers of CSB++ had statistically significantly increased WHZ and MUAC in comparison to the control, but decreased HAZ in comparison to all groups. High consumers of MNP had statistically significantly increased WAZ and MUAC in comparison to the control. Low consumers of MNP had no significant differences to the control for any anthropometric outcome but had decreased WAZ and WHZ in comparison to the RUSF and CSB++ groups.

Sex, birthweight, iron status, and diarrhoea significantly affected anthropometric status. Bottle feeding and maternal body mass index (BMI) were also significant. Age at baseline, iron repleteness at baseline, prelacteal feeding, cessation of exclusive breastfeeding before

TABLE 3 Change in anthropometric outcomes from baseline to endline comparing each pair of groups, for children with baseline and endline data

Change in anthropometric outcomes from baseline to endline	WAZ Coefficient (95% CI, *P*-value)	HAZ Coefficient (95% CI, *P*-value)	WHZ Coefficient (95% CI, *P*-value)	MUAC (cm) Coefficient (95% CI, *P*-value)
UNADJUSTED (n=292)				
Month[a]	-0.02 (-0.03 - -0.01, 0.001**)	-0.07 (-0.09 - -0.05, < 0.001***)	-0.01 (-0.03-0.01, 0.231)	0.02 (0.01-0.04, 0.010*)
RUSF x month[b] versus control	0.02 (<-0.01-0.03, 0.083)	0.01 (-0.01-0.04, 0.312)	0.01 (-0.01-0.04, 0.373)	0.04 (0.01-0.06, 0.008**)
RUSF x month[b] versus CSB++	< 0.01 (-0.02-0.02, 0.858)	0.02 (-0.01-0.05, 0.224)	< -0.01 (-0.03-0.03, 0.897)	< 0.01 (-0.02-0.03, 0.793)
RUSF x month[b] versus MNP	0.01 (-0.01-0.03, 0.244)	<0.01 (-0.03-0.03, 0.988)	0.02 (-0.01-0.05, 0.159)	0.03 (0.01-0.06, 0.018)
CSB++ x month[b] versus control	0.01 (-0.01-0.03, 0.151)	< -0.01 (-0.04-0.03, 0.778)	0.01 (-0.01-0.04, 0.337)	0.03 (<0.01-0.06, 0.027*)
CSB++ x month[b] versus MNP	0.01 (-0.01-0.03, 0.366)	-0.02 (-0.05-0.01, 0.225)	0.02 (-0.01-0.05, 0.150)	0.03 (<-0.01-0.06, 0.053)
MNP x month[b] versus control	0.01 (-0.01-0.02, 0.562)	0.01 (-0.01-0.04, 0.315)	-0.01 (-0.03-0.02, 0.605)	<0.01 (-0.02-0.03, 0.756)
ADJUSTED (n=235[c])				
Month[a]	-0.03 (-0.04 - -0.01, < 0.001***)	-0.06 (-0.08 - -0.04, < 0.001***)	-0.03 (-0.05 - <-0.01, 0.017*)	0.02 (<-0.01-0.03, 0.109)
RUSF high consumers x month[b]				
Versus control	0.03 (-0.01-0.06, 0.140)	< -0.01 (-0.07-0.06, 0.917)	0.03 (-0.02-0.09, 0.263)	0.08 (0.03-0.13, 0.003**)
Versus CSB++	-0.01 (-0.05-0.03, 0.714)	0.04 (-0.03-0.11, 0.238)	-0.04 (-0.10-0.02, 0.182)	0.01 (-0.04-0.07, 0.703)
Versus MNP	0.01 (-0.03-0.05, 0.590)	-0.02 (-0.09-0.05, 0.554)	0.02 (-0.04-0.08, 0.423)	0.03 (-0.02-0.08, 0.279)
RUSF low consumers x month[b]				
Versus control	0.03 (0.01-0.06, 0.006**)	0.01 (-0.03-0.06, 0.596)	0.04 (0.01-0.08, 0.026*)	0.05 (0.02-0.09, 0.004**)
Versus CSB++	< -0.01 (-0.03-0.03, 0.990)	0.06 (0.01-0.11, 0.031*)	-0.03 (-0.08-0.02, 0.195)	-0.02 (-0.06-0.03, 0.469)
Versus MNP	0.02 (-0.01-0.04, 0.215)	-0.01 (-0.05-0.04, 0.834)	0.04 (-0.01-0.08, 0.103)	<0.01 (-0.04-0.04, 0.863)
CSB++ high consumers x month[b]				
Versus control	0.07 (0.03-0.10, < 0.001***)	-0.03 (-0.09-0.03, 0.337)	0.11 (0.05-0.16, < 0.001***)	0.09 (0.04-0.14, 0.001**)
Versus RUSF	0.04 (<-0.01-0.07, 0.053)	-0.04 (-0.10-0.03, 0.259)	0.07 (0.01-0.12, 0.027*)	0.03 (-0.03-0.08, 0.312)
Versus MNP	0.05 (0.01-0.09, 0.006**)	-0.05 (-0.11-0.02, 0.158)	0.10 (0.04-0.16, 0.001**)	0.04 (-0.01-0.09, 0.154)
CSB++ low consumers x month[b]				
Versus control	0.01 (-0.02-0.04, 0.515)	-0.06 (-0.11 - <-0.01, 0.037*)	0.05 (<0.01-0.10, 0.031*)	0.05 (0.01-0.10, 0.014*)
Versus RUSF	-0.02 (-0.05-0.01, 0.181)	-0.06 (-0.12 - -0.01, 0.029*)	0.01 (-0.04-0.06, 0.659)	-0.01 (-0.05-0.04, 0.792)
Versus MNP	-0.01 (-0.04-0.03, 0.686)	-0.07 (-0.13 - -0.02, 0.012*)	0.04 (-0.01-0.09, 0.091)	0.00 (-0.04-0.05, 0.833)
MNP high consumers x month[b]				
Versus control	0.04 (0.01-0.06, 0.005**)	0.03 (-0.02-0.08, 0.192)	0.03 (-0.02-0.07, 0.208)	0.06 (0.02-0.09, 0.004**)
Versus RUSF	0.01 (-0.02-0.03, 0.688)	0.02 (-0.03-0.08, 0.361)	-0.01 (-0.06-0.03, 0.572)	0.00 (-0.05-0.04, 0.870)
Versus CSB++	< 0.01 (-.03-0.03, 0.811)	0.08 (0.02-0.13, 0.006*)	-0.05 (-0.10 - <0.01, 0.060)	-0.01 (-0.06-0.03, 0.625)
MNP low consumers x month[b]				
Versus control	-0.01 (-0.04-0.02, 0.433)	< -0.01 (-0.06-0.05, 0.923)	-0.02 (-0.07-0.03, 0.460)	0.04 (-0.01-0.08, 0.087)

(Continues)

TABLE 3 (Continued)

Change in anthropometric outcomes from baseline to endline	WAZ Coefficient (95% CI, *P*-value)	HAZ Coefficient (95% CI, *P*-value)	WHZ Coefficient (95% CI, *P*-value)	MUAC (cm) Coefficient (95% CI, *P*-value)
Versus RUSF	-0.04 (-0.07 - -0.01, 0.008**)	-0.01 (-0.07-0.05, 0.736)	-0.06 (-0.11 - -0.01, 0.026*)	-0.02 (-0.07-0.02, 0.364)
Versus CSB++	-0.04 (-0.08 - -0.01, 0.009**)	0.04 (-0.02-0.10, 0.168)	-0.09 (-0.15 - -0.04, 0.001**)	-0.03 (-0.08-0.02, 0.243)
Covariates adjusted for:				
Sex	0.43 (0.20-0.66, < 0.001***)	0.34 (0.08-0.59, 0.009**)	0.34 (0.12-0.57, 0.002**)	-0.16 (-0.39-0.07, 0.173)
Age at baseline	-0.01 (-0.08-0.06, 0.736)	-0.02 (-0.09-0.06, 0.673)	-0.04 (-0.10-0.03, 0.292)	< -0.01 (-0.07-0.07, 0.950)
Birthweight, kg	0.72 (0.46-0.99, < 0.001***)	0.77 (0.48-1.06, < 0.001***)	0.46 (0.21-0.72, < 0.001***)	0.51 (0.24-0.77, < 0.001***)
Iron status at baseline				
Fer <15 ug/L	0.39 (0.09-0.69, 0.010*)	0.20 (-0.14-0.53, 0.249)	0.38 (0.09-0.67, 0.011*)	0.31 (0.02-0.61, 0.039*)
Fer >50 ug/L	-0.07 (-0.35-0.20, 0.594)	-0.24 (-0.54-0.07, 0.127)	0.04 (-0.22-0.31, 0.739)	-0.12 (-0.39-0.15, 0.372)
Prelacteal feeding	< -0.01 (-0.11-0.11, 0.988)	-0.06 (-0.19-0.06, 0.334)	0.05 (-0.06-0.15, 0.410)	-0.01 (-0.12-0.11, 0.916)
Exclusive breastfeeding for more than 3 months	0.01 (-0.15-0.17, 0.905)	-0.02 (-0.20-0.16, 0.856)	0.03 (-0.13-0.18, 0.732)	0.03 (-0.13-0.19, 0.687)
Started complementary feeding at less than 3 months	0.28 (-0.11-0.68, 0.161)	0.26 (-0.19-0.70, 0.258)	0.22 (-0.17-0.60, 0.271)	0.20 (-0.20-0.59, 0.328)
Still breastfeeding	-0.05 (-0.13-0.02, 0.153)	-0.05 (-0.18-0.07, 0.410)	-0.11 (-0.22-0.01, 0.061)	-0.06 (-0.17-0.04, 0.231)
Drank from a bottle with a nipple in the past 24hrs	0.07 (0.02-0.11, 0.002**)	0.14 (0.06-0.21, < 0.001***)	0.01 (-0.05-0.08, 0.708)	0.04 (-0.02-0.10, 0.157)
Minimum dietary diversity in previous 24hrs	0.02 (-0.02-0.05, 0.392)	0.04 (-0.02-0.11, 0.208)	-0.01 (-0.06-0.05, 0.827)	-0.01 (-0.06-0.05, 0.836)
Diarrhoea in past 2 weeks	-0.09 (-0.12 - -0.05, < 0.001***)	-0.02 (-0.09-0.04, 0.463)	-0.10 (-0.16 - -0.05, < 0.001***)	-0.10 (-0.15 - -0.04, < 0.001***)
Mother underweight at baseline (BMI<18.5)	-0.28 (-0.58-0.03, 0.081)	-0.02 (-0.36-0.33, 0.926)	-0.32 (-0.62 - -0.03, 0.033*)	-0.29 (-0.60-0.02, 0.064)
Caregiver attended				
• Primary school	-0.07 (-0.47-0.33, 0.723)	0.01 (-0.43-0.46, 0.949)	-0.05 (-0.43-0.34, 0.812)	-0.02 (-0.42-0.38, 0.915)
• High school or higher	0.22 (-0.17-0.62, 0.269)	0.19 (-0.25-0.64, 0.390)	0.19 (-0.20-0.57, 0.335)	0.28 (-0.12-0.67, 0.171)
Poor card holder	-0.22 (-0.54-0.09, 0.167)	-0.34 (-0.70-0.01, 0.060)	-0.02 (-0.32-0.29, 0.918)	-0.20 (-0.51-0.11, 0.214)
Shared toilet	-0.27 (-0.59-0.06, 0.104)	-0.33 (-0.69-0.03, 0.072)	-0.13 (-0.44-0.18, 0.415)	-0.24 (-0.56-0.08, 0.147)

Mixed effects regression models were fit for each anthropometric measure, namely weight-for-age z-score (WAZ), height-for-age z-score (HAZ), weight-for-height z-score (WHZ), and mid-upper arm circumference (MUAC). Anthropometric measures were compared between the children in each pair of groups. Baseline values were accounted for in the model within each food group. Asterisks highlight significant *P*-values:

*<0.05, **< 0.01, ***<0.001.

[a]Month' refers to the control group and how long the control group has been on the program.

[b]This model includes parameters for the slope of the line in the control group with respect to time, and the change in the slope between the RUSF, CSB++ and MNP groups versus the control group.

[c]Missing data in the covariates resulted in a smaller n. In each cell, the coefficients, standard error and *P*-value are reported.

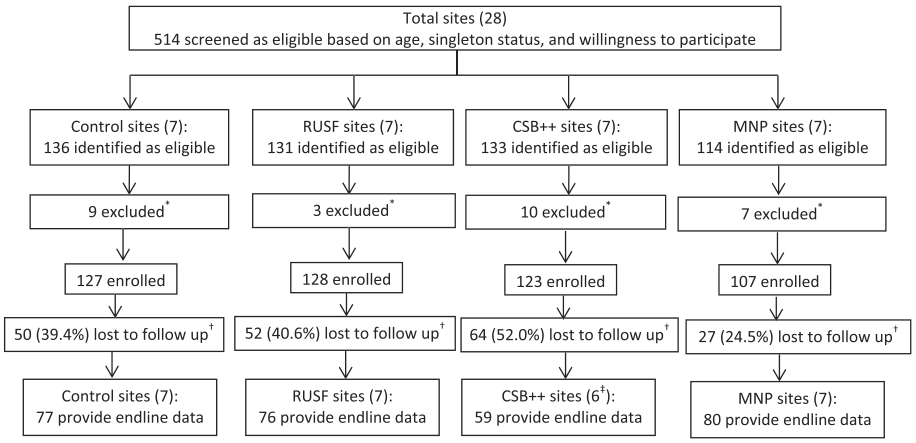

FIGURE 1 Trial profile-site selection, recruitment, enrolment of children and trial completion

3 months, age of commencing complementary feeding, continued breastfeeding, dietary diversity, caregiver's education, and living in a household that holds a poor card or shares a toilet did not have a significant effect on anthropometric outcomes.

4 | DISCUSSION

In our trial, a locally produced, fish-based RUSF slowed but did not prevent ponderal growth faltering in Cambodian children aged between 6 and 17 months. However, the impact was of limited clinical significance. The RUSF did not prevent linear growth faltering. Nor did CSB++ and MNP prevent growth faltering, or slow it to any clinically significant extent. This is consistent with studies elsewhere and in Cambodia, which have demonstrated the difficulty in preventing undernutrition in a representative population with moderately acutely malnourished (MAM) and non-MAM children using specialised products.

4.1 | Few trials in a representative, food secure population

Despite the consensus that prevention is essential, most specialised foods have been tested with MAM children (WHZ -3 to -2, and/or MUAC 11.5 to 12.5cm). Few prevention studies exist (Kennedy, Branca, Webb, Bhutta, & Brown, 2015), especially with non-MAM children receiving a preventative specialised food in comparison to an unsupplemented control group. The children in our study ranged from MAM to overweight, i.e. WHZ 2 to 3 (WHO, 2006). In Cambodia, as in most countries, there is no treatment of children with MAM. Our sample of children had a similar prevalence of MAM as the general population of Cambodian children aged 6 to 17 months (NIS et al., 2015). It can therefore be considered representative of the general population that might be targeted for undernutrition prevention programming, in that this population includes some moderately acutely malnourished children and mostly children that range from WHZ >-2 to <3 with MUAC > 12.5cm. This is not to say that the results can be generalised. One systematic review used the concept of food security and by their definition (Lassi, Das, Zahid, Imdad, & Bhutta, 2013), our population could be considered to be in a food secure, non-emergency context.

4.2 | Do specialised products prevent undernutrition?

In our trial, specialised products had limited effect on reducing growth faltering, as seen in Tables 2 and 3. To some extent, all the specialised products in our trial, especially the RUSF and CSB++ protected against ponderal growth faltering, but none protected against linear growth faltering. The RUSF afforded more protection than MNP, but not more than CSB++. In comparable trials, the impact of supplementary feeding on undernutrition has often been similarly slight, mixed, or nonsignificant. In those trials, WAZ, WHZ and MUAC usually increased for at least one of the intervention groups, whereas HAZ was less likely to improve and sometimes declined (Dewey & Adu-Afarwuah, 2008; Iannotti et al., 2014; Lin et al., 2008; Lutter et al., 2008; Ruel et al., 2008; Sguassero, de Onis, Bonotti, & Carroli, 2012; Skau et al., 2015; Thakwalakwa et al., 2012; Tomedi et al., 2012). One study, like ours, found HAZ decreased more for the CSB++ group than for the control (Mangani et al., 2015). However, it is worth noting that HAZ was already significantly lower in the CSB++ group at baseline.

Therefore, most interventions providing supplements or specialised foods did not prevent stunting, and some did not even prevent wasting. Hence, that the interventions in our study did not prevent growth faltering, and only had a small impact on anthropometry in comparison to the control was not unprecedented. A forthcoming Cochrane Review (see the protocol by Das, Salam, Weise Prinzo, Sadiq Sheikh, & Bhutta, 2017) will assess the effects of preventive lipid-based nutrient supplements given with complementary foods to infants and young children. This will contribute greatly to the understanding of the effects of specially formulated supplementary foods.

4.3 | Diarrhoea

One possible explanation for the continued growth faltering observed in our study is that the nutrients from both the standard

diet and the interventions provided may not have been well absorbed. Children who had had diarrhoea in the past 2 weeks had decreased WAZ, WHZ and MUAC. The prevalence of diarrhoea in our study population (32% overall) was much higher than the prevalence of diarrhoea in children under 5 years in Phnom Penh (17%) or nationally to children aged 6 to 11 months or twelve to 23 months (20% and 19%, respectively). However, it was similar to the prevalence of diarrhoea (40% of children under 5 years) in a comparable survey amongst urban poor in Phnom Penh (UNICEF & People In Need, 2014). Thus, high rates of diarrhoea may have contributed to continued growth faltering.

4.4 | Sex

Another explanation may be related to sex. In our trial, female children had increased WAZ, HAZ and WHZ compared with male children. The control and MNP groups had significantly more females. Since gender has been found to have a differential impact on MUAC and WHZ, particularly in the presence of stunting (Fiorentino et al., 2016; Wieringa et al., 2018), this may explain why a greater difference was not seen between the outcomes for the RUSF and CSB++ groups compared with the control and MNP groups.

4.5 | Potential displacement of breastmilk and food

Another possible explanation for the lack of effect on prevention of growth faltering may be that RUSF and CSB++ may have displaced children's normal intake of food and breastmilk rather than actually supplementing the existing diet (Dewey & Adu-Afarwuah, 2008; Mangani et al., 2015). The quantities of RUSF and CSB++ given in our study (between 40-110g/day) were relatively large and could conceivably have displaced breastmilk and other family foods (Dewey & Arimond, 2012). However, analysis thus far on the displacement of breastmilk and family food does not reveal any difference between dietary intakes across the groups (see Table A4).

4.6 | Other explanations for growth faltering

In our trial, children with higher birthweight had significantly greater increase in WAZ, HAZ, WHZ and MUAC from baseline to endline. Children of underweight mothers (BMI < 18.5 at baseline) had decreased WHZ. This highlights the multifactorial causes of child undernutrition. Additional factors, including birthweight, maternal BMI, iron status, and diarrhoea which contribute to poor anthropometric outcomes, must be taken into consideration, along with interventions to address them, such as maternal supplementation and adequate antenatal care, delayed cord clamping, and diarrhoeal prevention and treatment (Bhutta et al., 2013).

4.7 | Non-milk animal source foods

Daily consumption of animal-source foods is recommended for providing the protein, energy, and micronutrients needed for healthy micronutrient status, linear and ponderal growth (Manary, 2012; Michaelsen, Grummer-Strawn, & Begin, 2017; Neumann et al., 2013; PAHO/WHO, 2002). Most RUFs use milk or whey; non-milk supplementary foods using meat, fish or eggs have rarely been compared with milk-based products (Anderson, Bediako-Amoa, & Steiner-Asiedu, 2014; Bogard et al., 2015; Gera et al., 2017; Kuusipalo et al., 2006; Pachón, Domínguez, Creed-Kanashiro, & Stoltzfus, 2007; Skau et al., 2014). However, the evidence on whether milk or other animal source foods are more effective in preventing undernutrition is mixed. Two efficacy studies have involved fish-based supplementary foods. In Malawi, a study comparing a corn porridge fortified with fish powder to a peanut/soy spread found that children had similar linear and ponderal growth (Lin et al., 2008). In Cambodia, Winfood, based on rice and fish, was compared with CSB++ (containing milk) and CSB+ (containing no milk). Both Winfood and CSB++ promoted linear growth better than CSB+ (Skau et al., 2015). One study that compared milk and meat found meat had a greater impact (Grillenberger et al., 2003). In our trial, both the fish-based RUSF and the milk-based CSB++ provided some protection against ponderal growth faltering, demonstrating that fish has the potential to replace milk in specialised foods.

4.8 | Micronutrients and macronutrients

Our study is consistent with trials that found that in the absence of adequate macronutrients, micronutrients alone do not contribute to growth (Adu-Afarwuah et al., 2007; Dewey & Adu-Afarwuah, 2008; Dewey, Yang, & Boy, 2009; Imdad, Sadiq, & Bhutta, 2011; Jack et al., 2012; Rivera & Habicht, 2002; Zlotkin, 2009). Children in the high consuming MNP group had increased WAZ and MUAC compared with the control in a similar magnitude to the RUSF and CSB++ groups. Low consumers of MNP had no significant differences to the control for any anthropometric outcome, and had poorer outcomes for WAZ, HAZ and WHZ than children in the RUSF and CSB++ groups. Since MNP is added to food, these results may be interpreted as children who are high consumers of MNP actually eating more food, thus receiving the necessary macronutrients along with the MNP micronutrients.

4.9 | High and low consumption

In our trial, low rather than high consumers of RUSF experienced a protective effect against faltering of WAZ, WHZ and MUAC. This suggests that the RUSF, even in small quantities, actually supplements the existing diet as intended. Other researchers who have worked on small quantity LNSs (20-50g/day) have found that in small quantities, LNSs may improve growth (Dewey et al., 2017; Hess et al., 2015). They may also improve appetite (Arimond et al., 2015; Lesorogol,

Jean-Louis, Green, & Iannotti, 2015), something which caregivers in our acceptability trial remarked upon (Borg et al., 2018). This finding warrants a trial of the RUSF in small quantities.

That most plausible interpretation of the increased weight-related anthropometric measures (WAZ, WHZ and MUAC) among high consumers of CSB++ and MNP in comparison to the control group is that high consumers are eating more food generally. Hence it would be expected that their growth would falter less than the control group.

4.10 | Strengths and limitations

This study had two main strengths. First, this is one of few undernutrition prevention trials that has compared a novel specially formulated supplementary food to an unsupplemented control group, as well as to CSB++ and MNP which are widely used specialised products. Use of an unsupplemented control enables the assessment of the clinical and programmatic significance of the results. It informs programming, by making it possible to compare the provision of specialised products to no intervention (Gera et al., 2017). Second, our study generated much needed evidence in a geographic and social context other than Africa (Gera et al., 2017; Kennedy et al., 2015; Lazzerini, 2013).

There are four main limitations of this trial. First, the high and differential loss to follow up may have introduced bias. Second, self-reporting on compliance favours over-reporting of consumption, which may lead to underestimation of effectiveness. Third, our findings may not be generalisable to non-urban Cambodian populations. Since rural areas of Cambodia experience higher levels of undernutrition and poorer infant and young child feeding practices (NIS et al., 2015), it would be difficult to predict if the interventions would appear more or less effective. Finally, subgroup analysis of the effect of the specialised products specifically on MAM children was not undertaken due to low sample size.

5 | CONCLUSION

Our trial contributes to the limited literature on the supplementation of a population sample of children in a food secure, non-emergency setting. This makes it useful for programming, which has had to rely on findings from studies that focus specifically on MAM children or food insecure settings. In this trial, the most important finding is that the locally produced, fish-based RUSF, consumed in small quantities, was superior to a standard diet. In small quantities, the RUSF protected against the wasting and underweight seen in the control group, with improved outcomes for WAZ, WHZ and MUAC. However, the magnitude of improvements was of limited clinical significance

There were few significant differences between the RUSF and the CSB++ or MNP groups. None of the specialised products protected against stunting. The RUSF was not superior to CSB++. Both the RUSF and CSB++ groups performed better than low consumers of MNP, which confirms earlier findings that micronutrients in the absence of macronutrients do not improve growth. However, once again, the magnitude of improvements was of limited clinical significance.

Further research is warranted to explore the potential role, if any, of supplements and specially formulated supplementary foods in preventing undernutrition in a representative population of Cambodian children. With respect to the RUSF, future trials with MAM children, and with small quantities of the RUSF may be warranted. All future studies should include a control with a standard, unsupplemented diet. Programming for the prevention of childhood undernutrition in Cambodia will need to consider other approaches and address additional important factors. These findings should assist programmers in selecting nutrition interventions.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

ETHICAL STATEMENT

Ethics approval was received from the University of Queensland Medical Research Ethics Committee (2014001070) and from Cambodia's National Ethics Committee for Health Research (402 NECHR).

CONTRIBUTIONS

BB developed the research protocol, trial design, and questionnaires, and refined these with FTW, SM, MG, DS, CC, JB, AL and NR. AL and FTW secured funding. BB managed data collection with DS. BB conducted the statistical analysis with support from MG. BB wrote the manuscript and all authors subsequently commented on the manuscript and approved the final version.

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DATA SHARING

The datasets generated and/or analysed during the current study will be made available from the corresponding author after the publication of all major outputs, upon reasonable request.

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APPENDIX A

Appendix Table 2: Characteristics of the RUSF and comparators

Appendix Table 2: Characteristics of the RUSF and comparators

* RUSF daily serving size depends on the child's age, i.e. 6-8m – 4 pieces, 40g; 9-11m – 6 pieces, 60g; 12-17m – 11 pieces, 110g.

TABLE A1 Ingredients of RUSF snack (paste and wafer)

Ingredients	g/100g
Small indigenous fish	5.9
Mung beans	9.6
Rice	4.2
Soy beans	12.2
Icing sugar	10.3
Maltodextrin	9.3
Canola oil	3.7
Palm vegetable shortening	14.0
Desiccated coconut	1.5
Rice bran	2.2
Vitamin and mineral mix	0.9
Rice flour	9.0
Duck eggs	2.5
Refined sugar	7.2
Coconut	7.2
Salt	0.0
Flavour (vanilla or sesame seeds)	0.1
Oil for cooking	0.4

Comparators

The RUSF was compared with:

1. CSB++: CSB++ was chosen as a comparator because it is the standard supplementary food that WFP provides to children aged six months to two years to prevent undernutrition.
2. MNP: Sprinkles micronutrient powders were chosen since they are a commonly provided supplement in developing countries, such as Cambodia, with low dietary diversity, and complementary foods with low nutrient density (HF-TAG, 2011)
3. Control: A standard, unsupplemented diet, typically *borbor* and family foods was chosen as a control. *Borbor* is the traditional food for weanlings (children transitioning from exclusively milk diets to diets that include complementary foods) and is often the only food given until about nine months.

The active comparators complied with WFP and UNICEF standards for supplementary foods, and had been used and tested in Cambodia and elsewhere (Jack et al., 2012; LaGrone et al., 2012; Manary & Chang, 2012.). They have been found to be safe and to have no unintended side-effects. Table 2 contrasts the characteristics of the RUSF and comparators.

Plumpy'Nut™ was a potential comparator that was not used because it was less acceptable (Boudier, 2009). Moreover, including peanuts in a locally produced Cambodian RUSF was not considered advisable due to the high risk of aflatoxin contamination in South-East Asia (Binder et al., 2007; Shank, Wogan, & Gibson, 1972; Tran-Dinh, Kennedy, Bui, & Carter, 2009).

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Appendix Table 3 a: Loss to follow up across the arms from baseline to endline.

P-value was computed using Pearson chi squared. Asterisks highlight significant p-values: * <0.05, ** < 0.01, ***<0.001.

Appendix Table 3 b: Loss to follow up from baseline to endline.

Odds ratios, standard errors P-values, and 95% Confidence Intervals were computed using mixed effects regression models. Asterisks highlight significant p-values: * <0.05, ** < 0.01, ***<0.001.

All subjects (N=485) attended baseline. Thereafter, subjects attended 60-75% of data collection sessions. Loss to follow up refers to subjects who failed to attend the endline data collection (n = 192), regardless of how many other data collection points they attended. There were significant differences in loss to follow up between the groups. The MNP group had significantly lower odds of being lost to follow up. Comparisons of the odds of dropping out between the other groups were not statistically significant.

In comparison to the MNP group, subjects in the control group had more than twice the odds of dropping out (OR = 2.37; 95% CI = 1.03, 5.44; p = 0.042), while RUSF subjects had almost four times the odds (OR = 3.89; 95% CI = 1.71, 8.88; p = 0.001), and CSB++ subjects had almost five times the odds of dropping out (OR = 4.84; 95% CI = 2.08, 11.29; p <0.001). In comparison to the control group, subjects in the RUSF and CSB++ groups had about twice the odds of dropping out (OR = 1.65; 95% CI = 0.76, 3.55; p = 0.204; and OR = 2.05; 95% CI = 0.92, 4.57; p = 0.081 respectively) although these were not statistically significant. In comparison to the RUSF group, subjects in the CSB++ groups had slightly greater odds of dropping out (OR = 1.24; 95% CI = 0.57, 2.72; p = 0.585) although this was not statistically significant.

For every additional month that a subject stayed in the study, their odds of dropping out decreased by approximately half (OR = 0.58; 95% CI = 0.54, 0.62; p<0.001). Subjects who were older at baseline had slightly higher odds of dropping out (OR = 1.12; 95% CI = 1.04, 1.01; p=0.002). Subjects whose caregiver had had attended high school or higher had lower odds of dropping out (OR = 0.64; 95% CI = 0.41, 0.99; p=0.047). Subjects whose family were poor card holders had half the odds of dropping out (OR = 0.51; 95% CI = 0.34, 0.77; p=0.001). Sex, primary school education and having diarrhoea in the past two weeks did not make a statistically significant difference.

Appendix Table 4: Change in dietary intake from baseline to endline

P-values were computed by comparison of different food types using chi-squared.

There were no statistically significant differences between the groups in breastfeeding, dietary diversity, or amount eaten at each meal at baseline or endline. This suggests that the specialised foods did not displace breastmilk or food.

There was a statistically significant difference in meal frequency at baseline. More children in the control and MNP groups ate infrequently (1-2 times/day). At endline, there was no difference between groups. A possible explanation for the difference is that caregivers in the RUSF and CSB++ groups did not consider the specialised food a meal, and did not “count” them in answering the question at endline. If this were the case, it would mean that RUSF and CSB++ replaced meals. However, further analysis would be necessary to confirm that interpretation.

There was a statistically significant difference in consumption of snacks at baseline. Less children in the control group and more children in the MNP group ate snacks. At endline, there was no difference between groups. The question did not ask specifically about commercial snacks, so it cannot be confirmed whether parents in the RUSF or CSB++ groups considered the specialised foods as snacks.

Appendix Figure 1 depicts the change in monthly mean anthropometric measures from baseline to endline for the 292 children with baseline and endline measurements. The graphs show that WAZ, HAZ and WHZ decline and MUAC increases. The wide and overlapping confidence intervals of the graphs indicate that there may be no significant difference between the groups.

CHARACTERISTIC	RUSF	CSB++	MNP
Daily serving size	40-110g*	100g dry CSB++	1 sachet (1g)
Animal-source food	Fish	Milk	-
Energy (kcal/100g)	484	410	-
Protein (g/100g)	13	16	-
Carbohydrates (g/100g)	52	67	-
Lipids (g/100g)	24	9	-
Fibre (g/100g)	1.6	3	-
Vitamin A	1,080 µg	540 µg	400 µg
Vitamin D	60 µg	4.6 µg	5 µg
Vitamin B1 (thiamine)	0.59 mg	0.47 mg	0.5 mg
Vitamin B2 (riboflavin)	0.89 mg	0.84mg	0.5 mg
Vitamin B6	0.84 mg	2.1 mg	0.5 mg
Phosphorus	474 mg	530 mg	-
Calcium	366 mg	260 mg	-
Pantothenic acid	1.75 mg	7.3 mg	-
Copper	1.6 mg	-	0.56 mg
Vitamin E	10.9 mg	9.8 mg	5 mg
Folic acid	230 µg	115 µg	150 µg
Iron	8 mg	8.9 mg	10 mg
Magnesium	137 mg		-
Vitamin B3 (niacin)	9.63 mg	7.2 mg	6 mg
Vitamin C	53.4 mg	100 mg	30 mg
Zinc	8.4 mg	7.5 mg	4.1 mg
Potassium	806 mg	990 mg	-
Vitamin B12	10 µg	2.3 µg	0.9 µg
Biotin	0.37 mg	-	-
Selenium	90 µg	-	17 µg
Iodine	-	60 mg	90 µg
Vitamin K	3 µg	115 µg	-
Taste	Fishy	Creamy, sweet, smooth (Skau, Sok & Wieringa, 2012)	Should not have a taste (Salam, Macphail, Das, & Bhutta, 2013)
Preparation	No	10 mins cooking	No
Acceptability in Cambodia	Yes (Borg et al., 2019)	Acceptable in trial (Skau, Sok & Wieringa, 2012), but not in practice (WFP, 2014)	Yes (Jack et al., 2012)
Effectiveness in reducing malnutrition	To be tested	Not inferior to peanut-based RUSFs, which are the most effective in promoting linear growth and weight gain (LaGrone et al., 2012; Manary & Chang, 2012.)	Improves micronutrient status but not linear growth or weight gain (de Pee & Bloem, 2009; Dewey & Adu-Afarwuah, 2008; Jack et al., 2012)
Intra-household sharing	Unknown	Yes (LaGrone et al., 2012)	None noted (Jack et al., 2012)
Packaging	Unknown	Packaging may encourage sharing (de Pee & Bloem, 2009; Nackers et al., 2010)	Looks like "medicine" thus may discourage sharing (de Pee & Bloem, 2009; Nackers et al., 2010)
Local production capacity	Unknown	None (de Pee & Bloem, 2009)	None
Cost	To be determined. Goal is <US$0.10/day	Less expensive than peanut-based RUSFs if produced locally (Manary & Chang, 2012.), but also have to consider logistics, time to treat, relapse (Nackers et al., 2010)	Very cheap to produce at US$0.025/ daily dose (Zlotkin, 2009), but also have to consider logistics

	Total (N=485)	Control (n=127, 26%)	RUSF (n=128, 26%)	CSB++ (n=123, 25%)	MNP (n=106, 22%)	P-value
Loss to follow up, n (%)	192 (39.7%)	50 (38.4%)	52 (40.6%)	64 (52.0%)	26 (24.5%)	< 0.001***

	Odds ratio	95% CI		P value
Loss to follow up				
MNP vs control	2.37	1.03,	5.44	0.042*
MNP vs RUSF	3.89	1.71,	8.88	0.001**
MNP vs CSB++	4.84	2.08,	11.29	<0.000***
Control vs RUSF	1.65	0.76,	3.55	0.204
Control vs CSB++	2.05	0.92,	4.57	0.081
RUSF vs CSB++	1.24	0.57,	2.72	0.585
Adjusted for:				
Month of study	0.59	0.54,	0.63	<0.000***
Sex	0.90	0.70,	1.17	0.443
Age at baseline	1.12	1.04,	1.20	0.002**
Caregiver attended				
• primary school	1.28	0.84,	1.96	0.252
• high school or higher	0.64	0.41,	0.99	0.047*
Poor card holder	0.51	0.34,	0.77	0.001**
Diarrhoea	0.87	0.66,	1.14	0.305
Random effects	0.42	0.19,	0.94	

Change in dietary intake from baseline to endline	Total (N=292)	Control (n=77, 26%)	RUSF (n=76, 26%)	CSB++ (n=59, 20%)	MNP (n=80, 27%)	P-value
Breastfeeding						
At baseline, n (%)	187 (64.5%)	51 (66.2%)	47 (66.1%)	39 (62.7%)	50 (63.3%)	0.955
At endline, n (%)	144 (49.7%)	41 (54.0%)	33 (43.4%)	30 (50.9%)	40 (50.6%)	0.614
Minimum dietary diversity in past 24hrs						
At baseline, n (%)	81 (27.7%)	19 (24.7%)	24 (31.6%)	19 (32.2%)	19 (23.8%)	0.544
At endline, n (%)	256 (87.7%)	63 (81.8%)	68 (89.5%)	55 (93.2%)	70 (87.5%)	0.226
Meal frequency in past 24hrs at baseline, n (%)						
1-2 times	75 (26.8%)	24 (32.9%)	16 (21.9%)	9 (15.3%)	26 (34.7%)	0.004
3-4 times	200 (71.4%)	49 (67.1%)	57 (78.1%)	46 (78.0%)	48 (64.0%)	0.004
> 5 times	5 (1.8%)	0 (0.0%)	0 (0.0%)	4 (6.8%)	1 (1.3%)	0.004
Meal frequency in past 24hrs at endline, n (%)						
1-2 times	22 (7.5%)	7 (9.1%)	8 (10.5%)	2 (3.4%)	5 (6.3%)	0.812
3-4 times	262 (89.7%)	67 (87.0%)	66 (86.8%)	56 (94.9%)	73 (91.3%)	0.812
> 5 times	6 (2.1%)	2 (2.6%)	2 (2.6%)	1 (1.7%)	1 (1.3%)	0.812
Amount eaten at each meal at baseline, n (%)						
<2 tablespoonfuls each time	73 (26.0%)	19 (26.0%)	19 (25.7%)	15 (25.4%)	20 (26.7%)	0.866
2-3 tablespoonfuls each time	79 (28.1%)	25 (34.3%)	18 (24.3%)	13 (22.0%)	23 (30.7%)	0.866
< 1/2 bowl each time	78 (27.8%)	18 (24.7%)	22 (29.7%)	18 (30.5%)	20 (26.7%)	0.866
about 1 bowl each time	45 (16.0%)	9 (12.3%)	13 (17.6%)	13 (22.0%)	10 (13.3%)	0.866
>1 bowl each time	6 (2.1%)	2 (2.7%)	2 (2.7%)	0 (0.0%)	2 (2.7%)	0.866
Amount eaten at each meal at endline, n (%)						
<2 tablespoonfuls each time	19 (6.5%)	5 (6.5%)	4 (5.3%)	4 (6.8%)	6 (7.5%)	0.584
2-3 tablespoonfuls each time	81 (27.7%)	22 (28.6%)	19 (25.0%)	13 (22.0%)	27 (33.8%)	0.584
< 1/2 bowl each time	35 (12.0%)	12 (15.6%)	8 (10.5%)	8 (13.6%)	7 (8.8%)	0.584
about 1 bowl each time	150 (51.4%)	36 (46.8%)	41 (54.0%)	33 (55.9%)	40 (50.0%)	0.584
>1 bowl each time	6 (2.1%)	1 (1.3%)	4 5.3%)	1 (1.7%)	0 (0.0%)	0.584
Consumed sweet or salty snacks (eg chips, cakes, candies) in the past 24hrs						
At baseline, n (%)	86 (29.5%)	12 (15.6%)	26 (34.2%)	17 (28.8%)	31 (38.8%)	0.010
At endline, n (%)	249 (85.3%)	62 (80.5%)	63 (82.9%)	52 (88.1%)	72 (90.0%)	0.316

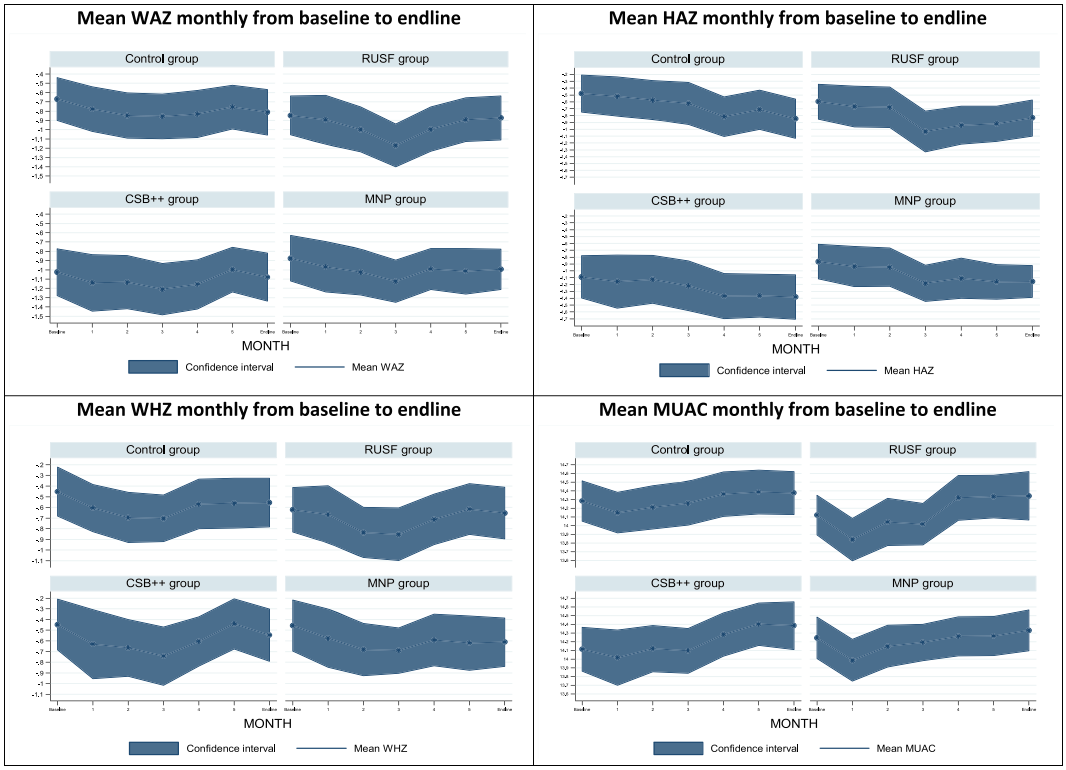

FIGURE A1 Mean anthropometric measures and confidence intervals monthly from baseline to endline for children with baseline and endline measurements

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Chapter 8: Process analysis and lessons learned

Chapter 8 examines the process taken in developing the ready-to-use supplementary food (RUSF). Part of this chapter has been published as:

- **Borg B,** Mihrshahi S, Laillou A, Sigh S, Sok D, Peters R, Chhoun C, Berger J, Prak S, Roos N, Griffin M, Wieringa FT. Development and testing of locally-produced ready-to-use therapeutic and supplementary foods (RUTFs and RUSFs) in Cambodia: Lessons learned. BMC Public Health. 2019; 19(1).

This chapter describes the process and context in which the ready-to-use supplementary food (RUSF) was conceived and developed. It begins by explaining the rationale for documenting the process. Then it briefly describes the lessons learned from the process. It goes on to outline what the process paper adds to the literature on the development of specially formulated supplementary foods and the implications for potential developers of such products. The last section is the submitted manuscript, revised based on the reviewers' comments.

Rationale for documenting the process

In the past ten years, there has been growing interest in the development and testing of locally-produced specially formulated foods. Invaluable knowledge and experience have been shared in relation to ingredients, ration size, nutrient content, safety and quality concerns, and packaging (1) and relative costs (2). However, there is limited published sharing of lessons learned around the process of making the policy and programmatic decision to develop a local specially formulated food in a given context, despite the recognition of the importance of understanding decision-making processes (3). These lessons can seldom be gleaned from the published protocols and papers. Developing a locally-produced specially formulated food requires considerable funding, physical and human resources, and time, all of which are easily underestimated. It is therefore essential to make an informed decision before

embarking on the process. Building on the experience of preceding projects can improve decision-making and optimise efficiency at all stages of the process. Projects like ours offer opportunities for learning and exchange between research, policy, and program actors, both within and between countries, which often go untapped.

Lessons learned

The research, policy, advocacy, and programming environment in Cambodia in 2013-14 created an expressed need and opportunity for this project, which built on the earlier experience of creating a specially formulated food in Vietnam. The project subsequently contributed to improved nutrition policy and to new programming options. Rigorous project planning, management, and documentation, as well as sound stakeholder collaboration, project administration and resourcing, are vital. A dedicated project manager is desirable in order to keep abreast of the literature and experiences elsewhere, identify and articulate needs and interests, and adhere to programming, policy, advocacy, and communication goals and guidelines in order to optimise opportunities.

What this paper contributes to the literature

Programmatic, policy, and decision-making lessons often remain hidden in grey literature or not documented at all. In publishing the lessons we learned, we hope to help others who are considering developing locally-produced specially formulated foods to clarify their objectives and avoid some of the challenges in order to maximise their contribution to preventing undernutrition in their setting.

The following publication describes the process and lessons learned in detail.

Borg et al. BMC Public Health (2019) 19:1200
https://doi.org/10.1186/s12889-019-7445-2

BMC Public Health

CORRESPONDENCE Open Access

Development and testing of locally-produced ready-to-use therapeutic and supplementary foods (RUTFs and RUSFs) in Cambodia: lessons learned

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Abstract

Background: Rates of childhood undernutrition are persistently high in Cambodia. Existing ready-to-use supplementary and therapeutic foods (RUSFs and RUTFs) have had limited acceptance and effectiveness. Therefore, our project developed and trialled a locally-produced, multiple micronutrient fortified lipid-based nutrient supplement (LNS) with therapeutic and supplementary versions. This ready-to-use food (RUF) is innovative in that, unlike many RUFs, it contains fish instead of milk. Development began in 2013 and the RUF was finalised in 2015. From 2015 until the present, both the RUTF and the RUSF versions were trialled for acceptability and effectiveness.

Methods: This paper draws on project implementation records and semi-structured interviews to describe the partnership between the Cambodian Ministries of Health and Agriculture, Forestry and Fisheries, UNICEF, the French National Research Institute for Sustainable Development (IRD), universities, and Vissot factory. It discusses the project implementation and lessons learned from the development and trialling process, and insights into positioning nutrition on the health agenda in low and middle-income countries.

Results: The lessons learned relate to the importance of project planning, management, and documentation in order to seize opportunities in the research, policy, advocacy, and programming environment while ensuring adequate day-to-day project administration and resourcing.

Conclusions: We conclude that projects such as ours, that collaborate to develop and test novel, locally-produced RUTFs and RUSFs, offer an exciting opportunity to respond to both local programmatic and broader research needs.

Keywords: Ready-to-use supplementary food (RUSF), Ready-to-use therapeutic food (RUTF), Lipid-based nutrient supplement (LNS), Locally-produced, Childhood malnutrition, Process, Lessons learned

Background

There is a longstanding recognition that undernutrition is not only an individual problem but has ramifications for economic development in many lower and middle income countries, including Cambodia [1, 2]. This has raised the profile of undernutrition, resulting in a body of evidence and agreed frameworks for addressing the problem [3]. Despite rapid economic development in Cambodia, rates of childhood undernutrition remain unacceptably high. There were significant improvements in nutrition between Cambodia's first and second Demographic and Health Surveys (CDHS) in 2000 and 2005. In that period, the prevalence of stunting in children under 5 years dropped from 50 to 43%, wasting decreased from 17 to 8%, and underweight dropped from 39 to 28% [4, 5]. By 2010, progress in combatting child undernutrition had stalled, with prevalences of stunting, wasting and underweight in children under 5 years at 40, 11, and 28% respectively [6]. Cambodia was not on track to meet its Millennium Development Goal targets.

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In 2014, almost one-third (32%) of all children under 5 years were stunted, 10% were wasted, 24% were underweight, and 2% were severely acutely malnourished, with a weight-for-height z-score (WHZ) of less than − 3 [7]. This can mostly be attributed to sub-optimal infant and young child feeding practices [8, 9], as well as infection [10], that result in inadequate energy and nutrient intakes to achieve optimal growth and micronutrient status from 6 to 23 months. Our project, a nutrition-specific intervention for treating and preventing malnutrition, grew out of that context.

Over the past two decades, various products and approaches for the prevention and treatment of childhood undernutrition have been developed and tested. Special nutritious foods can be used to prevent and treat undernutrition [11–13]. Some of these energy-dense foods require preparation e.g. fortified blended products, such as Corn-Soy Blend++ (CSB++, now called Supercereal Plus), that is cooked with water to make a porridge. Alternatively, they may be ready to eat. These include compressed bars or biscuits, such as BP-5™ or BP-100™. Increasingly, ready-to-use foods are lipid-based nutrient supplements (LNSs) which are often pastes, such as the peanut-based Plumpy'Doz™ or Plumpy'Nut®. These LNSs are proving effective, thanks to their relatively higher energy content, longer shelf life, and greater convenience [13, 14]. The WHO/UNICEF protocols for the composition of ready-to-use therapeutic foods (RUTFs) and their use in the treatment of severe acute malnutrition (SAM) have demonstrated their effectiveness [15–19]. As yet, no such standardised approach exists for the formulation of ready-to-use supplementary foods (RUSFs), or for approaches to prevention of undernutrition [15, 20].

WHO and various researchers have recommended the development of new therapeutic and supplementary foods that are affordable, acceptable and effective, and their comparison with existing products in terms of their potential for preventing growth faltering and undernutrition [13, 15, 17, 20–25]. A number of existing RUSFs and RUTFs and other supplements have been used or trialled in Cambodia, but to date, their success has been limited by low acceptability and effectiveness. Thus, the development of novel ready-to-use foods (RUFs) also responds to Cambodia's particular programmatic need [12].

UNICEF is mandated to support the Ministry of Health (MoH) to treat SAM, and to date, that had included paying for the majority of imported therapeutic product and in-patient treatment of SAM. The long-term objective, however, was that the MoH would purchase the therapeutic product themselves. Until then, the therapeutic food used to treat SAM had been BP-100™, which had limited acceptability [26]. Plumpy'Nut® had been trialled in Cambodia in 2009 and was poorly accepted [27], as elsewhere in the region [28]. In 2013, the MoH indicated that they would be more willing and able to commit to procuring therapeutic food if a cheaper, more acceptable (thus more effective) product could be purchased locally.

UNICEF was familiar with the success of a locally-produced specialised food that had been developed in Vietnam. In 2009, the Vietnamese National Institute of Nutrition, in collaboration with UNICEF and the French National Research Institute for Sustainable Development (IRD) had developed a food called HEBI (High Energy Bar for IMAM – Integrated Management of Acute Malnutrition) [28]. HEBI contained mostly local ingredients (rice, soy, and mung beans) and imported milk powder. It was formulated to resemble "mooncake", a delicacy eaten to celebrate the Vietnamese Mid-Autumn Festival, also known as the Children's Festival. HEBI proved more acceptable than, and as effective as, Plumpy'Nut® and became widely and successfully used in Vietnam in IMAM programming [29, 30]. It was determined that a similar project could be undertaken in Cambodia. Since milk powder is expensive and has to be imported, it was decided that the novel product should replace milk with fish, which is inexpensive, readily available, and more adapted to local tastes.

Therefore, UNICEF solicited IRD's assistance to develop a locally-produced RUTF. IRD had worked with the Department of Fisheries Post-Harvest Technologies and Quality Control (DFPTQ) in the Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries on previous nutrition research projects, including the development of a locally-produced complementary food [31]. In addition to their research capacity, DFPTQ could contribute its expertise with fish processing.

Around the same time, in June 2014, the United Nations World Food Program (WFP) in Cambodia phased out its distribution of CSB++ to children under 2 years and pregnant and lactating women. WFP Cambodia was experiencing budget constraints, and moreover, CSB++ had not been as acceptable or effective as expected [12]. Sprinkles micronutrient powders (MNP) had been distributed through the public health system, and although they proved effective in trial [32], in practice, coverage has been limited, and they have not been shown to contribute to improvements in linear growth [33–38]. Thus, there arose a gap in programming for the prevention of undernutrition, which is traditionally WFP's mandate. Recognising an opportunity for creating a supplementary version of the RUF to prevent undernutrition, UNICEF also engaged WFP. In 2014, a letter of agreement was signed between UNICEF, MoH, WFP, IRD, and DFPTQ to develop products for prevention and treatment of undernutrition. The aim was to create a ready-to-use food (RUF) in RUTF and RUSF versions, that would prove more acceptable, effective, and cheaper than the existing products.

Methods

Aim

This paper aims to share the lessons learned and challenges faced in developing and trialling locally-produced RUSFs and RUTFs in a low to middle-income country, Cambodia, where unacceptable rates of child undernutrition persist, despite robust economic growth. By describing the partners involved, the development and trialling process, and the opportunities for positioning nutrition on the health agenda, we hope that this paper will prove useful to others engaging in a similar process of local RUSF and RUTF development.

Design

This paper draws on project implementation records and semi-structured interviews. The project has been implemented in stages over 5 years, and is ongoing, as shown in Fig. 1. All of the trials in the project were carried out in Phnom Penh. Details on each of the trials are included under the relevant sub-headings. The trials were registered at ClinicalTrials. Gov (LNS-CAMBIN-FANTS, NCT02257437; LNS-CAMB-INFANTS-EFF, NCT02257762; FLNS_SAM, NCT02907424).

Formative acceptability testing

In July 2013, IRD carried out a taste trial of CSB++, BP-100™, HEBI, and eeZeePaste™ (a peanut-based RUTF from GC Rieber Compact). Both HEBI and eeZeePaste™ proved far more acceptable than CSB++ and BP-100™ in terms of organoleptic qualities, which confirmed that the development of a locally-produced RUF adapted to the tastes of Cambodian children was warranted.

Initial product development

In 2014, the first version of the RUF was developed [29]. Rice, small freshwater fish, soy, and mung beans - all important elements of the current Cambodian diet - were

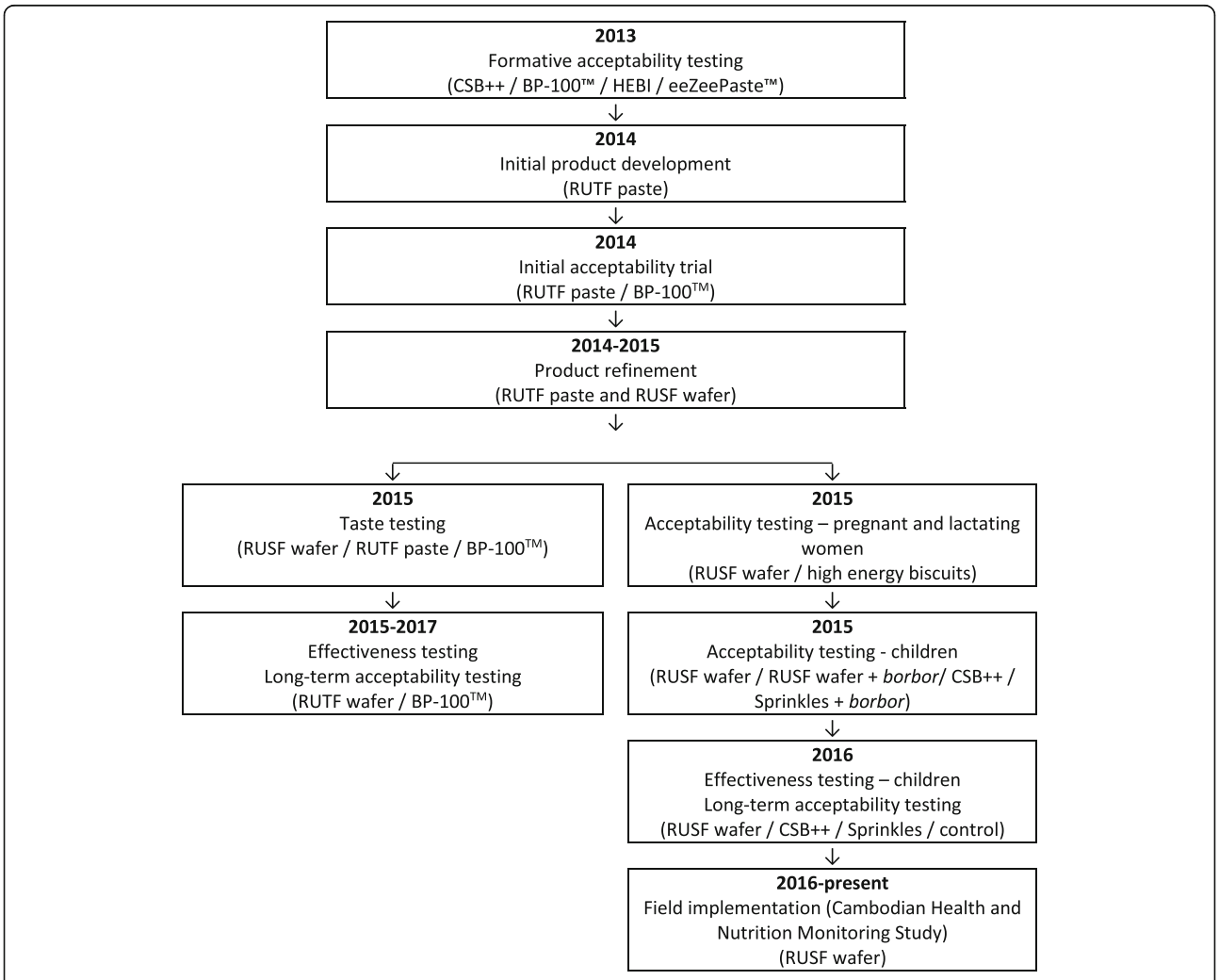

Fig. 1 Project implementation. * *Borbor*: white rice porridge, the traditional Cambodian weaning food

considered optimal ingredients, along with oil, sugar, and multiple micronutrients. The product was made by a local, quality-certified food factory, Vissot. Pre-tasting was conducted with Cambodian project and factory staff.

Initial acceptability trial

In June 2014, an acceptability trial was held in a Phnom Penh preschool with 61 children aged 2 to 7 years. The trial was a 2 × 2 non-randomised, nonblinded crossover design. Children ate the novel RUF and BP-100™ for 2 weeks each. Neither the RUF nor BP-100™ were very well accepted, in terms of the amount consumed. In organoleptic scoring (of sensory qualities, e.g. taste and smell), BP-100™ scored slightly higher. Therefore, the RUF was modified to reduce the fishy taste and smell. Details on the initial product development and acceptability trial have been reported elsewhere [29].

Product refinement

From late 2014 to early 2015, the product went through various refinements. Coconut powder was added to mask the fishy taste and smell. The form of the RUF, originally a paste, also changed. Snack consumption is ubiquitous in Cambodia, even amongst young children [12, 39, 40]. In an attempt to create a form that would be more acceptable [28], we took a well-known Cambodian snack, a wafer, and piped in the RUF paste. The final product was a wafer that is a hollow cylinder between 8.5-9 cm long with an internal diameter of 0.5 cm, filled with RUF paste. RUTF and RUSF versions were created, the main differences being the micronutrient premixes, and the oil and fibre contents. The RUFs were tested regularly for microbiological safety.

RUSF trials

The RUSF trials included acceptability testing with children and with pregnant and lactating women in mid-2015. Effectiveness among children was tested from February to October 2016. The trials were organised with the collaboration of the staff and health volunteers of the Mekong Health District in peri-urban Phnom Penh.

RUSF acceptability trial – pregnant and lactating women

A non-blinded crossover study was conducted with 98 pregnant and lactating women, comparing the RUSF snack to high energy biscuits (provided by UNICEF). The women ate each food at home for 3 days, then responded to organoleptic testing. Both foods were considered highly acceptable. A planned effectiveness trial with pregnant and lactating women did not proceed, due to limited funding.

RUSF acceptability trial – children

A two-week, non-blinded, randomised 4 × 4 crossover trial was conducted, with 95 children aged 9–23 months. It compared the acceptability of the novel RUSF, presented as the filled wafer snack or the snack mixed into *borbor* (white rice porridge), compared to CSB++ and MNP mixed with *borbor*. Children at 4 sites ate the 4 foods for 3 consecutive days over 12 days. Although children consumed more of the MNP-*borbor*, the RUSF as a snack or mixed with *borbor* provided two to three times more kilocalories. Caregivers reported that their children had the highest preference for MNP, but that they also liked the RUSF snack. Most importantly, caregivers ranked the RUSF snack highest, and focus group discussions confirmed this. Therefore, the research team felt confident to proceed to a six-month trial to test the RUSF's effectiveness. Details on the children's acceptability trial are described elsewhere [41, 42].

RUSF effectiveness trial – children

A six-month prospective, cluster randomised, non-blinded controlled trial with a 1:1 allocation ratio was conducted with 485 healthy, non-severely acutely malnourished children aged 6 to 11 months. The aim was to establish the novel RUSF's superiority to CSB++, MNP, and a control group. Twenty-eight sites were randomly allocated to one of the four arms. Data collection and food distribution were conducted monthly until endline. The main outcome was anthropometric status, and secondary outcomes were children's body composition, biochemical status, and cognitive development. In addition, long-term acceptability was assessed. The RUSF was not as effective as expected. All groups continued to experience growth faltering, although the RUSF group faltered at a lower rate. Details on the effectiveness trial are described elsewhere [43], and results are forthcoming [44].

Cambodian Health and Nutrition Monitoring Study

The RUSF is being utilised in the Cambodian Health and Nutrition Monitoring Study. Pregnant women with a mid-upper arm circumference (MUAC) < 23 cm are deemed malnourished and provided with RUSF. While the study does not aim to trial the RUSF, it may provide additional information on the implementation, acceptability, and effectiveness of the RUSF in a programmatic setting. Results have yet to be analysed and reported.

RUTF trials

The RUTF trial from 2015 to 2017 included taste testing to finalise the RUTF, followed by effectiveness and long-term acceptability testing with children presenting to the National Paediatric Hospital in Phnom Penh. The trial was conducted with the cooperation of the hospital staff.

RUTF taste testing and long-term acceptability testing

In October 2015, 52 children aged 6 months to 17 years and their caregivers participated in a taste test. These

children were visiting the outpatient department for various reasons and were not necessarily malnourished. The crossover design compared BP-100™ with the RUTF paste, and the RUSF wafer. The RUTF paste was considerably less acceptable, while BP-100™ and the RUSF wafer were equally acceptable. As a result, the paste form of the RUF was abandoned, and the RUTF was finalised as a filled wafer, like the RUSF.

In the subsequent effectiveness trial (described below), long-term acceptability was assessed with severely acutely malnourished children. Both products were highly acceptable, with BP-100™ slightly more so. Acceptability of the RUTF increased over the treatment period, while acceptability of BP-100™ varied. More details on the RUTF acceptability testing are reported elsewhere [45].

RUTF effectiveness trial

Effectiveness was tested in a single-blinded, randomised control trial conducted from September 2015 and January 2017. A total of 121 children with uncomplicated SAM aged 6 months to 5 years were randomised to receive either the novel RUTF or BP-100™ for home consumption for a period of 8 weeks. Anthropometric measures were assessed at baseline and fortnightly until endline at the eighth week. No statistically significant differences between the two products were found for changes in anthropometric status. This suggests that the locally-produced fish-based RUTF performed as well as BP-100™ and is a potential alternative to the latter for SAM treatment in Cambodia. Details on the RUTF effectiveness trial are reported elsewhere [46].

Results

This section describes the lessons learned from implementation of the locally-produced Cambodian RUF project. The project has provided useful insights into the opportunities and challenges of getting nutrition into the broader health and development platform in low and middle-income countries. These opportunities and challenges arise before, during and after project implementation, and emphasise the importance of having a broad overview of the project from the outset. Even before the project begins, there needs to be a deep understanding of the facilitators and obstacles in the research and policy environment, and of the experience of similar projects elsewhere. At every stage, it is vital that opportunities for uptake, advocacy, and for influencing policy or process are recognised and seized. This requires communication on multiple levels. Stakeholders must be identified, and their roles and responsibilities outlined clearly, while maintaining the balance between their respective objectives. Throughout, consistent project planning, management, resourcing, and documentation are essential.

Research and policy environment

The global and national nutrition research, policy, and programming environment around 2010–14 gave impetus to this project. The 2010 and 2014 CDHSs [6, 7] had shown that malnutrition rates in Cambodia were not improving. WHO's 2013 SAM guidelines had emphasised the need for research in Asia on the effectiveness of RUTFs using different ingredients, compared to existing therapeutic foods [17]. The Cambodian Fast Track Road Map for Improving Nutrition 2014–2020 acknowledged that SAM treatment needed to be expanded and accelerated and committed to developing and testing "new innovative nutrition-specific interventions, which are tailored specifically to the Cambodian context …. to improve the current strategies for the treatment and the prevention of severe malnutrition" [47]. In mid-2014, Cambodia joined the Scaling Up Nutrition (SUN) movement, thus declaring its commitment to reducing child undernutrition on the global stage. The project took advantage of this momentum.

In its turn, the project has influenced Cambodian nutrition policy by encouraging the MoH to focus on treating SAM and enabling them to do so with the novel RUTF. The existence of a locally-produced RUTF persuaded the MoH to agree to put therapeutic foods on the essential medicines list of 2017. Cambodia's new guidelines for management of acute malnutrition (comprised of the inpatient, outpatient, and community handbooks) state that any available therapeutic product, including the locally-produced RUTF, can be used for SAM treatment, and for the management of moderate acute malnutrition [48].

On a broader level, the existence of just one RUF could rationalise integrated management of acute malnutrition. At community level, early detection could lead not only to referral of SAM children, it could also result in moderately acutely malnourished children receiving the RUSF or a low dose of the RUTF. The RUF could be either provided freely through nongovernmental organisation (NGO) programs or sold at the market. A middle model, which caregivers favour, would be for community health volunteers to sell RUF [44]. This kind of public/private production and distribution model should be explored further. Any models of distribution to non-severely acutely malnourished children must avoid inadvertently increasing the risk of overweight and obesity [49].

The project has also received attention from elsewhere in the region, specifically, Laos, Indonesia and Papua New Guinea, countries which are exploring options for developing and using their own locally-produced RUFs.

Strategy and advocacy

The RUFs were brought to the attention of high-level Cambodian policy and decision makers in the Fill the

Nutrient Gap process and report, convened by WFP [50]. By bringing together multiple ministries under the direction of the inter-ministerial Council for Agricultural and Rural Development (CARD), the process has helped to place nutrition more firmly onto the broader government agenda. This may also facilitate nutrition-sensitive programming across sectors.

That said, at the outset, there was no clear strategy and advocacy plan for the project. Ad hoc opportunities through UNICEF events, conferences, and media were taken as they arose. Ideally, opportunities and strategies for advocacy would be identified in the planning phases of the project.

Project communication

The project needs to be communicated to the broader group of stakeholders, especially when actors have different backgrounds, goals, and roles. Too often, research is communicated in conferences that may not be attended by a wide range of actors. The National Nutrition Program Working Group provided a forum for project communication. Events such as project launch meetings that bring together a range of actors can also facilitate communication between multiple actors and across multiple levels. An important part of effective communication, especially in hierarchical societies, entails negotiating cultural differences and protocol. On multiple levels, project communication is essential and needs to be an explicit part of the project plan.

Stakeholders

The original group of core stakeholders comprised of UNICEF, MoH, WFP, IRD and DFPTQ provided a complementary set of skills, experience, and opportunities for developing, promoting, or utilising the RUFs. The various partners also had a history of collaboration. With respect to undernutrition, the primary mandate of UNICEF and the MoH is treating SAM, while WFP's mandate is preventing undernutrition, including by providing supplementary food. IRD and DFPTQ provided the research skills and experience to implement the project.

It is important to be explicit about the needs and pressures on all actors, about what prerogatives are privileged or steer the project, as well as how those priorities are reconciled, and how communication will be ensured and conducted. However, the letter of agreement between the stakeholders was very general and did not outline roles or responsibilities, including resourcing. In 2015, when WFP's funding for Cambodia decreased, and with it, the likelihood that WFP would provide supplementary food for the prevention of undernutrition in the foreseeable future, they withdrew from the project. This was a significant loss, given WFP's expertise in the development of specialised foods. A letter of agreement that clearly outlined the roles of each stakeholder in greater detail might have assisted in the selection of the stakeholder group. Moreover, a more binding agreement might have avoided the resourcing and planning issues that impeded the project's early progress.

Research versus policy and program implementation

There can be tension between research and policy or program goals and timelines [51], particularly when there is a large a variety of actors (researchers and research students, national and international institutions as well as NGOs, multiple ministries and their staff and volunteers). Researchers may not appreciate the policy and implementation demands that program people face, while the latter may expect research to deliver results too quickly or definitively. On a broader level, the research that is needed to satisfy program requirements may not be the research that is considered necessary in the academic community. This project did connect universities and research agencies to UN and government agencies, but perhaps could have negotiated the complex space between research and programming more effectively by explicitly acknowledging the stakeholders' various objectives and timelines.

Programming

The RUTF can now be used by hospitals and health centres that provide SAM treatment, as well as by NGOs that support community-based treatment. Vissot (a certified Cambodian food manufacturer that complies with the relevant Cambodian food safety and labelling standards) is also planning to make RUF available for sale to the public.

Currently, the RUTF is being piloted on a small scale by an NGO doing community-based SAM treatment, but it is not yet being used in the health system. A major difference between HEBI and the Cambodian RUF project is that the Vietnamese government were driving the development, production, and utilisation of HEBI. Once HEBI was demonstrated to be acceptable and effective, the Vietnamese government phased out BP-100™ and began using HEBI. Thus, a green light for HEBI uptake was built into the Vietnamese process. On the other hand, in Cambodia, the government was not driving the process. Private sector production will depend on government commitment to purchase. Therefore, a green light or trigger for agreeing to procure the RUTF for use in the hospitals and health centres should have been identified and agreed upon at the early stages, either in the stakeholder letter of agreement or a project planning document.

All new business ventures face the chicken and egg dilemma – without consumers, producers find it difficult

to invest, and without a product, consumers find it difficult to commit to purchasing. This project was no exception – while there was a great deal of interest in the product, including from NGOs who could use it, until the product was finalised and tested (at least for acceptability), there was no way of knowing what the demand would be, nor of knowing Vissot's capacity to meet demand. Similarly, although there is a target price which aims to make the RUFs' cost competitive with alternative supplementary foods, that can only be confirmed once the factory is producing at scale. Without a guaranteed demand, it was impossible to invest in the machinery and staff that would have helped the project progress in a timelier fashion. Again, a green light and procurement commitment in the stakeholder agreement may have helped to mitigate this problem.

Lessons learned are that formative research, which is seldom well-resourced, is vital. In the case of the RUF project, this would have involved project mapping which included cost analyses, and a survey or estimate of demand from NGOs as well as MoH. The National Nutrition Program Working Group comprised of government, UN agencies, researchers and NGOs working in nutrition in Cambodia, and convened by the MoH's National Nutrition Program, could have been drawn upon to facilitate this.

Project management

A project such as this, spanning several years, and engaging a variety of institutional stakeholders and individual actors, requires meticulous attention to daily and long-term management. It needs to continuously review the project's clarity of purpose and roles, expected outcomes, financial and human resources, and duration. Particularly in an environment of indeterminate and multiple potential sources of funding, organisational support and staffing, the project's plan, budget, and timing need to be defined at the outset, in order to manage expectations of all the actors. This requires an identified project manager, or if project management roles are shared, a clear division of responsibilities.

This long, multi-agency, multi-staff project also experienced challenges in project documentation, partly due to staff turnover and informal decision making. An identified project manager would be responsible for collaborating with all stakeholders to ensure thorough project documentation, including an initial project plan and regular reporting. Project documents need to outline activities, a timeline, and resources in detail. They also need to describe the research and policy context in which the project was conceived and opportunities for influencing policy, and to formulate an advocacy strategy. Decisions taken, and options excluded must be recorded.

Project resourcing

The project team had an admirably "can-do" attitude, which yielded a high ratio of benefits for resource inputs (at least in terms of funding). The use of doctoral students (who undertook the research as part of their PhDs) reduced costs, and the embedding of the project in a government department allowed the achievement of results that went beyond what may have been achieved if roles had been too sharply defined. Conversely, the "pitch in" approach left gaps in terms of responsibilities for tasks. Similarly, a dependence on ad hoc funding that was not clearly dedicated in advance - while allowing the project to happen at all - meant that some parts (such as the effectiveness trial with pregnant and lactating women) had to be abandoned when the expected funding did not materialise.

It is essential to consider human resources and to acknowledge strengths and gaps in expertise and competence. Again, it is vital to have a defined project manager who can be responsible for tying the threads together – for calling meetings, documenting decisions, and flagging resource gaps. A project manager need not be the most senior person. Indeed, the skills of senior people and experts are too often wasted by expecting them to also do project management. Such senior people are best used as a steering committee. One of their tasks is to identify the responsibilities of the project manager, and to ensure that the manager and team members are collaborating effectively. In this way, the willingness of team members can be optimised, while ensuring that adequate documentation and project administration happen.

Discussion

This project has responded both to a programmatic need articulated by the Cambodian MoH and to identified gaps in the current understanding of RUFs for the prevention and treatment of undernutrition. Engaging numerous actors over multiple years, it experienced challenges and successes. Most importantly, it seized an opportunity created by a combination of new research and policy and drew on similar experiences in neighbouring Vietnam. In turn, it encouraged greater commitment to sound nutrition programming and policy. Specifically, it contributed to improved guidelines for SAM treatment and created new options for nutrition programming.

The challenges could have been mitigated to a great extent by improved project planning, management, and documentation. Stakeholder agreements would have benefited from being more detailed and binding, which would have contributed to stakeholder collaboration. More rigorous project planning could have anticipated and perhaps resolved some of the dilemmas around demand, capacity, and cost of the RUFs. It would also

have clearly articulated the desired policy and program outcomes, resolved tensions between research and programming, and included green lights for ensuring that the RUTF was taken up in hospitals and health clinics treating SAM. More rigorous project planning would have identified specific policy, advocacy and communication goals and opportunities in advance, rather than in an opportunistic and ad hoc fashion, thus maximising the likelihood of exploiting opportunities. At a more quotidian level, improved project management – and specifically, a designated project manager - would have mitigated some of the administrative and resourcing challenges and enabled the project to unfold more smoothly. Improved documentation would have made it easier to learn and share lessons both within the project and outside it.

Conclusion

This collaborative project developed and tested novel, locally-produced RUTFs and RUSFs. Projects like this one can be rich and exciting in their contributions to both literature and programming. They offer fruitful opportunities for learning and exchange between research, policy, and program actors, which often go untapped. Future similar projects should focus on project planning, management and documentation that addresses both strategic (policy and advocacy) and administrative levels.

Abbreviations

CARD: Council for Agricultural and Rural Development (Cambodia); CDHS: Cambodian Demographic and Health Survey; CSB++: Corn-Soy Blend++, now called SuperCereal Plus; DFPTQ: Department of Fisheries Post-Harvest Technologies and Quality Control (in the Fisheries Administration of the Cambodian Ministry of Agriculture, Forestry and Fisheries); HEBI: High Energy Bar for IMAM; IMAM: Integrated Management of Acute Malnutrition; IRD: French National Research Institute for Sustainable Development; LNS: Lipid-based nutrient supplement; MoH: Ministry of Health (Cambodia); MUAC: Mid-upper arm circumference; NGO: Nongovernmental organisation; RUF: Ready-to-use food; RUSF: Ready-to-use supplementary food; RUTF: Ready-to-use therapeutic food; SAM: Severe acute malnutrition; SUN: Scaling Up Nutrition; UN: United Nations; WFP: United Nations World Food Program; WHO: World Health Organisation

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Authors' contributions

BB wrote the first draft of the paper with significant input from SM, AL, SS, and FTW. DS, RP, CC, JB, PS, NR, and MG contributed to the revision of the draft. All authors have read and approved the manuscript.

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Availability of data and materials

Data will be made available after the publication of major outputs, upon request to the corresponding author.

Ethics approval and consent to participate

Ethics approval for the various trials was received from the University of Queensland Medical Research Ethics Committee (2014001070) and from Cambodia's National Ethics Committee for Health Research (03/8 NECHR; 120 NEHR; 402 NECHR). Written informed consent will be obtained from all the caregivers or parents of the participating children before recruitment into the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Chapter 9: Discussion

This chapter summarises the outcomes of the trials, and the implications for undernutrition prevention. It begins by discussing the acceptability and effectiveness trials and how they address some of the gaps in the literature. It goes on to note the possible disadvantages of specially formulated supplementary foods. The next section considers some of the potential strategies and concerns for undernutrition prevention arising from our trial. Finally, the strengths and limitations of this research, and the lessons learned are outlined.

What does the acceptability trial contribute to the literature?

There have been few studies on the acceptability of supplementary foods in Cambodia (1-5). This trial design was similar to that used in other short duration acceptability trials of supplementary foods in Cambodia and elsewhere in terms of sample size (1, 6-17), trial duration (18-20), study objectives, design, subjects (1, 3, 7, 10-12, 14, 20), and outcomes (6, 10, 12-14, 20).

Use of ranking rather than preference scales

A strength of this trial in comparison to others was the use of ranking. Ultimately, caregivers determine whether a child will be given a particular food and will eventually develop a taste for it (20-23). The use of ranking compelled caregivers to choose between test foods. This result is more conclusive than preference scales and may help to mitigate the socially acceptable responding encountered in other studies (8, 18).

Comparison with other supplementary foods and traditional weaning food

In our trial we were able to compare the relative acceptability of the novel ready-to-use supplementary food (RUSF) containing fish to Corn-Soy Blend Plus Plus (CSB++) which contains milk, and the traditional Cambodian weaning food, *borbor* (white rice porridge) fortified with micronutrient powders (MNP). Many trials have not made such extensive comparisons and in some cases have only tested the

intervention food. Caregivers ranked the novel RUSF highest, which suggests that a fish-based product is more acceptable than a milk-based one, and even more acceptable than the familiar weaning food.

Format of the food – a paste-filled wafer snack

Caregivers reported that they appreciated the familiarity of the wafer. They said that the shape encouraged children to hold the snack themselves, and consequently, to eat more. In this respect, our product was well developed (24), and acceptable in a context where snacking is common (25). Whether this would encourage more frequent feeding, or less attentive feeding practices, could be explored in future.

Caregivers noticed that the large diameter of the wafer meant more paste in each bite. The paste tended to stick to the children's palate, and caregivers worried that children might choke, an issue which has been noted with other snacks (26). To mitigate this risk, the wafer diameter was reduced.

Volume versus energy in an acceptability trial

The various test foods compared in our trial made it possible to consider the implications of foods with quite different volume and calorific content. Many acceptability studies have compared foods that were inherently or volumetrically isocaloric (9, 11, 12, 14), hence few have considered energy consumption as an outcome (6, 11). However, porridges require larger volumes than lipid-based nutrient supplements (LNSs) to deliver equivalent calories (18, 27). Even consumed in smaller quantities, our novel RUSF provided more energy than CSB++ porridge or *borbor* fortified with MNP.

Given the limited gastric volume of young children, smaller portions of more nutrient dense foods are preferable in order to avoid displacement of breastmilk and local foods that enhance dietary diversity, including animal-source foods, fruits, and vegetables (28, 29). This is the rationale for trialling small-quantity small quantity lipid-based nutrient supplements (SQ-LNSs). Future studies would do well to consider the volume versus energy of test foods.

Effect on children's appetite

Our trial showed that the RUSF might improve appetite, with some caregivers reporting that, after eating the RUSF snack, their children ate more of the food that was offered at home. This observation was made in previous research involving LNSs (30). In small quantities, LNSs may actually improve appetite, potentially contributing to increased intake from other family foods (31).

Cost and willingness to pay

Our trial was able to assess the acceptability of the food for families from an economic perspective. As in other studies (9, 13, 32), caregivers expressed a willingness to pay. They indicated that they would pay between 300-1000 riel (US$0.07-0.25) for the RUSF snack, which is comparable to what they currently pay for snacks (25, 33). A recent study of locally-produced supplementary foods has not found them competitive with imported products in terms of cost (34). No thorough cost analysis has been conducted on the RUSF snack, but these results suggested that if the following effectiveness trial proved successful, the use of the product could be successfully scaled up.

Confirming field observations of the low acceptability of CSB++ in this context

In the quantitative questionnaire and the Focus Group Discussions (FDGs), caregivers ranked CSB++ very low. This confirms the field observations that CSB++ had low acceptability (35), which is relevant for future programming.

Conclusion

Given that effectiveness is predicated on acceptability, the acceptability trial was an important foundation for the effectiveness trial. The acceptability trial confirmed that fish is a promising alternative to milk in a locally-produced supplementary food. It also provided feedback that allowed the format of the food to be refined and made more acceptable. This improvement reduced potential bias in the effectiveness trial. Since most specially formulated foods are developed and tested in Africa, the trial contributes to the literature on the food preferences of children and caregivers in Cambodia and South-East Asia.

What does the effectiveness trial contribute to the literature?

Non-milk animal-source foods are as effectiveness as milk-based foods

The few trials of the effectiveness of specially formulated foods using non-milk animal-source foods have had mixed outcomes. Two Cambodian studies that compared milk- to fish-based products found no significant difference in anthropometric outcomes between groups (36, 37). Another study comparing a peanut/soy spread to a fish-fortified porridge found that the former was slightly more effective (38). In this trial, the RUSF (containing fish) appeared less effective than CSB++ (containing milk) at protecting against decreases in weight-for-age z-score (WAZ), weight-for-height z-score (WHZ), and mid-upper arm circumference (MUAC) amongst high consumers, but equally or more effective amongst low consumers, but the differences were marginal. Thus, this trial suggests that non-milk animal-source foods are as effective as milk-based foods (37).

Evidence on the effectiveness of supplementary foods in South-East Asia

This study helps fill a gap in the research pertaining to the effectiveness of supplementary foods in Asia generally, and in Cambodia and South-East Asia in particular. South-East Asia is generally underrepresented in the research on prevention of childhood undernutrition. While there are a number of studies on micronutrient supplementation from South and South-East Asia (39-44) including Cambodia (45-49), there are relatively few studies on the use of supplementary foods. Most studies on supplementary foods originate in Africa (50), and much of the research in that region has been conducted in Malawi (38, 51-60). Our research is important because it provides much-needed evidence on the effectiveness of supplementary foods in South-East Asia.

Micronutrients without adequate macronutrients have limited impact on growth

Our trial has reiterated the importance of ensuring that children consume adequate macronutrients as well as micronutrients. In this trial, high consumers of MNP had increased WAZ and MUAC compared to the control group in adjusted analysis. There was no significant difference between MNP and the

other products. Since MNP is added to food after cooking, high consumers of MNP were likely to have an increased intake of all foods. This would suggest that adequate food consumption with MNP, and not MNP alone, explains the increased ponderal growth of the high consumers of MNP in comparison to the control group. This concurs with the finding that micronutrients are more likely to achieve growth outcomes only if they are combined with adequate macronutrients (47, 61-70).

Supplementing with readily available foods may be more effective than specially formulated foods

Our trial, and our review of similar trials, suggested that specially formulated supplementary foods had an inconclusive or modest impact on undernutrition prevention. Amongst the supplementary feeding trials that were most successful in improving anthropometric outcomes were two that used readily available foods. In a recent study comparing supplementation of children's diets with one egg a day to an unsupplemented control, eggs were found to greatly increase WAZ and height-for-age z-score (HAZ) (71). In another, a mixed food basket including meat was found to increase WAZ and WHZ (72). This suggests that where supplementary feeding interventions are used, food-based approaches, using readily-available local foods, such as eggs, may be preferable to supplementing with specially formulated supplementary foods.

Impact of providing supplementary food to a representative population

Our trial tested the impact of providing supplementary foods to a representative population. Providing supplementary foods to representative populations has not been done in very many trials, even though it is widely agreed that prevention of undernutrition is preferable to avoid children reaching the recognised cut-offs for stunting or wasting (73-75). Our sample could be considered representative, in that it included some moderately acutely malnourished (MAM) children (WHZ > -3 to <-2 and MUAC 11.5 - 12.5cm), some non-MAM (WHZ > -2 and MUAC > 12.5cm), and some overweight children (WHZ 2 to 3) (76). Approximately 5% of the children in our study were MAM at baseline, which is comparable with prevalences in the general population (77). A small number of studies were found (see Table 2.5) that appeared to include MAM and non-MAM children, although exclusion criteria were not always clear (36, 38, 71, 78-83).

Impact of providing supplementary food to a food secure population

To date, there is no clear evidence that food supplementation prevents growth faltering in food secure settings (84, 85). Our trial contributes to the limited literature on undernutrition prevention in food secure settings.

Much of the evidence on the use of supplementary foods is from food-insecure or emergency contexts. Yet most undernutrition occurs in non-emergency settings, many of which could be considered relatively food secure, including Cambodia (50, 86). Definitions of food security are multiple and vary in their analysis from country to household level. For the purposes of determining whether our study population was food in/secure, we used two criteria. First, Blanket Supplementary Feeding Programmes (BSFP) entailing the distribution of supplementary foods to prevent undernutrition is recommended when MAM prevalence rates exceed 15 - 20% (87). This was not the case for our study population (see Table 2.1). Second, Cambodia's Identification of Poor Households Program, IDPoor (88), classified only 10% of the households in the study site as poor or very poor. Based on these two criteria, the study population was considered food secure.

Comparison of test food with an unsupplemented control

This trial contributes to the evidence on provision of supplementary products compared to an unsupplemented control. There have been many studies that have compared supplementary foods to each other but not to an unsupplemented control (89, 90).

Did the trial interventions prevent undernutrition?

None of our interventions prevented growth faltering. Mean anthropometric measures decreased in all groups from baseline to endline. HAZ decreased by 0.24 to 0.37; WAZ decreased by 0.03-0.14; WHZ decreased by 0.03-0.15. MUAC increased by 0.1-0.3cm. Therefore, the none of the interventions prevented undernutrition.

However, the RUSF and CSB++ did slow ponderal growth faltering with respect to the control group. As in similar trials, WAZ, WHZ and MUAC increased in comparison to the control group for at least one of the interventions, (28, 36, 38, 66, 72, 78-81, 90-93). In our trial, low consumers of the RUSF and high consumers of CSB++ showed the most improvement.

In similar trials, impact on HAZ was mixed (28, 36, 72, 79, 94, 95). None of the interventions in our trial improved linear growth with respect to the control group. In our study, and in at least one other, HAZ declined more for the CSB++ group than it did for the control (96).

Thus, in this trial, as in others, none of the supplementary foods prevented undernutrition, although the RUSF and CSB++ provided limited protection.

Are the outcomes clinically significant?

From a programmatic point of view, it is important to question whether our outcomes were clinically significant. In this trial, as in others, the magnitude of the impact of supplementary feeding on growth appears small to negligible (90, 94, 97), and the impact on linear growth is particularly mixed (28). To date, there is insufficient evidence to recommend routine provision of supplementary foods for the prevention of undernutrition in representative populations of children in food secure settings (98).

Conclusion

Neither the novel RUSF, nor either of the other interventions, prevented undernutrition. The RUSF and CSB++ slowed ponderal growth faltering with respect to the control group, but the impact was of limited clinical significance. None of the interventions had a significant impact on linear growth faltering. That said, the fish-based RUSF worked as well as CSB++, the gold standard, milk-based supplementary food that is widely provided to children aged six months to two years to prevent undernutrition.

Potential disadvantages of supplementary foods

A number of researchers have pointed out the potential long-term risks of using specially formulated supplementary foods (97, 99-101). These include possible undesirable effects; suboptimal patterns of growth; displacement of breastmilk and healthy family foods; disempowering caregivers and replacing traditional foods; encouraging consumption of non-nutritious commercial snacks; and diverting resources from other, potentially effective nutrition interventions.

Potential undesirable effects

Although interest in locally-produced supplementary foods has been growing for at least ten years, there is an acknowledged lack of data on potential adverse effects of these products (50, 90, 102). What research exists has tended to focus on immediate adverse effects such as toxic doses, morbidity related to food hygiene and displacement of breastmilk, and use of iron-rich foods in high malaria settings (64, 66).

Suboptimal patterns of growth

There is very little evidence on the potential long-term effects of provision of specially formulated supplementary foods on patterns of growth (99). Ideally, weight gain should be balanced, favouring lean tissue over fat (27, 103). A potential risk of the use of supplementary foods, especially LNSs, is rapid weight gain and obesity (100) particularly among stunted children (103). For this reason, WHO cautions against routine provision of supplementary foods to moderately wasted or stunted children to avoid inadvertently increasing the risk of the risk of overweight and obesity, particularly in the context of the dual burden of malnutrition (104), which Cambodia, like many other low- and middle-income countries, is facing (105).

Others question this recommendation, citing a lack of evidence that supplementary foods can contribute to overweight and obesity compared to clear evidence of the risks of not treating MAM, especially when it is concurrent with stunting (106). A recent trial which provided MAM children with supplementary foods for twelve weeks found that most of the weight gained (94%) was fat free mass (107). It is

recommended that future studies include measures of body composition to help resolve this question (50, 102).

Displacement of breastmilk and healthy family foods

Another possible unintended effect of supplementary foods is the displacement of breastmilk and healthy family foods, which risks decreasing dietary diversity, and food frequency. Reduction in breastmilk consumption, in addition to the loss of nutritional quality, also exposes children to increased pathogens, and decreases potential breastmilk-mediated immune protection (66, 96, 108). Dewey and Brown caution that a focus on only complementary feeding risks undermining breastfeeding and reiterate that feeding interventions that promote optimal breastfeeding and complementary feeding are more likely to result in appropriate growth (109). For this reason, the International Lipid-Based Nutrient Supplements (iLiNS) Project have specifically designed small quantity LNSs (SQ-LNSs) to avoid the displacement of breastmilk and to allow consumption of diverse family foods (29).

The quantities of RUSF provided in our trial (between 40-110g/day) could conceivably have displaced breastmilk and other family foods (108). This may have been the case for high consumers of RUSF, whereas low consumption of RUSF may have supplemented the existing diet (66, 96). However, analysis thus far on the displacement of breastmilk and family food does not reveal any difference between dietary intake across the groups.

Disempowering caregivers and replacing traditional foods

Specially formulated supplementary foods may be disempowering and deskilling for caregivers (73, 100, 101) in terms of their food preparation skills and feeding practices. It may also create the belief that processed foods are superior to breastmilk and family foods (89, 110).

Encouraging consumption of non-nutritious commercial snacks

In Cambodia, which has weak regulatory system for food production and marketing, and where there is high consumption of commercially produced snack foods of low nutritional quality (25, 111, 112),

commercialisation of supplementary foods could unintentionally encourage an increase in the consumption of processed foods and a decrease in the consumption of healthier foods (25, 85, 89, 100, 101). This may contribute to the rapid nutrition transition which Cambodia is experiencing (105). In addition, if the RUSF snack proves successful, it may be counterfeited in a way that looks similar but is not as healthy.

Diverting resources from other interventions

A reliance on supplementary foods could divert funding from other potentially effective interventions for undernutrition prevention. It is unclear whether the impact of supplementary foods is sustained, since very few trials have followed up over the long term, and those that have suggest that benefits have not persisted (28, 50, 89, 97, 100-102). Furthermore, the use of supplementary foods does not address other immediate causes of undernutrition such as inadequate breastfeeding and complementary feeding practices, hygiene, and infection, let alone underlying and basic causes (89, 97, 101). There is a need for trials that evaluate the effectiveness and long-term impact of supplementary foods compared to other types of nutrition-specific and nutrition-sensitive interventions (50, 85, 89, 97, 102).

Potential strategies and considerations for undernutrition prevention arising from our trial

This trial suggests that a supplementary food, as a stand-alone nutrition-specific intervention, has a limited impact on undernutrition prevention. A number of possible future directions for reflection and research have arisen from the trial.

Trialling the RUSF in small quantities

The RUSF was given in medium quantities, that is, between 40-110g/day providing 250–500 kcals, or 50–100% of required energy coming from foods other than breast milk. In smaller quantities, the RUSF would be less likely to displace breastmilk and other family foods, or to negatively impact caregiver feeding practices and skills. Given that low consumers of the RUSF had more positive anthropometric outcomes than high consumers, providing the RUSF in small quantities seems a promising strategy.

The RUSF should be trialled in daily doses of approximately 20g, or 110 kcal, which is less than 50% of the energy required from foods other than breast milk per day (29).

Interventions in addition to supplementary foods

The results of this trial highlight the potential role of other factors such as maternal body mass index (BMI) and iron status pre-conception, low birthweight, and diarrhoea, that must also be addressed in programming aimed at prevention of undernutrition. Evidence-based interventions targeting pre-pregnancy, peri-natal and antenatal periods, such as optimising adolescent health and nutrition, including age at first pregnancy; maternal micronutrient and macronutrient supplementation; delayed cord clamping; neonatal vitamin supplementation; kangaroo mother care; early, exclusive, and continued breastfeeding; improved dietary diversity and complementary feeding; as well as diarrhoea prevention and management, are all elements of an integrated strategy for undernutrition prevention (113).

Establishing standards for undernutrition prevention

Building an evidence base for the role of supplementary foods in undernutrition prevention is stymied by a lack of standards, goals, and guidelines on clinical significance. In severe acute malnutrition, recovery is clearly defined (WHZ is ≥ –2, MUAC is ≥ 12.5 cm and there has been no oedema for at least two weeks) (114). No clear standard exists for prevention of undernutrition. This is, in part, due to a lack of agreed terminology (74, 97). Clear conceptualisation of expected outcomes is also lacking – is prevention of undernutrition equivalent to successful treatment of SAM or of MAM? Is it achieving WHZ ≥ –1, which is the upper limit of mild wasting (WHZ ≥ –2 and < -1) and the lower limit of normal (103)? Clearer terminology, standards, goals, and guidelines are required.

Strengths of the research

Strengths of both trials

The acceptability and effectiveness trials had two strengths in common. First, they filled important gaps in the literature related to the use of animal-source foods other than milk in supplementary foods. Second, they provided much-needed evidence on the acceptability and effectiveness of supplementary foods in a geographic and social context other than Africa, specifically, in South-East Asia.

Robust design and methodology of the acceptability trial

The acceptability trial had a robust design and methodology. The large sample size in comparison to other trials and the high rate of retention increased the likelihood of representativeness. The crossover design reduced the risk of confounding, since each caregiver-child dyad served as its own control. The use of ranking forced caregivers to choose between the test foods, thus providing more conclusive results than preference scales, and mitigating against socially acceptable responding.

Robust design and methodology of the effectiveness trial

The effectiveness trial was a cluster randomised controlled trial, which provides the strongest level of evidence for the effectiveness of an intervention. It was one of relatively few undernutrition prevention trials that have compared supplementary interventions to an unsupplemented control group. In addition, a concerted attempt was made to use validated tools and questions, especially from the Cambodian Demographic and Health Survey (DHS).

Contribution to programmatic decision-making

The use of an unsupplemented control enabled the assessment of the outcomes in comparison to doing nothing, rather than in comparison to providing another supplementary food. This challenges the assumption that underlies many prevention studies and programs, namely, that any intervention is better than none. It allows programmers to evaluate the relative benefits of supplementary foods compared to other interventions.

In addition, unlike most prevention studies that have been conducted with MAM children in food insecure settings, this trial provides evidence on a representative population in a food secure setting. This enables better assessment of possible outcomes in that setting, which is extremely useful for programmatic decision-making.

Limitations of the research

Generalisability in both trials

Both trials were conducted in peri-urban Phnom Penh. The results may not be generalisable to rural Cambodian populations or to other South-East Asian populations. With respect to the acceptability trial, this may be less problematic, as food preferences – particularly for rice and freshwater fish – are similar across the country. However, it may be a bigger issue for the effectiveness results, given that rural areas of Cambodia experience higher levels of undernutrition and poorer infant and young child feeding practices. In rural areas, it would be difficult to predict if the interventions would be more or less effective.

Bias in the acceptability trial

Despite attempting to avoid bias toward any of the foods, unintentional interviewer and respondent bias, as well as socially acceptable responding, may have favoured the RUSF in the acceptability trial. Forcing caregivers to rank the foods may have mitigated against this.

Bias in the effectiveness trial

First, self-reporting may have favoured over-reporting of consumption and compliance, which may lead to an underestimation of effectiveness. Second, high and differential loss to follow up may have introduced bias, and potentially reduced the power of the study Multiple channels of contact (directly to the caregiver, through community health volunteers, and through other caregivers) were not able to mitigate loss to follow up in this highly mobile population.

Lessons learned

Amount of data collected

In the acceptability trial, it only became apparent after the data collection that the rankings provided sufficient information, and that collecting information on caregiver preferences in terms of organoleptic qualities (taste, colour, smell, etc.) was unnecessary. This was possibly because the supplementary food had already gone through a number of iterations based on earlier acceptability tests and was in its penultimate form by the time the RUSF acceptability trial was conducted. That said, the data collection on organoleptic qualities was not particularly taxing or time consuming for data collectors or respondents.

In the effectiveness trial, on the other hand, much more data was collected than could be analysed. This placed high demand on respondents, in terms of time. It may also have contributed to respondent and data collector fatigue and habituation, and thus to poorer quality data. Ultimately, it may have contributed to loss to follow up.

Small quantity doses

The results of the iLiNS Project's research on the effectiveness of SQ-LNSs had not yet been published when our effectiveness trial was designed (29, 108, 115-117). In hindsight, given the promising results for low consumers of our RUSF, it would have been useful for our trial to include an arm receiving a small dose of the RUSF.

Conclusion

The acceptability and effectiveness trials demonstrated that a novel, fish-based RUSF was acceptable in Cambodia, and as effective as the gold-standard CSB++. As such, they fill a gap in research on supplementary foods in South-East Asia.

In the effectiveness trial, none of the interventions prevented undernutrition, although they slowed ponderal growth faltering in comparison to the control. However, the clinical significance of this impact was modest. Since there are potential risks to the use of supplementary products, especially in medium quantities, trialling the RUSF in small quantities could be a promising approach.

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Chapter 10: Conclusion and recommendations

In Cambodia, the prevalence of undernutrition remains unacceptably high. It is crucial to implement effective strategies for undernutrition prevention. One possible strategy is provision of specially formulated supplementary foods. This project developed and trialled the acceptability and effectiveness of a locally-produced, ready-to-use supplementary food (RUSF). This chapter summarises the key findings of the trials, and possible future directions based on the findings.

Key findings

The novel RUSF is acceptable

The acceptability trial contributed new data on taste preferences of Cambodian caregivers and children and demonstrated that fish is a promising substitute for milk in a locally-produced RUSF.

The RUSF was not as effective as expected

In the subsequent effectiveness trial, the RUSF provided in medium quantities to a representative, food secure population, was not as effective as expected. None of the interventions prevented undernutrition. The RUSF performed as well as Corn-Soy Blend Plus Plus (CSB++) in slowing ponderal growth faltering, but the magnitude of the effect was small and may not be clinically significant.

Future research

Future research exploring the potential role - if any - of specially formulated supplementary foods in preventing undernutrition in among Cambodian children should consider the following.

Trial provision of small quantities of the RUSF

The evidence base for provision of small quantity lipid-based nutrient supplements (SQ-LNSs) is growing. Given that the RUSF had the most consistently positive effect amongst low consumers, a study on the RUSF used in small quantities is recommended.

Compare specially formulated supplementary foods with "real" food

Future studies in Cambodia should consider comparing supplementation with specially formulated foods to supplementation with common family foods such as eggs, or the widely used Cambodian fish paste, *prahok*. Similarly, in other international studies, specially formulated supplementary foods should be compared with common family foods.

General design features of future studies

Comparability of studies is complicated by different research designs, varying combinations and content of products or interventions, children's baseline nutritional status, and anthropometric outcomes assessed. Future studies should aim to use definitions, outcome measures and statistical approaches which are comparable with existing literature. They should, where possible, include an unsupplemented control group, if that can be done in an ethically sound manner. The nutritional status of the study population should be clearly identified e.g. as moderately acutely malnourished or representative (including moderately acutely malnourished and non-malnourished children) using weight-for-age z-scores (WAZ), height-for-age z-scores (HAZ), weight-for-height z-scores (WHZ) and mid-upper arm circumference (MUAC). Likewise, the setting should be identified as food secure or food insecure using the best available data.

Establish standards, goals, and guidelines for undernutrition prevention

Further progress in undernutrition prevention research and practice urgently requires consensus on terminology, standards, goals, and guidelines on clinically significant outcomes.

Conclusion and contribution to policy, practice, and research

Over the past ten years, interest in the development and testing of locally-produced specially formulated supplementary foods has grown. However, it is important to bear in mind that these products are not a silver bullet. Our locally-produced RUSF slowed but did not prevent undernutrition. The prevention of childhood undernutrition in Cambodia and elsewhere will require a combination of nutrition-specific and nutrition-sensitive interventions that address the immediate, underlying, and basic causes of undernutrition. The findings of the two trials should give pause when planning future research, selecting nutrition interventions, and developing nutrition policies.

Appendix 1: Ethics

Appendix 1.1 The University of Queensland Institutional Human Research Ethics Approval

Appendix 1.2 Cambodian Ministry of Health National Ethics Committee for Health (Acceptability trial approval)

Appendix 1.3 Cambodian Ministry of Health National Ethics Committee for Health (Effectiveness trial approval)

Appendix 1.1 The University of Queensland Institutional Human Research Ethics Approval

THE UNIVERSITY OF QUEENSLAND

Institutional Human Research Ethics Approval

Project Title:	Acceptability and Efficacy of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement (LNS) for Children Under Two Years in Cambodia
Chief Investigator:	Ms Bindi Borg
Supervisor:	Dr Eliana Jimenez Soto, Dr Seema Mihrshahi, Dr Frank Wieringa
Co-Investigator(s):	Dr Eliana Jimenez Soto, Dr Seema Mihrshahi, Dr Frank Wieringa, Dr Mark Griffing
School(s):	School of Population Health
Approval Number:	2014001070
Granting Agency/Degree:	United Nations World Food Program (WFP) Cambodia; IRD Cambodia (Institut de Recherche pour le Développement: UNICEF Cambodia
Duration:	31st January 2016

Comments/Conditions:

UQ approval subject to approval from the NECHR.

Please forward copy of their approval to the UQ Ethics Office before commencement

Note: if this approval is for amendments to an already approved protocol for which a UQ Clinical Trials Protection/Insurance Form was originally submitted, then the researchers must directly notify the UQ Insurance Office of any changes to that Form and Participant Information Sheets & Consent Forms as a result of the amendments, before action.

Name of responsible Committee:
Medical Research Ethics Committee
This project complies with the provisions contained in the *National Statement on Ethical Conduct in Human Research* and complies with the regulations governing experimentation on humans.

Name of Ethics Committee representative:
Professor Bill Vicenzino
Chairperson
Medical Research Ethics Committee

Signature _____ Date 10 OCT 2014

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CLINICAL TRIALS PROTECTION

Is your trial a Clinical Trial?

Please **tick** the applicable box/s for each question. The Definition of a Clinical Trial for the purposes of the Clinical Trial Protection is:

A study or research involving humans:

- ✓ to test a drug, or a surgical, therapeutic, preventative or diagnostic procedure or device where the nature of the study or research is such that it requires the investigator or an assistant to be a registered medical practitioner or other registered qualified health service provider; or
- ☐ requiring any invasive procedure (see below definition) to be undertaken by a registered medical practitioner or other registered qualified health service provider.
- ☐ Not applicable

An invasive procedure means (for the purpose of this definition) any procedure involving:

- ☐ penetration of the skin (other than taking of blood samples);
- ☐ biopsy or any taking of or extraction of tissue samples; or
- ☐ penetration of the bodily orifices (other than ears or mouth) or insertion of diagnostic or other device within the bodily orifices (other than ears or mouth).
- ✓ Not applicable

However, research or study involving humans where the research or study:

- ☐ involves evaluating outcomes of established health care management or treatment relating to the condition or illness from which the participants are suffering; or
- ☐ only involves the participants completing questionnaires or interviews.

will **not** be deemed to be a **clinical trial** for protection purposes.

Clinical Trials Required Information

If your trial is a **clinical trial** then please complete the required details on **Page 2** and include this form with your Ethics Office submission.

Does your Clinical Trial need to be Specifically Declared?

18. Will your trial:

a. Involve research subjects who are either pregnant or breastfeeding (this extends to the unborn fetus of a pregnant research subject and the breastfed infant or baby of a research subject)? **Yes** ✓ No ☐

b. Be undertaken in the USA or Canada? Yes ☐ No ✓

If you ticked yes to a. and/or b., your Clinical Trial will need to be specifically declared to the University's Clinical Trials Protection Provider before protection can be provided.

If you ticked no to a. and b., your Clinical Trial will be automatically included under the University's Clinical Trials Protection, upon Ethics Office approval.

Amendments

Any amendments that change the answers provided on this form must be emailed to insurance@uq.edu.au

ETHICS OFFICE INSTRUCTIONS ONLY

If Question 18 a and/or b has been ticked yes, then please scan and send **this form and a copy of the Patient Information Sheet and Patient Consent Form** to insurance@uq.edu.au

If Question 18 a. and b. are both ticked 'no' then please scan and send **this form only** to insurance@uq.edu.au

Clinical Trials Required Information

Ethics Approval Number:		
1.	**Ethics Approval** Which institution that granted ethics approval?	University of Queensland National Ethics Committee for Health Research (NECHR) in Cambodia
2.	**Principal Investigator** What is the name of the Principal Investigator and their position?	Bindi Borg, PhD student
3.	**School / Department** Who is the School /Department conducting the trial	School of Population Health
4.	**Clinical Trial Title & Description** Provide the trial name and a brief description.	Acceptability and Efficacy of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement for Children Under Two Years in Cambodia The World Food Program (WFP) and IRD (Institut de Recherche pour le Développement, Institute for Development Research) in Cambodia are creating a multiple micronutrient-fortified lipid-based nutrient supplement (LNS) that can be used for children 6-23 months. The proposed research will assess the acceptability and efficacy of the LNS on the nutritional status of 6-17 month-old children who are using the product.
5.	**Sponsor** (if applicable) What is the name of sponsor, their insurer and policy limits?	WFP, IRD and UNICEF in Cambodia.
6.	**Indemnity** Is an indemnity provided by the sponsor?	Because this LNS is a humanitarian and not a commercial product, indemnity is not applicable.
7.	**Granting Body** (if applicable) Who is the granting body for the non-sponsored trial?	WFP, UNICEF and IRD
8.	**Target Participant Numbers** What is the number of participants anticipated to be involved in the trial during the next 12 months?	522 total (100 for acceptability trial and 422 for efficacy trial)
9.	**Target Participants for Whole Trial Period** What is the number of participants anticipated being involved in the whole trial?	522 total (100 for acceptability trial and 422 for efficacy trial)
10.	**Number of Sites** What is the total number of sites?	One only - Prey Veng province of Cambodia
11.	**Invasive Nature of Trial** Provide details of any invasive procedures to be used during the trial.	Venous blood sampling only

12.	**Start Date** What is the start date of the trial?	August 2014
13.	**End Date** What is the expected end date of the trial?	December 2015
14.	**Name of Drug**	N/A
15.	**Dosage of Drug**	N/A
16.	**Trial - Full Description** (including references to risk events)	A significant proportion of global morbidity and mortality is linked to maternal and child undernutrition. WFP and IRD in Cambodia have created a multiple micronutrient-fortified lipid-based nutrient supplement (LNS) that can be used for children 6-23 months. This study is in two parts: 1. A trial to determine the acceptability of the LNS to women and children aged 12-17 months 2. A trial to determine the efficacy of the LNS for children aged 6-17 months in terms of growth and micronutrient status The LNS will be assessed for acceptability and efficacy in comparison to 3 other foods: another supplementary food (corn-soy blend ++, CSB++), a supplement (Sprinkles multiple micronutrient powder) added to rice porridge, and to plain rice porridge (*borbor*), which is the usual complementary feeding for children. Part 1 will assess whether women and their 12-17 month-old children like the food. Mothers and children will be invited to compare the LNS to the 3 other foods over a 13 day period. Acceptability will be assessed in terms of the amount of food the children consume. In addition, mothers will be asked to assess how they think their children liked the food, and to assess and rank the food themselves on taste, colour, smell, and consistency. Part 2 will assess the impact of the LNS on the nutritional status of lactating women and 6-17 month-old children who eat the LNS over a nine month period, in comparison to groups eating one of the other 3 foods. **A. Acceptability trial** *Study design* The acceptability study is a randomised crossover design in which mothers/carers (hereafter called "mothers") and their children will receive the four foods - LNS, CSB++, Sprinkles in *borbor*, and plain *borbor*. The study will take place in two parts over two weeks:

1. Substudy 1: Acceptability by children (12 days)
2. Substudy 2: Acceptability by mothers (1 day)

Study site
The trial will be conducted in Prey Veng province, at four test-feeding sites such as pagodas.

Participants and recruitment
Participants will be mothers and their 12-17 month children recruited by VHSG members in target villages. For more details, see sections 1 and 3a.

Sample size
The main outcome of interest is how much the children consume. We defined acceptability as mean consumption of at least 50% of the food offered, and high acceptability as consumption of 75% or more, assumed a SD of 30%, and aim to detect a difference in consumption of 20% (1, 2). To ensure a precision of 0.05, power of 0.8, and $p<0.05$, the required sample size is 20 children. Assuming 20% attrition, we need to enrol 24 children and mothers. This sample size is that same a as a similar acceptability study (2). However, taking into account the uncertainty around parameters such as SD and in order to be able to perform regression tests to control for confounding variables, we will aim at recruiting at least 100 participants. This is considered a typical sample size for a hedonic test (3) and is larger than most of the samples for similar studies (1, 2, 4-6). Attrition rates in those studies have been less than 10%, therefore, our sample size of 100 is more than adequate.

Methodology
On the first day, potential participants will be assessed for their eligibility at the test-feeding site, through the collection of baseline data. This will include demographics, morbidity, anthropometry (weight, height, mid-upper arm circumference), and dietary data including breastfeeding and complementary feeding status. Anthropometric measures will be taken, including weight to the nearest 0.01kg using SECA-UNICEF scales (UNISCALES); recumbent length to the nearest 0.1cm using WFP height boards; and mid-upper arm circumference (MUAC) with a flexible insertion tape to the nearest 1mm. Morbidity data pertaining to the previous two weeks will also be collected and children will also be tested for oedema.

Each mother and child will be asked to come to the test-feeding site for 12 days. Standard procedures will be used to randomly assign each test-feeding site to begin on a food. A woman from each of the four sites will be hired and trained to prepare the food, following food safety standards. Children in each group will taste each food in a different sequence, for three days each. On the 12 tasting days, mothers will be asked to feed their child and to assess how she thinks her child liked the food, using a

		five-point scale. The amount of food consumed will be recorded. On the 12th day, mothers will be asked to rank the four foods according to which she thinks her child liked best to least. Mothers will be asked to come to the study site on a 13th day. The foods will be presented to the mothers to rate them with respect to colour, consistency, smell, and taste using a five-point scale, then to rank them. Finally, a smaller number of mothers will be asked to stay for a focus group discussion related to infant feeding practices and reasons for preference ranking. *Data Analysis Plan* All data will be double-entered in Excel and will be analysed in the statistical software STATA version 13.1. The principal investigator will create a codebook, and project staff will enter data. Inclusion and exclusion criteria will be defines to exclude out-of-range or missing values. In determining appropriate statistical measures, it is important to recognise that where repeated measures are being taken, the assumption of independence is not satisfied, and all statistical tests will be for dependent samples. For all tests, significance levels will be considered $p<0.05$. The main outcome of interest is how much the children consume. The independent variable is the food and the dependent variable is consumption. Thus, multiple means of consumption will be compared. In the absence of clear guidelines on acceptability for supplementary food, we define acceptability as mean consumption of at least 50% (or 50g) of the food offered in approximately 15 minutes, and consumption of 75% (or 75g) or more as high acceptability. The consumption data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in consumption of the different foods. The secondary outcome is mothers' assessment of their child's preference for the food. The independent variable is the food and the dependent variable will be the mean of preference ratings on the five-point hedonic scale. The preference data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in preferences for the different foods. The maternal preference or sensory test will be analysed in the same way. A third outcome is mothers' ranked preference for the food. The independent variable is the food and the dependent variable will be the mean of the rankings of the foods. The ranking data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in the ranking of the different foods.

Enrolment data describing the characteristics of the recruited children (e.g. sex, age, nutritional status, morbidity, breastfeeding status) and mothers (e.g. age, morbidity, breastfeeding status) will be reported as means ± SD for continuous measures. Anthropometric indices will be calculated using WHO 2006 standards (ANTHRO version 3.2.2 January 2011) and expressed as z-scores for weight-for-height (WHZ) and length/height-for-age (L/HAZ).

Study Timeline
The acceptability trial data collection formats and questionnaires will be done in August 2014. Data collector training and logistics will happen in September. Recruitment, enrolment and data collection will happen in October, with data entry and transcription finalised from November to January. A report and a publication will be written in early 2015.

B. Efficacy trial

Study design
The trial is a prospective, cluster randomised, non-blinded controlled trial among infants 6-17 months of age. The trial aims to establish the superiority of the novel LNS, using CSB++ and Sprinkles as active comparators and the unimproved diet as a control. The allocation ratio is 1:1. The study will take place over nine months.

Study Site
The study will be conducted in at least twelve communes in Prey Veng province. This province has been selected has been selected for the reasons mentioned in Section 1:

Participants and recruitment
Participants are infants aged 6-8 months. Village Health Support Group members in target villages will assist the project staff to enrol mothers and babies. For more details, see section 1 and section 3a.

Sample size
The main outcome of interest is nutritional status (WHZ and L/HAZ), calculated through changes in weight, length/height over time for the new LNS in comparison to the CSB++, Sprinkles and the control after nine months of the interventions. The required sample size to allow detection of difference in mean z-scores of 0.1 between groups (95%CI), assuming SD = 1.0, with a precision of 0.05, power of 0.8, and $p<0.05$ is 384 subjects. Assuming an attrition of 10%, the number of subjects enrolled will be 422, or approximately 106 children in each group.

This is in keeping with similar efficacy studies which have aimed to detect a difference in mean z-scores of 0.16 between groups, assuming SD=0.08 (7),

		or a difference in mean z-scores of 0.1 and SD=0.08 (1). Therefore, detection of difference in mean z-scores of 0.1 between groups is reasonable. If we assume, as these studies have, that SD=0.08, then our sample size would be 246 subjects, or 270 subjects assuming an attrition of 10%. Thus, our sample size of 422 is adequate. *Methodology* Potential participants will be assessed for their eligibility through the collection of baseline data, including demographics, morbidity, anthropometry (weight, height, mid-upper arm circumference, skinfolds). If participants are eligible (i.e. not ill or severely malnourished), then data collection will proceed to collection of biochemical samples (blood), and dietary data (breastfeeding, food frequency and dietary diversity). At that point, participants with severe anaemia may still be excluded. If participants are eligible and enrolled, they will be provided with a one month supply of the food to which their commune has been allocated. Staff will give mothers will be given clear instructions on how to prepare the food, how often it should be consumed, and who should consume it (i.e. subjects). Instructions will include information on food safety and what to do if they or their child becomes sick or malnourished. In addition, staff will explain how often they will visit subjects at their home (monthly), what data will be collected at that time, and what participants should do if they have any questions or wish to withdraw. Participants will be provided with food on a monthly basis, which they will continue to consume over a nine-month period. Staff will visit mothers every month to bring more food and to collect data on consumption, sharing, and adherence. They will monitor adherence by checking how much food remains uneaten, or how long ago the monthly food supply was finished (which may indicate intra-household sharing). They will remind the participants of the instructions on hygienic food preparation, child feeding, and what to do if the child becomes sick or malnourished. *Data analysis plan* All data will be double-entered in Excel and will be analysed in the statistical software STATA version 13.1. The principal investigator will create a codebook, and project staff will enter data. Inclusion and exclusion criteria will be defined to exclude out-of-range or missing values. In determining appropriate statistical measures, it is important to recognise that where repeated measures are being taken, the assumption of independence is not satisfied, and statistical tests will be for dependent samples. For all tests, significance levels will be considered $p<0.05$. The main outcome of interest is change in nutritional status. The

		independent variables are the food, sex and age, and the dependent variables are the mean weight-for-height (WHZ) and length/height-for-age (L/HAZ). Anthropometric indices for children will be calculated using WHO 2006 standards (ANTHRO version 3.2.2 January 2011) and expressed as z-scores for weight-for-height (WHZ) and height-for-age (HAZ). Thus, multiple means will be compared, and changes will be analysed using a mixed effects model to determine whether there are statistically significant changes in WHZ and L/HAZ of participants consuming the different foods. This would allow us to undertake the analysis on the full sample (i.e. including subjects with some random missing measurements) as well as control for random and fixed effects, as required. A second outcome is body composition measured by skinfold thickness. The independent variable is the food and the dependent variable will be the mean of skinfold thickness. The data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in body composition of participants eating the different foods. The third outcome is change in iron status. The independent variable is the food and the dependent variable will be the mean biochemical markers. The data will be analysed using a mixed effects model to determine whether there is a statistically significant difference in iron status for participants consuming the different foods. Enrolment data describing the characteristics of the recruited participants (e.g. sex, age, nutritional and biochemical status, morbidity, breastfeeding status) will be reported as means ± SD for continuous measures. *Study timeline* The efficacy trial will take 18 months from August 2014. Subjects will be enrolled in October 2014, and baseline data collection will begin in November 2014. Endline data will be collected in July 2015, with data analysis and reporting completed by December 2015. *Data collection* For both trials, data collection forms and questionnaires will be designed in English, translated into Khmer, and back translated into English. They will be piloted during data collector training. Data collectors will be trained to administer the questionnaires and take anthropometric measures. A standardisation test will be used to check the precision and accuracy of data collectors' measurements, and to assign roles (supervisor, measurer, recorder) in the data collection team. Data collectors will also be trained in confidentiality, appropriate procedures, and communication with participants and others. They will also be trained to refer participants who are ill or suffering from severe acute malnutrition.

Risks

Participation in this study entails minor risks.

For participants

There is no risk to the participants from the intervention (foods), as participants with known allergies will be excluded. Any ill or malnourished participants will be excluded from the trial and referred for treatment. Any participants who dislike the foods or feel that the foods disagree with them will have the option of withdrawing from the trial.

In the preparation of test foods for the acceptability trial, optimal food hygiene will be maintained. Home fortification of food is subject to the food hygiene practiced in the home. As such, the participants will not be exposed to greater than normal risk. However, in explaining the preparation and use of the foods, participants will be reminded of the principles of food hygiene.

Venous blood samples will be collected by trained nurses, but may cause minor, temporary discomfort and bruising.

For all (including data collectors and staff)

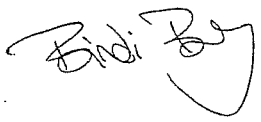
There is a normal transport-related risk to reach the trial sites for participants and staff. Transport will be compensated if necessary for participants, and they will be encouraged to travel safely. Staff will be using their usual form of transport in the course of their employment for the partner NGO, and will be encouraged to travel safely, following NGO policy and Cambodian law (e.g. helmets on motorbikes).

These risks will be outlined in the information and consent forms. Village health volunteers who assist the project staff to recruit participants will provide mothers with written and verbal information about the trial in Khmer. This information will include an explanation of aims of the study, methodology, foods, timeframe, relevant data and sample collection. At the point of enrolment, eligible participants will be reminded verbally and in writing of what participation entails. It the participant is willing to continue, they will be asked to provide their verbal and signed (or fingerprinted) consent for them and their babies to participate. It will also be made clear in all the written and verbal information provided, that potential participants have the option of not participating, and that they can withdraw at any time. It will be made clear that this will not jeopardise their relationship with the Village Health Support Group members or health clinic staff.

It will also be made clear in all the written and verbal information provided that participation and all data collected are confidential.

17.	Comments	

I declare this document is true and correct to the best of my knowledge:



Signature - Chief Investigator

6 August 2014
Date

Acceptability trial - participant information and consent sheet

This participant information and consent form is for the caregivers of children aged 12-17 months who have been invited to participate in an acceptability trial of a locally produced ready-to-use-supplementary food.

Acceptability of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement for Women and Children Under Two Years in Cambodia

---

Hello, my name is _____ and I work with the Department of Fisheries Post-Harvest Technologies and Quality control, Fisheries administration of the Ministry of Agriculture, Forestry and Fisheries.

Today, we are doing a study for the United Nations World Food Program (WFP) and UNICEF. These agencies distribute supplementary food to children and mothers to prevent and treat moderate malnutrition. WFP and UNICEF want to improve their products, so they are interested in knowing which food Cambodians like best. WFP and UNICEF want to test three foods that contain multiple micronutrients which help maintain good health and growth. They would like to compare these foods to *borbor*. Through your participation, you and your child will be helping us to make better and cheaper supplementary food that can help Cambodian mothers and children to be better nourished and healthier. The study is being conducted by Ms Bindi Borg from the University of Queensland and Dr Frank Wieringa from IRD.

We will serve four different foods on this site for the next 12 days. We ask you to come here and feed your child with each food for three days each, before passing onto the next food. We will measure how much your child ate of each food and how they liked each food. After the 12 days, we ask you to come to this site and then we will ask you about your opinion of the four different foods. If it is possible we will like you to come alone.

We will collect information about your child's and your health, height, weight and diet. All information collected will be kept private and confidential. You and your child will not be identifiable. We will return to this testing site to share the results with you when they are available. The results of the study will be published and shared with others who want to help mothers and children to be better nourished and healthier.

There are no risks to this study. It is very unlikely that there would be any side-effects such as vomiting or diarrhoea. Your participation is entirely your choice. Whether you choose to participate or not, it will not affect other services you and your family receive from the health centre, village health support group, or other government authorities. Although we hope you will continue with the study for the 13 days, you can stop participating at any time during the study. We realize that your time is valuable, so you will receive a XXX for your participation. If you have to pay to travel to this site, the cost will be reimbursed.

This study has been approved in ethical reviews by The University of Queensland in Australia and the National Ethics Committee for Health Research of the Cambodian Ministry of Health. If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: XXXXXXX

Do you understand what I have told you? Do you have any questions? Would you like to participate in the study? If you agree for you and your child to participate in the study, please sign or fingerprint in the box below.

Name of the caregiver:

Signature or thumbprint of the caregiver:

Date:

I have read the consent form in its entirety to the caregiver of the child.

Name of data collector: _____

Signature of data collector: _____

Date (day/month/year): _____

Leave a copy of the consent form with the caregiver. Circle the telephone number on the page to ensure that they understand they can call for more information.

Efficacy trial - participant information and consent sheet, control group

This participant information and consent form is for the caregivers of children aged 6-7 months who have been invited to participate in an efficacy trial of a locally produced ready-to-use-supplementary food.

Efficacy of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement for Children Under Two Years in Cambodia

---

Hello, my name is _____ and I work with the Department of Fisheries Post-Harvest Technologies and Quality control, Fisheries administration of the Ministry of Agriculture, Forestry and Fisheries.

Today, we are doing a study for the United Nations World Food Program (WFP) and UNICEF. These agencies distribute supplementary food to children and mothers to prevent and treat moderate malnutrition. WFP and UNICEF want to improve their products, so they are interested in knowing which food is best at promoting good health and growth. Therefore, we are conducting a study in Prey Veng. The study will be conducted by Ms Bindi Borg from the University of Queensland and Dr Frank Wieringa from IRD.

WFP and UNICEF want to test foods that help maintain good health and growth. They would like to compare these foods to a regular diet over the next nine months. We would ask that your child eats its regular diet, such as *borbor* and family foods. We will gather information at the beginning, end and during the study. We collect information about your child's and your health, height, weight and diet. At the beginning of the study and at the end of the study (nine months later), we will take your child's blood with a needle , so that we can know the levels of vitamins and minerals (such as iron, vitamin A, and zinc) in his/her body. Through your participation, you and your child will be helping us to make better and cheaper supplementary food that can help Cambodian children to be better nourished and healthier.

There are no risks to this study, although taking blood may be a little painful temporarily and may cause some bruising.

All information collected will be kept private and confidential. You and your child will not be identifiable. We will return to this testing site to share the results with you when they are available. The results of the study will be published and shared with others who want to help children to be better nourished and healthier.

Your participation is entirely your choice. Whether you choose to participate or not, it will not affect other services you and your family receive from the health centre, village health support group, or other government authorities. Although we hope you will continue with the study for the full nine months, you can stop participating at any time during the study. We realize that your participation is valuable, so you will receive a XXX for your participation at the end of nine months.

This study has been approved in ethical reviews by The University of Queensland in Australia and the National Ethics Committee for Health Research of the Cambodian Ministry of Health. If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: XXXXXXX

Do you understand what I have told you? Do you have any questions? Would you like to participate in the study? If you agree for your child to participate in the study, please sign or fingerprint in the box below.

Name of the caregiver:

Signature or thumbprint of the caregiver:

Date:

I have read the consent form in its entirety to the caregiver of the child.

Name of data collector: _____

Signature of data collector: _____

Date (day/month/year): _____

Leave a copy of the consent form with the caregiver. Circle the telephone number on the page to ensure that they understand they can call for more information.

Efficacy trial - participant information and consent sheet, intervention groups

This participant information and consent form is for the caregivers of children aged 6-7 months who have been invited to participate in an efficacy trial of a locally produced ready-to-use-supplementary food.

Efficacy of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement for Children Under Two Years in Cambodia

---

Hello, my name is _____ and I work with the Department of Fisheries Post-Harvest Technologies and Quality control, Fisheries administration of the Ministry of Agriculture, Forestry and Fisheries.

Today, we are doing a study for the United Nations World Food Program (WFP) and UNICEF. These agencies distribute supplementary food to children and mothers to prevent and treat moderate malnutrition. WFP and UNICEF want to improve their products, so they are interested in knowing which food is best at promoting good health and growth. Therefore, we are conducting a study in Prey Veng. The study will be conducted by Ms Bindi Borg from the University of Queensland and Dr Frank Wieringa from IRD.

WFP and UNICEF want to test foods that help maintain good health and growth. They would like to compare these foods to a regular diet over the next nine months. We will provide food for your child for the next nine months. We would ask that you and your child eat that food at least X times every day in addition to his/her regular diet. We will gather information at the beginning, end and during the study. We collect information about your child's and your health, height, weight and diet. At the beginning of the study and at the end of the study (nine months later), we will take your child's blood with a needle , so that we can know the levels of vitamins and minerals (such as iron, vitamin A, and zinc) in his/her body. Through your participation, you and your child will be helping us to make better and cheaper supplementary food that can help Cambodian children to be better nourished and healthier.

There are no risks to this study, although taking blood may be a little painful temporarily and may cause some bruising. It is very unlikely that there would be any side-effects such as vomiting or diarrhoea.

All information collected will be kept private and confidential. You and your child will not be identifiable. We will return to this testing site to share the results with you when they are available. The results of the study will be published and shared with others who want to help children to be better nourished and healthier.

Your participation is entirely your choice. Whether you choose to participate or not, it will not affect other services you and your family receive from the health centre, village health support group, or other government authorities. Although we hope you will continue with the study for the full nine months, you can stop participating at any time during the study.

This study has been approved in ethical reviews by The University of Queensland in Australia and the National Ethics Committee for Health Research of the Cambodian Ministry of Health. If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: XXXXXXX

Do you understand what I have told you? Do you have any questions? Would you like to participate in the study? If you agree for your child to participate in the study, please sign or fingerprint in the box below.

Name of the caregiver:

Signature or thumbprint of the caregiver:

Date:

I have read the consent form in its entirety to the caregiver of the child.

Name of data collector: _____

Signature of data collector: _____

Date (day/month/year): _____

Leave a copy of the consent form with the caregiver. Circle the telephone number on the page to ensure that they understand they can call for more information.

Timeline of acceptability study (August 2014 – March 2015)

	Activity	August				September				October				November				December				January				February				March			
	Weeks	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Submit ethics applications (UQ Aug, NECHR Oct)		X							X																							
2	Finalise protocols and data collection tools				X	X	X	X	X	X	X																						
3	Field preparation and logistics									X	X	X	X	X																			
4	Training staff, piloting tools/procedures/data analysis												X	X																			
5	Recruitment of participants ₸														X																		
6	Enrolment of participants ₸															X																	
7	Data collection ₸							*									X	X															
8	Data entry, cleaning and transcription																X	X	X	X													
9	Data analysis													*				X	X	X	*	*	X	X	X								
10	Reporting																									X	X	X	X				
11	Preparation of publication																													X	X	X	X

Timeline of efficacy study (July 2014 – March 2016)

	Activity Months	Jul 14	Aug 14	Sep 14	Oct 14	Nov 14	Dec 14	Jan 15	Feb 15	Mar 15	Apr 15	May 14	Jun 15	Jul 15	Aug 15	Sep 15	Oct 15	Nov 15	Dec 15	Jan 16	Feb 16	Mar-Jul 16
1	Finalise protocols	X																				
2	Submit ethics applications		X																			
3	Finalise data collection tools			X	X	X	X															
4	Field preparation, logistics				X	X	X															
5	Training staff, piloting tools							X														
6	Recruitment of participants ₸						*	X	X													
7	Enrolment of participants ₸								X	X												
8	Data collection ₸								X	X	X	X	X	X	X	X	X					
9	Data entry, cleaning									X	X	X	X	X	X	X	X	X				
10	Data analysis										X	X	X	X	X	X	X	X	X	X	X	X
11	Reporting																X	X	X	X	X	
12	Preparation of dissertation/publication													X	X	X	X	X	X	X	X	X

* Holidays (September W3 – Pchum Ben, November W1 – Water Festival, December-January - Christmas/New Year)

₸ Recruitment and enrolment of participants and data collection will begin only after ethics approval has been granted.

Appendix 1.2 Cambodian Ministry of Health National Ethics Committee for Health (Acceptability trial approval)

ព្រះរាជាណាចក្រកម្ពុជា
KINGDOM OF CAMBODIA
ជាតិ សាសនា ព្រះមហាក្សត្រ
NATION RELIGION KING

ក្រសួងសុខាភិបាល
MINISTRY OF HEALTH
គណៈកម្មាធិការជាតិក្រមសីលធម៌
សំរាប់ការស្រាវជ្រាវសុខភាពដែលទាក់ទងនឹងមនុស្ស
National Ethics Committee for Health Research

លេខ...083.NECHR

រាជធានីភ្នំពេញ, ថ្ងៃទី.03...ខែ.../1.....ឆ្នាំ2014..

Dr. Chhoun Chamnan

Project: Acceptability of a Locally-Produced Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement (LNS) Pregnant and Lactating Women and Children Under Two Years in Cambodia. Version N° 5, dated 17th October, 2014 .

Reference: 31st October, 2014 NECHR meeting minute

Dear Dr. Chhoun Chamnan,

I am pleased to inform you that your study protocol entitled "Acceptability of a Locally-Produced Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement (LNS) Pregnant and Lactating Women and Children Under Two Years in Cambodia. Version N° 5, dated 17th October, 2014" has been approved by National Ethic Committee for Health Research (NECHR) in the meeting on 31st October, 2014. This approval is valid for twelve months after the approval date.

The Principal Investigator of the project shall submit following document to the committee's secretariat at the National Institute of Public Health at #2 Kim Il Sung Blvd, Khan Tuol Kork, Phnom Penh. (Tel: 855-23-880345, Fax: 855-23-881949):

- Annual progress report
- Final scientific report
- Patient/participant feedback (if any)
- Analyzing serious adverse events report (if applicable)

The Principal Investigator should be aware that there might be site monitoring visits at any time from NECHR team during the project implementation and should provide full cooperation to the team.

Regards,

Chairman

Prof. ENG HUOT

Appendix 1.3: Cambodian Ministry of Health National Ethics Committee for Health (Effectiveness trial approval)

ក្រសួងសុខាភិបាល
MINISTRY OF HEALTH
គណៈកម្មាធិការជាតិក្រមសីលធម៌
សំរាប់ការស្រាវជ្រាវសុខភាពដែលទាក់ទងនឹងមនុស្ស
National Ethics Committee for Health Research

ព្រះរាជាណាចក្រកម្ពុជា
KINGDOM OF CAMBODIA
ជាតិ សាសនា ព្រះមហាក្សត្រ
NATION RELIGION KING

លេខ....*4.02.NECHR*

រាជធានីភ្នំពេញ, ថ្ងៃទី*06*.....ខែ..*11*.....ឆ្នាំ*2015*...

Dr.Chhoun Chamnan

Project: Efficacy of a locally-Produced Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement (LNS) in Preventing Growth Faltering and Improving Micronutrient Status for Children Aged 6-24 months in Cambodia. Version N° 1, dated 7th October, 2015

Reference: 06th November, 2015 NECHR meeting minute

Dear Dr.Chhoun Chamnan,

I am pleased to notify you that your study of the protocol entitled "Efficacy of a locally-Produced Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement (LNS) in Preventing Growth Faltering and Improving Micronutrient Status for Children Aged 6-24 months in Cambodia. Version N° 1, dated 7th October, 2015" has been approved by National Ethic Committee for Health Research (NECHR) in the meeting on 06th November, 2015. This approval is valid for twelve months after the approval date.

The Principal Investigator of the project shall submit following document to the committee's secretariat at the National Institute of Public Health Lot #80, Samdach Penn Nouth Blvd (289) Sangkat Boeunkok2, Khan Tuolkok,, Phnom Penh. (Tel: 855-23-880345, Fax: 855-23-881949):

- Annual progress report
- Final scientific report
- Patient/participant feedback (if any)
- Analyzing serious adverse events report (if applicable)

The Principal Investigator should be aware that there might be site monitoring visits at any time from NECHR team during the project implementation and should provide full cooperation to the team.

Regards,

Chairman

Prof. ENG HUOT

Appendix 2.1: Definitions of malnutrition

Malnutrition is a broad term that refers both to undernutrition (in energy, protein, or micronutrients) and overnutrition, that is, an excess of energy with or without micronutrient deficiency (1).

This dissertation deals with anthropometric indices of growth and nutrition, based on the 2006 WHO growth standards (2) that use weight and height measurements combined with sex and age to develop z-score curves. These anthropometric indices– weight-for-age (WAZ), length or height-for-age (LAZ/HAZ), weight-for-height (WHZ), and mid-upper arm circumference (MUAC) - are the most widely used and reported measures of growth and nutritional status in children aged six to twenty-three months. The standards use the terms moderate and extreme to refer to z-scores that are, respectively, more than 2 or 3 z-scores below the median on the relevant anthropometric scale (2).

Stunted children experience linear growth faltering. In other words, they are short for their age. *Moderate stunting* is a HAZ > -3 and < -2 and *severe stunting* is a HAZ <-3. Stunting is often considered an indicator of chronic or long-term undernutrition. *Wasted* children have ponderal growth faltering; they are thin. Wasting may occur suddenly, as a result of illness or food shortage, which may be seasonal. *Moderate wasting* is WHZ > -3 and <-2 and *severe wasting* is <-3, respectively. *Underweight* children, who have a low WAZ, may be wasted, stunted, or both. Underweight is relatively easy to measure and is a simple and useful indicator for detecting growth faltering, whether linear or ponderal.

In the past decade, MUAC has also grown in prominence as a reliable indicator for undernutrition (3). MUAC measurement requires only simple, inexpensive equipment (a flexible measuring tape, ideally colour-coded), is relatively easy to measure, does not require any calculation, and may be used by illiterate and/or innumerate measurers (4). MUAC has been shown to predict mortality better than WHZ (5). A range of 11.5-12.5cm is considered a *moderately low MUAC* <11.5cm is a *severely low MUAC* (6).

Moderate acute malnutrition is WHZ > -3 and <-2 and/or MUAC of 11.5-12.5cm, and *severe acute malnutrition* is WHZ <-3 and/or MUAC of <11.5-cm.

Overweight children have a WHZ > 2 and < 3 z-scores above the median, and *obese* children have a z-score > 3. There are no validated MUAC cut-offs to indicate overweight or obesity (7). It is important to note that children can be both stunted and overweight, which may indicate micronutrient deficiency (8).

References

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3. WHO Multicentre Growth Reference Study Group. WHO Child Growth Standards: Head circumference-for-age, arm circumference-for-age, triceps skinfold-for-age and subscapular skinfold-for-age: Methods and development. . Geneva: World Health Organization; 2007.
4. Blackwell N, Myatt M, Allafort-Duverger T, Balogoun A, Ibrahim A, Briend A. Mothers Understand And Can do it (MUAC): a comparison of mothers and community health workers determining mid-upper arm circumference in 103 children aged from 6 months to 5 years. Arch Public Health 2015;73(1):26.
5. Khara T, Dolan, C. Technical Briefing Paper: associations between wasting and stunting, policy, programming and research implications. Emergency Nutrition Network (ENN) 2014.
6. WHO/UNICEF. WHO child growth standards and the identification of severe acute malnutrition in infants and children. A Joint Statement. Geneva: World Health Organization; 2009.
7. WHO. Guideline: assessing and managing children at primary health-care facilities to prevent overweight and obesity in the context of the double burden of malnutrition. Updates for the Integrated Management of Childhood Illness (IMCI). Geneva: World Health Organization; 2017.
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Appendix 3.1: Energy and nutrient profile of novel RUSF

Recommended daily serving size	40-110g depending on age of child	
Ingredients (g/100g)	Rice	13.2
	Soy and mungbeans	21.8
	Fish	5.9
	Sugar	26.8
	Oil/shortening	18.1
	Micronutrient mix	0.9
	Coconut	8.7
	Rice bran	2.2
	Egg	2.5
	Flavouring	0.1
Nutrients (g/100g)		
Energy (kcal/100g)	484	
Protein (g/100g)	13.1	
Carbohydrates (g/100g)	51.6	
Lipids (g/100g)	24.4	
Fibre (g/100g)	1.6	
Added multiple micronutrients per 100g		
Vitamin A	1,080 µg	
Vitamin D	58.4 µg	
Vitamin B1 (thiamine)	0.28 mg	
Vitamin B2 (riboflavin)	0.78 mg	
Vitamin B6	0.65 mg	
Phosphorus	246 mg	
Calcium	302 mg	
Pantothenic acid	0.75 mg	
Copper	0.75 mg	
Vitamin E	10.7 mg	
Folic acid	94.2 µg	
Iron	6.0 mg	
Magnesium	48.4 mg	
Vitamin B3 (niacin)	7.3 mg	
Vitamin C	52.8 mg	
Zinc	7.5 mg	
Potassium	194.8 mg	
Vitamin B12	10.7 µg	
Biotin	105.6 µg	
Selenium	89 µg	

Data sources: 2007 Vietnamese food composition tables, micronutrient manufacturer

Appendix 4.1-4.5: Acceptability trial data collection forms

The acceptability data collection forms in Appendices 4.1-4.5 are in English and Khmer languages. The Khmer translations were originally typed using various Khmer fonts. Some of the fonts are no longer available, nor are they compatible with newer fonts. The text in the obsolete fonts appears in Latin fonts, usually as phonetic renderings of the Khmer, while the text in the current fonts appears correctly in Khmer script. This has resulted in less attractive layout than in the original data collection forms. The English is all original and correct.

Appendix 4.1 Forms 1 & 2: Recruitment and exclusion; participant information and consent

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): [ ]

kumar (Child´s ID, CHID): [ ][ ][ ] (Form ID, FORMID) [0][1]

ទម្រង់ទី១៖ ការសិក្សាសាកល្បង -- ទម្រង់សម្រាប់ពិនិត្យសមត្ថភាពចូលរួម និងសំណួរសម្រាប់មិនទទួលយកការសិក្សា

Form 1: Acceptability Trial – recruitment form and exclusion questions

eQµaHkumar Name of child	
eQµaHmþaykumar Name of the caregiver	
PUmi Village	
សង្កាត់ Sangkat	
កាលបរិច្ឆេទ Date	[ ][ ] [0][6] [2][0][1][5] ថ្ងៃ Day ខែ Month ឆ្នាំ Year

ប្រាប់ទៅអណាព្យាបាល៖

Tell caregivers:

ជំរាបសួរ ខ្ញុំបាទ/នាងខ្ញុំឈ្មោះ_____ យើងខ្ញុំកំពុងធ្វើការជាមួយនឹងគម្រោងផលិតនំត្រី។ យើងកំពុងធ្វើការសិក្សាលើគម្រោងផលិតនំត្រីដែលត្រូវបានការឧបត្ថម្ភនិងគាំទ្រដោយអង្គការយូនីសេហ្វ (UNICEF) កម្មវិធីអាហារូបត្ថម្ភថ្នាក់ជាតិនៃក្រសួងសុខាភិបាល នាយកដ្ឋានបច្ចេកវិទ្យាក៏ថែទំនិងគុណភាពនៃរដ្ឋបាលជលផលនៃក្រសួងកសិកម្ម រុក្ខាប្រមាញ់និងនេសាទ និងវិទ្យាស្ថានស្រាវជ្រាវនិងអភិវឌ្ឍន៍របស់ប្រទេសបារាំងដែលហៅកាត់ថាIRD។ ហើយគម្រោងនេះនឹងធ្វើការសិក្សានៅក្នុងសង្កាត់នេះ។ ពួកយើងមានអាហារថ្មីដែលជួយឲ្យសុខភាពល្អ និងការលូតលាស់របស់កុមារ។ ពួកយើងនឹងធ្វើការសិក្សាដោយឲ្យកុមារភ្លក់អាហារក្នុងរយៈពេល២សប្តាហ៍ ហើយធ្វើការចាប់ផ្តើមពីថ្ងៃទី១៩ខែមិថុនា រហូតដល់ថ្ងៃទី០៣ខែកក្កដា ឆ្នាំ២០១៥។

Hello, my name is _____. I am working with the Num Trey Project. Num Trey Project. The Num Trey Project is supported by UNICEF, National Nutrition Program of Ministry of Health, Department of Fisheries Post-Harvest Technologies and Quality Control, Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries, and IRD. The Num Trey Project is doing a study in this commune. We have some new foods that help maintain good health and growth for children. We will test the foods over two weeks, starting 19 June – 3 July 2015.

យើងនឹងបម្រើនូវអាហារខុសៗគ្នានៅទីតាំងសិក្សាដែលនៅជិតផ្ទះរបស់អ្នកចូលរួម។ អណាព្យាបាលនិងកុមារនឹងទៅកន្លែងសិក្សានោះជារៀងរាល់ថ្ងៃ សម្រាប់រយៈពេល២សប្តាហ៍។

We will serve different foods at a nearby test-feeding site. Caregivers and children will go to the site every day for about two weeks.

យើងនឹងធ្វើការស្ទង់មើលថាតើកុមារចូលចិត្តអាហារនិមួយៗប៉ុណ្ណា។ ពួកគេនឹងសួរអ្នកអំពីការយល់ឃើញរបស់អ្នកពីអាហារផ្សេងៗគ្នា។ ពួកគេនឹងនូវប្រមូលនូវព័តមានអំពីសុខភាពរបស់កូនអ្នកនិងសុខភាពរបស់អ្នក កម្ពស់និងទម្ងន់។ ព័តមានដែលប្រមូលបានទាំងអស់នឹងទុកជាការសម្ងាត់។

We will measure how much your child likes each food. They will ask you about your opinion of the different foods. They will collect information about your child's and your health, height and weight. All information collected will be kept private and confidential.

វានឹងមិនមានហានិភ័យអ្វីកើតឡើងក្នុងការសិក្សានេះទេ។ ការចូលរួមរបស់អ្នកគឺជាជម្រើសរបស់អ្នកទាំងស្រុង។

There are no risks to this study. Your participation is entirely your choice.

ការចំណាយទៅលើសោហុយធ្វើដំណើរសម្រាប់អ្នកនិងកូនរបស់អ្នកយើងនឹងផ្តល់ជូនសរុបអ្នកជាសប្តាហ៍។

Your transport for you and your baby will be reimbursed every 7-8 days.

តើអ្នកមានចំណាប់អារម្មណ៍និងមានពេលទំនេរសម្រាប់ចូលរួមទេ?

Would you be interested and available to participate? បាទ/ចាស Yes ☐ ទេ No ☐

បើសិនជាមាន សូមអនុញ្ញាតិឲ្យ ខ្ញុំសួរនូវសំនួរមួយចំនួនដើម្បីដឹងថាអ្នកនិងកូនអ្នកមានលក្ខណៈគ្រប់គ្រាន់សម្រាប់ចូលរួមក្នុងការសិក្សានេះ។

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐

kumar (Child´s ID, CHID): ☐☐☐ (Form ID, FORMID) 0 1

If yes, please let me ask some questions to see if you and your child are suitable participants. *Ask the following questions:*

Variable name	សូមសួរទៅអ្នកមើលថែកុមារ **PLEASE ASK THE CAREGIVER**	ចម្លើយ → សកម្មភាព **RESPONSE → ACTION**	កូដ **Code**
EXDOB	1. តើ(ឈ្មោះនេះ)សំបុត្រកំណើត សៀវភៅលឿងឬឯកសារផ្សេងទៀតមកជាមួយឬទេ? បើមិនមាន សូមរំលងទៅសំនួរទី៥។ Does (name) have a birth certificate, immunisation card, or some other document?) If no, go to question 2.	បាទ/ចាស☐ បើជាបាទ/ចាស សូមសរសេរនូវកាលបរិច្ឆេត Yes ☐ If yes, write the date: ទេ ☐ → បន្តទៅសំនួរបន្ទាប់ No ☐ Go to question 2	1 0
EX1AGE	បើសិនជាមាន សូមសរសេរថ្ងៃកំណើតនៅលើឯកសារ បើសិនថ្ងៃកំនើតមិនមែននៅចន្លោះ19/6/13 and 19/9/14ទេ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួមរបស់អ្នក។ តែគួរឲ្យស្តាយដែលអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់សម្រាប់ចូលរួមក្នុងការសិក្សាទេ ដោយសារឈ្មោះ( ) អាយុតិច/ច្រើនជាងអាយុដែលត្រូវសិក្សា។ មិនទទួលយកការចូលរួម និងបញ្ចប់សំនួរ។ If yes, write the date on document If date is not between 19/6/13 and 19/9/14, *say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is too young/old. EXCLUDE/END QUESTIONNAIRE*	បើជាបាទ/ចាស សូមសរសេរនូវកាលបរិច្ឆេត If yes, write the date on document: ☐☐ ☐☐ 2 0 ☐☐ éf Day Ex Month qñaM Year មិនទទួលយកការចូលរួម *EXCLUDED* ☐	99
EX2AGE	2. តើកូនរបស់អ្នកមានអាយុពី ៩ទៅ២៣ខែមែនទេ? បញ្ជាក់៖ កុមារកើតនៅចន្លោះថ្ងៃទី15/6/13 និង15/9/14 Is this child aged between 9-23 months, i.e. was your baby born between 19/6/13 and 19/9/14?	បាទ/ចាស☐ → បន្តទៅសំនួរបន្ទាប់ Yes ☐ Go to next question ទេ ☐ → មិនយក No ☐ Exclude.	1 0
EX1TWIN	3. តើកូនរបស់អ្នកនេះជាកូនភ្លោះឬ? Is this child a twin or multiple?	បាទ/ចាស☐ → មិនយក Yes ☐ Exclude. ទេ ☐ → បន្តទៅសំនួរបន្ទាប់ No ☐ Go to next question	1 0
EX1CF3M	4. ចាប់តាំងពីពាក់ខែមុនតើកូនរបស់អ្នកអាចញុំអាហារផ្សេងៗដែរឬទេ? Has this child been eating borbor or other solid foods for at least 3 months?	បាទ/ចាស☐ → បន្តទៅសំនួរបន្ទាប់ Yes ☐ → Go to next question ទេ ☐ → មិនយក No ☐ Exclude.	1 0
EX1ILL	5. តើកូនរបស់អ្នកកំពុងមានជំងឺធ្ងន់ធ្ងរឬទេ?អ្វីជាជំងឺអេដស៍ ឬរបេង។ល។ Does this child have any major illness right now (e.g. HIV, TB, etc)?	បាទ/ចាស☐ → មិនយក Yes ☐ Exclude. ទេ ☐ → បន្តទៅសំនួរបន្ទាប់ No ☐ Go to next question.	1 0
EX1ALRGY	6. តើកូនរបស់អ្នកធ្លាប់មានប្រតិកម្មជាមួយអាហារអ្វីខ្លះ? (ឧ. ញ៉ាំហើយធ្វើឲ្យពិបាកក្នុងការដកដង្ហើម ឬមានកន្ទួលរមាស់នៅពេលញ៉ាំអាហារណាមួយ) Does this child have allergies or intolerances to any food (e.g. difficulty breathing or a rash if they eat certain foods).	បាទ/ចាស☐ → មិនយក Yes ☐ → Exclude. ទេ ☐ → បន្តទៅសំនួរបន្ទាប់ No ☐ → Go to next question.	1 0
EX1STUDY	7. តើកូនរបស់អ្នកកំពុងចូលរួមធ្វើការសិក្សាជាមួយគំរោងឬការសិក្សាដ៏ទៃទៀតទេ? Is this child currently participating in any other test /study?	បាទ/ចាស☐ → មិនយក Yes ☐ → Exclude.	1

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐

kumar (Child´s ID, CHID): ☐☐☐ (Form ID, FORMID) 0 1

		ទេ ☐ → បន្តទៅសំនួរបន្ទាប់ No ☐ → Go to next question.	0
EX1MUM	8. តើអ្នក(ឬម្តាយកុមារ)កំពុងមានជំងឺធ្ងន់ធ្ងរឬទេ? (ឧ. ដួចជា៖ ជំងឺអេដស៍ ឬរបេង។ល។) Do you (or the mother) have any major illness right now (e.g. HIV, TB, etc)?	បាទ/ចាស ☐ → មិនយក Yes ☐ → Exclude.	1
		ទេ ☐ → បន្តទៅសំនួរបន្ទាប់ No ☐ → Go to next question.	0
EX1AVBL	9. តើអ្នកនិងកូនរបស់អ្នកអាចមានពេលជាដៀងរាល់ព្រឹក/ល្ងាចសម្រាប់ចូលរួមការសិក្សាក្នុងរយៈពេល១៥ថ្ងៃដោយចាប់ផ្តើមនៅថ្ងៃ១៩ ខែមិថុនា រហូតដល់ថ្ងៃទី៣ ខែកក្កដា ឆ្នាំ២០១៥ ។ បើសិនគាត់មិនទំនេរទេ កុំបញ្ចូលគាត់ក្នុងការសិក្សា។ Will you and your child be available every morning/ afternoon for the full 15 days of the study, 19 June – 3 July 2015? If no, exclude.	បាទ/ចាស ☐ → បន្តទៅសំនួរបន្ទាប់ Yes ☐ → Go to next question	1
		ទេ ☐ → មិនយក No ☐ → Exclude.	0
EX1AMPM	10. តើអ្នកទំនេរពេលណា?ពេលព្រឹកឬល្ងាច? (គូសចម្លើយ១ ឬអាចគូសទាំង២) Are you available morning and/or afternoon (tick one or both)?	ព្រឹក Morning ☐	1
		ល្ងាច Afternoon ☐	2
EX1YES	11. តើអ្នកនិងកូនរបស់អ្នកស្ម័គ្រចិត្តចូលរួមធ្វើការសិក្សាជាមួយយើងទេ? Are you willing for you and this child to participate in the study?	បាទ/ចាស ☐ → កត់ឈ្មោះ Yes ☐ Write down name	1
		ទេ ☐ → មិនយក No ☐ → Exclude.	0

បើអ្នកទទួលបានចម្លើយដែលមិនទទួលយកការចូលរួមរបស់អ្នកថែកុមារទេ នោះសូមនិយាយថា៖

If you get an answer that excludes the caregiver, please say:

អរគុណចំពោះឆន្ទៈដែលចង់ចូលរួមក្នុងការសិក្សាជាមួយពួកយើង តែគួរឲ្យសោកស្តាយដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ដើម្បីចូលរួមក្នុងការសិក្សា ដោយសារតែ [ប្រាប់នូវមូលហេតុដូចនៅក្នុងទម្រង់មិនទទួលយកការចូលរួមរបស់គាត់ ឧ. កុមារមិនមានអាយុចាប់ពី៩ខែ ទៅ២៣ខែ]។

Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because *[give the reason from the exclusion form that they were excluded, e.g. the child was not aged between 9-23 months, etc]*.. មិនបញ្ចូលគាត់ក្នុងការសិក្សាExcluded ☐

បើសិនជាអ្នកសួរគ្រប់សំនួរហើយអ្នកថែកុមារនោះមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួម និងមានឆន្ទៈចូលរួមនោះសូមនិយាយថា៖

If you ask all the questions and the caregiver is eligible and willing to participate, please say:

អរគុណសម្រាប់ឆន្ទៈចូលរួមរបស់អ្នក យើងនឹងសរសេរឈ្មោះអ្នកទុក។ ការសិក្សានឹងចាប់ផ្តើមចាប់ពីថ្ងៃសុក្រទី១៩ ខែមិថុនា ឆ្នាំ២០១៥។ សូមអញ្ជើញទៅកន្លែងសិក្សាជាមួយកូនរបស់អ្នកនៅកន្លែងផ្តល់អាហារ(.....) នៅវេលាម៉ោង៩ព្រឹក ឬម៉ោង២:៣០ល្ងាច។ សូមអ្នកយកបណ្ណ៍លឿង ឬបណ្ណ៍បញ្ជាក់អត្តសញ្ញាណផ្សេងទៀតរបស់កុមារមកជាមួយដើម្បីបញ្ជាក់ពីថ្ងៃខែឆ្នាំកំណើតរបស់កុមារ។

Thank you for your willingness to participate. I will write your name down. The study will begin tomorrow on Friday 19 June. Please go with your baby to (test-feeding site) at X o'clock in the morning/afternoon. Please bring your baby's yellow card.

យើងនឹងផ្តល់នូវការចំណាយលើការធ្វើដំណើរពីផ្ទះមកកន្លែងផ្តល់អាហារដល់អ្នកនិងកូនរបស់អ្នក ហើយថវិការនោះនឹងផ្តល់ឲ្យអ្នកចំនួន4000រៀលក្នុងមួយថ្ងៃ ហើយយើងនឹងបើកថវិការសរុបជាដៀងរាល់ថ្ងៃទី៧ ឬទី៨នៃការសិក្សា។

Your transport for you and your baby will be reimbursed at $1/day every 7-8 days.

បើសិនជាអ្នកសួរនូវគ្រប់សំណួរហើយ ហើយអណាព្យាបាលនោះមានគ្រប់លក្ខណៈសម្បត្តិគ្រប់គ្រាន់និងមានឆន្ទៈក្នុងការចូលរួម សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈដែលចូលរួម។ ឥឡូវនេះយើងនឹងប្រាប់អ្នកលម្អិតអំពីការសិក្សានិងសុំការយល់ព្រមពីអ្នកក្នុងការចូលរួម។

បន្តទៅពាក្យចូលរួម។

If you ask all the questions and the caregiver is eligible and willing to participate, please say: Thank you for your willingness to participate. Now I am going to tell you more about the study and ask for your consent to participate. *Go to consent form.*

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐

kumar (Child´s ID, CHID): ☐☐☐ (Form ID, FORMID) 0 1

ទម្រង់ទី២៖ ការសិក្សាសាកល្បង -- ព័តមានសម្រាប់អ្នកចូលរួមនិងពាក្យយល់ព្រម

Form 2: Acceptability trial - participant information and consent sheet

ទម្រង់នៃការយល់ព្រមនិងព័តមានចូលរួមនេះគឺសម្រាប់អណាព្យាបាលកុមារដែលមានអាយុ៩

ទៅ២៣ខែដែលត្រូវបានអញ្ជើញឲ្យចូលរួមក្នុងការសិក្សាលើភាពទទួលយកបាននូវអាហារបំប៉ន់ដែលអាចបរិភោគបានភ្លាមដោយមិនចាំបាច់ម៉ៀបចំ/ចម្អិនបន្ថែម

This participant information and consent form is for the caregivers of children aged 9-23 months who have been invited to participate in an acceptability trial of a locally produced ready-to-use-supplementary food.

ភាពទទួលយកបាននូវអាហារបំប៉នផ្អែកលើលីពីតមានណាយបញ្ចូលមីក្រូសារជាតិចិរុះសម្រាប់កុមារដែលមានអាយុក្រោម២ឆ្នាំក្នុងប្រទេសកម្ពុជា

Acceptability of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement for Children Under Two Years in Cambodia

ចូរអានពាក្យយល់ព្រមនេះទៅកាន់អ្នកចូលរួម:

ជំរាបសួរ ខ្ញុំបាទ/នាងខ្ញុំឈ្មោះ_____ ។

ខ្ញុំបាទ/នាងខ្ញុំធ្វើការងារជាមួយគម្រោងដែលមានឈ្មោះថានំត្រី។

Hello, my name is _____ and I work with the Num Trey Project.

នៅថ្ងៃនេះ យើងកំពុងធ្វើការសិក្សាលើគម្រោងផលិតនំត្រីដែលត្រូវបានការឧបត្ថម្ភនិងគាំទ្រដោយអង្គការយូនីសេហ្វ (UNICEF) កម្មវិធីអាហារូបត្ថម្ភថ្នាក់ជាតិនៃក្រសួងសុខាភិបាល នាយកដ្ឋានបច្ចេកវិទ្យាកែច្នៃនិងគុណភាពនៃរដ្ឋបាលជលផលនៃក្រសួងកសិកម្ម រុក្ខាប្រមាញ់និងនេសាទ និងវិទ្យាស្ថានស្រាវជ្រាវនិងអភិវឌ្ឍន៍របស់ប្រទេសបារាំងដែលហៅកាត់ថាIRD។ អង្គការនេះចែកចាយនូវអាហារបំប៉នទៅដល់កុមារនិងម្តាយដើម្បីការពារជំងឺកង្វះអាហារូបត្ថម្ភ។ ពួកគេចង់ធ្វើឲ្យផលិតផលរបស់គេឲ្យមានការប្រសើរឡើង ដូច្នេះពួកគេមានចំណាប់អារម្មណ៍ចង់ដឹងថាតើអាហារមួយណាដែលប្រជាជនកម្ពុជាចូលចិត្តខ្លាំងជាងគេ។ ពួកយើងចង់ធ្វើការសិក្សាអាហារដោយប្រៀបធៀបអាហារចំនួន៤ប្រភេទដែលមានមីក្រូសារជាតិចិរុះដែលលជួយរក្សានូវសុខភាពល្អនិងការលូតលាស់ល្អ។ ពួកគេចង់ប្រៀបធៀបអាហារទាំងនេះជាមួយនឹងបបរធម្មតា។ តាមរយៈការចូលរួមរបស់អ្នកនិងកូនរបស់អ្នក វានឹងអាចជួយយើងឲ្យផលិតនូវអាហារបំប៉នឲ្យកាន់តែល្អប្រសើរនិងថោកដែលអាចជួយដល់ម្តាយនិងកុមារនៅទូទាំងប្រទេសកម្ពុជាឲ្យមានស្ថានភាពអាហារូបត្ថម្ភល្អនិងមានសុខភាពល្អ។ ការសិក្សានេះនឹងត្រូវបានអនុវត្តដោយកញ្ញា Bindi Borg មកពីសកលវិទ្យាល័យ Queensland និង Dr Frank Wieringaមកពី IRD។

Today, we are doing a study for the Num Trey Project. The Num Trey Project is supported by UNICEF, National Nutrition Program of Ministry of Health, Department of Fisheries Post-Harvest Technologies and Quality Control, Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries, and IRD. These agencies distribute supplementary food to children and mothers to prevent malnutrition. They want to improve their products, so they are interested in knowing which food Cambodians like best. They want to test four foods that contain multiple micronutrients which help maintain good health and growth. They would like to compare these foods. Through your participation, you and your child will be helping us to make better and cheaper supplementary food that can help Cambodian mothers and children to be better nourished and healthier. The study is being conducted by Ms Bindi Borg from the University of Queensland and Dr Frank Wieringa from IRD.

យើងនឹងបំរើជូននូវបបរចំនួន៤ប្រភេទខុសគ្នានៅទីតាំងនេះ ក្នុងរយៈពេល១២ថ្ងៃបន្តបន្ទាប់។ យើងសូមអញ្ជើញអ្នកមកទីនេះ ហើយអ្នកនឹងបញ្ចុកអាហារ រយៈពាថ្ងៃដល់កូនអ្នកសម្រាប់អាហារមួយប្រភេទ មុននឹងចាប់ផ្តើមបញ្ចុកអាហារមួយប្រភេទទៀត។ យើងនឹងថ្លឹងថាតើកូនអ្នកបានញ៉ាំអាហារអស់ប៉ុន្មាន ហើយថាតើពួកគេចូលចិត្តអាហារទាំងនោះឬយ៉ាងណា។បន្ទាប់ពី១២ថ្ងៃនោះ យើងនឹងអញ្ជើញ អ្នកឲ្យមកទីនេះហើយយើងនឹងសួរអំពីយោបល់របស់អ្នកទៅលើអាហារទាំងនោះ។ បើសិនជាអាចយើងចង់ឲ្យអ្នកមកតែម្នាក់ឯងនៅក្នុងថ្ងៃនោះ។

We will serve four different foods on this site for the next 12 days. We ask you to come here and feed your child with each food for three days each, before passing onto the next food. We will measure how much your child ate of each food and how they liked each food. After the 12 days, we ask you to come to this site and then we will ask you about your opinion of the four different foods. If it is possible we will like you to come alone on that day.

យើងនឹងធ្វើការប្រមូលព័តមានអំពីកូនរបស់អ្នកនិងសុខភាពកូនរបស់អ្នក ដូចជាកម្ពស់ ទំងន់ និងរបបអាហាររបស់គេ។ ព័តមានដែលប្រមូលបានទាំងអស់នឹងត្រូវទុកជាការសម្ងាត់និងជាលក្ខណៈឯកជនសម្រាប់អ្នក។ អ្នកនិងកូនរបស់អ្នកនឹងមិនអាចត្រូវបានគេកំណត់អត្តសញ្ញាណបានឡើយ។ យើងនឹងត្រលប់មកកន្លែងសិក្សានេះម្តងទៀតដើម្បីចែកចាយនូវលទ្ធផលជាមួយអ្នកនៅពេលដែលលទ្ធផលនោះបានបោះពុម្ពចេញហើយ។ លទ្ធផលនៃការសិក្សានឹងត្រូវបោះពុម្ពនិងចែកចាយជាមួយអ្នកណាដែលចង់ជួយម្តាយនិងទារកឲ្យមាន ស្ថានភាពអាហារូបត្ថម្ភល្អនិងសុខភាពល្អ។

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐

kumar (Child´s ID, CHID): ☐☐☐ (Form ID, FORMID) 0 1

We will collect information about your child's and your health, height, weight and diet. All information collected will be kept private and confidential. You and your child will not be identifiable. We will return to this testing site to share the results with you when they are available. The results of the study will be published and shared with others who want to help mothers and children to be better nourished and healthier.

វាគ្មានគ្រោះថ្នាក់អ្វីទាំងអស់នៅក្នុងការចូលរួមក្នុងការសិក្សា។ ការចូលរួមរបស់អ្នកគឺជាជំរើសរបស់អ្នកទាំងស្រុង។ ថាតើអ្នកជ្រើសរើសចូលរួម ឬក៏អត់ វានឹងមិនប៉ះពាល់ដល់ការទទួលសេវាកម្មផ្សេងៗរបស់អ្នកនិងគ្រួសាររបស់អ្នកទេ ពី មណ្ឌលសុខភាព ឬស្ថាប័នរដ្ឋផ្សេងៗ។ បើទោះយើងបានសង្ឃឹមថាអ្នកនឹងបន្តចូលរួមជាមួយ ការសិក្សាសំ រាប់រយៈពេល១២ថ្ងៃក៏ដោយ ក៏អ្នកអាចបញ្ឈប់ការចូលរួមរបស់អ្នកពេលណាក៏បានក្នុងកំឡុងពេលសិក្សានេះ។ យើងដឹងថាពេលវេលារបស់អ្នកគឺមានតំលៃ ដូច្នេះអ្នកនឹងទទួលបានវត្ថុអនុស្សាវរីយ៍មួយសំរាប់ការចូលរួមរបស់អ្នកនៅពេលដែលអ្នកនៅចូលរួមជាមួយពួកយើងរហូតដល់ចុងបញ្ចប់នៃការសិក្សា

ហើយយើងនឹងជូនឌូវថវិការសំរាប់ធ្វើដំណើរទៅកន្លែងទទួលអាហារចំនួន៤០០០រៀលក្នុងមួយថ្ងៃដោយយើងនឹងធ្វើការបើជូនជារៀងរាល់ថ្ងៃទី៧ ឬទី៨នៃការសិក្សានូវទឹកប្រាក់សរុបនៃចំនួន៧ឬ៨ថ្ងៃនោះ។

There are no risks to this study. Your participation is entirely your choice. Whether you choose to participate or not, it will not affect other services you and your family receive from the health centre, village health support group, or other government authorities. Although we hope you will continue with the study for the full 12 days, you can stop participating at any time during the study. We realize that your time is valuable, so you will receive a gift for your participation if you complete the 12 days. The cost of travel will be reimbursed at $1/day every 7-8 days.

ការសិក្សានេះត្រូវបានទទួលការយល់ព្រមឲ្យធ្វើការសិក្សាដោយសាកលវិទ្យាល័យ Queensland ក្នុងប្រទេសអូស្ត្រាលី និងគណៈកម្មការក្រមសីលធម៌ជាតិសម្រាប់ការស្រាវជ្រាវសុខភាពរបស់ក្រសួងសុខាភិបាលប្រទេសកម្ពុជា។

តើអ្នកមានសំណួរដែរឬទេ? ប្រសិនបើនៅពេលណាមួយក្នុងកំឡុងពេលសិក្សាអ្នកមាន សំណួរ នោះអ្នកអាចទូរសព្ទ៍ទៅកាន់កញ្ញាដារៀមដែលមានលេខទូរសព្ទ៍ ០៩២ ៧៧០៦៧៨។

This study has been approved in ethical reviews by The University of Queensland in Australia and the National Ethics Committee for Health Research of the Cambodian Ministry of Health. If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: Daream 092 770 678

យើងចង់សួរអ្នកអំពីការចូលរួមរបស់អ្នកក្នុងការសិក្សាឥឡូវនេះ។ បើសិនជាអ្នកយល់ព្រមចូលរួមជាមួយកូនរបស់អ្នកក្នុងការសិក្សា សូមចុះហត្ថលេខា ឬផ្តិតមេដៃក្នុងប្រអប់ខាងក្រោមនេះ។

Do you understand what I have told you? Do you have any questions? Would you like to participate in the study? If you agree for you and your child to participate in the study, please sign or fingerprint in the box below.

eQµaHkumar Name of the child	
eQµaHmþaykumar Name of the caregiver	
ហត្ថលេខា ឬស្នាមមេដៃរបស់អ្នកថែកុមារ Signature or thumbprint of the caregiver	
លេខកំណត់អត្តសញ្ញាណកុមារ Child´s ID	☐☐☐

ខ្ញុំបានអានពាក្យយល់ព្រមទាំងអស់ដល់អ្នកថែកុមារ។

I have read the consent form in its entirety to the caregiver of the child.

ឈ្មោះអ្នកប្រមូលទិន្នន័យ Name of the data collector	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐

kumar (Child´s ID, CHID): ☐☐☐ (Form ID, FORMID) 0 1

ហត្ថលេខាអ្នកប្រមូលទិន្នន័យ Signature of data collector	
kalbriecäTRbmUlTinñn½y Date of data collection	☐☐ ថ្ងៃ Day 0 6 ខែ Month 2 0 1 5 ឆ្នាំ Year

បើសិនជាអ្នកថែរក្មេង/អណាព្យាបាលមិនយល់ព្រមចូលរួមទេ សូមនិយាយថា៖ អរគុណសម្រាប់ពេលវេលារបស់អ្នក។ អ្នកអាចត្រលប់ទៅផ្ទះបាន។

If the caregiver does not agree to participate, say: Thank you for your time. You are free to leave now.

ប្រគល់ពាក្យយល់ព្រមមួយច្បាប់ទៅអ្នកថែក្មេង។ គូសរង្វង់នៅលើលេខទូរសព្ទ៍នៅលើក្រដាស់ នោះដើម្បីប្រាកដថាពួកគាត់ដឹងថាគាត់អាចទូរសព្ទ៍មកលេខណាសំរាប់សួរព័តមានបន្ថែម។

បើសិនជាអ្នកថែរក្មេង/អណាព្យាបាលយល់ព្រមចូលរួមទេ

ប្រគល់ពាក្យចូលរួមទៅឲ្យអ្នកថែរក្មេង/អណាព្យាបាល។ សូមគូសរង្វង់នៅលើលេខទូរសព្ទ៍នៅលើទំព័រ។ និយាយថា៖ ពិតមាននេះគឺសម្រាប់អ្នក អ្នកអាចទូរសព្ទ៍ទៅលេខនេះ ០៩២ ៧៧០៦៧៨។

If the caregiver agrees to participate, tear off and leave the next page with the caregiver. Circle the telephone number on the page. Say: This information is for you. If you want more information, you can call this number, 092 770 678.

ឥឡូវនេះខ្ញុំសូមសួរនូវសំណួរខ្លះអំពីកូនរបស់អ្នក។ ប្រើ "ការសិក្សាការទទួលយកបាន ទម្រង់ប្រមូលទិន្នន័យមូលដ្ឋាន"

I am now going to ask you some questions about your child. *Administer "Acceptability trial, baseline data collection form."*

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐

kumar (Child´s ID, CHID): ☐☐☐ (Form ID, FORMID) 0 1

ប្រគល់ទំព័រនេះទៅអ្នកចូលរួម GIVE THIS PAGE TO PARTICIPANT

ភាពទទួលយកបាននៃអាហារបំប៉នដែលដាក់បញ្ចូលនូវមីក្រូសារជាតិចិ្រនិងសំបូរលីពីតសម្រាប់កុមារក្រោមអាយុ២ឆ្នាំក្នុងប្រទេសកម្ពុជា

Acceptability of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement for Children Under Two Years in Cambodia

ប្រាប់ទៅអណាព្យាបាល៖

Tell caregiver:

អ្នកបានយល់ព្រមចូលរួមក្នុងការសិក្សានូវការទទួលយកបាននៃអាហារបំប៉នដែលអាចញុំាបានតែម្តងដោយមិនបាច់ចម្អិនហើយផលិតក្នុងស្រុក។ សូមអញ្ជើញមកជាមួយកូនរបស់អ្នកដោយយកពាក្យយល់ព្រមនេះមកជាមួយ ហើយសូមយកបណ្ណ៍លឿងឬសំបុត្រកំណើតមកជាមួយអ្នកផង ។

You have agreed for you and your child to participate in an acceptability trial of a locally produced ready-to-use-supplementary food. Please come with your child. Please bring this paper and your child's yellow card or birth certificate.

ពិតមានទាំងអស់ដែលបានប្រមូលនឹងត្រូវរក្សាដោយសម្ងាត់។ វានឹងមិនមានហានិភ័យអ្វីទាំងអស់។

All information collected will be kept private and confidential. There are no risks to this study.

ការចូលរួមគឺជាជម្រើសរបស់អ្នក។ យើងសង្ឃឹមថាអ្នកនឹងបន្តការចូលរួមក្នុងការសិក្សាសម្រាប់រយៈពេល១២ថ្ងៃ ប៉ុន្តែអ្នកអាចមានសិទ្ធិឈប់ចូលរួមក្នុងការសិក្សាបានគ្រប់ពេល។ យើងដឹងថាពេលវេលារបស់អ្នកគឺមានតំលៃ ដូច្នេះអ្នកនឹងទទួលបាននូវវត្ថុអនុស្សាវីយ៍មួយសម្រាប់ការចូលរួមរបស់អ្នកបើអ្នកនៅបន្តការចូលរួមរបស់អ្នករហូតដល់ចប់ការសិក្សា។

យើងនឹងជូននូវថវិការសំរាប់ការធ្វើដំណើរទៅកន្លែងទទួលអាហារចំនួន៤០០០រៀលក្នុងមួយថ្ងៃដោយយើងនឹងធ្វើការបើជូនជារៀងរាល់ថ្ងៃទី៧ ឬទី៨នៃការសិក្សានូវទឹកប្រាក់សរុបនៃចំនួន៧ឬ៨ថ្ងៃនោះ។

Your participation is your choice. We hope you will continue with the study for the full 12 days, but you are free to stop participating at any time. We realize that your time is valuable, so you will receive a gift for your participation if you complete the full 12 days. The cost of travel will be reimbursed at $1/day every 7-8 days.

បើសិនជាអ្នកមានសំណួរ ឬបើអ្នកចង់ពិភាក្សាអំពីការចូលរួមរបស់អ្នកក្នុងការសិក្សានេះ អ្នកអាចនិយាយទៅកាន់បុគ្គលិកគម្រោងកញ្ញាដាម៉ៀមដែលមានលេខទូរសព្ទ័ ០៩២ ៧៧០៦៧៨។

If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call Ms Sok Daream on this number:092 770678

eQµaHkumar Name of the child	
eQµaHmþaykumar Name of the caregiver	
ហត្ថលេខា ឬស្នាមមេដៃនៃអ្នកថែកុមារ Signature or thumbprint of the caregiver	
លេខកំណត់អត្តសញ្ញាណកុមារ Child´s ID	☐☐☐
ទីកន្លែងសម្រាប់ផ្តល់អាហារ៖ Test feeding site:	
ពេលវេលា Time:	
ទីកាលបរិច្ឆេទ៖19/06-03/07/2015 Dates: 19/06-03/07/2015	

Appendix 4.2 Form 3: Baseline questionnaire

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME3):_____ GñkRbmUlTiñn½y (Interviewer ID, IVID3): ☐

kumar (Child´s ID, CHID3): ☐☐☐ (Form ID, FORMID) 0 3

ទម្រង់ទី៣៖ ទម្រង់បញ្ជីសំនួរប្រមូលទិន្នន័យមូលដ្ឋាន – សម្រាប់កុមារ ថ្ងៃ០ **Form 3: Acceptability trial, baseline data collection form – children**

Variable name					លេខកូដ
សង្កាត់ Sangkat (SANGKAT)	ទួលសង្កែTuol Sangkae ☐	1	គីឡូម៉ែត្រលេខ៩Kiloumaetr Lekh 9 ☐		3
	ឬស្សីកែវRuessei Kaev ☐	2	ច្រាំងចំរេះChrang Chamreh Pir ☐		4
PUmi Village (VILLAGE)	Kleang Sangឃ្លាំងសាំង ☐	1	Phum Kha 2ខ២ ☐		8
	Boeng Salangចឹងសាឡុង ☐	2	Phum Khorឃ ☐		9
	Boeng Chhukចឹងឈូក ☐	3	Phsar Touchផ្សារតូច ☐		10
	Spean Khposស្ពានខ្ពស់ ☐	4	Tuol Sangkaeទួលសង្កែ ☐		11
	Kroal Kouក្រាលគោ☐	5	Tuol Koukទួលគោក ☐		12
VILLAGE2 (*other village)*	Phum Kaក ☐	6	Meattakpheapមិត្តភាព ☐		13
	Phum Kha 1ខ១ ☐	7	Sammeakkiសាមគ្គី ☐		14
ទីកន្លែងផ្តល់អាហារ Test-feeding site (SITE)	Site 1 Sokly's house☐				1
	Site 2 Sopha & Nath's house☐				2
	Site 3 Leang Sok's house☐				3
	Site 4 Thearith's house☐				4
kalbriecäTRbmUlTiñn½y Date of data collection (DATE3)	☐☐ ថ្ងៃ Day	0 6 ខែ Month	2 0 1 5 ឆ្នាំ Year		
ការប្រមូលទិន្នន័យបានទាំងអស់ Data collection completed (COMPLETE3)	ទេNo ☐				1
	បាទ/ចាសYes ☐				2

ឈ្មោះអ្នកដឹកនាំក្រុម Team leader name (SPVSR)	Kunthea ☐		1
	Phanna ☐		2
កាលបរិច្ឆេទនៃការពិនិត្យរបស់អ្នកដឹកនាំក្រុម Date checked by team leader (CHEKDATE3)	☐☐ ថ្ងៃ Day	0 6 ខែ Month	2 0 1 5 ឆ្នាំ Year
ឈ្មោះអ្នកគ្រប់គ្រងក្នុងការិយាល័យ Office supervisor name (OFFICE3)	ប៊ីនឌីBindi ☐		1
កាលបរិច្ឆេទពិនិត្យដោយអ្នកគ្រប់គ្រងក្នុងការិយាល័យ Date checked by office supervisor (OFFDATE3)	☐☐ ថ្ងៃ Day	0 6 ខែ Month	2 0 1 5 ឆ្នាំ Year
ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី១ Data entry person 1 name (ENTERER1_3)	ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី១ Data entry person 1 name ☐		
កាលបរិច្ឆេទបញ្ចូលទិន្នន័យទី១ Date entered (ENTDATE1_3)	☐☐ ថ្ងៃ Day	0 ☐ ខែ Month	2 0 1 5 ឆ្នាំ Year
ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី២ Data entry person 2 name (ENTERER2_3)	ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី២ Data entry person 2 name ☐		
កាលបរិច្ឆេទបញ្ចូលទិន្នន័យទី២ Date entered (ENTDATE2_3)	☐☐ ថ្ងៃ Day	0 ☐ ខែ Month	2 0 1 5 ឆ្នាំ Year

eQµaHkumar Name of child (NAMECH3)	
eQµaHmþaykumar Name of the caregiver (NAMECG3)	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME3):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID3): ☐

kumar (Child´s ID, CHID3): ☐☐☐ (Form ID, FORMID) 0 3

Variable name	Question	Response	Code
RSHP RSHPOTH	**1. etIGñkmanTMnak;TMngGVICamYynwgkumarenH?** What is your relationship to (name)? *sUmKUsrgVg;ykcMellyEtmYy* Select ONLY ONE answer	ម្តាយបង្កើតBiological mother ☐ ម្តាយចុងStepmother ☐ ជីដូនGrandmother ☐ ឪពុកFather ☐ បងស្រីSister ☐ ផ្សេងៗ(ពិពណ៌នា)Other (describe) ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	1 2 3 4 5 7 8 9
CARE2W	**2. etIGñkman)anTTYlxusRtUvkñúgkarEfTaMkumarenH ya:gticNas; 2s)þah¾cugeRkayenHbx¤eT?** Have you had responsibility for taking care of (name) for at least the last two weeks?) *sUmKUsrgVg;ykcMellyEtmYy* *Select ONLY ONE answer*	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
SEX	**3. etI kumarenH ePTRbus bx¤Rs** Is (name) a male or female? *sUmKUsrgVg;ykcMellyEtmYy* *Select ONLY ONE answer*	ប្រុសMale ☐ ស្រីFemale ☐	1 2
DOB2	4. តើ(ឈ្មោះនេះ)សំបុត្រកំណើត សៀវភៅលឿងឬឯកសារផ្សេងទៀតមកជាមួយឬទេ? បើមិនមាន សូមរំលងទៅសំនួរទី៥។ Does (name) have a birth certificate, immunisation card, or some other document?) If no, go to question 5.	ទេNo ☐ បាទ/ចាសYes ☐	0 1
AGE2 AGE2EX	បើសិនជាមាន សូមសរសេរថ្ងៃកំណើតនៅលើឯកសារ បើសិនថ្ងៃកំណើតមិនស៊ីគ្នានៅចន្លោះ19/6/13 and 19/9/14ទេ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួមរបស់អ្នក។ តែគួរឲ្យស្តាយដែលអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់សម្រាប់ចូលរួមក្នុងការសិក្សាទេ ដោយសារឈ្មោះ( ) អាយុតិច/ច្រើនជាងអាយុដែលត្រូវសិក្សា។ មិនទទួលយកការចូលរួម និងបញ្ចប់សំនួរ។ If yes, write the date on document If date is not between 19/6/13 and 19/9/14, s*ay: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is too young/old.* *EXCLUDE AND END QUESTIONNAIRE*	បើជាបាទ/ចាស សូមសរសេរខ្ទង់កាលបរិច្ឆេត If yes, write the date on document: ☐☐ ☐☐ 2 0 ☐☐ éf Day Ex Month qñaM Year មិនទទួលយកការចូលរួម *EXCLUDED* ☐	99

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME3):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID3): ☐

kumar (Child´s ID, CHID3): ☐☐☐ (Form ID, FORMID) 0 3

AGE AGEEX	**5. etIkumarmanGayub:unñan** បើសិនជាកុមារអាយុក្រោម៩ខែ ឬលើស២ឆ្នាំ សូមនិយាយថាអរគុណសម្រាប់ឆន្ទៈចូលរួមរបស់អ្នក តែគួរឲ្យសោកស្តាយដែលអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈសម្រាប់ការចូលរួមទេ ព្រោះអាយុកូនរបស់អ្នកមិនស្ថិតនៅចន្លោះអាយុដែលត្រូវសិក្សា។ មិនទទួលយកការចូលរួម ហើយបញ្ចប់សំនួរ How old is (name)? If < 9 months or > 2yrs, s*ay: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is too young/old..* *EXCLUDE AND END QUESTIONNAIRE*	GayuKitCaEx ..... ☐☐ Age in months មិនទទួលយកការចូលរួម *EXCLUDED* ☐	99
BFG	6. តើអ្នកកំពុងបំបៅកូនឬ? (បើអ្នកថែកុមារនោះជាម្តាយ) បើសិនជាអ្នកថែរក្សាកុមារមិនមែនជាម្តាយ ត្រូវសួរ៖ តើកុមារ (ឈ្មោះ)កំពុងតែបៅដោះឬ? *If caregiver is mother, ask:* Are you still breastfeeding (name)? *If caregiver is not mother, ask:* Is (name) still being breastfed?	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME3):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID3): ☐

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CF CFEX	7. តើកូនរបស់អ្នកបានចាប់ផ្តើមញ៉ាំអាហារផ្សេងទៀតទេក្រៅពីបៅដោះម្តាយ? បើសិនជាចម្លើយថា បាទសូមបន្តទៅសំនួរទី៨ បើសិនជាចំលើយទេសំរាប់សំនួរនេះ–សូមនិយាយថាសូមអរគុណ ហើយបញ្ចប់បញ្ជីសំនួរ។ Does (name) have foods or drinks other than breastmilk? If Yes, go to question 8. If No, Refused to respond, or Don't know – *Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is not yet eating foods or drinks other than breastmilk.* EXCLUDE AND END QUESTIONNAIRE	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐ មិនទទួលយកការចូលរួម EXCLUDED ☐	0 1 8 9 99
AGECF	8. តើនៅអាយុប៉ុន្មានដែលកុមារ (ឈ្មោះ) បានចាប់ផ្តើមញ៉ាំអាហារ ឬផឹកទឹកដែលមិនជាទឹកដោះម្តាយ? At about what age did (name) start having foods or drinks other than breastmilk?	At <3mths នៅអាយុតិចជាង៣ខែ ☐ At <6mths នៅអាយុតិចជាង៦ខែ ☐ At >6mths បន្ទាប់ពីអាយុជាង៦ខែ ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	1 2 3 8 9
EATS	9. តើកុមារ (ឈ្មោះ) បានអ្នកញ៉ាំអាហារ ឬផឹកទឹកអ្វីខ្លះចាប់តាំងពីគេចេះញ៉ាំអាហារមក? គូសនូវចម្លើយខាងស្តាំនេះ What foods or drinks does (name) usually eat or drink since they began solids? *Tick all that apply*	EATS/1 អាហារហ្វឹមយូឡុរបស់កុមារ ឬទឹកដោះគោផ្សេងៗ ☐ Infant formula or other milk EATS/2 សារធាតុរាវដូចជាទឹក តែ ទឹកផ្លែឈើ សូដា។ល។ ☐ Liquids such as water, tea, juice, soda, etc EATS/3 បបរ បាយ គុយទាវ/មី នំប៉័ង ☐ Borbor, rice, noodles, or bread EATS/4 ផ្លែឈើ ឬបន្លែ ☐ Any fruit or vegetables EATS/5 អាហារប្រភេទសាច់ដូចជា ស៊ុត សាច់ ត្រី ☐ Any animal food such as eggs, meat, fish EATS/6 បង្អែម ឬអាហារញ៉ាំលេងប្រៃ ☐ Sweet or salty snacks EATS/7 ផ្សេងៗ(ពិព័ណនា) ☐ Any other food or drink (describe) EATSOTH EATS/8 បដិសេធមិនឆ្លើយRefused to respond ☐ EATS/9 មិនដឹងDon't know ☐	1 2 3 4 5 6 7 8 9
IMPBB	10. តើកុមារនេះមានញ៉ាំបបរខាប់គ្រប់គ្រឿង (បបរដែលដាំជាមួយបន្លែប្រៃង និងសាច់សត្វដូចជា ពងទា/ពងមាន់ សាច់ ឬត្រី? បើមិនមាន បន្តទៅសំនួរ១៣។ 11 *Does this child eat improved borbor (borbor with vegetables, oil and an animal food such as eggs, meat, or fish?* *If no, go to question 11.*	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
IMPBB2	បើសិនជាមាន តើចម្លើយញឹកញាប់ប៉ុណ្ណា? *If yes, how often does this child eat improved borbor?*	២ទៅ៣ដងក្នុងមួយថ្ងៃ2-3 times/day ☐ ម្តងដងក្នុងមួយថ្ងៃOnce a day ☐ ពីរបីថ្ងៃម្តងOnce every few days ☐ Seldom ☐	2 3 4 5

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME3):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID3): ☐

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		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9
SUPPS	11. តើកូនរបស់អ្នកធ្លាប់បានញុាំអាហារបំប៉នផ្តល់ឱ្យដោយអង្គការណាឬទេ (អួចជាអាហារ ស្រ្តើងខល ស៊ុីអសប៊ីផ្ទឹសផ្ទឹស។ល។)? បើមានអ្នកអាចបង្ហាញកញ្ចប់បានដែរឬទេ? បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ*13* Has this child ever used Sprinkles, CSB++ or similar supplementary foods or supplements/vitamins? Tick all that apply. (show packages or examples of foods). *If **No** to* this *question – jump to question 13*	ទេNo ☐	0
		បាទ/ចាសYes ☐	1
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9
SUPPS2	12. តើអាហារបំប៉នមួយណា ឬអាហារបន្ថែមណា/វីតាមីនណាដែលកូនរបស់អ្នកបានប្រើ? សូមគូសចំពោះអាហារខាងក្រោមបើបានញុាំចំពោះចម្លើយនៅខាងស្តាំ។ (បង្ហាញកញ្ចប់ ឬគំរូនៃអាហារ) Which supplementary foods or supplements/vitamins has the child used? Tick all that apply. (show packages or examples of foods).	SUPPS2/2 ស្រ្តើងខលSprinkles ☐	2
		SUPPS2/3 ស៊ុីអសប៊ីផ្ទឹសផ្ទឹសCSB++ ☐	3
		SUPPS2/4 អាហារបំប៉នផ្សេងទៀតបើមាន ហើយសូមរៀបរាប់Other supplementary foods (describe) ☐ SUPPFOOD_____	4
		SUPPS2/5 ថ្នាំគ្រឿងបន្ថែមផ្សេងទៀតOther supplements (describe) ☐ SUPPSOTH_____	5

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ILL3D	13. តើពាក្យថ្ងៃមុននេះ កុមារ(ឈ្មោះ)មានឈឺទេ? (គួសចម្លើយតែមួយ) បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ*19* In the past 3 days, has (name) been ill? (Tick ONLY ONE answer) If No to this question – jump to question 19	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
ILLRATE3 ILLRATEX	14. ជាគំនិតរបស់អ្នក តើកុមារ(ឈ្មោះ) មានជំងឺធ្ងន់ មធ្យម ឬស្រាល? បើសិនជាជំងឺធ្ងន់ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈដែលចង់ចូលរួម។ ប៉ុន្តែសូមទោសដោយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួមដោយសារ(ឈ្មោះ)មានជំងឺធ្ងន់តាំងពីពាក្យថ្ងៃមុន។ យើងផ្តល់យោបល់ឲ្យអ្នកទៅមណ្ឌលសុខភាព ឬគ្លីនិកដើម្បីពិនិត្យ។ មិនយកជាប់បញ្ចប់សំនួរ In your opinion , was (name's) illness serious, moderate or slight? If Serious – Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) has been seriously ill in the last 3 days. We suggest that you visit a health care provider or clinic. EXCLUDE AND END QUESTIONNAIRE	ជំងឺធ្ងន់ Serious ☐ មធ្យមModerate ☐ ស្រាលSlight ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐ មិនទទួលយកការសិក្សាEXCLUDED ☐	1 2 3 8 9 99
FEVER3D	15. តើកុមារ(ឈ្មោះ)មានក្តៅខ្លួនទេចាប់តាំងពីពាក្យថ្ងៃ? Has (name) been ill with a fever at any time in the past 3 days?	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
ARI3D1	16. តើកុមារ(ឈ្មោះ)មានក្អកទេចាប់តាំងពីពាក្យថ្ងៃ? បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ*19* Has (name) had an illness with a cough at any time in the past 3 days? If No to this question – jump to question 19	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
ARI3D2	17. នៅពេលកុមារ(ឈ្មោះ)ជំងឺក្អក តើគេមានដកដង្ហើមញាប់ជាងធម្មតាដោយដង្ហក់ ដកដង្ហើមញឹក ឬមានការពិបាកក្នុងការដកដង្ហើម? បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ*19* When (NAME) had an illness with a cough, did he/she breathe faster than usual with short, fast breaths or had difficulty breathing?). If No to this question – jump to question19	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9

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ARI3D3 ARIOTHER	18. មានការដកដង្ហើយញាប់ ឬមានការពិបាកក្នុងការដកដង្ហើមដោយមានបញ្ហានៅដើមទ្រូង ឬមានស្ទះនៅច្រមុះ? Was the fast or difficult breathing due to a problem in the chest or a blocked nose?)	ដើមទ្រូងChest only ☐ ច្រមុះNose only ☐ ទាំង២Both ☐ ផ្សេងទៀត ចូរដៀបរាប់Other (describe) ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	1 2 3 7 8 9
DIAR3D1	19. តើកុមារមានរាគទេចាប់ពីពាថ្ងៃមុន? ខ. បន្ទោរបង់ពាទៅ៤ដងក្នុងរយៈពេលល២៤ម៉ោង បើមាន បន្តទៅសំនួរ *20* បើទេ បដិសេធ មិនដឹង រំលងទៅសំនួរ*21* Has (name) had had diarrhoea in the past 3 days? i.e. 3 or more loose stools during 24 hours *If **Yes** – go to question 20. If No, Refused, Don't know – go to question 21*	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
DIAR3D2 DIAREX	20. តើកុមារមានបន្ទោរបង់ដោយមានឈាមជាប់ឈាមកទេ? បើមាន សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសវែងឈ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួមដោយសារកុមារ (ឈ្មោះ) មានបន្ទោរបង់ឈាម ដែលបញ្ជាក់ថាគាត់មានជំងឺធ្ងន់ធ្ងរចាប់តាំងពីពាថ្ងៃ មុន។ យើងឲ្យយោបល់ថាអ្នកគួរតែទៅពិនិត្យនៅមណ្ឌលសុខភាពឬគ្លីនិក។ បើទេ បដិសេធ មិនដឹង រំលងទៅសំនួរ*21* *Was there any blood in the stools?* *If Yes – Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) has had blood in their stools, which indicates a serious illness, in the last 3 days. We suggest that you visit a health care provider or clinic.* *EXCLUDE AND END QUESTIONNAIRE* *If No, Refused, Don't know – go to question 21*	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐ មិនទទួលយកការសិក្សាEXCLUDED ☐	0 1 8 9 99

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME3):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID3): ☐

kumar (Child´s ID, CHID3): ☐☐☐ (Form ID, FORMID) 0 3

VOMIT3D	21. តើកុមារមានក្អួតទេចាប់ពីពាថ្ងៃមុន? Has (name) vomited in the past 3 days?	ទេNo ☐ ចាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
APPET1W	22. តើកុមារ(ឈ្មោះ)ញុាំអាហារជាធម្មតា ឬវាច្រើនជាងធម្មតា ឬតិចជាងធម្មតានៅក្នុងសប្តាហ៍មុន? Has (name) been eating normally, more than usual, or less than usual in the past week?	ធម្មតាNormally ☐ ច្រើនជាងធម្មតាMore than usual ☐ តិចជាងធម្មតាLess than usual ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 2 8 9
RASH3D	23. តើកុមារ (ឈ្មោះ)មានឡើងកន្ទួលលើស្បែកទេតាំងពីពាថ្ងៃមុន? Has (name) had a skin rash in the past 3 days?	ទេNo ☐ ចាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
SYMPT3D SYMPOTH	24. តើកុមារមានរោគសញ្ញា ឬជំងឺអ្វីផ្សេងទៀតដែលខ្ញុំមិនបានសួរតាំងពីពាថ្ងៃមុន? Has (name) had any other sickness or symptoms that I have not asked about in the past 3 days? បើមាន សូមបញ្ជាក់ If yes - Please specify.	ទេNo ☐ ចាទ/ចាសYes ☐ បើសិនជាមាន តើរោគសញ្ញា ឬជំងឺអ្វីដែរ If yes, what sickness or symptoms? បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9

បើសិនជាអ្នកទទួលបានចម្លើយដែលមិនទទួលយកការចូលរួមរបស់អ្នកថែរក្សាកុមារទេ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារ[ផ្តល់នូវមូលហេតុដែលទទួលយកនៅក្នុងបញ្ជីសំនួរខាងលើ] បើសិនជាបញ្ហានោះពាក់ពន្ធ័ជាមួយនឹងបញ្ហាសុខភាព សូមប្រាប់គាត់ថាឲ្យគាត់យកកូនរបស់គាត់ទៅមណ្ឌលសុខភាព/មន្ទីរពេទ្យ។

If you get an answer that excludes the caregiver, say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because [give the reason]. [If health related reason, say] We suggest that you take your child to the health clinic.

បើសិនជាអ្នកសួរនូវសំនួរទាំងអស់ហើយ ហើយអ្នកថែរក្សាកុមារ/កុមារនោះមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូល រួម សូមនិយាយថា៖ អរគុណសម្រាប់ចម្លើយរបស់អ្នក។ សូមយកបញ្ជីសំនួរនោះហើយអញ្ជើញទៅតុបន្ទាប់ ដើម្បីឲ្យបុគ្គលិករបស់យើងធ្វើការវាស់កូនរបស់អ្នក។

If you ask all the questions and the caregiver is eligible to participate, say: Thank you for answering these questions. Please take this questionnaire and go to the next station to have your child measured.

WT	25. ទំងន់ជាគីឡូក្រាម(កម្រិតលម្អៀង0.1kg)? ថ្លឹងទម្ងន់ម្តាយ ហើយចុចជញ្ជីងឲ្យទៅ0 ហើយហុចកុមារឲ្យទៅម្តាយ ហើយកត់ត្រានូវទម្ងន់កុមារដែលបង្ហាញលើជញ្ជីង Weight in kilograms to the closest 0.1kg? Weigh mother, zero, pass child to mother, record weight.	ទម្ងន់(kg) Weight (kg) ☐☐.☐ បដិសេធMother refused ☐ ផ្សេងៗ Other ☐	 8 9
HT	26. ប្រវែងជាសង់ទីម៉ែត្រ(កម្រិតលម្អៀង0.1cm)? វាស់ដោយដាក់កុមារឲ្យដេកចុះ គណនាអក *WHZ* បើ*<-3* វាស់ម្តងទៀតដើម្បីពិនិត្យ។ ផ្តល់ដំណឹងទៅអ្នកគ្រប់គ្រង បើ*<-3* សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានបន្ទាបបង់ណាម ដែលបញ្ជាក់ថាគាត់មានជំងឺធ្ងន់ធ្ងរតាំងពីពាថ្ងៃ មុន។ យើងឲ្យយោបល់ថាអ្នកគួរតែទៅពិនិត្យនៅមន្ទីរពេទ្យមគង្គ។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ Length in centimetres to the closest 0.1cm? Measure lying down	ប្រវែង(cm) Length (cm) ☐☐☐.☐ បដិសេធMother refused ☐	 8

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME3):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID3): | | |

kumar (Child´s ID, CHID3): | | | | (Form ID, FORMID) | 0 | 3 |

WHZEX	*Calculate WHZ.* ***If <-3*** *measure again to check. Inform supervisor.* ***If <-3*** *– say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is severely malnourished. This is very serious. You need to take your child to the Mekong hospital. We will give you money to go to the hospital.* EXCLUDE AND END QUESTIONNAIRE	ផ្សេងៗ Other ☐ មិនទទួលយកការសិក្សា*EXCLUDED* ☐	9 99

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME3):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID3): ☐

kumar (Child´s ID, CHID3): ☐☐☐ (Form ID, FORMID) 0 3

MUAC	27. ប្រវែងរង្វង់កំភួនដៃ(MUAC)គិតជា cm រំលងខិតទៅជិត0.1cm? បើប៉ះចំណុចព័ណ៌លឿង វាស់ម្តងទៀតដើម្បីពិនិត្យ។ ផ្តល់ដំណឹងទៅអ្នកគ្រប់គ្រង បើក្រហម សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិគ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានបន្ទួរបង់ឈាម ដែលបញ្ជាក់ថាគាត់មានជំងឺធ្ងន់ធ្ងរជាប់តាំងពីពាក្យ មុន។ យើងស្បែរបាប់ថាអ្នកគួរតែទៅពិនិត្យនៅមន្ទីរពេទ្យមេគង្គ។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ Mid upper arm circumference (MUAC) in cm closest 0.1cm? If yellow– measure again to check. Inform supervisor. If red– say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is severely malnourished. This is very serious. You need to take your child to Mekong hospital. We will give you money for transport to go to the hospital if necessary . EXCLUDE AND END QUESTIONNAIRE	MUAC (cm) ☐☐●☐	
		បដិសេធMother refused ☐	8
		ផ្សេងៗ Other ☐	9
MUACEX			
		មិនទទួលយកការសិក្សាEXCLUDED ☐	99

បើសិនជាអ្នកទទួលបានចម្លើយដែលមិនទទួលយកការចូលរួមរបស់អ្នកថែរកុមារទេ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានជំងឺកង្វះអាហារូបត្ថម្ភស្រួចស្រាវ វាជាជំងឺធ្ងន់ធ្ងរ។ អ្នកត្រូវតែយកកូនរបស់អ្នកទៅមន្ទីរពេទ្យមេគង្គ។ យើងនឹងផ្តល់ប្រាក់ដល់អ្នកសម្រាប់ការចំណាយលើការធ្វើដំណើរក្នុងការយកកូនរបស់អ្នកទៅមន្ទីរពេទ្យបើសិនជាចាំបាច់។

If you get an answer that excludes the caregiver, say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because your child is severely malnourished. This is very serious. You need to take your child to the Mekong hospital. We will give you money for transport to go to the hospital if necessary.

បើសិនអ្នកបានសួរគ្រប់សំណួរហើយ ហើយអ្នកថែរកុមារ/កុមារមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួម សូមនិយាយថាសូមអរគុណសម្រាប់ចម្លើយទាំងអស់។ សូមត្រលប់មកម្តងទៀតនៅចឺនេះនៅថ្ងៃស្អែក នៅវេលាម៉ោង.....ដើម្បីធ្វើការផ្តល់អាហារ។

If you ask all the questions and the caregiver is eligible to participate, say: Thank you for answering these questions. Please come back here tomorrow at XXX o'clock to test the food.

Appendix 4.3 Forms 4, 5, & 6: Daily data collection; consumption record days 1-12; preference ranking, days 3-6-9-12

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer(IVNAME4):_____GñkRbmUlTinñn½y (Interviewer ID, IVID4):

kumar (Child´s ID, CHID4): | | | | (Form ID, FORMID) | 0 | 6 |

ទម្រង់ទី4៖ ទម្រង់បញ្ជីសំនួរប្រមូលទិន្នន័យប្រចាំថ្ងៃ – សម្រាប់កុមារ ថ្ងៃទី១ទៅថ្ងៃទី១២

Form 4: Acceptability trial, daily data collection form – children, days 1-12

Variable name		លេខកូដ
សង្កាត់ Sangkat (SANGKAT4)	Svay Pakស្វាយប៉ាក	1
	SANGKAT4_2 Other (describe) ផ្សេងៗ(ពិពណ៌នា) _____ ☐	7
PUmi Village (VILLAGE4)	Phum Svay Pakស្វាយប៉ាក	1
	Phum Louលូ	2
	Phum La Kamboarឡាំកំបោ	3
	VILLAGE4_2 Other (describe) ផ្សេងៗ(ពិពណ៌នា) _____ ☐	7
ទីកន្លែងផ្តល់អាហារ Test-feeding site (SITE4)	Site 1 Sokly's house☐	1
	Site 2 Sopha & Nath's house☐	2
	Site 3 Leang Sok's house☐	3
	Site 4 Thearith's house☐	4
kalbriecäTRbmUlTinñn½y Date of data collection (DATE4)	☐☐ ថ្ងៃ Day 0 6 ខែ Month 2 0 1 5 ឆ្នាំ Year	
ការប្រមូលទិន្នន័យបានទាំងអស់ Data collection completed (COMPLETE4)	ទេNo ☐	1
	បាទ/ចាសYes ☐	2

ឈ្មោះអ្នកដឹកនាំក្រុម Team leader name (SPVSR4)	Kunthea ☐ Phanna ☐	1 2
កាលបរិច្ឆេទនៃការពិនិត្យរបស់អ្នកដឹកនាំក្រុម Date checked by team leader (CHEKDATE4)	☐☐ ថ្ងៃ Day 0 6 ខែ Month 2 0 1 5 ឆ្នាំ Year	
ឈ្មោះអ្នកគ្រប់គ្រងក្នុងការិយាល័យ Office supervisor name (OFFICE4)	ប៊ីនឌីBindi ☐	1
កាលបរិច្ឆេទពិនិត្យដោយអ្នកគ្រប់គ្រងក្នុងការិយាល័យ Date checked by office supervisor (OFFDATE)	☐☐ ថ្ងៃ Day 0 6 ខែ Month 2 0 1 5 ឆ្នាំ Year	
ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី១ Data entry person 1 name (ENTERER1_4)	ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី១ Data entry person 1 name ☐	
កាលបរិច្ឆេទបញ្ចូលទិន្នន័យទី១ Date entered (ENTDATE1_4)	☐☐ ថ្ងៃ Day 0 ☐ ខែ Month 2 0 1 5 ឆ្នាំ Year	
ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី២ Data entry person 2 name (ENTERER2_4)	ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី២ Data entry person 2 name ☐	
កាលបរិច្ឆេទបញ្ចូលទិន្នន័យទី២ Date entered (ENTDATE2_4)	☐☐ ថ្ងៃ Day 0 ☐ ខែ Month 2 0 1 5 ឆ្នាំ Year	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer(IVNAME4):_____GñkRbmUlTinñn½y (Interviewer ID, IVID4):

kumar (Child´s ID, CHID4): ☐☐☐ (Form ID, FORMID) 0 6

eQµaHkumar Name of child (NAMECH4)	
eQµaHmþaykumar Name of the caregiver (NAMECG4)	

Variable name	សំនួរ **Question**	ចម្លើយ **Response**	កូដ **Code**
BFGDAILY	1. តើអ្នកកំពុងបំបៅកូនឬ? (បើសិនអ្នកថែកុមារជាម្តាយ) បើសិនជាអ្នកថែកុមារមិនមែនជាម្តាយ ត្រូវសួរ៖ តើកុមារ(ឈ្មោះ)កំពុងតែបៅដោះឬ? បើសិនទេ សូមរំលងទៅសំនួរ3 *If caregiver is mother, ask:* Are you still breastfeeding (name)? *If the caregiver is is not the mother, ask:* Is (name) still being breastfed? If **No** – please jump to question 3	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
LASTBF	2. តើកុមារ(ឈ្មោះ)បានបៅដោះចុងក្រោយពេលណា? គួសចម្លើយតែមួយ) When did (name) last breastfeed? (Tick ONLY ONE answer)	តិចជាង១ម៉ោងមុន < 1 hour ago ☐ ច្រើនជាង១ម៉ោងមុន> 1 hour ago ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 8 9
LASTEAT	3. តើកុមារកំពុងបៅដោះឬ (ឧ. បាទ/ចាសជាមួយសំនួរទី១ Q1)? សូរថា៖ តើកុមារ(ឈ្មោះ)បានញ៉ាំអ្វីចុងក្រោយក្រៅពីបៅដោះ? បើកុមារឈប់បៅដោះហើយ (ឧ. បាទ/ចាសជាមួយសំនួរទី១ Q1)? សូរថា៖ តើកុមារ(ឈ្មោះ)បានញ៉ាំអ្វីចុងក្រោយក្រៅពីបៅដោះ? គួសចម្លើយតែមួយ) If child is still breastfeeding (i.e. yes to Q1), ask: When did (name) last eat or drink something other than breastmilk? If child is no longer breastfeeding (i.e. no to Q1), ask: When did (name) last eat or drink something? (Tick ONLY ONE answer)	តិចជាង១ម៉ោងមុន < 1 hour ago ☐ ច្រើនជាង១ម៉ោងមុន > 1 hour ago ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	1 2 8 9
ILL24H	4. តើក្នុង២៤ម៉ោងមុននេះ កុមារ(ឈ្មោះ)មានឈឺទេ? (គួសចម្លើយតែមួយ) បើទេ សូមរំលងទៅសំណួរ៨ បើមាន សូមបន្តទៅសំនួរ5 In the past 24hrs has (name) been ill? (Tick ONLY 1 answer) If No– go to question 8 If Yes– go to question 5	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
ILLRATE	5. ជាគំនិតរបស់អ្នក តើកុមារ(ឈ្មោះ) មានជំងឺធ្ងន់ មធ្យម ឬស្រាល? បើសិនជាជំងឺធ្ងន់ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈដែលចង់ចូលរួម។	ជំងឺធ្ងន់ Serious ☐ មធ្យមModerate ☐	1 2

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer(IVNAME4):_____GñkRbmUlTinñn½y (Interviewer ID, IVID4):

kumar (Child´s ID, CHID4): ☐☐☐ (Form ID, FORMID) 0 6

ILLRATEX	ប៉ុន្តែសូមទោសដោយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួមដោយសារ(ឈ្មោះ)មានជំងឺធ្ងន់តាំងពី២៤ម៉ោងមុន។ យើងផ្តល់យោបល់ឲ្យអ្នកទៅមណ្ឌលសុខភាព ឬគ្លីនិកដើម្បីពិនិត្យ។ មិនយកហើយបញ្ចប់សំនួរ In your opinion, was (name's) illness serious, moderate or slight? If Serious – Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) has been seriously ill in the last 24hrs. We suggest that you visit a health care provider or clinic. EXCLUDE AND END QUESTIONNAIRE	ស្រាលSlight ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐ មិនទទួលយកសម្រាប់ការសិក្សាEXCLUDED ☐	3 8 9 99
FEVER24H	6. តើកុមារ(ឈ្មោះ)មានក្តៅខ្លួនទេចាប់តាំងពី២៤ម៉ោងមុន? Has (name) been ill with a fever in the past 24 hours?	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
ARI24H1	7. ក្នុងកំឡុងពេល២៤ម៉ោងមុនរហូតដល់ឥឡូវតើកុមារ(ឈ្មោះ)មានក្អកទេ? Has (name) had an illness with a cough in the past 24 hours?	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
DIAR24H1	8. ក្នុងកំឡុងពេល២៤ម៉ោងមុនរហូតដល់ឥឡូវតើកុមារមានរាគទេ? ខ. បន្ទោរបង់ចាប់ពីពាងក្នុងរយៈពេល២៤ម៉ោង បើមាន បន្តទៅសំនួរ *9* បើទេ បដិសេធ មិនដឹង រំលងទៅសំនួរទី*10* Has (name) had had diarrhoea in the past 24 hours, i.e. 3 or more loose stools during 24hr? *If **Yes** – go to question 9* *If No, Refused, Don't know – go to question 10*	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer(IVNAME4):_____GñkRbmUlTinñn½y (Interviewer ID, IVID4):

kumar (Child´s ID, CHID4): ☐☐☐ (Form ID, FORMID) 0 6

DIAR24H2	9. ក្នុងកំឡុងពេល២៤ម៉ោងមុនរហូតដល់ឥឡូវតើកុមារមានបន្ទោរបង់ដោយមានឈាមជាប់លាមកទេ? បើមាន សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានបន្ទោរបង់ឈាម ដែលបញ្ជាក់ថាគាត់មានជំងឺធ្ងន់ចាប់តាំងពី២៤ម៉ោងមុន។ យើងឲ្យយោបល់ថាអ្នកគួរតែទៅពិនិត្យនៅមណ្ឌលសុខភាព ឬគ្លីនិក។ បញ្ចប់សំនួរ ហើយមិនទទួលការចូលរួម បើទេ បដិសេធ មិនដឹង រំលងទៅសំនួរទី*10* Was there any blood in the stools in the past 24hrs? *If **Yes** – Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) has had blood in their stools, which indicates a serious illness, in the last 24hrs. We suggest that you visit a health care provider or clinic.* EXCLUDE AND END THE QUESTIONNAIRE *If **No, Refused, Don't know** – go to question 10*	ទេNo ☐	0
		បាទ/ចាសYes ☐	1
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9
DIAR24HEX		មិនទទួលយកសម្រាប់ការសិក្សាEXCLUDED ☐	99
VOMIT24H	10. តើកុមារ(ឈ្មោះ)មានក្អួតទេចាប់តាំង២៤ម៉ោងមុន? Has (name) vomited in the past 24 hours?	ទេNo ☐	0
		បាទ/ចាសYes ☐	1
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9
RASH24H	11. តើកុមារ(ឈ្មោះ)មានឡើងកន្ទួលលើ ស្បែកទេចាប់តាំងពី២៤ម៉ោងមុន? Has (name) had a skin rash in the past 24 hrs?	ទេNo ☐	0
		បាទ/ចាសYes ☐	1
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9
APPET24H	12. តើកុមារ(ឈ្មោះ)ញុំអាហារជាធម្មតា ឬច្រើនជាងធម្មតា ឬតិចជាងធម្មតានៅក្នុង24ម៉ោងមុន? Has (name) been eating normally, more than usual, or less than usual in the past 24 hrs?	ធម្មតាNormally ☐	0
		ច្រើនជាងធម្មតាMore than usual ☐	1
		តិចជាងធម្មតាLess than usual ☐	2
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer(IVNAME4):_____GñkRbmUlTinñn½y (Interviewer ID, IVID4):

kumar (Child´s ID, CHID4): ☐☐☐ (Form ID, FORMID) 0 6

SYMPT24H	13. តើកុមារមានរោគសញ្ញាអ្វីផ្សេងទៀតដែលខ្ញុំមិនបានសួរតាំងពី24ម៉ោងមុន?	ទេNo ☐	0
		បាទ/ចាសYes ☐	1
	បើមាន សូមបញ្ជាក់	បើសិនជាមាន តើរោគសញ្ញាអ្វីដែរ	
	Has (name) had any other symptoms that I have not asked about in the past 24 hours?	If yes: What symptoms?	
SYMP24H2	If yes - Please specify.		
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9

បើសិនជាមិនត្រូវបានជ្រើសរើសឱ្យចូលរួមដោយសារជំងឺ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានជំងឺធ្ងន់។ យើងឱ្យយោបល់ថាអ្នកគួរតែទៅពិនិត្យនៅមណ្ឌលសុខភាព ឬគ្លីនិក។

If excluding due to illness, say: Thank you for answering these questions. Unfortunately, your child is not eligible to participate because they have a serious illness. We suggest that you visit a health care provider or clinic.

បើសិនជាត្រូវបានជ្រើសរើស សូមនិយាយថា៖ អរគុណសម្រាប់ការផ្តល់ចម្លើយ។ សូមអញ្ជើញទៅកន្លែងបន្ទាប់ ហើយយើងនឹងចាប់ផ្តើមបម្រើអាហារដល់អ្នកភ្លាម។

If not excluding, say: Thank you for answering these questions. Please go to the next station and we will soon serve the food.

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer(IVNAME4):_____GñkRbmUlTinñn½y (Interviewer ID, IVID4):

kumar (Child´s ID, CHID4): ☐☐☐ (Form ID, FORMID) 0 6

ទម្រង់ទី៥៖ ការសិក្សាសាកល្បង – ផ្នែកសិក្សាទី១ – កំណត់ញ៉ាំប្រចាំថ្ងៃ ពីថ្ងៃទី១ទៅថ្ងៃទី១២

Form 5: Acceptability trial, sub-study 1 (child) – daily consumption record, days 1-12

eQµaHkumar Name of child	
eQµaHmþaykumar Name of the caregiver	

Variable	Question	Response	Code
PRODWT	ផលិតផល Product	បបរជាមួយ LNS LNS +Borbor ☐ LNSជាតំណាញ់លេងLNS snack ☐ បបរជាមួយCSB++ ☐ បបរជាមួយSprinkles ☐	1 2 3 4
EATDAY	ថ្ងៃរបស់អាហារ Day on this food:	ថ្ងៃទី១1st ☐ ថ្ងៃទី២2nd ☐ ថ្ងៃទី៣3rd ☐	1 2 3
PREWT	1. ទម្ងន់សរុបរបស់ចាន ស្លាបព្រា ក្រដាស់ជូតមាត់ និងអាហារមុនពេលញ៉ាំ(g) Wt of bowl/spoon/napkins/food/product (100.0±1g to nearest 0.1g).	☐☐☐.☐	
POSTWT	2. ទម្ងន់សរុបរបស់ចាន ស្លាបព្រា ក្រដាស់ជូតមាត់ និងអាហារក្រោយពេលញ៉ាំ(g) Weight of bowl/spoon/napkins/remaining food after eating to 0.1g	☐☐☐.☐	
STARTIME	3. កត់ត្រាទ្ធម៉ោងដែលកុមារចាប់ផ្តើមញ៉ាំអាហារ (ម៉ោង.នាទី) (រយៈពេលឲ្យញ៉ាំប្រហែលជា១៥នាទី) Record time that child started eating (hr.min). (Allow approximately 15mins.)	☐☐.☐☐ ម៉ោង Hour នាទី Minutes	
ENDTIME	4. កត់ត្រាទ្ធម៉ោងដែលកុមារ បញ្ឈប់ញ៉ាំអាហារ (ម៉ោង.នាទី) (រយៈពេលញ៉ាំប្រហែលជា១៥នាទី) Record time that child stopped eating (hr.min). (Should be approx 15mins.)	☐☐.☐☐ ម៉ោង Hour នាទី Minutes	
REFUSED	5. តើកុមារមានបដិសេធមិនញ៉ាំទេ? (អ្នកប្រមូលទិន្នន័យត្រូវសង្កេតដោយខ្លួនឯងចំពោះសំនួរនេះ មិនត្រូវសួរអ្នកថែកុមារទេ) Did the child refuse to eat? (Data collector observation– do not ask caregiver.)	ទេNo ☐ បាទ/ចាសYes ☐ ការគេង Sleeping ☐ មិនដឹងDon't know ☐	0 1 2 9
RELUCT	6. តើកុមារមានអល់ឯកមិនចង់ញ៉ាំទេ? (អ្នកប្រមូលទិន្នន័យត្រូវសង្កេតដោយខ្លួនឯងចំពោះសំនួរនេះ មិនត្រូវសួរអ្នកថែកុមារទេ) Was child reluctant to eat? (Data collector observation– do not ask caregiver.)	ទេNo ☐ បាទ/ចាសYes ☐ យំ Crying ☐ មិនដឹងDon't know ☐	0 1 2 9
SPIT	7. តើកុមារមានបដិសេធមិនញ៉ាំទេ? (អ្នកប្រមូលទិន្នន័យត្រូវសង្កេតដោយខ្លួនឯងចំពោះសំនួរនេះ មិនត្រូវសួរអ្នកថែកុមារទេ) Did child spit the food out? (Data collector observation– do not ask caregiver.)	ទេNo ☐ បាទ/ចាសYes ☐ មិនដឹងDon't know ☐	0 1 9
FORCED	8. តើម្តាយមានបានបង្ខំកូនឲ្យញ៉ាំទេ? (អ្នកប្រមូលទិន្នន័យត្រូវសង្កេតដោយខ្លួនឯងចំពោះសំនួរនេះ មិនត្រូវសួរអ្នកថែកុមារទេ) Was mother forcing child to eat? (Data collector obs– don't ask mother)	ទេNo ☐ បាទ/ចាសYes ☐ មិនដឹងDon't know ☐	0 1 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer(IVNAME4):_____GñkRbmUlTinñn½y (Interviewer ID, IVID4):

kumar (Child´s ID, CHID4): | | | | (Form ID, FORMID) | 0 | 6 |

ទម្រង់ទី៦៖ ការសិក្សាសាកល្បង – ផ្នែកសិក្សាទី១ – ការឆ្យេរចំណាត់ថ្នាក់ពីការចូលចិត្តរបស់ម្តាយ ថ្ងៃទី៣ ទី៦ ទី៩ ទី១២

Form 6: Acceptability trial, sub-study 1 (child) – children's preference ranking by mother, days 3-6-9-12

eQµaHkumar Name of child	
eQµaHmþaykumar Name of the caregiver	

kalbriecäTRbmUlTinñn½y Date of data collection (DATE)	ថ្ងៃ Day:	ខែ Month: 0	ឆ្នាំ Year: 2015	លេខកូដ Code
ទីកន្លែងផ្តល់អាហារ Test-feeding site (SITE)	Site 1 Sokly's house☐			1
	Site 2 Sopha & Nath's house☐			2
	Site 3 Leang Sok's house☐			3
	Site 4 Thearith's house☐			4
ផលិតផល Product (PRODUCT)	បបរជាមួយ LNS LNS +Borbor ☐			1
	LNSជានំញុាំលេង LNS snack ☐			2
	បបរជាមួយCSB++ ☐			3
	បបរជាមួយSprinkles ☐			4
ថ្ងៃរបស់អាហារ Day on this food: (EATDAY)	ថ្ងៃទី1st ☐			1
	ថ្ងៃទី2nd ☐			2
	ថ្ងៃទី3rd ☐			3

ត្រូវនិយាយថា៖ កូនរបស់អ្នកបានញុាំអាហារអស់រយៈពេលពាថ្ងៃហើយ។ តើអ្នកគិតថាកូនរបស់អ្នកចូលចិត្តអាហារនេះឬទេ?

Say: Your child has been eating this food for 3 days. How do you think your child liked this food? (Code: LIKE)

1 =មិនចូលចិត្តទាល់តែសោះ 1 = Disliked a lot	2 =មិនចូលចិត្តគិចៗ 2 = Disliked a little	3 =ធម្មតា 3 = Neither liked nor disliked	4 =ចូលចិត្តគិចៗ 4 = Liked a little	5 =ចូលចិត្តខ្លាំង 5 = Liked a lot
				

Appendix 4.4 Forms 7, 8, & 9: Caregiver baseline data; sensory test; and ranking day 13

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME7):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID7): ☐

kumar (Child´s ID, CHID7): ☐☐☐ (Form ID, FORMID) 0 7

ទម្រង់ទី៥៖ ការសិក្សាសាកល្បង – ផ្នែកសិក្សាទី២ (អ្នកថែកុមារ) – ការប្រមូលទិន្នន័យមូលដ្ឋាននៅថ្ងៃទី១៣

Form 7: Acceptability trial, sub-study 2 (caregiver) – baseline data on day 13

Variable name		លេខកូដ
សង្កាត់ Sangkat (SANGKAT7)	Svay Pakស្វាយប៉ាក	1
	(SANGKAT7_2) Other (describe) ផ្សេង។(ពិពណ៌នា) _____ ☐	7
PUmi Village (VILLAGE7)	Phum Svay Pakស្វាយប៉ាក	1
	Phum Louលូ	2
	Phum La Kamboarឡាំបោ	3
	(VILLAGE7_2) Other (describe) ផ្សេង។(ពិពណ៌នា) _____ ☐	7
ទីកន្លែងផ្តល់អាហារ Test-feeding site (SITE7)	Site 1 Sokly's house ☐	1
	Site 2 Sopha & Nath's house ☐	2
	Site 3 Leang Sok's house ☐	3
	Site 4 Thearith's house ☐	4
kalbriecäTRbmUlTinñn½y Date of data collection (DATE7)	☐☐ ថ្ងៃ Day 0 7 ខែ Month 2 0 1 5 ឆ្នាំ Year	
ការប្រមូលទិន្នន័យបានទាំងអស់ Data collection completed (COMPLETE7)	ទេNo ☐	1
	បាទ/ចាសYes ☐	2

ឈ្មោះអ្នកដឹកនាំក្រុម Team leader name (SPVSR7)	Kunthea ☐	1
	Phanna ☐	2
កាលបរិច្ឆេទនៃការពិនិត្យរបស់អ្នកដឹកនាំក្រុម Date checked by team leader (CHEKDATE7)	☐☐ ថ្ងៃ Day 0 7 ខែ Month 2 0 1 5 ឆ្នាំ Year	
ឈ្មោះអ្នកគ្រប់គ្រងក្នុងការិយាល័យ Office supervisor name (OFFICE7)	ប៊ីនឌីBindi ☐	1
កាលបរិច្ឆេទពិនិត្យដោយអ្នកគ្រប់គ្រងក្នុងការិយាល័យ Date checked by office supervisor (OFFDATE7)	☐☐ ថ្ងៃ Day 0 7 ខែ Month 2 0 1 5 ឆ្នាំ Year	
ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី១ Data entry person 1 name (ENTERER1_7)	ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី១ Data entry person 1 name ☐	
កាលបរិច្ឆេទបញ្ចូលទិន្នន័យទី១ Date entered (ENTDATE1_7)	☐☐ ថ្ងៃ Day 0 ☐ ខែ Month 2 0 1 5 ឆ្នាំ Year	
ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី២ Data entry person 2 name (ENTERER2_7)	ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី២ Data entry person 2 name ☐	
កាលបរិច្ឆេទបញ្ចូលទិន្នន័យទី២ Date entered (ENTDATE2_7)	☐☐ ថ្ងៃ Day 0 ☐ ខែ Month 2 0 1 5 ឆ្នាំ Year	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME7):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID7): ☐

kumar (Child´s ID, CHID7): ☐☐☐ (Form ID, FORMID) 0 7

eQµaHkumar Name of child (NAMECH7)	
eQµaHmþaykumar Name of the caregiver (NAMECG7)	

Variable name	Question	Response	លេខកូដ Code
RSHP2	**1. etIGñkmanTMnak;TMngGVICamYynwgkumarenH?** *sUmKUsrgVg;ykcMellyEtmYy* What is your relationship to (name)? Select ONLY ONE answer	ម្តាយបង្កើតBiological mother ☐	1
		ម្តាយចុងStepmother ☐	2
		ជីដូនGrandmother ☐	3
		ឪពុកFather ☐	4
		បងស្រីSister ☐	5
		ផ្សេងៗ(ពិពណ៌នា)Other (describe) ☐	7
RSHP2OTH			
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9
CARE2W7	**2. etIGñkman)anTTYlxusRtUvkñúgkarEfTaMkumarenH ya:gticNas; 2s)þah¾cugeRkayenHb¤eT?** *sUmKUsrgVg;ykcMellyEtmYy* Have you had responsibility for taking care of (name) for at least the last two weeks?) Select ONLY ONE answer	ទេNo ☐	0
		បាទ/ចាសYes ☐	1
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9
AGEMUM	3. តើអ្នកអាយុប៉ុន្មាន? How old are you?	..... ☐☐ Age in years អាយុជាឆ្នាំ	
ETHNIMUM	4. តើអ្នកកាន់សាសនាអ្វី? What religion do you identify with? (Tick ONLY ONE answer)	ព្រះពុទ្ធ Buddhist ☐	2
		អូស្លឹមMuslim ☐	3
		ផ្សេងៗ សូមរៀបរាប់Other (describe) ☐	7
ETHNMUM2		_____	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME7):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID7): ☐

kumar (Child´s ID, CHID7): ☐☐☐ (Form ID, FORMID) 0 7

ILL1MUM	5. តើពាក់ថ្ងៃមុននេះ អ្នកមានឈឺទេ? (ចូរគូសចម្លើយមួយ) បើទេ បញ្ចប់សំនួរ In the past 3 days, have you been ill? (Tick ONLY ONE answer) *If* No *to* this *question – jump to end.*	ទេNo ☐ បាទ/ចាសYes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
ILL2MUM	6. ជាគំនិតរបស់អ្នក តើអ្នក មានជំងឺធ្ងន់ មធ្យម ឬស្រាល? បើធ្ងន់ធ្ងរ សូមនិយាយថា៖ សូមអរគុណសម្រាប់ឆន្ទៈចូលរួម។ តែត្រូវឲ្យស្គាល់ដែលអ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់សម្រាប់ចូលរួមក្នុងការសិក្សាដោយសារតែអ្នកមានជំងឺធ្ងន់ចាប់ពីពាក់ថ្ងៃមុនមក។ យើងសំណូរពរឲ្យអ្នកទៅមណ្ឌលសុខភាពឬគ្លីនិក។ បញ្ចប់សំណួរ In your opinion , was your illness serious, moderate or slight? *If* ***Serious*** *– Say: Thank you for your willingness to participate. Unfortunately, you are not eligible to participate because you have been seriously ill in the last 3 days. We suggest that you visit a health care provider or clinic.* EXCLUDE AND END QUESTIONNAIRE	ជំងឺធ្ងន់ Serious ☐ មធ្យមModerate ☐ ស្រាលSlight ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	1 2 3 8 9
ILLMUMEX		មិនទទួលសម្រាប់ការសិក្សាEXCLUDED ☐	99

បើសិនជាមិនជ្រើសរើសដោយសារជំងឺ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានបន្ទាប់ឈាមដែលបញ្ជាក់ថាគាត់មានជំងឺធ្ងន់ចាប់តាំងពីពាក់ថ្ងៃ មុន។ យើងឲ្យយោបល់ថាអ្នកគួរតែទៅពិនិត្យនៅមណ្ឌលសុខភាព ឬគ្លីនិក។

If excluding due to illness, say: Thank you for answering these questions. Unfortunately, you are not eligible to participate because of your illness. We suggest that you visit a health care provider or clinic.

បើសិនជាត្រូវបានជ្រើសរើស សូមនិយាយថា៖ អរគុណសម្រាប់ការផ្តល់ចម្លើយ។ សូមបន្តទៅតុបន្ទាប់ ហើយយើងនឹងចាប់ផ្តើមបម្រើអាហារដល់អ្នក។

If not excluding, say: Thank you for answering these questions. Please go to the next station and we will soon serve the food.

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME7):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID7): | |

kumar (Child´s ID, CHID7): | | | | (Form ID, FORMID) | 0 | 7 |

ទម្រង់ទី៥៖ ការសិក្សាសាកល្បង – ផ្នែកសិក្សាទី២ (អ្នកថែរក្សាកុមារ) – ការធ្វើតេស្តដោយញ៉ាំណ ថ្ងៃទី១៣

Form 8: Acceptability trial, sub-study 2 (caregiver) - sensory test, day 13

eQµaHkumar Name of child	
eQµaHmþaykumar Name of the caregiver	

តើអ្នកគិតយ៉ាងម៉េចចំពោះផលិតផលទាំងនេះ? **What do you think of these products?**

Variable name	LNS +បបរ LNS + borbor	ល្អណាស់(1) Very Good (1)	ល្អ(2) Good (2)	មធ្យត(3) Neutral (3)	អន់(4) Bad (4)	អន់ខ្លាំង(5) Very Bad (5)
						
SENLNSA	រូបរាង Appearance					
SENLNSC	ពណ៌ Colour					
SENLNSS	ក្លិន Smell					
SENLNST	រសជាតិ Taste					
SENLNSX	សាច់ន Texture					
SENLNSO	សរុប Overall					

Variable name	CSB++ porridge CSB++ បបរ	ល្អណាស់(1) Very Good (1)	ល្អ(2) Good (2)	មធ្យត(3) Neutral (3)	អន់(4) Bad (4)	អន់ខ្លាំង(5) Very Bad (5)
						
SENCSBA	រូបរាង Appearance					
SENCSBC	ពណ៌ Colour					
SENCSBS	ក្លិន Smell					
SENCSBT	រសជាតិ Taste					
SENCSBX	សាច់ន Texture					
SENCSBO	សរុប Overall					

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME7):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID7): | | |

kumar (Child´s ID, CHID7): | | | | (Form ID, FORMID) | 0 | 7 |

Variable name	Sprinkles + borbor Sprinkles + បបរ	ល្អណាស់(5) Very Good (1)	ល្អ(4) Good (2)	មធ្យម(3) Neutral (3)	អន់(2) Bad (4)	អន់ខ្លាំង(1) Very Bad (5)
						
SENSPA	រូបរាង Appearance					
SENSPC	ព័ណ Colour					
SENSPS	ក្លិន Smell					
SENSPT	រសជាតិ Taste					
SENSPX	សាច់ន Texture					
SENSPO	សរុប Overall					

Variable name	LNS Snack LNS ជាន់ញុំាលេង	ល្អណាស់(5) Very Good (1)	ល្អ(4) Good (2)	មធ្យម(3) Neutral (3)	អន់(2) Bad (4)	អន់ខ្លាំង(1) Very Bad (5)
						
SENSNKA	រូបរាង Appearance					
SENSNKC	ព័ណ Colour					
SENSNKS	ក្លិន Smell					
SENSNKT	រសជាតិ Taste					
SENSNKX	សាច់ន Texture					
SENSNKO	សរុប Overall					

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME7):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID7): ☐

kumar (Child´s ID, CHID7): ☐☐☐ (Form ID, FORMID) 0 7

ទម្រង់ទី៥៖ ការសិក្សាសាកល្បង – ផ្នែកសិក្សាទី២ (អ្នកថែរក្សាកុមារ) – ការធ្វើតេស្តដោយការឲ្យចំណាត់ថ្នាក់ ថ្ងៃទី១៣

Form 9: Acceptability trial, sub-study 2 (caregiver) - ranking test, day 13

eQµaHkumar Name of child	
eQµaHmþaykumar Name of the caregiver	

តើអ្នកគិតយ៉ាងម៉េចដែរចំពោះផលិតផលនេះ?

How did you like these products?

Variable name	**Product** ផលិតផល	ចូលចិត្តខ្លាំង **Like most (1)**	ចូលចិត្តលេខរៀងទី២ **Like 2nd best (2)**	ចូលចិត្តលេខរៀងទី៣ **Like 3rd best (3)**	មិនសូវចូលចិត្ត **Like least (4)**
					
RANKLNS	LNS +បបរ LNS + ជាមួយបបរ				
RANKCSB	CSB++ ជាមួយបបរសរ CSB++ porridge				
RANKSP	Sprinkles ជាមួយបបរសរ Sprinkles with borbor				
RANKSNK	LNS snack **LNS** ជានំញុំាលេង				

RANKNO	ម្តាយមិនអាចឲ្យចំណាត់ថ្នាក់បាន The mother could not rank the products	9

Appendix 4.5 Form 10: Focus group discussion day 14

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:__Ung Sreymach_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): 3

kumar (Child´s ID, CHID): | | | | (Form ID, FORMID) 0 6

ទម្រង់ទី៥៖ ការសិក្សាសាកល្បង – វគ្គកសិក្សាទី២ (អ្នកថែរក្សាមារ) – ក្រុមពិភាក្សា ថ្ងៃទី១៤

Form 10: Acceptability trial, sub-study 2 (caregiver) – focus group discussion, day 14

ជំរាបសួរ ខ្ញុំបាទ/នាងខ្ញុំឈ្មោះ_____ ។ ខ្ញុំបាទ/នាងខ្ញុំធ្វើការងារជាមួយគម្រោងផលិតនំត្រី។ ពួកគេគឺជាសហការីរបស់ខ្ញុំ (នៃនាំពួកគេ) ដែលជាអ្នកកត់ត្រានិងជួយក្នុងការសម្របសម្រួលក្នុងការពិភាក្សា។ (នៃនាំអ្នកផ្សេងទៀតដែលផ្តល់អាហារ)។

Hello, my name is _____. I am working with the Num Trey Project. These are my colleagues (*introduce them*) who will be taking notes and helping to facilitate this discussion. (*Introduce anyone else who is observing*).

ថ្ងៃនេះយើងនឹងនិយាយអំពីអាហារដែលអ្នក និងកូនរបស់អ្នកបានភ្លក់ក្នុងរយៈពេល២សប្តាហ៍មុន។ ក្នុងនាម អ្នកជាម្តាយ សូមអ្នកផ្តល់ឱ្យយើងនូវព័តមានសំខាន់ខ្លះ។ ព័តមានទាំងនេះនឹងទុកជាការសម្ងាត់និងឯកជន។ យើងនឹងណែនាំខ្លួនពួកយើង ហើយយើងអាចហៅឈ្មោះគ្នាទៅវិញទៅមកបាន។ នៅមុនពេលយើងចាប់ផ្តើម សូមមេត្តាឱ្យយើងរំលឹកនូវការណែនាំសម្រាប់ការពិភាក្សានេះ។

Today we are going to talk about the foods that you and your child have tasted over the past two weeks. As mothers, you can provide us with some important information. This will be a private, confidential discussion. We will only introduce ourselves and call each other by our first names. Before we get started, let's review the guidelines for this discussion.

1. វគ្គនេះនឹងត្រូវការរយៈពេល1-2ម៉ោង។ វគ្គនេះនឹងត្រូវការការថតសម្លេងហើយយើង ក៏ត្រូវការអ្នកកត់ត្រាដែរ។
   (កំណត់សម្គាល់សម្រាប់អ្នកសម្របសម្រួល៖ បើអ្នកមិនទាន់បានណែនាំ សូមមេត្តាណែ នាំខ្លួនទៅសហការីរបស់អ្នក)។
   This session will take 1-2 hours. This session will be tape-recorded and we will have a note taker. (*If you haven't already, please introduce your colleague/s*).

2. អ្នកទាំងអស់គ្នាសូមមេត្តានិយាយឱ្យបានលឺ។
   Everyone please speak clearly one at a time.

3. យើងសូមឱ្យអ្នកទាំងអស់គ្នាចូលរួម ប៉ុន្តែបើអ្នកមិនមានអារម្មណ៍ថាស្រួលក្នុងការនិយាយទេ អ្នកមិនចាំបាច់និយាយទេ។ ម្យ៉ាងវិញទៀត សូមទុកឱកាសឱ្យអ្នកដទៃទៀតនិយាយផង។
   We would like everyone to participate, but if you do not feel comfortable talking you do not have to. On the other hand, please give each other a chance to speak.

4. វាមិនមានចម្លើយណាខុសឬត្រូវឡើយ។ អ្នកគួរតែមានអារម្មណ៍ស្រួលដើម្បីបញ្ចេញនូវ អ្វីដែលអ្នកគិត។
   There are no right or wrong answers. You should feel free to express whatever you are thinking.

5. ការចូលរួមរបស់អ្នកនិងចម្លើយរបស់អ្នកត្រូវបានទុកជាការសម្ងាត់ទាំងស្រុង។ អ្នកអាច ណែនាំឈ្មោះដែលអ្នកចង់ឱ្យគេហៅ វាមិនចាំបាច់ថាជាឈ្មោះពិតរបស់អ្នកក៏ដោយ។ យើងនឹងមិនប្រើឈ្មោះរបស់អ្នកក្នុងរបាយការណ៍ណាទេ។
   Your participation and your answers are completely confidential. You can introduce yourself with whichever name you want, not necessarily your real name. We will not use your name in any of our reports.

6. តើអ្នកទាំងអស់គ្នាយល់អំពីគោលការណ៍ទាំងអស់គ្នាហើយឬនៅ? តើមានអ្នកណាមាន សំណួរអ្វីទេ?
   Does everyone understand the rules? Does anyone have any questions?

គិតត្រលប់ទៅពេលដែលពួកគាត់បានភ្លក់អាហារនៅ២សប្តាហ៍មុន តើអាហារណាដែលកូនរបស់អ្នកចូលចិត្តបំផុត? (LNS + បបរ, **LNS** ជាទំព្យាំលេង, CSB++ ជាមួយបបរ, sprinkles ជាមួយបបរ)

Think back over the past two weeks. Which food did your child like best? (LNS+borbor, LNS snack, CSB++, Sprinkles + borbor)

LNS+borbor 6នាក់

LNS snack ៧នាក់

CSB++ ៦នាក់

Sprinkles + borbor ៨នាក់

Comments:

Lns+borbor: ពួកគាត់ទាំងអស់គ្នាយល់ថា*lns+borbor*គួរធ្វើមិចកុំឱ្យវាខាប់ពេកពិបាក់បញ្ចុកក្មេង

Csb++ ពួកគាត់យល់ថាវាសាបពេកពិបាក់ញ៉ាំ។

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:__Ung Sreymach_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): 3

kumar (Child´s ID, CHID): [ ][ ][ ] (Form ID, FORMID) 0 6

តើហេតុអ្វីបានជាកូនអ្នកចូលចិត្តអាហារនេះ?

- ផ្តើមដោយ៖ គេញ៉ាំបានច្រើន មិនបដិសេធមិនញ៉ាំ ចង់ញ៉ាំ មិនអស់ឯកក្នុងការញ៉ាំ ខ្ញុំមិនបានបង្ខំគេឲ្យញ៉ាំ គេញ៉ាំបានរហ័ស គេញ៉ាំយ៉ាងសប្បាយ ធ្វើឲ្យគេសប្បាយ ធ្វើមុខគ្រាញ់/ផ្សេង។

What makes you think your child liked this product?

S/he ate a lot
S/he didn't refuse to eat
S/he wanted to eat, wasn't reluctant to eat
I didn't force him/her to eat
S/he ate quickly
S/he was happy
S/he made happy, yummy faces

Other Comments:

តើអាហារមួយណាដែលអ្នកមិនសូវចូលចិត្ត? (LNS + បបរ, **LNS** ជាទំញ៉ាំលេង, CSB++ ជាមួយបបរ, springkles ជាមួយបបរ)

Which food did your child like least?

LNS+borbor
LNS snack
CSB++ ៥នាក់
Sprinkles + borbor ២នាក់

Comments:

តើអ្វីដែលធ្វើឲ្យអ្នកគិតថាកូនអ្នកមិនសូវចូលចិត្តអាហារនេះ?

- ចាប់ផ្តើមដោយ៖ គេខ្ជាក់/ច្រួសចេញវិញច្រើន បដិសេធមិនញ៉ាំ មិនចង់ញ៉ាំ អស់ឯកក្នុងការញ៉ាំ ខ្ញុំបានបង្ខំគេ ឲ្យញ៉ាំ ប្រើពេលយូរក្នុងការបញ្ចុក គាត់មិនសប្បាយចិត្ត/ម្ហូអ៊ាំ យំ គេធ្វើមុខមិនសប្បាយចិត្ត/ផ្សេង។

What makes you think your child didn't like this product?

S/he spat/spilled a lot
S/he refused to eat/ didn't want to eat, was reluctant to eat
I had to force him/her to eat
S/he took a long time to eat
S/he was distressed/ unhappy/ crying
S/he made unhappy faces

Other Comments:

ឥឡូវនេះ ខ្ញុំនឹងធ្វើការសួរអ្នកឲ្យរៀបរាប់លម្អិតអំពីអាហារនិមួយឲ្យខ្ញុំ ដោយរួមបញ្ចូលទាំងរូបរាង រសជាតិ ពណ៌ ក្លិន ភាពមិនប្រែប្រួលរបស់នំ និងសាច់នំ ថាតើអ្នកវាយតម្លៃវាយ៉ាងណា?

- តើអាចរៀបរាប់ពីLNSណាជាមួយនឹងបបរសរធម្មតា?
- តើអាចរៀបរាប់ពី CSB++?
- តើអាចរៀបរាប់ពី Sprinkles ណាជាមួយនឹងបបរសរធម្មតា?
- តើអាចរៀបរាប់ពីបបរសរធម្មតា?

Now, I am going to ask you to describe each food for me, including its appearance, taste, colour, smell, consistency, how you find it overall.

- Can you please describe LNS with borbor?

៧នាក់និយាយថា**lns** ក្លិនដូចចំនីមាន់ ពណ៌ក៏អត់ស្អាត តែសំរាប់រស់ជាត់គ្រាញ់ មានរស់ជាត់ផ្អែម មើលទៅដូចជាសូកូឡាតែក្នុងនោះហាក់មានក្លិនឈ្ងុយតិច។ដែរ និយាយជារួមអាចដាយក្មេងញ៉ាំបាន។

- Can you please describe CSB++?

៧នាក់បាននិយាយថាវាដូចជាបបរធម្មតាដែរ ហើយក្លិនវាល្អ ហើយរាវល្មម ងាយស្រួលអោយកូនញ៉ាំ។

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:__Ung Sreymach_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): 3

kumar (Child´s ID, CHID): | | | | (Form ID, FORMID) 0 6

ប៉ុន្តែមាន១នាក់និយាយថា បបរនេះវារាងសាបពេក ដូចជាអត់មានប្រៃអីសោះ អត់មានជាតិជៅ ហើយរាងស្អាតៗក៏នៅពេលញ៉ាំ។

- Can you please describe Sprinkles with borbor?

៩នាក់និយាយថាពណ៌វាស្អាត់

៨នាក់ថារស់ជាតិវាល្អ ក្លិនល្អ(ដូចគ្នាជាមួយបបរធម្មតា)

១នាក់បាននិយាយថាពណ៌អត់ស្អាតហើយម្សៅវ

- Can you please describe LNS snack?

  ១០នាក់រស់ជាតិឆ្ងាញ់(ក្នុងនោះវាមានរស់ជាត់ផ្អែម ហើយរស់ជាត់ប៊ែបនេះទាក់ទាញកូនក្មេង)

ឥឡូវនេះ ខ្ញុំនឹងសួរអ្នកថាតើអាហារមួយណាដែលអ្នកចូលចិត្តបំផុត (សួរម្តាយ)?តើហេតុអ្វី?

- អាហារមួយណាអ្នកចូលចិត្តជាងគេ? (សួរម្តាយ)
- ហេតុអ្វីបានជាអ្នកចូលចិត្តអាហារនេះជាងគេ? (សួរម្តាយ)
- ហេតុបានជាវាមានភាពប្រសើរជាងអាហារមួយទៀត? (សួរម្តាយ)

Now I'm going to ask you which food you (the mother, not the child) liked best and why.
Which food did you (the mother, not the child) like best?
Why is it better that the other ones?
Why do you (the mother, not the child) like this food best?

LNS+borbor
LNS snack

១០នាក់និយាយថាគាត់ចូលចិត្ត ព្រោះវាឆ្ងាញ់ រស់ជាត់ប៉ុន្មឹងល្មម ឈ្ងុយ ងាយស្រួលញ៉ាំ វាមានរស់ជាត់ផ្អែមតិចៗ ហើយរូបរាងស្អាត គួរអោយទាក់ទាញទំាងខាងក្នុងនិងខាងក្រៅ ហើយខំខាងក្នុងដូចសូកូឡា ហើយសំបកខំខាងក្រៅជាខុំរ៉ែរក្មេងចូល ចិត្តញ៉ាំ។

CSB++
Sprinkles + borbor

ឥឡូវនេះ ខ្ញុំនឹងសួរអ្នកថាតើអាហារមួយណាដែលអ្នកមិនសូវចូលចិត្ត(សួរម្តាយ)?តើហេតុអ្វី?

- អាហារមួយណាអ្នកមិនសូវចូលចិត្ត? (សួរម្តាយ)
- ហេតុអ្វីបានជាអ្នកមិនសូវចូលចិត្តអាហារនេះ?
- ហេតុបានជាវាមានអន់ជាងអាហារមួយទៀត?

Now I'm going to ask you which food you the mother, not the child) liked least and why.
Which food did you the mother, not the child) like it least?
Why do you find this food the least acceptable / less acceptable than the other foods?

LNS+borbor
LNS snack
CSB++

៨នាក់គាត់យល់ថាវាម្សៅពេក សាបពេក រស់ជាតិអត់ឆ្ងាញ់ តែសំរាប់ក្លិនអាចទទួលយកបាន។

Sprinkles + borbor

ឥឡូវនេះ ខ្ញុំនឹងសួរអ្នកបើសិនជាអ្នកមានសំណើរអ្វីសម្រាប់ការធ្វើឲ្យអាហារនេះប្រសើរឡើង។

តើមានមធ្យោបាយអ្វីដែលធ្វើឲ្យអាហារដែលអ្នកចូលចិត្តបំផុតប្រសើរជាងនេះទេ? ឧ. តើមានអ្វីដែលអ្នកចង់បន្ថែមដើម្បីធ្វើឲ្យវាកាន់តែត្រូវបានចូលចិត្តញ៉ាំ?

ហេតុអ្វី? ឧ. តើធ្វើដូចម្តេចដើម្បីធ្វើឲ្យវាប្រសើរឡើង

Now I'm going to ask you if you have any suggestions for improving the foods.
Is there any way to improve (the food they liked best)? *Prompt*: is there anything you would add or take out to make it more appetising?
Why? i.e. how would that improve it

ពួកគាត់មួយចំនួននិយាយថាសុំកុំអោយសំបកខាងក្រៅរឹងពេក ហើយបើអាចសុំអោយសំបកវាស្រួយជាងនេះបន្តិច។ ហើយមានម្នាក់និយាយថា សំកុំអោយស្ងួតខាងក្នុងរមួតពេកព្រោះវាងាយអោយស្អិតក៏ ហើយនំនេះផ្អែមចឹងពេលញ៉ាំ គឺនាប់ដែត។

សំរាបរូបរាងប្រម៉ឹងទំហំ អាចទទួលយកបានហើយប៉ុន្មឹង។

មាន១នាក់ចង់អោយរស់ជាត់ចាស់ជាងនេះ ប៉ុន្តែក្នុងពេលហ្នឹងវែងមាន៦នាក់និយាយថារស់ជាត់ប៉ុន្មឹងសមរម្យហើយព្រោះ កាលណារស់ជាតិចាស់ពេកអាចបណ្តាល់អោយក្មេងនាប់ក្តៅខ្លួន។

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:__Ung Sreymach_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): 3

kumar (Child´s ID, CHID): | | | | (Form ID, FORMID) 0 6

បើសិនជាអាហារនោះមិនមែនជាLNS អញ្ចឹងសួរថា៖ តើមានមធ្យោបាយអ្វីដើម្បីធ្វើ ឲ្យអាយុអហ្សប្រសើរឡើង (បង្ហាញពួកគេពីអាហារនោះ)?

ខ. តើមានអ្វីដែលអ្នកចង់បន្ថែមដើម្បីធ្វើឲ្យវាកាន់តែត្រូវបានទូលបិត្តញុាំ?

ហេតុអ្វី? ខ. តើធ្វើដូចម្តេចដើម្បីធ្វើឲ្យវាប្រសើរឡើង

If that food wasn't the LNS, then ask:
Is there any way to improve the LNS (show them that food)? *Prompt*: is there anything you would add or take out to make it more appetising?
Why? i.e. how would that improve it

តើជាទូទៅអ្នកជាអ្នកបញ្ចុកកូនរបស់អ្នក? ចាប់ផ្តើម៖ តើជាទូទៅអ្នកជាអ្នកបញ្ចុកកូនរបស់អ្នក ឬក៏អ្នកណា ផ្សេងជាអ្នកបញ្ចុក?

Who usually feeds your child? *Prompt*: do you usually feed your child or does someone else usually feed your child?

ម្តាយបង្កើតBiological mother ☐

ម្តាយចុងStepmother ☐

ជីដូនGrandmother ☐

ឪពុកFather ☐

បងស្រីSister ☐

ផ្សេងៗ(ពិព័ណនា)Other (describe) ☐

តើអ្នក (ឬក៏អ្នកដ៏ទៃទៀតដែលបញ្ចុកកូនអ្នក) នឹងចំនងជាបញ្ចុកកូនអ្នកនូវអាហារទាំងនេះជាប្រចាំឬទេ? (ខ. ពាងងក្នុងមួយថ្ងៃ)? តើអាហារមួយណាដែលអ្នកចង់បញ្ចុក?

- ហេតុអ្វី?
- ហេតុអ្វីមិនចង់?
- តើមានអ្វីអាចធ្វើឲ្យអ្នកចង់បញ្ចុកអាហារនេះទៅកុមារជាប្រចាំដែរឬទេ(ខ. ពាងងក្នុងមួយថ្ងៃ)?

Would you (or the other person who feeds the child) be likely to serve any of these foods to your children on a regular basis (e.g. 3 times a day)?
Which one/s? Why? Why not?

LNS+borbor
LNS snack
ពួកគាត់និយាយថាអាចបញ្ចុកខ្ទៅពាងងក្នុង១ថ្ងៃគឺពេលព្រឹកនិងល្ងាច គឺអាយុក្មេងញុាំរំលែងបន្តាប់ពីញុាំបាយ។ ហើយប្រហែលជាអាចអោយរាល់ថ្ងៃ ។
CSB++
Sprinkles + borbor

What might make you want to feed this food to your children on a regular basis (e.g. 3 times a day)?

LNS+borbor
LNS snack
CSB++
Sprinkles + borbor

បើមិនមែនជាLNS អញ្ចឹងសួរថា៖

តើអ្នក (ឬក៏អ្នកដ៏ទៃទៀតដែលបញ្ចុកកូនអ្នក) នឹងចំនងជាបញ្ចុកកូនអ្នកនូវអាហារLNSជាប្រចាំឬទេ? (ខ. ពាងងក្នុងមួយថ្ងៃ)?

- ហេតុអ្វី?
- ហេតុអ្វីមិនចង់?
- តើមានអ្វីអាចធ្វើឲ្យអ្នកចង់បញ្ចុកអាហារនេះទៅកុមារជាប្រចាំដែរឬទេ(ខ. ពាងងក្នុងមួយថ្ងៃ)?

If that food wasn't the LNS, then ask: Would you (or the other person who feeds the child) be likely to serve the LNS to your children on a regular basis (e.g. 3 times a day)?

Why?
Why not?

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:__Ung Sreymach_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): 3

kumar (Child´s ID, CHID): | | | | (Form ID, FORMID) 0 6

What might make you want to feed the LNS to your children on a regular basis (e.g. 3 times a day)?

បើLNS មានរូបរាងដូចបែបនេះ(បង្ហាញរំ)? តើអ្នកនឹងដាក់វាចូលក្នុងបបរដើម្បីបញ្ចុកកូនរបស់អ្នក ឬឱ្យញ៉ាំជាខ្ទះតែម្តង?

- តើហេតុអ្វីបានជាអ្នកដាក់ក្នុងបបរហើយបញ្ចុក? តើហេតុអ្វីបានជាអ្នកមិនឱ្យញ៉ាំជាខ្ទះ?
- តើហេតុអ្វីបានជាអ្នកឱ្យញ៉ាំជាខ្ទះ? តើហេតុអ្វីបានជាអ្នកមិនឱ្យញ៉ាំដោយដាក់ក្នុងបបរ?

តើជាទូទៅអ្នកឱ្យចំអិនលក់កូនរបស់អ្នកញ៉ាំនៅរាល់ថ្ងៃ?

The LNS comes in this form *[show the LNS bar]* and it can also be mixed into borbor? Would you be more likely to give it to your child in borbor, or as a snack?

Why would you give it in borbor? Why wouldn't you give it as a snack?

គាត់និយាយ ថា ក្រែមមួយឆ្នាំអាចលាយជាមួយបបរព្រោះពិបាកកាន់ញ៉ាំតែបើលើសពី១ឆ្នាំកាន់ញ៉ាំល្អជាង។

Why would you give it as a snack? Why wouldn't you give it in borbor?

ព្រោះក្មេងចង់កាន់ខ្ទំញ៉ាំលែងតែសំរាប់តែក្មេងលើលពី១ឆ្នាំទើបកាន់ញ៉ាំបាន។

What are the usual snacks that your child eats during the day?

៤នាក់និយាយថាខ្ទំសាគីរ៉ា ក្មេងៗចូលចិត្តញ៉ាំព្រោះវាស្រួយ ផ្អែម រស់ជាតិដូចដំឡូង មានជាតិទឹកដោះគោ ក្មេងខ្លះញ៉ាំការ៉ាម ខ្ទំប្រៃ ហើយ៤នាក់ទៀតអោយផ្លែឈើ។

តើអ្នកបានខ្ទំទាំងនេះមកពីណា?ចាប់ផ្តើមដោយ៖ អ្នកដាំវានៅក្នុងផ្ទះ (ខ.ផ្លែឈើ) អ្នកធ្វើវានៅផ្ទះ ឬទិញគេ?

Where do you get these snacks?ទិញពីផ្សារ កន្លែងលក់ខ្ទំ

Grow them at home (e.g. fruit),

make them at home,

buy them,?

other

តើជាទូទៅអ្នកចំណាយប៉ុន្មានសម្រាប់ខ្ទំទាំងនោះ? ចាប់ផ្តើមដោយ៖ ខ. បើសិនជាអ្នកទិញវា តើជាមធ្យមអ្នកចំណាយអស់ប៉ុន្មាន?

តើជាទូទៅអ្នកចំណាយប៉ុន្មានសម្រាប់ទិញខ្ទំញ៉ាំលេងទាំងនោះសម្រាប់កូនរបស់អ្នក(កុមារវ័យលបានភ្លក់អាហាររបស់យើង)? ចាប់ផ្តើមដោយ៖ ខ. បើសិនជាអ្នកទិញវា តើជាមធ្យមអ្នកចំណាយអស់ប៉ុន្មាន?

How much do you usually pay per snack? Prompt: for example, if you buy them, how much do you pay on average?

ពួកគាត់និយាយថា១កញ្ចប់១០០រៀល ៥០០ ២០០

How much do you usually spend on snacks each day for your child (the one who tested the food)?

ហើយក្នុង១ថ្ងៃចំនាយប្រហែល២០០០ ឬ ៣០០០រៀលក្នុង១ថ្ងៃ។

ឥឡូវនេះ ខ្ញុំនឹងសួរអ្នកឱ្យប្រៀបធៀបអំពីLNS ទៅនឹងខ្ទំដែលកូនអ្នកញ៉ាំ. តើអ្នកធ្វើការប្រៀបធៀបLNSយ៉ាងម៉េច?

- តើអ្នកគិតថាកូនរបស់អ្នកនឹងមានអារម្មណ៍ថាមានLNSឱជារស/រសជាតិ/អាចទទួលយកបានដូចខ្ទំដែលញ៉ាំជាប្រចាំដែរឬទេ?

Now I'm going to ask you to compare the LNS to the usual snacks that your child eats. How does the LNS compare?

ទាំងអស់គ្នាគិតថាវាល្អជាងខ្ទំដែលក្មេងៗចូលចិត្តទិញញ៉ាំ ព្រោះ**lns**មានគុណភាពល្អជាង ដោយសារក្មេងពេលញ៉ាំខ្ទំ**lns**ហ្នឹងហើយពេលទៅផ្ទះញ៉ាំបាយអត្រើនជាងមុន ហើយដោយថាខាងអង្គការចុះមកចឹងយកមកប្រាកដជាអាហារបំប៉នសំរាប់ក្មេងៗដើម្បី ឆាយក្មេងៗមានសុខភាពល្អ។
ហើយសំរាប់ក្មេងៗវាចូលចិត្តញ៉ាំតែបើម្តាយចង់ឆាយជាខ្ទំអីស្រេចតែទៅលើម្តាយ។
៤នាក់បាននិយាយថាក្មេងភាគច្រើនទាល់តែមានបន្តប់ខ្លះម្តងយើងអាយខ្ទំនេះម្តងយើងអាយខ្ទំនោះចឹងទើបក្មេងៗវាចូលចិត្ត។

Do you think that your child would find the LNS as palatable/tasty/acceptable as the usual snacks?

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:__Ung Sreymach_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): 3

kumar (Child´s ID, CHID): | | | | (Form ID, FORMID) 0 6

ដោយធ្វើការប្រៀបធៀបជាមួយនឹងនំធម្មតា តើអ្នកនឹងទំនងជា ឬមិនសូវចង់ ឬអាចផ្តល់តំលៃស្មើនឹងប្រឹស ជីសLNSយកមកធ្វើជានំសម្រាប់កូនរបស់អ្នកដែរឬទេ?

- ហេតុអ្វី?
- ហេតុអ្វីមិនចង់?
- តើហេតុអ្វីបានជាធ្វើឲ្យអ្នកជ្រើសរើសLNSធ្វើជានំសម្រាប់កុមារជាប្រចាំ?

In comparison to your child's usual snack, would you be more likely, less likely, or equally to choose the LNS as a snack for your child?

		Why?	Why not?
more likely,		១០នាក់បានឆ្លើយថាអាចទិញអោយកូនញ៉ាំបាន ព្រោះបាលួសំរាប់កុមារ។	
less likely			
equally likely			
Don't know			

What might make you want to choose the LNS as a snack for your child on a regular basis?

ព្រោះវាលួជាងនំក្មេងញ៉ាំផ្សេង។

ដោយធ្វើការប្រៀបធៀបជាមួយនឹងនំធម្មតា តើអ្នកនឹងទំនងជា ឬមិនសូវចង់ ឬអាចផ្តល់តំលៃស្មើនឹងទិញLNS យកមកធ្វើជានំសម្រាប់កូនរបស់អ្នកដែរឬទេ?

In comparison to your child's usual snack, if you had to pay for the LNS, would you be more likely, less likely, or equally to buy the LNS as a snack for your child?

- more likely,

សំរាប់នំគ្រីវាគឺលួជាងនំធម្មតានឹងហើងប្រាកដណាថាអាចទិញបានអោយក្មេង។ញ៉ាំបើទោះបីជាពេលខ្លះថ្លៃជាងតិចតួចក៏ដោយ។

- less likely,
- equally likely

បើអ្នកត្រូវតែចំណាយសម្រាប់LNS តើតម្លៃប៉ុន្មានដែលអ្នកមានឆន្ទៈក្នុងការចំណាយដើម្បីទិញLNSទំហំប៉ុន១ដុំនេះសម្រាប់កូនរបស់អ្នក (បង្ហាញLNS)?

- ចាប់ផ្តើមដោយ៖ តើវាថោកជាង ឬថ្លៃជាងនំដែលអ្នកទិញមកឲ្យកូនអ្នកញ៉ាំជាទូទៅ?
- បើសិនជាថ្លៃជាង តើហេតុអ្វីបានជាអ្នកសុខចិត្តចំណាយ?
- បើសិនជាថោកជាង តើហេតុអ្វីបានជាអ្នកសុខចិត្តចំណាយតិច ឬតើហេតុអ្វីបានជាអ្នកស្ទាក់ចិត្តចំណាយស្មើនឹងតម្លៃនំទូទៅដែលអ្នកទិញមកឲ្យកូនរបស់អ្នកញ៉ាំ?
- បើសិនជាតម្លៃដូចគ្នា តើហេតុអ្វីបានជាអ្នកស្ទាក់ចិត្តចំណាយតម្លៃស្មើនឹងនំទូទៅដែលអ្នកទិញមកឲ្យកូនអ្នកញ៉ាំ?

If you had to pay for the LNS, how much would you be willing to pay for a piece/bar this size as a snack for your child *[show the LNS package]*?

ពួកគាត់៥នាក់ ឆ្លើយថាអាចនំ១តំលៃ៣០០រៀលឬ២តំលៃ៥០០រៀលឬ អាចដល់១០០០រៀល ព្រោះពេលខ្លះនំក្មេង។អាចដល់តំលៃប៉ុន្នឹងក្នុងមួយកញ្ចប់។

Is that more, less or the same as you pay for your child's usual snack?

more,
less
same

If more, why would you be willing to pay more?

If less, why would you be willing to pay less OR why wouldn't you be willing to pay as much as you pay for your child's usual snack?

If the same, why would you be willing to pay the same as you pay for your child's usual snack?

តើមានអ្វីខ្លះដែលអ្នកចង់និយាយ/ម្យ៉ាបារាប់អំពីអាហារដែលអ្នកបានភ្លក់កន្លងមក?

Is there anything else that you would like to say about any of the foods you tasted?

ពួកគាត់ចង់អោយដាក់លក់ឆាប់ៗ។

តើមានអ្វីផ្សេងទៀតទេដែលអ្នកចង់និយាយជាពិសេសអំពី LNS?

Is there anything else that you would like to say particularly about the LNS?

ការដាក់ឈ្មោះមាន៦នាក់និយាយថា

១. ទំពែ្រ(ព្រោះវាធំក្លិនត្រី)

២. ទំព្រីស្ងួលម្ហែម

៣. ទំព្រីឆ្ងុយឆ្ងាញ់

៤. ទំព្រីវីតាមីនសំរាប់កុមារ

៥. ទំព្រីវីតាមីនសំរាប់កុមារនិយម្ហាយ

ហើយពួកគាត់ស្នើរសុំអោយសរសេរពត៍មានអំពីផលប្រយោនិ៍នៃការបរិភោគទំព្រីនៅលើកញ្ចប់ដើម្បីអោយអ្នកផ្សេងយល់។

ហើយសំបកកញ្ចប់ សុំអោយដាក់រូបកុមារ ហើយពណ៍សំអោយស្អាតជាងហ្នឹងបន្តិចឬក៏អាចដាក់ដូចរូបនៅលើកញ្ចប់**sprincal**ហើយអាចដាក់ពណ៍ទឹកក្រូច។

មាន៦នាក់បាននិយាយថាការប៉ែងចែកលក់នៅលើទីផ្សារជាការលួងាយស្រួលទិញ ហើយបើអាចសុំដាក់នៅមណ្ឌលសុខភាព ឬកន្លែងលក់ថ្នាំពេទ្យ ហើយពានាក់ទៀតនិយាយថាកាលណាដាក់នៅពេទ្យពេទ្យម៉ែនណាំអោយប្រើ និងប្រាប់អោយប្រើវាជាការល្អ។

៥នាក់បាននិយាយថា បើយើងលក់នៅតូបលក់ទំតូច។ជាការលួងាយស្រួលទិញ។

ហើយបើប្រៀបធៀបហ្នឹងទំក្មេង។ញ៉ាំធម្មតាគាត់ប្រាកដជាទិញទំនេះអោយក្មេង។ញ៉ាំ។

ហើយបើគេលក់ម្តងមួយកញ្ចប់ធំមិនប្រាកដថាមានលុយទិញទេព្រោះពេលខ្លះមានពេលខ្លះអត់លុយ។

ចំណាយពេលអស់(៥៤:៥៣)

សូមអរគុណសម្រាប់ការនិយាយជាមួយពួកខ្ញុំ។ ការចូលរួមរបស់អ្នកគឺបានជួយយ៉ាងខ្លាំងក្នុងការធ្វើឲ្យប្រសើរឡើងនូវការទទួលយកបាននៃអាហារដែលធ្វើឲ្យសុខភាពល្អដែលយើងនឹងផលិតសម្រាប់កុមារនិងម្តាយ។

Thank you for talking with us. Your input is helpful in improving the acceptability of the healthy foods that we develop for children and mothers.

Appendix 5.1-5.5: Effectiveness trial data collection forms

The effectiveness data collection forms in Appendices 5.1-5.5 are in English and Khmer languages. The Khmer translations were originally typed using various Khmer fonts. Some of the fonts are no longer available, nor are they compatible with newer fonts. The text in the obsolete fonts appears in Latin fonts, usually as phonetic renderings of the Khmer, while the text in the current fonts appears correctly in Khmer script. This has resulted in less attractive layout than in the original data collection forms. The English is all original and correct.

Appendix 5.1 Form 1: Recruitment and exclusion

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

ទម្រង់ទី១៖ ប្រសិទ្ធភាពនៃត្រីរបស់ការសិក្សា-- ទម្រង់សម្រាប់ជ្រើសរើសការចូលរួម និងសំណួរសម្រាប់មិនទទួលយកការសិក្សា

Form 1: Efficacy Trial – recruitment and exclusion

eQµaHkumar Name of child	
eQµaHអ្នកមើលថែកុមារ Name of caregiver	
PUm សង្កាត់ Village, Sangkat	
កាលបរិច្ឆេទ Date	☐☐ ☐☐ 2016 ថ្ងៃ Day ខែ Month ឆ្នាំ Year

ប្រាប់ទៅអ្នកមើលថែកុមារ ៖ យើងខ្ញុំកំពុងធ្វើការជាមួយនឹងគម្រោងផលិតនំត្រី។

ជំរាបសួរ ខ្ញុំបាទ/នាងខ្ញុំឈ្មោះ_____

យើងកំពុងធ្វើការសិក្សាលើគម្រោងផលិតនំត្រីដែលត្រូវបានការឧបត្ថម្ភនិងគាំទ្រដោយអង្គការយូនីសេហ (UNICEF)
កម្មវិធីអាហារូបត្ថម្ភ ក់ជាតិនៃក្រសួងសុខាភិបាល
នាយកដ្ឋ នបច្ចេកវិទ្យាកែច្នៃនិងគុណភាពនៃរដ្ឋបាលជលផលនៃក្រសួងកសិកម្ម
និងវិទ្យាស្ថ នស្រាវជ្រាវនិងអភិវឌ្ឍន៍របស់ប្រទេសបារាំងដែលហៅកាត់ថាIRD។ រុក្ខាប្រមាញ់និងនេសាទ
ហើយគម្រោងនេះនឹងធ្វើការសិក្សានៅក្នុងទីក្រុងភ្នំពេញ។យើងចង់ធ្វើការតាមដានសុខភាពនិងការរីកលូតលាស់របស់កុមារដែល
មានអាយុលើសពី៦ខែ ដោយចាប់ផ្តើមពីថ្ងៃទី ២២ ខែកុម្ភ: និងបញ្ចប់នៅថ្ងៃទី ៣០ ខែកញ្ញាឆ្នាំ ២០១៦។

Tell caregivers:
Hello, my name is _____. I am working with the Num Trey Project. The Num Trey Project is supported by UNICEF, National Nutrition Program of Ministry of Health, Department of Fisheries Post-Harvest Technologies and Quality Control, Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries, and IRD. The Num Trey Project is doing a study around Phnom Penh. We want to follow the health and growth of children over 6 months, starting 22 February and ending 30 September 2016.

ក្នុងមួយខែម្តងនោះអ្នកនឹងត្រូវអញ្ជើញមកចូលរួម ដើម្បីឲពួកយើងសួរសំណួរដល់អ្នក។ យើងនឹងប្រមូលព័តមានរបស់អ្នកនិង
កូនរបស់អ្នកអំពីសុខភាព កម្ពស់និងទម្ងន់។ យើងនឹងត្រូវបូមយកឈាមនិងលាមករបស់កូនអ្នកនៅថ្ងៃនេះ និង
ថ្ងៃបញ្ចប់នៃការសិក្សានេះ។ ពត៌មានទាំងអស់ដែលប្រមូលបាននឹងត្រូវបានរក្សាទុកដោយឡែកនិងរក្សាសម្ងាត់។

Once a month, you would need to come for us to ask you questions. We will collect information about your child's and your health, height and weight. Two times, at the beginning and the end of the study, we will take blood and stool samples from your baby. All information collected will be kept private and confidential.

វានឹងមិនមានហានិភ័យអ្វីកើតឡើងក្នុងការសិក្សានេះទេ។ ការចូលរួមរបស់អ្នកគឺជាជម្រើសរបស់អ្នកទាំងស្រុង។
ការចំណាយទៅលើសោហុយធ្វើដំណើរសម្រាប់អ្នកនិងកូនរបស់អ្នកយើងនឹងផ្តល់ ជូនម្តង$1 ហើយនឹងអំណោយតិចតួច
រាល់ពេលដែលអ្នកអញ្ជើញមក ចូលរួមការសិក្សានេះ។

តើអ្នកមានចំណាប់អារម្មណ៍និងមានពេលទំនេរសម្រាប់ចូលរួមដែរឬទេ? បាទ/ចាស ☐ ទេ ☐

There are no risks to this study. Your participation is entirely your choice.
Your transport for you and your baby will be reimbursed at $1 and you will receive a small gift every time you come.
Would you be interested and available to participate? Yes ☐ No ☐

បើសិនជាមាន សូមអនុញ្ញាត្តិឲ្យ
ខ្ញុំសួរនូវសំនួរមួយចំនួនដើម្បីដឹងថាអ្នកនិងកូនអ្នកមានលក្ខណៈគ្រប់គ្រាន់សម្រាប់ចូលរួមក្នុងការសិក្សានេះដែរឬទេ។
សួរសំនួរដូចខាងក្រោម

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

If yes, please let me ask some questions to see if you and your child are suitable participants. *Ask the following questions*:

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

Variable name	សូមសួរទៅអ្នកមើលថែកុមារ **PLEASE ASK THE CAREGIVER**	ចម្លើយ **RESPONSE**	កូដ Code
EXDOB	1. តើ(ឈ្មោះនេះ)មានសំបុត្រកំណើត ប័ណ្ណលឿងចាក់វ៉ាក់សាំងឬឯកសារផ្សេងទៀតមកជាមួយឬទេ? បើមិនមាន សូមរំលងទៅសំនួរទី២។ Does (name) have a birth certificate, immunisation card, or some other document?)	ទេNo ☐ បាទ/ចាសYes ☐	0 1
EX1AGE	បើសិនជាមាន សូមសរសេរថ្ងៃកំណើតតាមឯកសារចាក់វ៉ាក់សាំង បើមិនមានសូមសរសេរតាមការចងចាំរបស់អ្នកថែទាំកុមារ បើសិនថ្ងៃកំនើតមិនមែននៅចន្លោះ…… និង…… ទេ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួមរបស់អ្នក។ តែគួរឲ្យស្តាយដែលអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់សម្រាប់ចូលរួមក្នុងការសិក្សាទេ ដោយសារឈ្មោះ(eQµaH) អាយុតិចពេក/ច្រើនជាងអាយុដែលត្រូវសិក្សា។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ If yes, write the date on document. If no document but mother knows birthdate, write it. If date is not between …… and …, say: Thanks for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is too young/old. *EXCLUDE, END QUESTIONNAIRE, GO TO EXCLUSION STATEMENT*	☐☐ ☐☐ 2015 éf Day Ex Month qñaM Year *EXCLUDED* ☐	99
EX2AGE	2. etIkumarmanGayub:unñan ? បើសិនជាកុមារអាយុក្រោម8ខែ ឬលើស10ខែសូមនិយាយថាអរគុណសម្រាប់ឆន្ទៈចូលរួមរបស់អ្នក តែគួរឲ្យសោកស្តាយដែលអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់សម្រាប់ការចូលរួមទេ ព្រោះអាយុកូនរបស់អ្នកតិចពេក/ច្រើនជាង ។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ How old is (name)? If < 8 months or > 10mths, say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is too young/old. *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	☐☐ ☐☐ Ex Months éf Days មិនទទួលយកការចូលរួម មិនទទួលយកការចូលរួម *EXCLUDED* ☐	99
EX1TWIN	3. តើកូននេះជាកូនភ្លោះ២ឬភ្លោះច្រើនឬទេ? បើកុមារជាកូនភ្លោះ២ឬច្រើនសូមនិយាយថា: អរគុណចំពោះឆន្ទៈរបស់អ្នកដើម្បីចូលរួម។ តែគួរឲ្យស្តាយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ចូលរួមដោយសារតែ (ឈ្មោះ) គឺជាភ្លោះ។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ Is this child a twin or multiple? If the child is a twin or multiple, say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is a twin. *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	ទេNo ☐ បាទ/ចាសYes ☐ មិនទទួលយកការចូលរួម *EXCLUDED* ☐	0 1 99
EX1ILL	4. តើកូនរបស់អ្នកកំពុងមានជំងឺធ្ងន់ធ្ងរឬទេ?ដូចជាជំងឺអេដស៍ឬរបេង។ល។បើកុមារមានជំងឺធ្ងន់ធ្ងរសូមនិយាយថា:	ទេNo ☐ បាទ/ចាសYes ☐	0 1

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

	អរគុណចំពោះឆន្ទៈរបស់អ្នកដើម្បីចូលរួម។ តែគួរឲ្យស្តាយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ចូលរួមដោយសារតែ (ឈ្មោះ)មានជំងឺធ្ងន់ធ្ងរ។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ Does this child have any major illness right now (e.g. HIV, TB, etc)? If the child has a major illness, say: Thank you for your willingness to participate. Unfortunately, (name) is not eligible to participate because s/he has a major illness. *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	មិនទទួលយកការចូលរួម *EXCLUDED* ☐	99
EX1ALRGY	5. តើកូនរបស់អ្នកធ្លាប់មានប្រតិកម្មជាមួយអាហារអ្វីខ្លះ? (ឧ. ញ៉ាំហើយផ្ញើឲ្យពិបាកក្នុងការដកដង្ហើម ឬមានកន្ទួលមាស់នៅពេលញ៉ាំអាហារណាមួយ)បើកុមារមានប្រតិកម្មសូមនិយាយថា: អរគុណចំពោះឆន្ទៈរបស់អ្នកដើម្បីចូលរួម។ តែគួរឲ្យស្តាយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ចូលរួមដោយសារតែ (ឈ្មោះ)មានប្រតិកម្មអាហារ។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ Does this child have allergies or intolerances to any food (e.g. difficulty breathing or a rash if they eat certain foods). If the child has food intolerances, say: Thank you for your willingness to participate. Unfortunately, (name) is not eligible to participate because s/he has food intolerances. *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	ទេNo ☐ បាទ/ចាសYes ☐ មិនទទួលយកការចូលរួម *EXCLUDED* ☐	0 1 99
EX1STUDY	6. តើកូនរបស់អ្នកកំពុងចូលរួមធ្វើការសិក្សាជាមួយគំរោងឬការសិក្សាដ៏ទៃទៀតទេ?បើកុមារកំពុងចូលរួមធ្វើការសិក្សាជាមួយគំរោងឬការសិក្សាដ៏ទៃទៀត សូមនិយាយថា: អរគុណចំពោះឆន្ទៈរបស់អ្នកដើម្បីចូលរួម។ តែគួរឲ្យស្តាយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ចូលរួមដោយសារតែ (ឈ្មោះ) កំពុងចូលរួមធ្វើការសិក្សាជាមួយគំរោងឬការសិក្សាដ៏ទៃទៀត។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ Is the child currently participating in any other study? If the child is participating in another study, say: Thank you for your willingness to participate. Unfortunately, (name) is not eligible because s/he is participating in another study. *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	ទេNo ☐ បាទ/ចាសYes ☐ មិនទទួលយកការចូលរួម *EXCLUDED* ☐	0 1 99
EX1AVBL	7. តើអ្នកនិងកូនរបស់អ្នកអាចមានពេលសម្រាប់ចូលរួមការសិក្សាក្នុងរយៈពេល៦ខែពេញ, ចាប់ផ្តើមពីពេលនេះរហូតដល់ចុងខែកញ្ញាឬទេ ? បើសិនជាគាត់ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ Will you and your child be available for the full 6 months of the study, from today until September 2016? If no: *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	ទេNo ☐ បាទ/ចាសYes ☐ មិនទទួលយកការចូលរួម *EXCLUDED* ☐	0 1 99
EX1YES	8. តើអ្នកនិងកូនរបស់អ្នកស្មគ្រ័ចិត្តចូលរួមធ្វើការសិក្សាជាមួយយើងទេ? បើសិនជាគាត់ទំនេរ បញ្ជូលគាត់ក្នុងការសិក្សា។បើសិនជាគាត់មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ Are you willing for you and this child to participate in the study? If yes, write down name. If no, *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	ទេNo ☐ បាទ/ចាសYes ☐ មិនទទួលយកការចូលរួម EXCLUDED ☐	0 1 99

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

សារចុងបញ្ចប់នៃការមិនមិនទទួលយក

បើអ្នកទទួលបាននូវចម្លើយដែលមិនទទួលយកការចូលរួមរបស់អ្នកថែកុមារទេ នោះសូមនិយាយថា៖
អរគុណចំពោះឆន្ទៈដែលចង់ចូលរួមក្នុងការសិក្សាជាមួយពួកយើង តែគួរឲ្យសោកស្តាយដែលអ្នក
និងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ដើម្បីចូលរួមក្នុងការសិក្សា ដោយសារតែ
[ប្រាប់នូវមូលហេតុដូចនៅក្នុងទម្រង់មិនទទួលយកការចូលរួមរបស់គាត់ ឧ. កុមារមិនមានអាយុចន្លោះពី៨ ទៅ ៩ខែ]។ មិនបញ្ចូលគាត់ក្នុងការសិក្សា ☐

EXCLUSION STATEMENT: If you get an answer that excludes the caregiver, please say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because [give the reason from the exclusion form that they were excluded, e.g. the child was not aged between 8-9 months, etc]..

Excluded ☐

បើសិនជាអ្នកសួរគ្រប់សំនួរហើយអ្នកថែកុមារនោះមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួម និងមានឆន្ទៈចូលរួមនោះសូមនិយាយថា៖
អរគុណសម្រាប់ឆន្ទៈចូលរួមរបស់អ្នក យើងនឹងសរសេរឈ្មោះអ្នកទុក។
យើងនឹងផ្តល់នូវការចំណាយលើការធ្វើដំណើរ ដល់អ្នកនិងកូនរបស់អ្នកចំនួន $1 ហើយនឹងអំណោយតិចតួច
រាល់ពេលដែលអ្នកអញ្ជើញមក ចូលរួមការសិក្សានេះ។
បើសិនជាអ្នកសួរនូវគ្រប់សំណួរហើយ ហើយអណាព្យាបាលនោះមានគ្រប់លក្ខណៈសម្បត្តិគ្រប់គ្រាន់និងមានឆន្ទៈក្នុងការចូលរួម
សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈដែលចូលរួម។
ឥឡូវនេះយើងនឹងប្រាប់អ្នកលម្អិតអំពីការសិក្សានិងសុំការយល់ព្រមពីអ្នកក្នុងការចូលរួម។ បន្តទៅពាក្យយល់ព្រមចូលរួម ។

If you ask all the questions and the caregiver is eligible and willing to participate, please say: Thank you for your willingness to participate. I will write your name down.
Your transport for you and your baby will be reimbursed at $1/day and you will receive a small gift every time you come.

Now I am going to tell you more about the study and ask for your consent to participate. Go to consent form.

Appendix 5.2 Form 2A : Participant information and consent, control &

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME2):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID2): [ ] (Form ID, FORMID) [0][2]

kumar (Child´s ID, CHID2): [ ][ ][ ][ ] (Child´s BioID, CHBIOID): [ ][ ][ ][ ]

ទម្រង់ទី២: ប្រសិទ្ធភាពនំត្រីរបស់ការសិក្សា- ពិតមានអ្នកចូលរួមនិងពាក្យយល់ព្រម, ក្រុមផ្ទៀងផ្ទាត់

Form 2A: Efficacy trial - participant information and consent sheet, control group

ទម្រង់នៃការយល់ព្រមនិងពិតមានចូលរួមនេះគឺសម្រាប់អ្នកថែទាំ កុមារដែលមានអាយុ៨ ទៅ
៩ខែដែលត្រូវបានជ្រើសរើសក្នុងការសិក្សាលើគោលនយោបាយអ្នកបានទទួលអាហារបំប៉ន់ដែលមានប្រតិកម្មបានតាមដោយមិន

ជំរាបសួរ ខ្ញុំបាទ/នាងខ្ញុំឈ្មោះ_____ ។ ខ្ញុំបាទ/នាងខ្ញុំធ្វើការងារជាមួយគំរោងផលិតនំត្រី។
គំរោងផលិតនំត្រីនេះទទួលបានការឧបត្ថម្ភនិងគាំទ្រដោយអង្គការយូនីសេហ្វ(UNICEF)
កម្មវិធីអាហារូបត្ថម្ភថ្នាក់ជាតិនៃក្រសួងសុខាភិបាល
នាយកដ្ឋានបច្ចេកវិទ្យាកែច្នៃនិងគុណភាពនៃរដ្ឋបាលជលផលនៃក្រសួងកសិកម្ម
រុក្ខាប្រមាញ់និងនេសាទនិងវិទ្យាស្ថានស្រាវជ្រាវនិងអភិវឌ្ឍន៍របស់ប្រទេសបារាំងដែលហៅកាត់ថាIRD។
អង្គការនេះបានចែកចាយនូវអាហារបំប៉ន់ទៅដល់កុមារនិងម្តាយដើម្បីការពារ និង
ព្យាបាលជំងឺកង្វះអាហារូបត្ថម្ភកម្រិតមធ្យម។ ពួកយើងមានចំណាប់អារម្មណ៍ចង់ដឹងថា
អាហារមួយណាដែលល្អបំផុតក្នុងការជំរុញឲមានសុខភាព និងការលូតលាស់ល្អ។
ហេតុនេះហើយបានជាយើងកំពុងធ្វើការសិក្សានៅតំបន់ជាយក្រុងភ្នំពេញ។ការសិក្សានេះនឹងត្រូវបានអនុវត្តដោយអ្នកស្រី Bindi Borg មកពីសកលវិទ្យាល័យ Queensland អ្នកស្រី Sok Daream មកពីសកលវិទ្យាល័យ Copenhagen និង Dr Frank Wieringa មកពីវិទ្យាស្ថានស្រាវជ្រាវនិងអភិវឌ្ឍន៍របស់ប្រទេសបារាំងដែលហៅកាត់ថា IRD

Hello, my name is _____ and I work with the Num Trey Project. The Num Trey Project is supported by UNICEF, National Nutrition Program of Ministry of Health, Department of Fisheries Post-Harvest Technologies and Quality Control, Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries, and IRD. These agencies distribute supplementary food to children and mothers to prevent and treat moderate malnutrition. We are interested in knowing which food is best at promoting good health and growth. Therefore, we are conducting a study in peri-urban Phnom Penh. The study will be conducted by Ms Bindi Borg from the University of Queensland, Ms Sok Daream from the University of Copenhagen, and Dr Frank Wieringa from IRD.

យើងចង់ដឹងថាតើអាហារមួយណាដែលជួយឱ្យកុមារធំលូតលាស់និងមានសុខភាពល្អ។
យើងចង់ប្រៀបធៀបអាហារទាំងនេះទៅនឹងរបបអាហារធម្មតាក្នុងរយៈពេល 6 ខែខាងមុខនេះ។ យើងនឹងសុំឱ្យកូនរបស់អ្នកបរិភោគ របបអាហារធម្មតាឲបានទៀងទាត់ដូចជា បបរ និងអាហារគ្រួសារ។ យើងនឹងប្រមូលពត័មាននៅដើមគ្រា, អំឡុងពេល និង ចុងបញ្ចប់នៃការសិក្សាស្រាវជ្រាវ ។

We want to know which foods help children to grow and be healthy. We would like to compare these foods to a regular diet over the next 6 months. We would ask that your child eats its regular diet, such as borbor and family foods. We will gather information at the beginning, end and during the study.

យើងនឹងធ្វើការប្រមូលពិតមានអំពីកូនរបស់អ្នកនិង ខ្លួនអ្នកផ្ទាល់ ដូចជាសុខភាព កម្ពស់ ទំងន់ និងរបបអាហារ ។
នៅពេលចាប់ផ្តើមនិងនៅចុងបញ្ចប់នៃការសិក្សានេះ (6 ខែក្រោយមក),
យើងនឹងត្រូវបូមយកឈាមកូនរបស់អ្នកជាមួយនឹងម្ជុលមួយ ដើម្បីឲយើងអាចដឹងពីកម្រិតនៃវីតាមីននិងសារធាតុរ៉ែ
(ដូចជាជាតិដែក, វីតាមីន A និងជាតិស័ង្កសី) នៅក្នុងរាងកាយរបស់គាត់ ។ ក្រោមការចូលរួមរបស់លោកអ្នក អ្នកនិងកូនរបស់អ្នក
នឹងជួយពួកយើងដើម្បីធ្វើឱ្យមានភាពល្អប្រសើរឡើង និងធ្វើឲអាហារបន្ថែមមានតម្លៃថោកជាងមុន
ដែលអាចជួយជំរុញឲកុមារកម្ពុជាទទួលបានជីវជាតិគ្រប់គ្រាន់និងមានសុខភាពល្អប្រសើរជាងមុន។
វាគ្មានហានិភ័យអ្វីទាំងអស់នៅក្នុងការចូលរួមក្នុងការសិក្សានេះ។ បើទោះបីជាការបូមឈាមអាចនឹងមាន ការឈឺចាប់បន្តិចក្តី
ព្រមទាំងអាចបង្កឱ្យមានស្នាមជាំមួយចំនួន វាគ្រាន់តែជាអាការៈបណ្តោះអាសន្នបុំណ្ណោះ។

We will collect information about your child's and your health, height, weight and diet. At the beginning of the study and at the end of the study (6 months later), we will take your child's blood with a needle , so that we can know the levels of vitamins and minerals (such as iron, vitamin A, and zinc) in his/her body. Through your participation, you and your child will be helping us to make better and cheaper supplementary food that can help Cambodian children to be better nourished and healthier.
There are no risks to this study, although taking blood may be a little painful temporarily and may cause some bruising.

ពិតមានដែលប្រមូលបានទាំងអស់នឹងត្រូវទុកជាការសម្ងាត់និងដោយឡែកពីគ្នា។
អ្នកនិងកូនរបស់អ្នកនឹងមិនអាចត្រូវបានគេកំណត់អត្តសញ្ញាណបានឡើយ។
យើងនឹងត្រលប់មកកន្លែងសិក្សានេះម្តងទៀតដើម្បីចែកចាយនូវលទ្ធផលជាមួយអ្នកនៅពេលដែលលទ្ធផលនោះបានបោះពុម្ពចេ

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME2):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID2): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID2): ☐☐☐☐ (Child´s BioID, CHBIOID): ☐☐☐☐

ញហើយ។ លទ្ធផលនៃការសិក្សានឹងត្រូវបោះពុម្ពនិងចែកចាយជាមួយអ្នកណាដែលចង់ជួយម្តាយនិងទារកឲ្យមានស្ថានភាពអាហាររូបត្តម្ភល្អនិងសុខភាពល្អ។

All information collected will be kept private and confidential. You and your child will not be identifiable. We will return to this testing site to share the results with you when they are available. The results of the study will be published and shared with others who want to help children to be better nourished and healthier.

ការចូលរួមរបស់អ្នកគឺជាជំរើសរបស់អ្នកទាំងស្រុង។ ថាតើអ្នកជ្រើសរើសចូលរួម ឬក៏អត់ វានឹងមិនប៉ះប៉ាល់ដល់ការទទួលសេវាកម្មផ្សេងៗរបស់អ្នកនិងគ្រួសាររបស់អ្នកទេ ពី មណ្ឌលសុខភាព អ្នកស្ម័គ្រចិត្តទ្រទ្រង់សុខភាពភូមិ ឬស្តាប័ន រដ្ឋផ្សេងៗ។ បើទោះជាយ៉ាងណាក៏ដោយ ក៏យើងសង្ឃឹមថាអ្នកនឹងបន្តចូលរួមជាមួយការសិក្សារបស់យើងសំរាប់រយៈពេល៦ខែពេញ។
អ្នកអាចបញ្ឈប់ការចូលរួមរបស់អ្នកពេលណាក៏បានក្នុងកំឡុងពេលសិក្សានេះ។ យើងដឹងថាពេលវេលារបស់អ្នកមានតំលៃដូច្នេះហើយយើងនឹងផ្តល់ជូននូវថវិការសំរាប់ធ្វើដំណើរ
ចំនួន៤០០០រៀលនិងអំណោយតិចតួចជារៀងរាល់ពេលដែលអ្នកអញ្ជើញមកកន្លែងសិក្សានេះ។

Your participation is entirely your choice. Whether you choose to participate or not, it will not affect other services you and your family receive from the health centre, village health support group, or other government authorities. Although we hope you will continue with the study for the full 6 months, you can stop participating at any time during the study. We realize that your participation is valuable, so you will receive $1 for transport and a small gift each time you come.

ការសិក្សានេះត្រូវបានអនុម័ត និងពិនិត្យឡើងវិញស្របតាមក្រមសិលធម៌វិជ្ជាជីវៈដោយសាកលវិទ្យាល័យនៃរដ្ឋ Queensland ក្នុងប្រទេសអូស្ត្រាលីនិងគណៈកម្មាធិការក្រមសិលធម៌ជាតិ សម្រាប់ការស្រាវជ្រាវសុខភាពនៃក្រសួងសុខាភិបាលកម្ពុជា។
ប្រសិនបើអ្នកមានសំណួរណាមួយឬ
អ្នកចង់ពិភាក្សាអំពីការចូលរួមរបស់អ្នកនៅក្នុងការសិក្សានេះអ្នកអាចនិយាយទៅកាន់បុគ្គលិកគម្រោងនេះឬអ្នកអាចទូរសព្ទ៍ទៅកាន់លេខនេះ: ០១១៥៦៤៨០១

This study has been approved in ethical reviews by The University of Queensland in Australia and the National Ethics Committee for Health Research of the Cambodian Ministry of Health. If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: 011 564 801

តើអ្នកយល់ពីអ្វីដែលខ្ញុំបានប្រាប់អ្នកទេ? តើអ្នកមានសំណួរណាមួយទេ? តើអ្នកចង់ទៅចូលរួមក្នុងការសិក្សានេះទេ?
ប្រសិនបើអ្នកបានយល់ព្រមសម្រាប់កូនរបស់អ្នកដើម្បីចូលរួមក្នុងការសិក្សានេះ,
សូមចុះហត្ថលេខាឬផ្តិតមេដៃក្នុងប្រអប់ខាងក្រោមនេះ។

Do you understand what I have told you? Do you have any questions? Would you like to participate in the study? If you agree for your child to participate in the study, please sign or fingerprint in the box below.

eQµaHkumar Name of the child (CHNAME2)	
ឈ្មោះអ្នកថែទាំកុមារ Name of caregiver (CGNAME2)	
ហត្ថលេខា ឬស្នាមមេដៃរបស់អ្នកថែទាំកុមារ Signature or thumbprint of the caregiver (CGSIGNED)	
លេខកំណត់អត្តសញ្ញាណកុមារ Child´s ID (CHID2)	☐☐☐☐

ខ្ញុំបានអានពាក្យយល់ព្រមទាំងអស់ដល់អ្នកថែកុមារ។ I have read the consent form in its entirety to the caregiver of the child.

ឈ្មោះអ្នកប្រមូលទិន្នន័យ Name of data collector	
ហត្ថលេខាអ្នកប្រមូលទិន្នន័យ Signature of data collector (IVSIGNED)	
kalbriecäTRbmUlTinñn½y Date of data collection (DATE2)	☐☐ ថ្ងៃ Day ☐☐ ខែ Month 2016 ឆ្នាំ Year

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME2):_____ GñkRbmUlTinñn½y (Interviewer ID, IVID2): [ ] (Form ID, FORMID) [0][2]

kumar (Child´s ID, CHID2): [ ][ ][ ][ ] (Child´s BioID, CHBIOID): [ ][ ][ ][ ]

បើសិនជាអ្នកថែរក្មេង/អាណាព្យាបាលមិនយល់ព្រមចូលរួមទេ សូមនិយាយថា៖ អរគុណ សម្រាប់ពេលវេលារបស់អ្នក។ អ្នកអាចត្រលប់ទៅផ្ទះបាន។ If the caregiver does not agree to participate, say: Thank you for your time. You are free to leave now.

បើសិនជាអ្នកថែរទាំក្មេង/អាណាព្យាបាលយល់ព្រមចូលរួម ប្រគល់ពាក្យយល់ព្រមមួយច្បាប់ទៅគាត់។ គូសរង្វង់លើលេខទូរសព្ទ៍នៅលើក្រដាស់ រួចប្រាប់គាត់ថា ព័តមាននេះគឺសម្រាប់អ្នក។ ប្រសិនបើអ្នកចង់ដឹងព័តមានបន្ថែម, នោះអ្នកអាចទូរសព្ទ៍មកកាន់លេខនេះបាន(០១១៥៦៤៨០១)។

If the caregiver agrees to participate, tear off and leave the next page with the caregiver. Circle the telephone number on the page. Say: This information is for you. If you want more information, you can call this number, 011 564 801.

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (IVNAME2):_____ GñkRbmUlTiñn½y (Interviewer ID, IVID2): [ ] (Form ID, FORMID) [0][2]

kumar (Child´s ID, CHID2): [ ][ ][ ][ ] (Child´s BioID, CHBIOID): [ ][ ][ ][ ]

ប្រគល់ទំព័រនេះទៅអ្នកចូលរួម GIVE THIS PAGE TO PARTICIPANT

ភាពទទួលយកបាននៃអាហារបំប៉ន់ដែលដាក់បញ្ចូលនូវមីក្រូសារជាតិច្រើននិងសំបូរលីពីតសម្រាប់កុមារក្រោមអាយុ២ឆ្នាំក្នុងប្រទេសកម្ពុជា

Acceptability of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement for Children Under Two Years in Cambodia

ប្រាប់ទៅអណាព្យាបាល៖
Tell caregiver:

អ្នកបានយល់ព្រមចូលរួមក្នុងការសិក្សានូវការទទួលយកបាននៃអាហារបំប៉នដែលអាចញ៉ាំបានតែម្តងដោយមិនបាច់ចម្អិនហើយផលិតក្នុងស្រុក។ សូមអញ្ជើញមកជាមួយកូនរបស់អ្នកដោយយកពាក្យយល់ព្រមនេះមកជាមួយ
ហើយសូមយកប័ណ្ណលឿងឬសំបុត្រកំណើតមកជាមួយអ្នកផង ។
You have agreed for you and your child to participate in an acceptability trial of a locally produced ready-to-use-supplementary food. Please come with your child. Please bring this paper and your child's yellow card or birth certificate each time.

ពិតមានទាំងអស់ដែលបានប្រមូលនឹងត្រូវរក្សាដោយសម្ងាត់។ វានឹងមិនមានហានិភ័យអ្វីទាំងអស់។
All information collected will be kept private and confidential. There are no risks to this study.

ការចូលរួមរបស់អ្នកគឺជាជំរើសរបស់អ្នកទាំងស្រុង។
យើងសង្ឃឹមថាអ្នកនឹងបន្តចូលរួមជាមួយការសិក្សារបស់យើងសំរាប់រយៈពេល៦ខែពេញ ប៉ុន្តែ
អ្នកអាចបញ្ឈប់ការចូលរួមរបស់អ្នកពេលណាក៏បានក្នុងកំឡុងពេលសិក្សានេះ។
យើងដឹងថាពេលវេលារបស់អ្នកមានតំលៃ ដូច្នេះហើយអ្នកនឹងទទួលបានអំណោយប្រសិនបើអ្នកចូលរួម
ក្នុងរយៈពេល៦ខែពេញ។ មិនតែប៉ុណ្ណោះ យើងនឹងផ្តល់ជូននូវថវិការសំរាប់ធ្វើដំណើរ
ចំនួន៥០០០រៀលនិងអំណោយតិចតួចជារៀងរាល់ពេលដែលអ្នកអញ្ជើញមកកន្លែងសិក្សានេះ។
Your participation is your choice. We hope you will continue with the study for the full 6 months, but you are free to stop participating at any time. We realize that your time is valuable, so you will receive a gift for your participation if you complete the full 6 months. We realize that your participation is valuable, so you will receive $1 for transport and a small gift each time you come.

បើសិនជាអ្នកមានសំណួរ ឬបើអ្នកចង់ពិភាក្សាអំពីការចូលរួមរបស់អ្នកក្នុងការសិក្សានេះ
អ្នកអាចនិយាយទៅកាន់បុគ្គលិករបស់គម្រោងនេះ ឬអ្នកអាចទូរសព្ទ័មក លេខ:០១១ ៥៦៤៨០១
If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: 011 564 801.

eQµaHkumar Name of the child	
ឈ្មោះអ្នកថែទាំកុមារ Name of caregiver	
ហត្ថលេខា ឬស្នាមមេដៃនៃអ្នកថែកុមារ Signature or thumbprint of caregiver	
លេខកំណត់អត្តសញ្ញាណកុមារ Child´s ID	[ ][ ][ ][ ]
ទីកន្លែងផ្តល់អាហារ Data collection site:	

Appendix 5.2 Form 2B: Participant information and consent, intervention

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

ទម្រង់ទី២ខ៖ ប្រសិទ្ធភាពនំត្រីរបស់ការសិក្សា- ព័តមានអ្នកចូលរួម និង ពាក្យយល់ព្រមចូលរួម, ក្រុមអន្តរាគមន៍

Form 2B: Efficacy trial - participant information and consent sheet, intervention groups

ទម្រង់ព័តមានអ្នកចូលរួម និង ពាក្យយល់ព្រមចូលរួមនេះគឺសម្រាប់អ្នកថែទាំកុមារដែលមានអាយុពី ៨ ទៅ ៩ខែ
ដែលត្រូវបានអញ្ជើញឲ្យចូលរួមក្នុងការសិក្សាលើប្រសិទ្ធភាពសាកល្បង របស់ផលិផលក្នុងស្រុកអាចញ៉ាំបានដោយមិនចាំបាច់រៀបចំ/ចម្អិនបន្ថែម

This participant information and consent form is for the caregivers of children aged 8-9 months who have been invited to participate in an efficacy trial of a locally produced ready-to-use-supplementary food.

ជំរាបសួរ ខ្ញុំបាទ/នាងខ្ញុំឈ្មោះ_____ ។ ខ្ញុំបាទ/នាងខ្ញុំធ្វើការងារជាមួយគំរោងផលិតនំត្រី។
គំរោងផលិតនំត្រីនេះទទួលបានការឧបត្ថម្ភនិងគាំទ្រដោយអង្គការយូនីសេហ្វ(UNICEF)
កម្មវិធីអាហារូបត្ថម្ភថ្នាក់ជាតិនៃក្រសួងសុខាភិបាល
នាយកដ្ឋានបច្ចេកវិទ្យាកែច្នៃនិងគុណភាពនៃរដ្ឋបាលជលផលនៃក្រសួងកសិកម្ម
រុក្ខាប្រមាញ់និងនេសាទនិងវិទ្យាស្ថានស្រាវជ្រាវនិងអភិវឌ្ឍន៍របស់ប្រទេសបារាំងដែលហៅកាត់ថាIRD។
អង្គការនេះបានចែកចាយនូវអាហារបំប៉ននៅដល់កុមារនិងម្តាយដើម្បីការពារ និង
ព្យាបាលជំងឺកង្វះអាហារូបត្ថម្ភកម្រិតមធ្យម។ ពួកយើងមានចំណាប់អារម្មណ៍ចង់ដឹងថា
អាហារមួយណាដែលល្អបំផុតក្នុងការជំរុញឲមានសុខភាព និងការលូតលាស់ល្អ។
ហេតុនេះហើយបានជាយើងកំពុងធ្វើការសិក្សានៅតំបន់ជាយក្រុងភ្នំពេញ។ការសិក្សានេះនឹងត្រូវបានអនុវត្តដោយអ្នកស្រី Bindi Borg មកពីសកលវិទ្យាល័យ Queensland អ្នកស្រី Sok Daream មកពីសកលវិទ្យាល័យ Copenhagen និង Dr Frank Wieringa មកពីវិទ្យាស្ថានស្រាវជ្រាវនិងអភិវឌ្ឍន៍របស់ប្រទេសបារាំងដែលហៅកាត់ថា IRD
យើងចង់ដឹងថាតើអាហារមួយណាដែលជួយឱ្យកុមារធំលូតលាស់និងមានសុខភាពល្អ។
យើងចង់ប្រៀបធៀបអាហារទាំងនេះទៅនឹងរបបអាហារធម្មតាក្នុងរយៈពេល 6 ខែខាងមុខនេះ។
យើងនឹងផ្តល់ជូនអាហារសម្រាប់កូនរបស់អ្នករយៈពេល 6 ខែខាងមុខទៀត។ យើងនឹងសុំឱ្យ កូនរបស់អ្នកបរិភោគអាហារនេះ បន្ថែមទៅលើ របបអាហារធម្មតារបស់នាង/គាត់។

Hello, my name is _____ and I work with the Num Trey Project. The Num Trey Project is supported by UNICEF, National Nutrition Program of Ministry of Health, Department of Fisheries Post-Harvest Technologies and Quality Control, Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries, and IRD. These agencies distribute supplementary food to children and mothers to prevent and treat moderate malnutrition. We are interested in knowing which food is best at promoting good health and growth. Therefore, we are conducting a study in peri-urban Phnom Penh. The study will be conducted by Ms Bindi Borg from the University of Queensland, Ms Sok Daream from the University of Copenhagen, and Dr Frank Wieringa from IRD. We want to know which foods help children to grow and be healthy. We would like to compare these foods to a regular diet over the next 6 months. We will provide food for your child for the next 6 months. We ask that your child eat that food every day in addition to his/her regular diet.

យើងនឹងធ្វើការប្រមូលពិតមានអំពីកូនរបស់អ្នកនិង ខ្លួនអ្នកផ្ទាល់ ដូចជាសុខភាព កម្ពស់ ទំងន់ និងរបបអាហារ ។
នៅពេលចាប់ផ្តើមនិងនៅចុងបញ្ចប់នៃការសិក្សានេះ (6 ខែក្រោយមក),
យើងនឹងត្រូវបូមយកឈាមកូនរបស់អ្នកជាមួយនឹងម្ជុលមួយ ដើម្បីឲយើងអាចដឹងពីកម្រិតនៃវីតាមីននិងសារធាតុរ៉ែ
(ដូចជាជាតិដែក, វីតាមីន A និងជាតិស័ង្កសី) នៅក្នុងរាងកាយរបស់គាត់ ។
ជារៀងរាល់ខែយើងនឹងវាស់ស្ទង់ពីការធំលូតលាស់របស់កូនអ្នកនិងសួរសំណួរអំពីសុខភាព និង របបអាហាររបស់គាត់ ។
ក្រោមការចូលរួមរបស់លោកអ្នក អ្នកនិងកូនរបស់អ្នក នឹងជួយពួកយើងដើម្បីធ្វើឱ្យមានភាពល្អប្រសើរឡើង
និងធ្វើឲអាហារបន្ថែមមានតម្លៃថោកជាងមុន ដែលអាចជួយជំរុញឲកុមារកម្ពុជាទទួលបានជីវជាតិគ្រប់គ្រាន់និងមានសុខភាពល្អ។
វានឹងគ្មានគ្រោះថ្នាក់អ្វីទាំងអស់ក្នុងការចូលរួមជាមួយការសិក្សានេះ, បើទោះបីជាការបូមឈាមអាចនឹងមាន ការឈឺចាប់បន្តិចក្តី
ព្រមទាំងអាចបង្កឱ្យមានស្នាមជាំមួយចំនួន វាគ្រាន់តែជាអាការៈបណ្តោះអាសន្នប៉ុណ្ណោះ។
អាហារទាំងនេះត្រូវបានពិសោធន៍ថាមានសុវត្ថិភាពនិងធ្វើឲមានសុខភាពល្អ

We will collect information about your child's and your health, height, weight and diet. At the beginning of the study and at the end of the study (6 months later), we will take your child's blood with a needle, so that we can know the levels of vitamins and minerals (such as iron, vitamin A, and zinc) in his/her body. Every month, we will measure your child's growth, and ask questions about his/her health and diet. Through your participation, you and your child will be helping us to make better and cheaper supplementary food that can help Cambodian children to be better nourished and healthier.
There are no risks to this study, although taking blood may be a little painful temporarily and may cause some bruising. The food has been tested and is healthy and safe.

ពិតមានដែលប្រមូលបានទាំងអស់នឹងត្រូវទុកជាការសម្ងាត់និងដោយឡែកពីគ្នា ។
អ្នកនិងកូនរបស់អ្នកនឹងមិនអាចត្រូវបានគេកំណត់អត្តសញ្ញាណបានឡើយ។
យើងនឹងត្រលប់មកកន្លែងសិក្សានេះម្តងទៀតដើម្បីចែកចាយនូវលទ្ធផលជាមួយអ្នកនៅពេលដែលលទ្ធផលនោះបានបោះពុម្ពចេញហើ

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

យ។ លទ្ធផលនៃការសិក្សានឹងត្រូវបោះពុម្ពនិងចែកចាយជាមួយអ្នកណាដែលចង់ជួយម្តាយនិងទារកឲ្យមានស្ថានភាពអាហារូបត្តម្ភល្អនិងសុខភាពល្អ។

All information collected will be kept private and confidential. You and your child will not be identifiable. We will return to this testing site to share the results with you when they are available. The results of the study will be published and shared with others who want to help children to be better nourished and healthier.

ការចូលរួមរបស់អ្នកគឺជាជំរើសរបស់អ្នកទាំងស្រុង។ ថាតើអ្នកជ្រើសរើសចូលរួម ឬក៏អត់ វានឹងមិនប៉ះពាល់ដល់ការទទួលសេវាកម្មផ្សេងៗរបស់អ្នកនិងគ្រួសាររបស់អ្នកទេ ពី មណ្ឌលសុខភាព អ្នកស្ម័គ្រចិត្តទ្រទ្រង់សុខភាពភូមិ ឬស្ថាប័ន រដ្ឋផ្សេងៗ។ បើទោះជាយ៉ាងណាក៏ដោយ ក៏យើងសង្ឃឹមថាអ្នកនឹងបន្តចូលរួមជាមួយការសិក្សារបស់យើងសំរាប់រយៈពេល៦ខែពេញ។
អ្នកអាចបញ្ឈប់ការចូលរួមរបស់អ្នកពេលណាក៏បានក្នុងកំឡុងពេលសិក្សានេះ។ យើងដឹងថាពេលវេលារបស់អ្នកមានតំលៃ ដូច្នេះហើយយើងនឹងផ្តល់ជូននូវថវិការសំរាប់ធ្វើដំណើរ
ចំនួន៥០០០រៀលនិងអំណោយតិចតួចជារៀងរាល់ពេលដែលអ្នកអញ្ជើញមកកន្លែងសិក្សានេះ។

Your participation is entirely your choice. Whether you choose to participate or not, it will not affect other services you and your family receive from the health centre, village health support group, or other government authorities. Although we hope you will continue with the study for the full 6 months, you can stop participating at any time during the study. We realize that your participation is valuable, so you will receive $1 for transport and a small gift each time you come.

ការសិក្សានេះត្រូវបានអនុម័ត និងពិនិត្យឡើងវិញស្របតាមក្រមសិលធម៌វិជ្ជាជីវៈដោយសាកលវិទ្យាល័យនៃរដ្ឋ Queensland ក្នុងប្រទេសអូស្ត្រាលីនិងគណៈកម្មាធិការក្រមសិលធម៌ជាតិ សម្រាប់ការស្រាវជ្រាវសុខភាពនៃក្រសួងសុខាភិបាលកម្ពុជា។ ប្រសិនបើអ្នកមានសំណួរណាមួយឬ
អ្នកចង់ពិភាក្សាអំពីការចូលរួមរបស់អ្នកនៅក្នុងការសិក្សានេះអ្នកអាចនិយាយទៅកាន់បុគ្គលិកគម្រោងនេះឬអ្នកអាចទូរសព្ទ៍ទៅកាន់លេខនេះ: ០១១ ៥៦៤ ៨០១

This study has been approved in ethical reviews by The University of Queensland in Australia and the National Ethics Committee for Health Research of the Cambodian Ministry of Health. If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: 011 564 801

តើអ្នកយល់ពីអ្វីដែលខ្ញុំបានប្រាប់អ្នកឬទេ? តើអ្នកមានសំណួរឬទេ? តើអ្នកចង់ចូលរួមក្នុងការសិក្សានេះឬទេ។ បើសិនជាអ្នកយល់ព្រមឲកូនរបស់អ្នកចូលរួមជាមួយ ការសិក្សានេះ សូមចុះហត្ថលេខា ឬផ្តិតមេដៃក្នុងប្រអប់ខាងក្រោមនេះ។

Do you understand what I have told you? Do you have any questions? Would you like to participate in the study? If you agree for your child to participate in the study, please sign or fingerprint in the box below.

ឈ្មោះកុមារ Name of the child	
ឈ្មោះអ្នកថែទាំកុមារ Name of caregiver	
ហត្ថលេខា ឬស្នាមមេដៃរបស់អ្នកថែកុមារ Signature or thumbprint of caregiver	
លេខកំណត់អត្តសញ្ញាណកុមារ Child´s IDENTIFY	☐☐☐☐

ខ្ញុំបានអានពាក្យយល់ព្រមទាំងអស់ដល់អ្នកថែទាំកុមារ។ I have read the consent form in its entirety to the caregiver of the child.

ឈ្មោះអ្នកប្រមូលទិន្នន័យ Name of the data collector	
ហត្ថលេខាអ្នកប្រមូលទិន្នន័យ Signature of data collector	
kalbriecäTRbmUlTinñn½y Date of data collection	☐☐ ☐☐ 2016 ថ្ងៃ Day ខែ Month ឆ្នាំ Year

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

បើសិនជាអ្នកថែរទាំក្មេង/អាណាព្យាបាលមិនយល់ព្រមចូលរួមទេ សូមនិយាយថា៖ អរគុណ សម្រាប់ពេលវេលារបស់អ្នក។ អ្នកអាចត្រលប់ទៅផ្ទះបាន។

If the caregiver does not agree to participate, say: Thank you for your time. You are free to leave now.

បើសិនជាអ្នកថែរទាំក្មេង/អាណាព្យាបាលយល់ព្រមចូលរួម ប្រគល់ពាក្យយល់ព្រមមួយច្បាប់ទៅគាត់។ គូសរង្វង់លើលេខទូរសព្ទ័នៅលើក្រដាស់ រួចប្រាប់គាត់ថា ព័តមាននេះគឺសម្រាប់អ្នក។ ប្រសិនបើអ្នកចង់ដឹងព័តមានបន្ថែម, នោះអ្នកអាចទូរសព្ទ័មកកាន់លេខនេះបាន(០១១ ៥៦៤ ៨០១) ប្រគល់ពាក្យយល់ព្រមមួយច្បាប់ទៅឲអ្នកថែរទាំក្មេង។ គូសរង្វង់លើលេខទូរសព្ទ័នៅលើក្រដាស់ ដើម្បីធានាថាពួកគាត់បានយល់ច្បាស់ ថាពួកគាត់អាចទូរសព្ទ័មកបានសំរាប់ព័តមានបន្ថែម ។

If the caregiver agrees to participate, tear off and leave the next page with the caregiver. Circle the telephone # on the page. Say: This information is for you. If you want more information, you can call this number, 011 564 801. Leave a copy of the consent form with the caregiver. Circle the telephone number on the page to ensure that they understand they can call for more information.

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

ប្រគល់ទំព័រនេះទៅអ្នកចូលរួម GIVE THIS PAGE TO PARTICIPANT

ភាពទទួលយកបាននៃអាហារបំប៉ន់ដែលដាក់បញ្ចូលនូវមីក្រូសារជាតិច្រើននិងសំបូរលីពីតសម្រាប់កុមារក្រោមអាយុ២ឆ្នាំក្នុងប្រទេសកម្ពុជា

Acceptability of a Multiple Micronutrient-Fortified Lipid-Based Nutrient Supplement for Children Under Two Years in Cambodia

ប្រាប់ទៅអ្នកថែទាំកុមារ៖

Tell caregiver:

អ្នកបានព្រមព្រៀង សម្រាប់អ្នកនិងកូនរបស់អ្នកក្នុងការចូលរួមក្នុងការសិក្សាមួយ ការទទួលយកបាននៃអាហារបំប៉ន់ដែលអាចញ៉ាំបានតែម្តងដោយមិនបាច់ចម្អិនហើយផលិតក្នុងស្រុក។ សូមមកជាមួយនឹងកូនរបស់អ្នក។

សូមយកក្រដាសនេះនិងកាតលឿងឬសំបុត្រកំណើតកូនរបស់អ្នកមកជាមួយរាល់ពេល។

You have agreed for you and your child to participate in an acceptability trial of a locally produced ready-to-use-supplementary food. Please come with your child. Please bring this paper and your child's yellow card or birth certificate each time.

ពិតមានទាំងអស់ដែលបានប្រមូលនឹងត្រូវរក្សាទុកដោយឡែក និង រក្សាសម្ងាត់។ វានឹងមិនមានហានិភ័យអ្វីទាំងអស់។

All information collected will be kept private and confidential. There are no risks to this study.

ការចូលរួមរបស់អ្នកគឺជាជំរើសរបស់អ្នកទាំងស្រុង។

យើងសង្ឃឹមថាអ្នកនឹងបន្តចូលរួមជាមួយការសិក្សារបស់យើងសំរាប់រយៈពេល៦ខែពេញ ប៉ុន្តែ អ្នកអាចបញ្ឈប់ការចូលរួមរបស់អ្នកពេលណាក៏បានក្នុងកំឡុងពេលសិក្សានេះ។

យើងដឹងថាពេលវេលារបស់អ្នកមានតំលៃ

ដូច្នេះហើយអ្នកនឹងទទួលបានអំណោយមួយសម្រាប់ការចូលរួមរបស់អ្នក

នៅចុងបញ្ចប់នៃការសិក្សា៦ខែក្រោយ។ មិនតែប៉ុណ្ណោះ យើងនឹងផ្តល់ជូននូវថវិការសំរាប់ធ្វើដំណើរ ចំនួន៥០០០រៀលនិងអំណោយតិចតួចជារៀងរាល់ពេលដែលអ្នកអញ្ជើញមកកន្លែងសិក្សានេះ។

Your participation is your choice. We hope you will continue with the study for the full 6 months, but you are free to stop participating at any time. We realize that your time is valuable, so you will receive a gift for your participation if you complete the full 6 months. We realize that your participation is valuable, so you will receive $1 for transport and a small gift each time you come.

បើសិនជាអ្នកមានសំណួរ ឬបើអ្នកចង់ពិភាក្សាអំពីការចូលរួមរបស់អ្នកក្នុងការសិក្សានេះ អ្នកអាចនិយាយទៅកាន់បុគ្គលិករបស់គម្រោងនេះ ឬអ្នកអាចទូរសព្ទ័មក លេខ: ០១១ ៥៦៤ ៨០១

If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: 011 564 801.

ឈ្មោះកុមារ Name of the child	
ឈ្មោះអ្នកថែទាំកុមារ Name of the caregiver	
ហត្ថលេខា ឬស្នាមមេដៃនៃអ្នកថែទាំកុមារ Signature or thumbprint of the caregiver	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 2

kumar (Child´s ID, CHID): ☐☐☐☐

លេខកំណត់អត្តសញ្ញាណកុមារ Child´s ID	☐☐☐☐
ទីកន្លែងផ្តល់អាហារ Data collection site:	

Appendix 5.3 Form 3: Baseline questionnaire

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

ទម្រង់ទី៣៖ ប្រសិទ្ធភាពនៃព្រីរបស់ការសិក្សា, ទម្រង់បញ្ជីសំនួរប្រមូលទិន្នន័យមូលដ្ឋាន – ប្រជាសាស្ត្រ

Form 3A: Efficacy trial, baseline data collection form - Demographics

ឈ្មោះអថេរ **Variable name**								បន្តក្នុង
ខណ្ឌ Khan (KHAN)			ខណ្ឌ ឬស្សីកែវ Khan Russey Keo ☐	1	ជ្រោយចង្វា Khan Chhroy ChhangVa ☐	2		
សង្កាត់ Sangkat (SANGKAT)	ទួលសង្កែ Tuol Sangkae ☐	1	ច្រាំងចំរេះ Chrang Chamreh 2 ☐	5	ស.ក ជ្រោយចង្វារ Chhroy ChhangVa ☐	9		
	ឬស្សីកែវ Ruessei Kaev ☐	2	ស.ក ស្វាយប៉ាក Svay Pak ☐	6	ស.ក ព្រែកតាសេក Prek Tasek ☐	10		
	ស.ក ច្រាំងចំរេះ ១ Chhrang Chamres 1 ☐	3	ស.ក ព្រែកលាប Prek Leap ☐	7	ស.ក កោះដាច់ Kos Dach ☐	11		
	ស.ក គីឡូម៉ែត្រ ៦ Km 6 ☐	4	ស.ក បាក់ខែង Bak Kheng ☐	8	ផ្សេងៗ(ពិព័ណនា) Other ☐	12		
PUmi Village (VILLAGE)	Chhrang Chamres 1 Phum 1 ស.ក ច្រាំងចំរេះ ១ 1 ☐	1	Tuol Kouk ទួលគោក ☐	16	Prek Leap ព្រែកលៀប ☐	31		
	Chhrang Chamres 1 Phum 2 ស.ក ច្រាំងចំរេះ ១ 2 ☐	2	Mittapheap មិត្តភាព ☐	17	Khean Khleang ខ្សែនឃ្លាំង ☐	32		
	Chhrang Chamres 1 Phum 3 ស.ក ច្រាំងចំរេះ ១ 3 ☐	3	Lor KomBor ឡកំបោ ☐	18	Bak Kheng Le បាក់ខែងលើ ☐	33		
	Chhrang Chamres 1 Phum 4 ស.ក ច្រាំងចំរេះ ១ 4 ☐	4	Prek Tasek ព្រែកតាសេក ☐	19	Kdey Chhas ក្តីឆាស់ ☐	34		
	Chroy Changva Phum 1 ជ្រោយចង្វារ 1 ☐	5	Prek Reang ព្រែករាំង ☐	20	Chhom Bok Meas ចំបក់មាស ☐	35		
	Chroy Changva Phum 2 ជ្រោយចង្វារ 2 ☐	6	Prek Takorng ព្រែកតាគង់ ☐	21	Chhong Kos village ភូមិ ចុងកោះ ☐	36		
	Chroy Changva Phum 3 ជ្រោយចង្វារ 3 ☐	7	Doeum Kor ដើមគ ☐	22	Lavea village ភូមិ ល្វា ☐	37		
	Boeng Chhuk ចឹងឈូក ☐	8	Prek Tarath ព្រែកតារ័ត្ន ☐	23	Kabal Kos village ភូមិ ក្បាលកោះ ☐	38		
	Spean Khpos ស្ពានខ្ពស់ ☐	9	Samki សាមគ្គី ☐	24	Kos Dach village ភូមិ កោះដាច់ ☐	39		
	Kroal Ko ក្រាលគោ ☐	10	Kleang Sang ឃ្លាំងសាំង ☐	25	Roneah ភូមិ រនះ ☐	40		
	Phum Kor ភូមិ ក ☐	11	Boeng Salang ចឹងសាឡាង ☐	26	Toul sangke ផ្សារតូច ☐	42		
	Phum Khor 1 ភូមិ ខ១ ☐	12	Doeum Kor ដើមគ ☐	27	Svay Pak ស្វាយប៉ាក ☐	43		
	Phum Khor 2 ភូមិ ខ២ ☐	13	Khean Khleang ខ្សែនឃ្លាំង ☐	28	Lu លូ ☐	44		
	Phum Khuor ឃ ☐	14	Bak Kheng បាក់ខែង ☐	29	ផ្សេងៗ(ពិព័ណនា) Other ☐	41		
	Phsar Touch ផ្សារតូច ☐	15	KhaTor ខ្មែរ ☐	30				
ទីកន្លែងផ្តល់អាហារ Data collection site (SITE)	Phsar Touch ផ្សារតូច ☐	1	Kor & Khuor ភូមិ ក & ឃ ☐	11	Prek Leap/Khean Khleang ព្រែកលៀប & ខ្សែនឃ្លាំង ☐	21		
	Tuol Kouk 1 ទួលគោក 1 ☐	2	Boeng Salang ចឹងសាឡាង ☐	12	Sangkat Bak Kheng ស.ក បាក់ខែង ☐	22		
	Tuol Kouk 2 ទួលគោក 2 ☐	3	Boeng Chhuk &Spean Khpos ចឹងឈូក & ស្ពានខ្ពស់ ☐	13	Chhong Kos/Roneah/Kos Dach ភូមិ ចុងកោះ & ភូមិ កោះដាច់ & ភូមិ រនះ ☐	23		
	Mittapheap មិត្តភាព ☐	4	Lor KomBor ឡកំបោ ☐	14	Kleang Sang ឃ្លាំងសាំង ☐	24		
	Samki សាមគ្គី ☐	5	Sangkat Prek Tasek ស.ក ព្រែកតាសេក ☐	15	Boeng Chhuk ចឹងឈូក ☐	26		
	Doeum Kor/Khean Khleang ដើមគ & ខ្សែនឃ្លាំង ☐	6	Chroy Changva Phum 1 ជ្រោយចង្វារ ☐	16	Toul sangke ផ្សារតូច ☐	27		
	Chhrang Chamres 1 Phum 1&2 ស.ក ច្រាំងចំរេះ ១ 1&2 ☐	7	Lavea/ Kabal Kos ភូមិ ល្វា & ភូមិ ក្បាលកោះ ☐	17	Svay Pak ស្វាយប៉ាក ☐	28		
	Chhrang Chamres 1 Phum 3&4 ស.ក ច្រាំងចំរេះ ១ 3&4 ☐	8	Chroy Changva Phum 2 ជ្រោយចង្វារ 2 ☐	18	Lu លូ ☐	29		
	Kroal Ko ក្រាលគោ ☐	9	Chroy Changva Phum 3 ជ្រោយចង្វារ 3 ☐	19	ផ្សេងៗ(ពិព័ណនា) Other ☐	25		
	Khor 1& Khor 2 ភូមិ ខ១& ភូមិ ខ២ ☐	10	Bak Kheng/KhaTor បាក់ខែង & ខ្មែរ ☐	20	_____			

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): [ ] (Form ID, FORMID) [0][3]

kumar (Child´s ID, CHID): [ ][ ][ ][ ]

kalbriecäTRbmUlTiñn½y Date of data collection (DATE)	[ ][ ] [ ][ ] [2][0][1][6] ថ្ងៃ Day ខែ Month ឆ្នាំ Year	
ការប្រមូលទិន្នន័យបានទាំងអស់ Data collection completed (COMPLETE)	ទេNo ☐	1
	បាទ/ចាស Yes ☐	2

កាលបរិច្ឆេទនៃការពិនិត្យរបស់អ្នកដឹកនាំក្រុម Date checked by team leader (CHEKDATE)	[ ][ ] [ ][ ] [2][0][1][6] ថ្ងៃ Day ខែ Month ឆ្នាំ Year	

កាលបរិច្ឆេទពិនិត្យដោយអ្នកគ្រប់គ្រងក្នុងការិយាល័យ Date checked by office supervisor (OFFDATE)	[ ][ ] [ ][ ] [2][0][1][6] ថ្ងៃ Day ខែ Month ឆ្នាំ Year	
ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី១ Data entry person 1 name (ENTERER1)	ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី១ Data entry person 1 name ☐	
កាលបរិច្ឆេទបញ្ចូលទិន្នន័យទី១ Date entered (ENTDATE1)	[ ][ ] [ ][ ] [2][0][1][6] ថ្ងៃ Day ខែ Month ឆ្នាំ Year	
ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី២ Data entry person 2 name (ENTERER2)	ឈ្មោះអ្នកបញ្ចូលទិន្នន័យទី២ Data entry person 2 name ☐	
កាលបរិច្ឆេទបញ្ចូលទិន្នន័យទី២ Date entered (ENTDATE2)	[ ][ ] [0][ ] [2][0][1][6] ថ្ងៃ Day ខែ Month ឆ្នាំ Year	

eQµaHkumar Name of child (NAMECH)	
eQµaHអ្នកមើលថែកុមារ Name of caregiver (NAMECG)	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

CadMbUg ´sUmsYrGMBIB½t'manTUeTAmYycMnYnGMBIkumar

(First, I will ask some general questions about the child)

Variable name	Question	Response	Code
RSHP	1. etIGñkmanTMnak;TMngGVICamYynwgkumarenH? sUmKUsrgVg;ykcMellyEtmYy ប្រសិនបើអ្នកថែទាំមិនមែនជា (ឈ្មោះ) ម្តាយ, រំលងទៅសំណួរទី២។ ប្រសិនបើអ្នកថែទាំគឺជា (ឈ្មោះ) ម្តាយ, រំលងទៅសំណួរទី៣ ។ What is your relationship to (NAME)? Select ONLY ONE answer If the caregiver is not (NAME'S) mother, go to question 2. If the caregiver is (NAME'S) mother, go to question 3.	ម្តាយបង្កើត Biological mother ☐ ជីដូន Grandmother ☐ ឪពុក Father ☐ បងស្រី Sister ☐ bgb¥ÚnRbus Brother ☐ ផ្សេង។(ពិពណ៌នា) Other (describe) ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 4 5 7 8 9
MOTHER	2. តើម្តាយ (នៃឈ្មោះ) នៅឯណាពេលនេះ? sUmKUsrgVg;ykcMellyEtmYy Where is (NAME'S) mother now? Select ONLY ONE answer	At work in PP នៅកន្លែងធ្វើការនៅក្នុងរាជធានីភ្នំពេញ ☐ At work outside PP នៅកន្លែងធ្វើការនៅខាងក្រៅរាជធានីភ្នំពេញ ☐ At work outside Cambodia នៅកន្លែងធ្វើការនៅក្រៅប្រទេសកម្ពុជា ☐ ស្លាប់ Not alive ☐ ផ្សេង។(ពិពណ៌នា) Other (describe) ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 4 7 8 9
CAREGVR	*3.* តើអ្នកជាអ្នកថែទាំ របស់កូននេះជាប់លាប់ឬទេ? sUmKUsrgVg;ykcMellyEtmYy Are you the child's usual caregiver? Select ONLY ONE answer	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
CARE2W	4. etI2s)þah¾cugeRkayenH GñkបានមើលថែTaMkumarenH bx¤eT? sUmKUsrgVg;ykcMellyEtmYy Have you been looking after (NAME) for at least the last two weeks?) Select ONLY ONE answer	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
SEX	5. etI kumarenH ePTRbus b¤ ស្រី Is (name) a male or female?	ប្រុស Male ☐ ស្រី Female ☐	1 2

ឥឡូវនេះខ្ញុំនឹងសួរសំណួរមួយចំនួនអំពីអ្នក។ I will now ask some questions about you.

AGECG	6. តើអ្នកអាយុប៉ុន្មាន? How old are you?	Age in years អាយុជាឆ្នាំ ☐☐	
ETHNICG	7. តើអ្នកកាន់សាសនាអ្វី? What religion do you identify with? (Tick ONLY ONE answer)	ព្រះពុទ្ធ Buddhist ☐ មូស្លីម Muslim ☐ គ្រិស្តChristian ☐ ផ្សេង។ សូមរៀបរាប់ Other (describe) ☐ _____	1 2 3 7

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

ទម្រង់ទី៣៖ប្រសិទ្ធភាពនៃព្រឹត្តិការណ៍សិក្សា, ទម្រង់បញ្ជីរសំនួរប្រមូលទិន្នន័យមូលដ្ឋាន – កំណើតនិងអត្រាជំងឺ **Form 3B: Efficacy trial, baseline data collection form – birth and morbidity**

ប្រសិនបើអ្នកមើលថែទាំកុមារគឺជាម្តាយរបស់កុមារត្រូវនិយាយថា: \LÚv´sUmkt;eQµaHkUnrbs;GñkTaMgGs; TaMgនៅrs; TaMgsøab; cab;BIkUnTI 1 eTA .

ប្រសិនបើអ្នកមើលថែទាំកុមារមិនមែនជាម្តាយរបស់កុមារត្រូវនិយាយថា: \LÚv´sUmkt;eQµaH; បងប្អូនរួមម្តាយរបស់កុមារនេះTaMgGs; TaMgនៅrs; TaMgsøab; cab;BIkUnTI 1 eTA kt;eQµaHkUnTaMgGs;kñúgbegÁal 212. កត់ត្រា កូនស្លោះ២និងកូនស្លោះ៣ នៅលើជួរដេកដាច់ដោយឡែក។ (ប្រសិនបើផ្តល់កំណើតកូនច្រើនជាង ៣ ប្រើសំណួរបន្ថែម) ។

If the caregiver is the baby's mother say: Now I would like to record the names of all your births, whether still alive or not, starting with the first one you had. If the caregiver is not the baby's mother say: Now I would like to record the names of all of this child's siblings from the same mother, whether still alive or not, starting with the first one. Record twins and triplets on separate rows. (If there are more than 3 births, use an additional questionnaire).

	BIRTH1	BIRTH2	BIRTH3	BIRTH4	BIRTH5	BIRTH6	BIRTH7
BIRTH កំណើត កូនទី	1. etIkUnTI1¼ kUn bnÞab;eQµaH GVI ? What name was given to your first/next baby? ¬ eQµaH ¦ (NAME)	2. etI kumarenH ePT Rbus bɤRs Was that baby a male or female?	3. etIkUnTaMg enHman ePøaH bɤeT? Were any of these births twins?	4. etI ¬eQµaH ¦ ekItExNa qñaMNa ? sYreyagrkéf¶xYb kMeNItrbs;eKebIminca MEx skIsYr rkE xqñaMExµr rYcbMElg . In what month and year was (NAME) born? Probe: When is his/her birthday?	5. etI ¬eQµaH¦ enArs; bɤ søab;? Is (NAME) still alive?	6. ebIenArs; ³ etI ¬eQµaH¦ rs;enACa mYyGñk bɤ eT ? IF ALIVE: Is (NAME) living with you?	7. ebIsøab; ³ etI ¬ eQµaH ¦ søab; enA Gayub:unµan? ebIsøab;enA Ga yu1qñaM sYreyag³ etI ¬eQµaH ¦ søab;enA Gayub:unµa nEx? kt;Rta Ca éf¶ebI Gayut icC ag1Ex kt;CaEx ebIGayu ticCag 2qñaM kt;CaqñaM ebIG ayu cabBI 2qñaMeLIg IF DEAD: How old was (NAME) when he/she died? IF '1 YR', PROBE: How many months old was (NAME)? Record days if less than 1 month; months if less than two years; or years.
01 ១		ប្រុស Male ☐ 1 ស្រី Female ☐ 2	ម្នាក់; Single ☐ 1 eRcInnak;; Multiple ☐ 2	☐☐ ខែ Month ☐☐☐☐ ឆ្នាំ Year	ស្លាប់Dead ☐ 0 ↘ 8 នៅរស់Alive ☐ 1	ទេ No ☐ 0 បាទ/ចាស Yes ☐ 1	☐☐ éf Days qñaM Years ☐☐ ¶ Ex Months ☐☐
02 ២		ប្រុស Male ☐ 1 ស្រី Female ☐ 2	ម្នាក់; Single ☐ 1 eRcInnak;; Multiple ☐ 2	☐☐ ខែ Month ☐☐☐☐ ឆ្នាំ Year	ស្លាប់Dead ☐ 0 ↘ 8 នៅរស់Alive ☐ 1	ទេ No ☐ 0 បាទ/ចាស Yes ☐ 1	☐☐ éf Days qñaM Years ☐☐ ¶ Ex Months ☐☐
03 ៣		ប្រុស Male ☐ 1 ស្រី Female ☐ 2	ម្នាក់; Single ☐ 1 eRcInnak;; Multiple ☐ 2	☐☐ ខែ Month ☐☐☐☐ ឆ្នាំ Year	ស្លាប់Dead ☐ 0 ↘ 8 នៅរស់Alive ☐ 1	ទេ No ☐ 0 បាទ/ចាស Yes ☐ 1	☐☐ éf Days qñaM Years ☐☐ ¶ Ex Months ☐☐

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

BIRTH8	8. etI\LÚvenHGñkmanépÞeBaHb¤eT? (ឬម្តាយរបស់ទារកនេះ ប្រសិនបើអ្នកឆ្លើយតបគឺមិនមែនជាម្តាយ) ប្រសិនបើetIGñkmanépÞeBaHb:unµanExehIy ? kt;RtacMnYnExeBjelj. Are you (or NAME'S mother, if respondant is not the mother) pregnant now? If yes, how many months pregnant are you? Record the number of completed months.	ទេ No ☐ បាទ/ចាស Yes ☐ Ex Months ☐☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
BIRTH9	9. etIGñkNa)anCYybegáItkUn ¬eQµaH¦? Who assisted with the delivery of (NAME)?	buKÁlikeBTü Health personnel evC¢bNÐit¼RKUeBTümFüm Doctor/medical assistant ☐ qµb Midwife ☐ Kilanub,dæak Nurse ☐ buKÁlepSgeTot Other person qµbbUraN Traditional birth attendant ☐ jatisNþan¼mitþP½k Relative/friend ☐ epSgeTot Other (specify) ☐ _____ KµanGñkNaeT No one assisted ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	 1 2 3 4 5 6 10 8 9
BIRTH10	10. តើ(កូនឈ្មោះនេះ) កើតគ្រប់ខែឬទេ? (៣ សប្តាហ៍មុនឬ 2 សប្តាហ៍បន្ទាប់ពីពេលកំណត់គ្រប់ខែ) ឆាប់ពេកឬយឺតពេក? Was (NAME THIS CHILD) born on time (3 weeks before or 2 weeks after the due date), too early, or too late?	គ្រប់ខែOn time ☐ ឆាប់Early ☐ យឺតLate ☐ តើទារកកើតនៅអាយុប៉ុន្មានខែ? At how many months/days was (NAME) born? ☐ ☐☐ Ex Months éf Days បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 2 3 8 9
BIRTH11	11. etI ¬eQµaH¦ ekItedayvHkat; mann½yfa eK)anvHeBaHrbs;GñkedIm,IykkUnb¤ ? Was (NAME) delivered by caesarean, that is, did they cut your belly open to take the baby out?	ទេ No ☐ cas+ suMvH Yes, elective ☐ Yes, emergency/medically indicated cas+ RtUvvHbnÞan; ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 2 8 9
BIRTH12	12. etI ¬eQµaH¦man)anføåGeTenAeBlekIt? ប្រសិនបើគ្មាន ឬ បដិសេធ ឬ មិនដឹងរំលងទៅសំណួរទី 14 Was (NAME) weighed at birth? If No, Refused, Don't know skip to question 14	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 8 9
BIRTH13	13. etI ¬eQµaH¦manTMgn;b:unµan eBlekIt? kt;RtaTMgn;CaKILÚRkamBIb½NÑ suxPaBebIman ប្រសិនអត់b½NÑ សុខភាព កំណត់ត្រាទម្ងន់ជាគីឡូក្រាមពីការចងចាំ។ How much did (NAME) weigh? Record weight in kilograms from health card, if available. If health card not available, record weight in kilograms from recall.	KILÚRkamBIb½NÑ KG from card ☐☐.☐☐☐ KILÚRkamBIkarcaM KG from recall ☐☐.☐☐☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	 8 9
IFA1	14. មុនeBlmanépÞeBaHenH etIGñk)anTTYl ឬ បាន TijfañM គ្រាប់CatiEdk EdrbxeT?¤ បង្ហាញរូបភាពថ្នាំជាតិដែក	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐	0 1 8

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	បើអត់ សូមរំលងទៅសំនួរទី16 Before this pregnancy with (NAME), were you given or did you buy any iron-folate tablets? Show tablets. If no, go to 16	មិនដឹង Don't know ☐	9
IFA2	15. មុនeBlmanépÞeBaHenH etIGñk)anelbfañMCatiEdk cMnYnb:unµanគ្រាប់?¤ Before the pregnancy with (NAME), how many iron-folate tablets did you take?	ចំនួនគ្រាប់ថ្នាំ Number of tablets ☐☐☐	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
IFA2	16. kñúgGMLúgeBlmanépÞeBaHenH etIGñk)anTTYl ឬ បាន TijfañM គ្រាប់CatiEdk EdrbxeT?¤ បើអត់ សូមរំលងទៅសំនួរទី18 During this pregnancy with (NAME), were you given or did you buy any iron-folate tablets? Show tablets. If no, go to 18.	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
IFA4	17. kñúgGMLúgeBlmanépÞeBaHenH etIGñk)anelbfañMCatiEdk cMnYnb:unµanគ្រាប់?¤ During the pregnancy with (NAME), how many iron-folate tablets did you take?	ចំនួនគ្រាប់ថ្នាំ Number of tablets ☐☐☐	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
IFA5	18. ក្រោយពេលសំរាលកូន (ឈ្មោះ)etIGñk)anTTYl ឬ បាន TijfañM គ្រាប់CatiEdk Edrbx¤eT?¤ បើអត់ សូមរំលងទៅសំនួរទី20 After (NAME's) birth, were you given or did you buy any iron-folate tablets? Show tablets. If no, go to 20.	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
IFA6	19. ក្រោយពេលសំរាលកូន (ឈ្មោះ) etIGñk)anelbfañMCatiEdk cMnYnb:unµanគ្រាប់?¤ After (NAME's) birth, how many iron-folate tablets did you take?	ចំនួនគ្រាប់ថ្នាំ Number of tablets ☐☐☐	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
DEWORM	20. kñúgGMLúgeBlmanépÞeBaHenHetIGñk)an លេបថ្នាំទម្លាក់ព្រូន ឬ ដង្កូវពោះវៀនឬទេ?¤ ឧទាហរណ៍ During this pregnancy with (NAME), did you take any drug for intestinal parasites? Show examples.	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
MALARIA 1	21. kñúgGMLúgeBlmanépÞeBaHenHetIGñkman)aneRbIfñaMkar BaCMgWRKuncajEdrbxeT;?¤ បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ23 During this pregnancy with (NAME), During this pregnancy, did you take any drugs to keep you from getting malaria? If no, skip to question 23.	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
MALARIA 2	22. ; etIGñk)aneRbIfñaMGVI ?¤និងប្រើប៉ុន្មានដង? sUmkt;Rtaral;cMellyដែលបានរៀបរាប់;។ បង្ហាញថ្នាំគ្រុនចាញ់។	fñaM eGsPI¼hVg;sIuda SP/FANSIDAR☐ cMnYndg Times ☐	1
		fñaMkøÚrUKIn CHLOROQUINE☐ cMnYndg Times ☐	2

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	What drugs did you take, and how many times? Record all mentioned. Show typical antimalarial drugs to respondent	ផ្សេងទៀត ចូរបៀបរាប់ Other (describe) ☐ cMnYndg Times _____ ☐	7
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
ILL2W	23. តើ២សប្តាហ៍ចុងក្រោយ នេះ កុមារ(ឈ្មោះ)មានឈឺទេ? (តួសចម្លើយតែមួយ) បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ26 In the past 2 weeks, has (NAME) been ill? (Tick only one answer) If No to this question – jump to question 26	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
ILLRATE2	24. ជាគំនិតរបស់អ្នក តើកុមារ(ឈ្មោះ) មានជំងឺធ្ងន់ មធ្យម ឬស្រាល? បើសិនជាជំងឺធ្ងន់ធ្ងរ សូមរំលងទៅសំនួរ25 In your opinion , was (NAME'S) illness serious, moderate or slight? If Serious go to question 25.	ជំងឺធ្ងន់ Serious ☐	1
		មធ្យម Moderate ☐	2
		ស្រាល Slight ☐	3
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
ILLRATE3	25. តើអ្នកបានយក (ឈ្មោះ) ទៅជួបគ្រូពេទ្យឬទេ? ប្រសិនបើបានទៅវេជ្ជបណ្ឌិត សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈដែលចង់ចូលរួម។ ប៉ុន្តែសូមទោសដោយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួមដោយសារ(ឈ្មោះ)មានជំងឺធ្ងន់ធ្ងរកាលពី ២សប្តាហ៍មុននេះ ។ មិនយកហើយបញ្ចប់សំនួរ Did you take (NAME) to the doctor? If yes, visited the doctor – Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) has been seriously ill in the last 2 weeks. EXCLUDE AND END QUESTIONNAIRE	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
		មិនទទួលយកការសិក្សា EXCLUDED ☐	99
FEVER2W	26. តើកុមារ(ឈ្មោះ)មានក្តៅខ្លួនទេ ក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? Has (NAME) been ill with a fever at any time in the past 2 weeks?	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
ARI2W1	27. តើកុមារ(ឈ្មោះ)មានក្អកទេក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយនេះ? បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ៣០ Has (NAME) had an illness with a cough at any time in the past 2 weeks? If No to this question – jump to question 30	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
ARI2W2	28. នៅពេលកុមារ(ឈ្មោះ)មានជំងឺក្អក តើគេមានដកដង្ហើមញាប់ជាងធម្មតាដោយដង្ហក់ ដកដង្ហើយញឹក ឬមានការពិបាកក្នុងការដកដង្ហើមឬទេ? បើសិនចម្លើយទេ សូមរំលងទៅសំនួរ30 When (NAME) had an illness with a cough, did he/she breathe faster than usual with short, fast breaths or had difficulty breathing?). If No to this question – jump to question30	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
AR2W3	29. មានការដកដង្ហើយញឹក ឬមានការពិបាកក្នុងការដកដង្ហើមដោយមានបញ្ហានៅដើមទ្រូង ឬមានស្ទះនៅច្រមុះ? Was the fast or difficult breathing due to a problem in the chest or a blocked nose?)	ដើមទ្រូងChest only ☐	1
		ច្រមុះNose only ☐	2
		ទាំង២Both ☐	3
		ផ្សេងទៀត ចូរបៀបរាប់ Other (describe) ☐ _____	7

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		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹងDon't know ☐	9
DIAR2W1	30. តើកុមារមានរាគទេក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? ខ. បន្ទោរបង់ពាទៅ៤ដងក្នុងរយៈពេលល២៤ម៉ោង បើមាន បន្តទៅសំនួរ 31 បើទេ បដិសេធ មិនដឹង រំលងទៅសំនួរ32 Has (NAME) had had diarrhoea in the past 2 weeks? i.e. 3 or more loose stools during a 24 hour period. If Yes – go to question 31. If No, Refused, Don't know – go to question 32	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
DIAR2W2	31. តើកុមារមានបន្ទោរបង់ដោយមានឈាមជាប់លាមកទេ? បើមាន សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិគ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានបន្ទោរបង់ឈាម ដែលបញ្ជាក់ថាគាត់មានជំងឺធ្ងន់ក្នុងរយៈពេល២សប្តាហ៍មុននេះ។យើងឲ្យយោបល់ថាអ្នកគួរតែទៅពិនិត្យនៅមណ្ឌលសុខភាពឬគ្លីនិក។ បើទេ បដិសេធ មិនដឹង រំលងទៅសំនួរ 32 Was there any blood in the stools? If Yes – Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) has had blood in their stools, which indicates a serious illness, in the last 2 weeks. We suggest that you visit a health care provider or clinic. EXCLUDE AND END QUESTIONNAIRE If No, Refused, Don't know – go to question 32	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
		មិនទទួលយកការសិក្សា EXCLUDED ☐	99
VOMIT2W	32. តើកុមារមានក្អួតទេ រយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? Has (name) vomited in the past 2 weeks?	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
APPET2W	33. តើកុមារ(ឈ្មោះ)ញុាំអាហារជាធម្មតា ឬច្រើនជាងធម្មតា ឬតិចជាងធម្មតានៅក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? Has (name) been eating normally, more than usual, or less than usual in the 2 weeks?	ធម្មតាNormally ☐	0
		ច្រើនជាងធម្មតាMore than usual ☐	1
		តិចជាងធម្មតាLess than usual ☐	2
		បដិសេធមិនឆ្លើយRefused to respond ☐	8
		មិនដឹងDon't know ☐	9
RASH2W	34. តើកុមារ (ឈ្មោះ)មានឡើងកន្ទួលរលើសួរកទេក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? Has (name) had a skin rash in the past 2 weeks?	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
SYMPT2W	35. តើកុមារមានរោគសញ្ញា ឬជំងឺអ្វីផ្សេងទៀតដែលខ្ញុំមិនបានសួរក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? បើមាន សូមបញ្ជាក់ Has (name) had any other sickness or symptoms that I have not asked about in the past 2 weeks? If yes - Please specify.	ទេNo ☐	0
		បាទ/ចាសYes ☐	1
		បើសិនជាមាន តើរោគសញ្ញា ឬជំងឺអ្វីដែរ If yes, what sickness or symptoms? _____	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
MEDS2W	តើកុមារ (ឈ្មោះ)មានលេបថ្នាំអ្វីទេក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? ប្រសិនបើលេប តើបានលេបថ្នាំអ្វីខ្លះ? គ្មានថ្នាំចម្លើយទាំងអស់ដែលទទួលបាន ប្រសិនបើទេ សូមរំលងទៅសំនួរ36 Has (name) taken any medicine in the past 2 weeks?	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
MEDS2W2	If yes, which medicines did (NAME) take? Tick all that apply. If no, go to question 36.	vItamIn Vitamins ☐	1
		fµaMk¥Üt Anti-vomiting ☐	2
		fµaMraK Anti-diarrhea ☐	3
		fµaMk¥k Anti-cough ☐	4
		fñaMbM)at;karQWcab; Painkillers ☐	5
		fµaMbM)at;karrlak Anti-inflammatories ☐	6

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐☐☐☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

		fµaMGg;TIb'lyUTik Antibiotics ☐ Anti-malarial ☐ fµaMepSg²eTotEdleGayedayGñkCMnajxagsuxPaB ពិព័ណ៌នា ☐ _____ Other medicine supplied by health professionals (describe) fµaMepSg²eTotEdleGayedayminEmnGñkmanCMnajxagsuxPaB ពិព័ណ៌នា ☐ _____ Other medicine supplied by non-health professionals (describe) បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	7 11 12 8 9
VITAMINA	36. kñúgGMLúgeBl 6Ex knøgmk etI ¬eQµaH¦)anTTYlfñaM vItamIn Ga ឬeT? sUmbgðajfñaMRKab;vItamIn Ga cMlgéf¶ Ex qñaM ទទួលfñaMBIb½NÑ កត់ត្រាកាលបរិច្ឆេទនៃការរលេបថ្នាំចុងក្រោយពីប័ណ្ណសុខភាពប្រសិនបើបាន។ Within the last six months, was (NAME) given a vitamin A dose like (this/any of these)? Show common types of capsules. Copy date of most recent dose from Health Card if recorded.	ទេ No ☐ បាទ/ចាស Yes ☐ If yes, write the date: បើបាទ/ចាស សូមសរសេរនូវកាលបរិច្ឆេទ ☐☐ ☐☐ 2 0 1 ☐ éf¶ Day Ex Month qñaM Year បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
	37. kñúgGMLúgeBl 6Ex knøgmk etI ¬eQµaH¦)anTTYlfñaMចាក់ RBUn EdrbtæeT ? Was (NAME) given any drug for intestinal worms in the last six months?	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9

ឥឡូវនេះខ្ញុំចង់សួរសំណួរមួយចំនួនអំពីសុខភាពរបស់អ្នក *Now I would like to ask some questions about your health*

ILL1MUM	38. តើអ្នក(ឬម្តាយកុមារ)កំពុងមានជំងឺធ្ងន់ធ្ងរឬទេ? (ឧ. ដូចជា៖ ជំងឺអេដស៍ ឬរបេង។ល។) Do you have any major illness right now (e.g. HIV, TB, etc)?	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
ILL2MUM	39. តើក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយនេះ អ្នកមានឈឺទេ? (ចូរសួរចម្លើយមួយ) បើទេ រំលងទៅសំនួរបញ្ចប់ In the past 2 weeks, have you been ill? (Tick ONLY ONE answer). If No – jump to end	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
ILL3MUM	40. ជាគំនិតរបស់អ្នក តើអ្នក មានជំងឺធ្ងន់ មធ្យម ឬស្រាល? បើធ្ងន់ធ្ងរ សូមរំលងទៅសំនួរ 41 In your opinion , was your illness serious, moderate or slight? If Serious – go to question 41.	ជំងឺធ្ងន់ Serious ☐ មធ្យម Moderate ☐ ស្រាល Slight ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 8 9
ILL4MUM	41. តើអ្នកបានទៅជួបគ្រូពេទ្យឬទេ? Did you go to the doctor?	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9

បើសិនជាអ្នកទទួលបានចម្លើយដែលមិនទទួលយកការចូលរួមBIkumar សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម

ដោយសារ[ផ្តល់នូវមូលហេតុដែលទទួលដូចនៅក្នុងបញ្ជីសំនួរខាងលើ] បើសិនជាបញ្ហានោះពាក់ពន្ធ័ជាមួយនឹងបញ្ហាសុខភាព សូមប្រាប់គាត់ឬឲ្យគាត់យកកូនរបស់គាត់ទៅមណ្ឌលសុខភាព/មន្ទីរពេទ្យ។

If you get an answer that excludes the child, say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because [give the reason]. [If health related reason, say] We suggest that you go to OR you take your child to the health clinic.

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

ទម្រង់ទី៣៖ ប្រសិទ្ធភាពនៃការសិក្សាសាកល្បង ទម្រង់បញ្ជីសំនួរប្រមូលទិន្នន័យមូលដ្ឋាន – គោលដៅការវិវត្ត ការវិវត្តមជ្ឈដ្ឋាន

Form 3C: Efficacy trial, baseline data collection form – developmental milestones

ឥឡូវនេះខ្ញុំនឹងសួរសំណួរមួយចំនួនអំពីឥរិយាបទរបស់កូននេះ។ Now I'm going to ask some questions about this child's behaviour.

Variable name	សូមសួរទៅអ្នកមើលថែកុមារ PLEASE ASK THE CAREGIVER	ចម្លើយ RESPONSE	Code
SMILE	1. ıBï¿½ÿÜ TıIяБ Б ¿ъВТıиЙ= ıBtC ¿ÀГ ЌıKï¿½ ТЧ ıЋ®ıPÿ Ŧ ЛъВТıиЙ? Ч ф®ıPÿ ĉМЧ ДıиМï¿½ÿÜ ТБ Б ¿Р &ÓÓū PıBÞ¿ъKï¿½ĈÏ ÿÜ TıЊ Ќ' ў Does this child smile? Can we try to observe that? See if the child smiles (try to make it laugh).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐	0
		អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐	1
		į ТЧ ıЋ®ıТМЧ ѓЫï Ч ю Ч ЛjInterviewer observed ☐	3
		ЪЫ Ч ю Ч ЛРДТ ЛıКï¿½ ТЧ ıЋ® Interviewer didn't observe ☐	4
		អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐	8
		អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	9
SOUND	2. ıBï¿½ıЋ®ıIяТ ЛĸÏ Ï áеУ ТМЧ ıЋЫЌО ТЇ Ч ıЋЏТЋдıиЙ?	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐	0
	ıBtC ¿ÀГ ЌıKï¿½ ТЧ ıЋ®ıPÿ Ŧ ЛъВТıиЙ? ıPÿ Ę ıBï¿½ÿÜ Т	អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐	1
	ıIяТ ЛъĉМЇ áеУ ТМЧ ıЋЫЌО ТЇ Ч ıЋЏТЋдıиЙ	į ТЧ ıЋ®ıТМЧ ѓЫï Ч ю Ч ЛjInterviewer observed ☐	3
	&A TıЋО Oвфï¿½ С Ï ÿÜ ТЛДıЙ ЋЧ ĉÜ РъВ' ў	ЪЫ Ч ю Ч ЛРДТ ЛıКï¿½ ТЧ ıЋ® Interviewer didn't observe ☐	4
		អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐	8
		អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	9
SIGHT	3. ıBï¿½ıЋ®ıIяТ ЛтО РıPÿ Ъ¿ВУ ĉМг Ï ÆЛЂъЛЇ ТМЧ ıЋЫДıиЙ?	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐	0
	ıBtC ¿ÀГ ЌıKï¿½ ТЧ ıЋ®ıPÿ Ŧ ЛъВТıиЙ?	អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐	1
	Ч ф®ıPÿ ĉМЧ ДıиМï¿½ÿÜ Тб РıPÿ	į ТЧ ıЋ®ıТМЧ ѓЫï Ч ю Ч ЛjInterviewer observed ☐	3
	&ıЋЇï¿½ĉÜ РъВıЋО ОВÿуъЛЇ ТМЧ ıЋЫЬ' ў	ЪЫ Ч ю Ч ЛРДТ ЛıКï¿½ ТЧ ıЋ® Interviewer didn't observe ☐	4
		អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐	8
		អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	9
	Does this child follow things with its eyes? Can we try to observe that? See if the child follows (move fingers in front of eyes).		
HEAD	4. ıBï¿½ıЋЏıIяТ ЌıЋЋъМï áеУ ТМЧ ıЋЫıЋЏЋдТ ЛıЙ?	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐	0
	ıBtC ¿ÀГ ЌıKï¿½ ТЧ ıЋ®ıPÿ Ŧ ЛъВТıиЙ?	អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐	1
	Ч ф®ıPÿ ĉМЧ ДıиМï¿½ÿÜ Тſ ЌıЋЋъМï áеУ ТМЧ ıЋЫıЋЏЋдЋ&Ч ѓоЪЫ	į ТЧ ıЋ®ıТМЧ ѓЫï Ч ю Ч ЛjInterviewer observed ☐	3
	ъИг Ю Ï ¿ ÿÜ ТıЏЪЋt ФМРÿ ТЌıУ ï¿½ъВĈÏ ФВÿ ОВÿуıЋЋЋ	ЪЫ Ч ю Ч ЛРДТ ЛıКï¿½ ТЧ ıЋ® Interviewer didn't observe ☐	4
	ıBï¿½¿ъĵ З ıЋЋЋМıPÿ '	អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐	8
		អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	9
	Does this child hold its head up? Can we try to observe that? See if the child holds its head up (ask caregiver to put child on tummy and wave to make it look up).		
ROLL	5. ıBï¿½ıЋЏıIяıЌяĈÏ ŷ МıЙ?	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐	0
	ıBtC ¿ÀГ ЌıKï¿½ ТЧ ıЋ®ıPÿ Ŧ ЛъВТıиЙ?	អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐	1
	Ч ф®ıPÿ ĉМЧ ДıиМï¿½ÿÜ Тſ ЌĈÏ ŷ МıЁ Л&Ч ѓоЪЫ ъИг Ю Ï ¿ у	į ТЧ ıЋ®ıТМЧ ѓЫï Ч ю Ч ЛjInterviewer observed ☐	3
	Ū ТıЏЪЋt ФМРÿ ıЏУ ï¿½ЏЦ яЛДıиУ ï¿½ъЙï¿½ ЌıЗ ıВВï¿½¿ъĈÏ ŷ Мє	ЪЫ Ч ю Ч ЛРДТ ЛıКï¿½ ТЧ ıЋ® Interviewer didn't observe ☐	4
		អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐	8
		អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	9
	Does this child roll over? Can we try to observe that? Ask		

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ____ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ____ ____ ____ ____

	caregiver to put child on tummy and encourage to roll.		
REACH	6. ıвЇ¸фшlяѓ ЛшN ЋиЮ к МЬ₫Ѓ ЛъВТдиЙ? ıвЇ¸Ѓ ₫ѓ ЌшКѐ¸ ТЧ ıЋ₫ıPУ Ѓ ЛъВТдиЙ? Ч ф₫PУ ĉМЧ дшМЁ¸Ū Ѓ ЌшN ЋиЮ к МЬ₫УЬ₫Ѓ ъВУ ıЮ. Оp Рѓшшбў	caregiver says no ☐ 0 caregiver says yes ☐ 1 Interviewer observed ☐ 3 Interviewer didn't observe ☐ 4 caregiver refused to respond ☐ 8 caregiver doesn't know ☐ 9	
	Does this child reach for things? Can we try to observe that? See if the child reaches for an object in front of it.		
TALK	7. ıвЇ¸фшlяѓ ЌНЮ ЋиЇ¸ Ū З₫Ѓ ЛъВТдиЙ? ıвЇ¸Ѓ ₫ѓ ЌшКѐ¸ ТЧ ıЋ₫ıPУ Ѓ ЛъВТдиЙ? Ч ф₫к Ū″С НЮ ЋиЇ¸ Ū З₫Ю ¡ ЛЇ¸Ū Т	caregiver says no ☐ 0 caregiver says yes ☐ 1 Interviewer observed ☐ 3 Interviewer didn't observe ☐ 4 caregiver refused to respond ☐ 8 caregiver doesn't know ☐ 9	
	Does this child babble? Can we try to observe that? Ask caregiver to babble to child.		
TALK2	8. ıвЇ¸фшlяѓ ЌЛ₫ С МıЋ₫ Ū Ї ĈЃ ЛъВТдиЙ? ıвЇ¸Ѓ ₫ѓ ЌшКѐ¸ ТЧ ıЋ₫ıPУ Ѓ ЛъВТдиЙ? Ч ф₫к ЪЇ ъИ¡ Ю₫ С Ū Ї ĈЃ Ū Т	caregiver says no ☐ 0 caregiver says yes ☐ 1 Interviewer observed ☐ 3 Interviewer didn't observe ☐ 4 caregiver refused to respond ☐ 8 caregiver doesn't know ☐ 9	
	Does this child form words? Can we try to observe that? Ask caregiver to "say" its words.		
TALK3	9. ıвЇ¸фшlяѓ ЌС У ĕЇ ĈЃ ЛJ ĉъВТдиЙ? ıвЇ¸Ѓ ₫ѓ ЌшКѐ¸ ТЧ ıЋ₫ıPУ Ѓ ЛъВТдиЙ? ıPУ ĉМЧ дшМЁ¸Ū ТшlяѓĉМВЇ₫ РаЎĕ¸ З МЮ ЛЂ₫Ū Ї ĈРк ЌЮхІ	caregiver says no ☐ 0 caregiver says yes ☐ 1 Interviewer observed ☐ 3 Interviewer didn't observe ☐ 4 caregiver refused to respond ☐ 8 caregiver doesn't know ☐ 9	
	Can this child understand some words? Can we try to observe that? See if the child responds to some words.		
MOUTH	10. ıвЇ¸фшlяѓ ЌЮ Ї ĉМЧ ЌĕУ Ї ЂЋ Ū З₫ВТдиЙ? ıвЇ¸Ѓ ₫ѓ ЌшКѐ¸ ТЧ ıЋ₫ıPУ Ѓ ЛъВТдиЙ? ıPУ ĉМЧ дшМЁ¸Ū ТшlяѓЌЮ Ї ₫ĕj МЌĕУ Ї ЂЋ Ū З₫ к Ч ₫ĕj МЮ ЪЇ ъИ¡ ю Р дшĉМ₫шlЂĕ₫	caregiver says no ☐ 0 caregiver says yes ☐ 1 Interviewer observed ☐ 3 Interviewer didn't observe ☐ 4 caregiver refused to respond ☐ 8 caregiver doesn't know ☐ 9	
	Does this child bring things to its mouth? Can we try to observe that? See if the child brings a candy to its mouth – leave the candy with caregiver – do not reuse.		
SIT	11. ıвЇ¸фшlяшЌяЪЋ₫ıЮ С Ū Лі ТЏ Ѓ ЛъВТдиЙ? ıвЇ¸Ѓ ₫ѓ ЌшКѐ¸ ТЧ ıЋ₫ıPУ Ѓ ЛъВТдиЙ? ıPУ ĉМЧ дшМЁ¸Ū ТшlяѓЌЮ Ї ₫ĕj МЌĕУ Ї ЂЋ Ū З₫ к Ч ₫ĕj МЮ ЪЇ ъИ¡ ю	caregiver says no ☐ 0 caregiver says yes ☐ 1 Interviewer observed ☐ 3 Interviewer didn't observe ☐ 4 caregiver refused to respond ☐ 8 caregiver doesn't know ☐ 9	
	Can this child sit with support? Can we try to observe that?		

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): [ ] (Form ID, FORMID) [0][3]

kumar (Child´s ID, CHID): [ ][ ][ ][ ]

	See if the child can sit with support (ask caregiver to sit child up).		
SIT2	12. ıвÏ¿фıшÏяſ ЌЪҺ❶ ıшÞ С ĵ āЛЦЈЮЌС Ŧ ЛъВТдıшЙ? ıвıщС ЁвſЌıшЌі¿ ТЧ ıЋ❶ıшРЏ¿ Ŧ ЛъВТдıшЙ? ıшРЏ¿ Ѓ ıвÏ¿фıшÏяſ ЌЪҺ❶ Ŧ ЛıшÞ С Ū ЛЦЈЮЌС дıшЙў &Ŧ Мкъ Ъї ъИг ю Ї ешЋ ā к ЪҺ❶' Can this child sit without support? Can we try to observe that? See if the child can sit without support (ask caregiver to sit child up).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ ıЋ❶ıшТМЧ ёЇ Ч ю Ч ЛįInterviewer observed ☐ Ъї Ч ю Ч ЛРдЦŦ ЛıшЌі¿ ТЧ ıЋ❶ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
CRAWL	13. ıвÏ¿фıшÏяſ ЌҶТıшÞ С ıщМ❶ВЛЦā ЦЋЋ❶Ŧ ЛъВТдıшЙ? ıвıщС ЁвſЌıшЌі¿ ТЧ ıЋ❶ıшРЏ¿ Ŧ ЛъВТдıшЙ? ıшРЏ¿ Ѓ ıвÏ¿фıшÏяſ ЌҶТıшÞ С ıщМ❶ВЛЦā ЦЋЋ❶Ŧ Лдıшйў &Ŧ Мкъ Ъї ъИг ю Ї ешЋ ā к ıЋЪҺt ❶МРЏ¿ ТЌı□ ıЋ ā' Can this child crawl on its hands and knees? Can we try to observe that? See if the child can crawl on its hands and knees (ask caregiver to put child on tummy and call it to them).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ ıЋ❶ıшТМЧ ёЇ Ч ю Ч ЛįInterviewer observed ☐ Ъї Ч ю Ч ЛРдЦŦ ЛıшЌі¿ ТЧ ıЋ❶ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
STAND	14. ıвÏ¿фıшÏяſ ЌA TıшÞ С Ū ЛЦЈЮЌС Ŧ ЛъВТдıшЙ? ıвıщС ЁвſЌıшЌі¿ ТЧ ıЋ❶ıшРЏ¿ Ŧ ЛъВТдıшЙ? ıшРЏ¿ Ѓ ıвÏ¿фıшÏяſ ЌA ŦŦ ЛıшÞ С Ū ЛЦЈЮЌС дıшЙў &Ŧ Мкъ Ъї ъИг ю Ї ешЋ ā к A ЂъНЁ ıщ Ъ'р Can this child stand with assistance? Can we try to observe that? See if the child can stand with assistance (ask caregiver to stand child against chair).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ ıЋ❶ıшТМЧ ёЇ Ч ю Ч ЛįInterviewer observed ☐ Ъї Ч ю Ч ЛРдЦŦ ЛıшЌі¿ ТЧ ıЋ❶ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
WALK	15. ıвÏ¿фıшÏяſ ЌıвВЁŦ ЛıшÞ С Ū ЛЦЈЮЌС дıшЙ? ıвıщС ЁвſЌıшЌі¿ ТЧ ıЋ❶ıшРЏ¿ Ŧ ЛъВТдıшЙ? ıшРЏ¿ Ѓ ıвÏ¿фıшÏяſ ЌıвВЁŦ ЛıшÞ С Ū ЛЦЈЮЌС дıшЙў ĉŦ Мкъ Ъї ъИг ю Ї ешЋ ā к A ЂъНЁ ıщ ЪрıшЦĢ ıшЄ Ї ЏŪ Т Can this child walk with assistance? Can we try to observe that? See if the child can walk with assistance (ask caregiver to stand child against chair and call it to them).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ ıЋ❶ıшТМЧ ёЇ Ч ю Ч ЛįInterviewer observed ☐ Ъї Ч ю Ч ЛРдЦŦ ЛıшЌі¿ ТЧ ıЋ❶ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
STAND 2	16. ıвÏ¿фıшÏяſ ЌA TıшÞ С ĵ āЛЦЈЮЌС Ŧ ЛъВТдıшЙ? ıвıщС ЁвſЌıшЌі¿ ТЧ ıЋ❶ıшРЏ¿ Ŧ ЛъВТдıшЙ? ıшРЏ¿ Ѓ ıвÏ¿фıшÏяſ ЌA ŦŦ ЛıшÞ С ĵ āЛЦЈЮЌС дıшЙў ĉŦ Мкъ Ъї ъИг ю Ї ешЋ ā к A T Can this child stand without assistance? Can we try to	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ ıЋ❶ıшТМЧ ёЇ Ч ю Ч ЛįInterviewer observed ☐ Ъї Ч ю Ч ЛРдЦŦ ЛıшЌі¿ ТЧ ıЋ❶ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

	observe that? See if the child can stand without assistance (ask caregiver to stand child).		
WALK2	17. ıBÏ¿dIıIяſ ÍıBŸF ЛıĐ C ĵ ãЛЦЈЖС дıЙ? ıBŸıC ŸaſÍıK¿, ТЧ ıĥ®ıPУ Ŧ ЛъВТдıЙ? ıPУ Ą ıBÏ¿dIıIяſ ÍıBŸF ЛıĐ C ĵ ãЛЦЈЖС дıЙў ĉŦ Мк ЪЇ ъИ ıю Ї ея ãпк А ТıЦЦG ıе Ї ÿŪ Т Can this child walk without assistance? Can we try to observe that? See if the child can walk without assistance (ask caregiver to stand child and call it to them).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ ¡ ТЧ ıĥ®ТМЧ ЄЇ Ч ю Ч ЛjInterviewer observed ☐ Ъї Ч ю Ч ЛЈ ДŦ ЛıК¿, ТЧ ıĥ® Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
LOOK	18. ıBÏ¿dIıIяıкÍяð РТЇ ıPУ ТМЧ єıQУ ъВУ ıС ŸaŭÏ ıеУ Ъ ъВТдıЙ? ıBŸıC ŸaſÍıK¿, ТЧ ıĥ®ıPУ Ŧ ЛъВТдıЙ? Мк ёБ ФЗЎ¢С ıQ Ї ÿŪ Т Мѕ ℓМРЇ ŭ Ї ФЗЎ¢ яıЦG ıPУ Ą ıBÏ¿dIð РТЇ ıPУ ФЗЎ¢ яд ıЙЎў Does this child look for things out of view? Can we try to observe that? Show the child an object, then hide the object and see if the child looks for it.	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ ¡ ТЧ ıĥ®ТМЧ ЄЇ Ч ю Ч ЛjInterviewer observed ☐ Ъї Ч ю Ч ЛЈ ДŦ ЛıК¿, ТЧ ıĥ® Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9

ЛıЦ С Ą Ї ЪТЬЎЖ Ч ĉŪ МЌıPĢ; ТМЧ ЄЇ ў

Say: Thank you for answering these questions.

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

ទម្រង់ទី៣៖ ប្រសិទ្ធភាពនៃគ្រឹះរបស់ការសិក្សា, ទម្រង់បញ្ជីសំនួរប្រមូលទិន្នន័យមូលដ្ឋាន – ទិន្នន័យរបបអាហារ

Form 3D: Efficacy trial, baseline data collection form – dietary data

eQµaHkumar Name of child (NAMECH)	
eQµaHអ្នកមើលថែកុមារ Name of caregiver (NAMECG)	

CadMbUg ´sUmsYrGMBIrbbGaharkumar about the child's diet

Now I will ask some questions

PRELACT 1	1. kñúgGMLúgeBl 3éf¶dMbUgeRkaysMraletI ¬eQµaH¦ RtUv)anpþl;GVImYysMrab;pwkeRkABITwkedaHmþay bɤeT? បើមាន សូមបន្ត បើអត់ សូមរំលងទៅសំនួរលេខ2 In the first three days after delivery, was (NAME) given anything to drink other than breast milk? If yes, continue. If no go to question 2.	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
PRELACT 2	etIGñk)aneGayTwkGVIdl;kUn ¬eQµaH¦ sMrab;pwk? manTwkGVIepSgeToteT ? kt;Rtaral;TwkEdl)aneGay5 (បើសិនជាចាំបាច់ត្រូវបង្ហើបសំនួរ) What was (NAME) given to drink? Anything else? Tick all that apply. (Prompt if necessary)	Milk (other than breastmillk)TwkedaHeKaxab;☐	1
		Plain water TwkFmµta ☐	2
		Sugar or honey water Twksár¼TwkXµúM ☐	3
		Sugar –salt-water solution TwkGMbillaysár ☐	4
		Coconut/fruit juice TwkdUg¼TwkEpøeQI ☐	5
		Infant formula TwkedaHeKaemSA ☐	6
		Herbal tea TwkEt ☐	10
		Other (describe) ផ្សេងទៀត ចូររៀបរាប់ ☐	7
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
EBF	2. តើកុមារ(ឈ្មោះ)បានបៅទឹកដោះម្តាយតែមួយមុខគត់ ដល់អាយុប៉ុន្មាន (អត់បៅសូមបីតែទឹក)? Until what age did (NAME) have only breastmilk, not even water?	Never breastfed	0
		មិនបានបៅទឹកដោះម្តាយសូមបីតែបន្តិច ☐	
		<3mths នៅអាយុតិចជាង៣ខែ ☐	1
		<6mths នៅអាយុតិចជាង៦ខែ ☐	2
		>6mths បន្ទាប់ពីអាយុជាង៦ខែ ☐	3
		Refused to respond បដិសេធមិនឆ្លើយ ☐	8
		Don't know មិនដឹង ☐	9
BFG	3. តើកុមារ(ឈ្មោះ)បានកំពុងបៅទឹកដោះម្តាយឬទេ? បើមាន សូមបន្តទៅសំនួរលេខ៤ បើអត់ សូមរំលងទៅសំនួរលេខ5 Is (NAME) still being breastfed? If yes go to question 4. If no, go to question 5	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
BFGFREQ	4. តើកុមារ(ឈ្មោះ)បានបៅទឹកដោះម្តាយប៉ុន្មានដង កាលពីម្សិលមិញ និង យប់មិញ ? (ចន្លោះ២៤ម៉ោងចុងក្រោយ) How many times did (NAME) breastfeed yesterday (last 24 hours) during the day and the night?	កាលពីម្សិលមិញ មិនបានបៅទឹកដោះម្តាយ ☐	0
		Did not breastfeed yesterday	
		បានបៅទឹកដោះម្តាយ ១ ទៅ ២ដង ☐	1
		Breastfed 1-2 times	
		បានបៅទឹកដោះម្តាយ ៣ ទៅ ៥ដង ☐	2
		Breastfed 3-5 times	
		បានបៅទឹកដោះម្តាយ ៦ ទៅ ៨ដង ☐	3
		Breastfed 6-8 times	
		បានបៅទឹកដោះម្តាយ ច្រើនជាង៨ដង ☐	4
		Breastfed >8 times	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

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		មិនដឹង Don't know ☐	9
CF	5. តើកុមារ(ឈ្មោះ) មានញ៉ាំអាហារផ្សេងទៀតឬទេ ក្រៅពីបៅទឹកដោះម្តាយ? បើសិនជាចម្លើយថា បាទ/ចាស សូមបន្តទៅសំនួរទី៨ បើសិនជាចំលើយទេ ដោយបដិសេធមិនឆ្លើយ ឬ ឆ្លើយថាមិនដឹង –សូមនិយាយថាអរគុណ សម្រាប់ឆន្ទៈចូលរួមរបស់អ្នក តែគួរឲ្យសោកស្តាយដែលអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈសម្រាប់ការចូលរួមទេ គ្រប់គ្រាន់សម្រាប់ចូលរួមក្នុងការសិក្សាទេ ដោយសារឈ្មោះ( ) មិនទាន់ចេះញ៉ាំអាហារ ឬភេសជ្ជៈផ្សេងទៀត ក្រៅពីបៅទឹកដោះម្តាយ។ មិនទទួលយកការចូលរួម ហើយបញ្ចប់បញ្ជីសំនួរ។ Does *(NAME)* have foods or drinks other than breastmilk? If Yes, go to question 8. If No, Refused to respond, or Don't know – *Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is not yet eating foods or drinks other than breastmilk.*EXCLUDE AND END QUESTIONNAIRE	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐ មិនទទួលយកការចូលរួម EXCLUDED ☐	0 1 8 9 99
AGECF	6. តើនៅអាយុប៉ុន្មានដែលកុមារ (ឈ្មោះ) បានចាប់ផ្តើមញ៉ាំអាហារ ឬផឹកទឹកដែលមិនមែនជាទឹកដោះម្តាយ? At about what age did (NAME) start having foods or drinks other than breastmilk?	At <3mths នៅអាយុតិចជាង៣ខែ ☐ At <6mths នៅអាយុតិចជាង៦ខែ ☐ At >6mths បន្ទាប់ពីអាយុជាង៦ខែ ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 8 9
BMS24H	7. etImSilmij b¤ yb;mij ¬eQµaH¦)anpwk TwkGVImYyBIdbTwkedaHeKaEdrb¤eT ? Did (NAME) drink anything from a bottle with a nipple yesterday or last night?	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

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FOODGEN 8. តើកុមារ (ឈ្មោះ) បានញ៉ាំអាហារ ឬផឹកទឹកអ្វីខ្លះចាប់តាំងពីគេចេះញ៉ាំអាហារមក? គួសន្សរចម្លើយទាំងអស់ដែលទទួលបាន What foods or drinks does *(NAME)* usually eat or drink since they began solids? *Tick all that apply*	Plain water TwkFmµta ☐	1
	Liquids such as tea, juice, soda, etc សារធាតុរាវដូចជាទឹកតែ ទឹកផ្លែឈើ ទឹកសូដា។ល។ ☐	2
	Soup ទឹកស៊ុប ☐	3
	Milk (tinned, powdered, or fresh animal milk) TwkedaHeKa dUcCa TwkedaHeKakMb:ug emS:ATwkedaHeKabɑTwkedaHeKaRss;² ☐	4
	Infant formula. júaM TwkedaHeKakUnekµg EdlpSMtamrUbmnþ dUcCa RhVg;ebeb Duymuic uImILak;> bɑeT ? ebIman³ etI ¬eQµaH¦ ☐	5
	Any brand of commercially fortified baby food, e.g., Cerelac]? júaMGaharEdlbBa©ÚlBBYkmIRkUsarCatiEdlmanm:akeQµaHBaNiC¢kmµ dUUcCaesr:aLak; EdrbɑeT ? ☐	6
	júaM nMb½ug)ay nMbBa©úk¼mI bbr bɑGaharepSgeToteFVIBIRKab;FBaØCati ?☐	10
	Bread, rice, noodles, borbor or other food made from grain	
	Pumpkin, carrots, yellow or orange sweet potatoes ល្ពៅ ការ៉ុត ដំឡូងជ្វាពណ៌លឿង ឬ ពណ៌ទឹកក្រូច☐	11
	White potatoes, white yams, manioc, cassava, roots	12
	júaM dMLÚgs Rtav dMLÚgmI éqfav bɑGaharepSgeTotEdlman emIm¼bɑs EdrbɑeT? ☐	
	Dark green, leafy vegetables júaM bEnøébtgcas; bEnømansøwkeRcIn EdrbɑeT? ☐	13
	Ripe mangoes, papayas? ស្វាយទុំ ល្ហុងទុំ ☐	14
	Any other fruit or vegetables júaM EpøeQI bɑbEnøepSgeTot bɑeT ? ☐	15
	Liver, kidney, heart or other organ meats? ថ្លើមសត្វ, ក្រលាន,បេះដូងសត្វឬគ្រឿងក្នុងសត្វផ្សេងៗ ? ☐	16
	សាច់សត្វផ្សេងៗទៀត ឧ. សាច់គោ,សាច់ជ្រូក, សាច់ជ្រៀម,សាច់ពពែ,សាច់មាន់ឬសាច់ទា ☐	17
	Any other meat, e.g. beef, pork, lamb, goat, chicken, or duck	
	Eggs ពងមាន់ ☐	18
	Fresh or dried fish or shellfish ត្រីស្រស់ឬត្រីគ្រៀមឬខ្យងខ្ចៅ ☐	19
	ចំណីអាហារដែលផលិតពីសណ្តែកសៀង សណ្តែកហោឡាំងគារ សណ្តែកបាយ ឬ សណ្តែកផ្សេងៗ ☐	20
	Any foods made from beans, peas, lentils, or nuts	
	Yoghurt, cheese or any other food made from milk យ៉ាអួរ ឈីស ឬ អាហារដ៏ទៃទៀតដែលផលិតពីទឹកដោះគោ☐	21
	Any foods made with oil, fat, or butter ចំណីអាហារណាដែលផលិតពីប្រេង ខ្លាញ់ ឬបិរ☐	22
	Any snake, snail, frog, rat, or insects ប្រភេទពស់ផ្សេងៗ, ខ្យង, កង្កែប, កណ្តុរ, ឬសត្វល្អិត ☐	23
	Sweet or salty snacks eg chips, cakes, candies បង្អែម ឬអាហារញ៉ាំលេងប្រៃ ឧ. ប្រភេទនំស្រួយៗ នំខេក ស្ករគ្រាប់ ☐	24
	Any other solid, semi-solid, or soft food? ប្រភេទអាហាររឹង ផ្សេងៗ ប្រភេទអាហារ ជ្រាយៗ ឬប្រភេទអាហារទន់ៗ ☐	7
	Other (describe) ផ្សេងទៀត ធ្វើរៀបរាប់ _____	
	បដិសេធមិនឆ្លើយRefused to respond ☐	8
	មិនដឹងDon't know ☐	9

FOOD24H	9. etIកុមារ ¬eQµaH¦ manjúaMGaharrwg GaharRCay bɑGaharRទន់eTenAeBléf¶ bɑeBlyb; កាលពីmSilmij? ប្រសិនបើមាន សូមបន្តទៅសំនួរលេខ ១០ ប្រសិនបើអត់ សូមបន្តទៅសំនួរលេខ 13 Did (NAME) eat any solid, semi-solid, or soft foods	ទេ No ☐	0
		ចាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9

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	yesterday during the day or at night? If yes, go to 10. If no, go to 13		

10. etI កាលពីម្សិលមិញកុមារ¬eQµaH¦)anjúaM ឬធឹកGVIខ្លះ? គូសនូវចម្លើយដែលទទួលបាន What foods yesterday did (NAME) eat or drink yesterday? Tick all that apply	Plain water TwkFmµta ☐	1
	Liquids such as tea, juice, soda, etc សារធាតុរាវដូចជាទឹកតែ ទឹកផ្លែឈើ ទឹកសូដា។ល។ ☐	2
	Soup ទឹកស៊ុប ☐	3
	Milk (tinned, powdered, or fresh animal milk) TwkedaHeKa dUcCa TwkedaHeKakMb:ug emS:ATwkedaHeKabɤTwkedaHeKaRss;² ☐ If yes, how many times?ebIman³ etI ¬eQµaH¦ júa b:unµandg? ☐	4
	Infant formula. júaM TwkedaHeKakUnekµg EdlpSMtamrUbmnþ dUcCa RhVg;ebeb Duymuic uImILak;> bɤeT ? ebIman³ etI ¬eQµaH¦ ☐ If yes, how many times? pwkTwkedaHeKakUnekµgb:unµandg? ☐	5
	Any brand of commercially fortified baby food, e.g., Cerelac]? júaMGaharEdlbBa©ÚlBBYkmIRkUsarCatiEdlmanm:akeQµaHBaNiC¢kmµ dUUcCaesr:aLak; EdrbɤeT ? ☐	6
	júaM nMb½ug)ay nMbBa©úk¼mI bbr bɤGaharepSgeToteFVIBIRKab;FBaØCati ?☐	10
	Bread, rice, noodles, borbor or other food made from grain	
	Pumpkin, carrots, yellow or orange sweet potatoes ល្អោ ការ៉ុត ដំឡូងជ្វាពណ៌លឿង ឬ ពណ៌ទឹកក្រូច ☐	11
	White potatoes, white yams, manioc, cassava, roots júaM dMLÚgs Rtav dMLÚgmI éqfav bɤGaharepSgeTotEdlman emIm¼bɤs EdrbɤeT? ☐	12
	Dark green, leafy vegetables júaM bEnøébtgcas; bEnømansøwkeRcIn EdrbɤeT? ☐	13
	Ripe mangoes, papayas? ស្វាយទុំ ល្អុងទុំ☐	14
	Any other fruit or vegetables júaM EpøeQI bɤbEnøepSgeTot bɤeT ? ☐	15
	Liver, kidney, heart or other organ meats? ថ្លើមសត្វ, ក្រលាន,បេះដូងសត្វឬគ្រឿងក្នុងសត្វផ្សេងៗ ? ☐	16
	សាច់សត្វផ្សេងៗទៀត ឧ. សាច់គោ,សាច់ជ្រូក, សាច់ជៀម,សាច់ពពែ,សាច់មាន់ឬសាច់ទា ☐	17
	Any other meat, e.g. beef, pork, lamb, goat, chicken, or duck	
	Eggs ពងមាន់ ☐	18
	Fresh or dried fish or shellfish ត្រីស្រស់ឬត្រីគ្រៀមឬខ្យងខ្ចៅ ☐	19
	ចំណីអាហារដែលផលិតពីសណ្តែកសៀង សណ្តែកហោឡាំងតារ សណ្តែកបាយ ឬ សណ្តែកផ្សេងៗ ☐	20
	Any foods made from beans, peas, lentils, or nuts	
	Yoghurt, cheese or any other food made from milk យ៉ាអួរ ឈីស ឬ អាហារដ៏ទៃទៀតដែលផលិតពីទឹកដោះគោ☐	21
	Any foods made with oil, fat, or butter ចំណីអាហារណាដែលផលិតពីប្រេង ខ្លាញ់ ឬបិរ☐	22
	Any snake, snail, frog, rat, or insects ប្រភេទពស់ផ្សេងៗ, ខ្យង, កង្កែប, កណ្តុរ, ឬសត្វល្អិត ☐	23
	Sweet or salty snacks eg chips, cakes, candies បង្អែម ឬអាហារញ៉ាំលេងប្រៃ ឧ. ប្រភេទនំស្រួយៗ នំខេក ស្ករគ្រាប់ ☐	24
	Any other solid, semi-solid, or soft food? ប្រភេទអាហាររឹង ផ្សេងៗ ប្រភេទអាហារ ជ្រាយៗ ឬប្រភេទអាហារទន់ៗ ☐	7
	Other (describe) ផ្សេងទៀត ចូរបញ្ជាក់ _____	
	បដិសេធមិនឆ្លើយRefused to respond ☐	8
	មិនដឹងDon't know ☐	9

FF24H	11. etI ¬eQµaH¦)anjúaMGaharrwg GaharRCaylµm bɤGahar	១ ទៅ ២ ដង 1-2 times ☐	1
		៣ ទៅ ៤ ដង 3-4 times☐	2

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kumar (Child´s ID, CHID): ☐☐☐☐

	ទន់b:unμandgkalBImSilmij enAeBléf¶ bʊeBlyb;? How many times did (NAME) eat solid, semisolid, or soft foods yesterday during the day or at night?	៥ ឬ ច្រើនជាងនេះ 5 or more times ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	5 8 9
FOODAMT	12. កាលពីម្សិលមិញ អំឡុងពេលថ្ងៃ និង នៅពេលយប់ តើកុមារបានបរិភោគអាហាររឹង អាហារជ្រាយ និង អាហារទន់បានប្រហែលប៉ុន្មានដែរ ? Approximately how much solid, semisolid, or soft foods did (NAME) eat each time yesterday during the day or at night?	<2 tablespoonfuls each time ម្តង <២ ស្លាបព្រាបាយអោញ ☐ 2-3 tablespoonfuls each time ម្តង ២ ទៅ ៣ ស្លាបព្រាបាយអោញ ☐ < 1/2 bowl each time ម្តងតិចជាងកន្លះចានចង្កុះ ម្តង< ១/២ ចានចង្កុះ ☐ About 1 bowl each time ម្តងកន្លះ ទៅ មួយចានចង្កុះ ☐ >1 bowl each time ម្តងច្រើនជាង១ចានចង្កុះ ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 2 3 4 8 9
SUPPS	13. តើកូនរបស់អ្នកធ្លាប់បានញ៉ាំ ស្ព្រីងខល ហេប៊ី ស៊ីអេសប៊ីផ្លើសផ្លើសឬអាហារបំប៉នស្រដៀងគ្នា ឬអាហារបំប៉នបន្ថែម ឬ វីតាមីនផ្សេងៗណាឬទេ ? បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរចុងបញ្ចប់ Has (NAME) ever used Sprinkles, HEBs, CSB++ or similar supplementary foods or supplements/vitamins? If No to this question – jump to end.	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
SUPPS2	14. តើអាហារបំប៉នមួយណា ឬអាហារបន្ថែមណា/វីតាមីនណាដែលកូនរបស់អ្នកបានប្រើ? សូមគូសគ្រីសចំពោះអាហារទាំងនេះ (បង្ហាញកញ្ចប់ ឬគំរូនៃអាហារ) បើប្រើស្ព្រីងខល បន្តទៅសំនួរទី ១៥។ បើសិនជាហេប៊ីសូមរំលងទៅសំនួរទី១៧។ បើសិនជាមិនប្រើស្ព្រីងខល ឬហេប៊ីសូមបញ្ចប់សំនួរ។ បើមិនបានប្រើស្ព្រីងខលទេ សូមរំលងទៅសំនួរចុងបញ្ចប់ Which supplementary foods or supplements/vitamins has (NAME) used? Tick all that apply. (show packages or examples of foods). If using Sprinkles, go to question 15. If using HEBs go to question 17. If not using Sprinkles or HEBs, go to end.	ស្ព្រីងខលSprinkles ☐ ស៊ីអេសប៊ីផ្លើសផ្លើសCSB++ ☐ ហេប៊ី HEBs ☐ អាហារបំប៉នផ្សេងទៀតបើមាន ហើយសូមរៀបរាប់ ☐ Other supplementary foods (describe) _____ គ្រឿងបន្ថែមផ្សេងទៀតOther supplements (describe) ☐ _____	1 2 3 4 5
SPRINKL 1	15. តើ កុមារញ៉ាំស្ព្រីងខល ញឹកញាប់ប៉ុណ្ណា? How often does (NAME) have Sprinkles?	ស្ទើតែមិនដែលញ៉ាំសោះ Almost never ☐ ញ៉ាំស្ទើតែរាល់ថ្ងៃ Almost daily ☐ ញ៉ាំ២ ទៅ ៣ ដងក្នុងមួយ 2-3 times/week ☐ ១សប្តាហ៍ ញ៉ាំម្តង Once a week ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 2 3 8 9
SPRINKL 2	16. តើកុមារញ៉ាំស្ព្រីងខល ម្តងប៉ុន្មានកញ្ចប់ក្នុងមួយថ្ងៃ? How many sachets of Sprinkles does (NAME) have each day?	១កញ្ចប់ 1 sachet ☐ ២កញ្ចប់ 2 sachets ☐ Other (describe) ផ្សេងទៀត ចូររៀបរាប់ ☐ _____ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 7 8 9
HEB1	17. តើ កុមារញ៉ាំហេប៊ីញឹកញាប់ប៉ុណ្ណា? How often does (NAME) eat HEBs?	ស្ទើតែមិនដែលញ៉ាំសោះ Almost never ☐ ញ៉ាំស្ទើតែរាល់ថ្ងៃ Almost daily ☐ ញ៉ាំ២ ទៅ ៣ ដងក្នុងមួយ 2-3 times/week ☐ ១សប្តាហ៍ ញ៉ាំម្តង Once a week ☐	0 1 2 3

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
HEB2	18. តើកុមារញ៉ាំហេប៊ីម្តងប៉ុន្មានក្នុងមួយថ្ងៃ? How many HEBs does (NAME) have each day?	1-2 1 -2 ☐	0
		3-4 3-4 ☐	1
		Other (describe) ផ្សេងទៀត ចូរដៀបរាប់ ☐	7
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9

បើសិនជាអ្នកទទួលបានចម្លើយដែលមិនទទួលយកការចូលរួមរបស់អ្នកថែរក្សាកុមារទេ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ ក្រៅក្រោន់ក្នុងការចូលរួម ដោយសារ [ផ្តល់នូវមូលហេតុដែលទទួលដូចនៅក្នុងបញ្ជីសំនួរខាងលើ] *If you get an answer that excludes the caregiver, say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because [give the reason].*

បើសិនជាអ្នកសួរនូវសំនួរទាំងអស់ហើយ ហើយអ្នកថែរក្សាកុមារ/កុមារនោះមានលក្ខណៈក្រៅក្រោន់ក្នុងការចូល រួម សូមនិយាយថា៖ អរគុណសម្រាប់ចម្លើយរបស់អ្នក។ *If you ask all the questions and the caregiver is eligible to participate, say: Thank you for answering these questions.*

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

ទម្រង់ទី៣៖ ប្រសិទ្ធភាពនៃព្រឹត្តិបត្រសម្រាប់ការសិក្សា, ទម្រង់បញ្ជីសំនួរប្រមូលទិន្នន័យមូលដ្ឋាន – esdækic©sgÁm

Form 3E: Efficacy trial, baseline data collection form – socio-economic

ឥឡូវនេះខ្ញុំនឹងសួរសំណួរមួយចំនួនអំពីអ្នក គ្រួសាររបស់អ្នក និង ស្ថានភាពរស់នៅរបស់គ្រួសារអ្នក រួមបញ្ចូលទាំងសំណួរទាក់ទងពីកំរិតប្បធម៌ ទឹកស្អាត អនាម័យ និងប្រាក់ចំណូល និងជាហ្មូរបែរ។

I will now ask some questions about you and about your household and your living situation, including questions about education, water and sanitation, income generation, and so on.

eQµaHkumar Name of child (NAMECH)	
eQµaHអ្នកថែទាំ**kumar** Name of caregiver (NAMECG)	

Variable name	សំនួរ Question	ការឆ្លើយតប Response	កូដ code
EDMUM	1. តើអ្នកធ្លាប់បានចូលសាលារៀនឬទេ? ប្រសិនទេ សូមរំលងទៅសំនួរទី4 Have you ever attended school? If no, skip to question 4.	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
EDMUM2	2. etIGñkeronx<s;bMput)ankMritNa bzmsikSa GnuviTüal½y ឬកំរិតខ្ពស់ជាងviTüal½y What is the highest level of school you attended: primary, secondary, or higher?	បឋមសិក្សា Primary ☐ អនុវិទ្យាល័យ Junior high school ☐ វិទ្យាល័យ Senior high school ☐ កំរិតខ្ពស់ជាងviTüal½y Higher ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 8 9
EDMUM3	3. etIGñk)aneronថ្នាក់fñak;TIb:unµanenAkMritsikSaxageII ? ebIeron)anticCag mYyqñaMenAkMritsikSaenaH sUmkt;Rta '00' What is the highest (grade/form/year) you completed at that level? IF COMPLETED LESS THAN ONE YEAR AT THAT LEVEL, RECORD '00'.	fñak;TI grade/form/year ☐☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 8 9
HH	4. តើជាធម្មតាមានសមាជិកប៉ុន្មាននាក់រស់ នេងនៅក្នុងផ្ទះជាមៀងរាល់យប់? How many people usually sleep in this house each night?	Number of people cMnYnsmaCik. ☐☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	 8 9
HHU5	5. ជាធម្មតា etImankumarGayueRkam 5 qñaM ប៉ុន្មាននាក់ រស់នៅក្នុងគ្រួសាររបស់អ្នក? (rYmTaMងកុមាររំលងកំពុងធ្វើការសិក្សា) How many children under 5 years of age usually live in your household? – (including the study child)	cMnYnkumarGayueRkam 5qñaM Number children < 5 years ☐☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	 8 9
WATER1	6. enArdUvR)aMgetIsmaCikRKYsarGñkeRbIR)as;RbPBTwkGVI CasMxan;sMrab;pwk? សូមគូសចន្លើយតែមួយគត់ What is the main source of drinking water during the dry season for members of your household? Circle ONLY ONE answer	hUrtambMBg;dl;kñúgpÞH Piped into dwelling ☐ hUrtambMBgdl;kñúgrbgpÞH Piped to yard/plot ☐ bMBg;dak;tamsaFarN³ Public tap/standpipe ☐ bMBg;tBIGNþÚg Tube well or borehole ☐ TwkGNþÚgCIk Dug well or spring ☐ ទឹកអណ្តូងស្នប់ Pumping well ☐ TwkePøóg Rainwater ☐	1 2 3 4 5 6 10

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

		lk;tamLan b¤lk;enAtamtUb Tanker truck/ cart ☐	11
		RbPBTwkelIdIdUcCaTenø TMnb; RtBaMg bwg RbLay ☐ Surface water: river/ stream /dam/ /lake/ pond/ canal/ irrigation channel	12
		Twkdb/ការដុង Bottled water ☐	13
		epSgeTot Other specify ☐	7
		_____	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
WATER 3	7. តើប្រភពទឹកស្អាតក្នុងអំឡុងរដូវស្ងួត និង ក្នុងរដូវភ្លៀង របស់សមាជិក គ្រួសារអ្នកដូចគ្នាទេ? ប្រសិនបើដូច សូមរំលងទៅសំនួរទី៨	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
WATER 4	ប្រសិនបើខុសគ្នា etlអ្នកeRbIR)as;RbPBTwkGVI CasMxan;sMrab;pwk ? សូមគូសចម្លើយតែមួយគត់ During the wet season, is the main source of drinking water for members of the household the same as during dry season?) If YES, go to question 8 If No, what is the main source of drinking water during the wet season? Circle ONLY ONE answer	hUrtambMBg;dl;kñúgpÞH Piped into dwelling ☐	1
		hUrtambMBgdl;kñúgrbgpÞH Piped to yard/plot ☐	2
		bMBg;dak;tamsaFarN³ Public tap/standpipe ☐	3
		bMBg;tBIGNþÚg Tube well or borehole ☐	4
		TwkGNþÚgClk Dug well or spring ☐	5
		ទឹកអណ្តូងស្នប់ Pumping well ☐	6
		TwkePøóg Rainwater ☐	10
		lk;tamLan b¤lk;enAtamtUb Tanker truck/ cart ☐	11
		RbPBTwkelIdIdUcCaTenø TMnb; RtBaMg bwg RbLay ☐ Surface water: river/ stream /dam/ /lake/ pond/ canal/ irrigation channel	12
		Twkdb/ការដុង Bottled water ☐	13
		epSgeTot Other specify ☐	7
		_____	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
WATER 5	8. តើអ្នកមានធ្វើសម្លាប់មេរោគក្នុងទឹកដោយប្រើវិធីសាស្ត្រផ្សេងៗ ដើម្បីឲ្យទឹកមានសុវត្ថភាពសម្រាប់ការទទួលទានឬទេ? សូមគូសចម្លើយតែមួយគត់ Do you treat your water in any way to make it safer to drink? Circle ONLY ONE answer	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
WATER 6	9. etIGñkប្រើវិធីសាស្ត្រ dUcemþcedIm,Iធ្វើeGay ទឹក ;briePaKenaH mansuvtßiPaB? sUmKUsrgVg;ykcMeIIyEdlBak;B½n§TaMgGs; What do you do to the water to make it safer to drink? (Circle ALL applicable answers)	Twkdb/ការដុង Bottled water ☐	1
		ដាំ Boil ☐	
		ដាក់ថ្នាំសម្លាប់ទឹក ក្លរីន ឬចាហួយ ☐ Add bleach, chlorine or Agar	2
		សាច់ជូរ White alum ☐	3
		ច្រោះដោយក្រណាត់ Strain it through a cloth ☐	4
		ប្រើឧបករណ៍ចម្រោះទឹក Use a water filter☐	5
		ប្រើពន្លឺព្រះអាទិត្យសម្លាប់មេរោគ Solar disinfection ☐	6
		ទុកឲ្យវាងដោយខ្លួនវា Let it stand and settle ☐	10
		epSgeTot Other specify ☐	7
		_____	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

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		មិនដឹង Don't know ☐	9
WATER 7	10. តើអ្នកតែងតែសម្លាប់មេរោគក្នុងទឹកគ្រប់ពេលដើម្បីឲ្យវាមានសុវត្ថិភាពជាងមុន ឬគ្រាន់តែក្នុងករណីពិសេស? សូមគូសចម្លើយតែមួយគត់ Do you always treat your water to make it safer or only in special cases? Circle ONLY ONE answer	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
WATER 8	11. តើអ្នកបានឲទឹកស្អាត មានសុវត្ថិភាពដល់កូនរបស់អ្នក (ឈ្មោះ)ឬទេ? សូមគូសចម្លើយតែមួយគត់ Do you give (NAME) water that has been treated to make it safer? Circle ONLY ONE answer	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
HANDS 1	12. តើអ្នកលាងដៃរបស់អ្នកជាមួយនឹងសាប៊ូញឹកញាប់b:uណកឹa? សូមគូសចម្លើយតែមួយគត់ How often do you wash your hands with soap? Circle ONLY ONE answer If "almost never" jump to 15	ស្ទើរតែមិនដែលលាងសោះ Almost never ☐	0
		តិចជាងម្តងក្នុង១សប្តាហ៍ <once/week ☐	1
		២ទៅ៣ថ្ងៃ លាងម្តង Once every 2-3 days ☐	2
		១ថ្ងៃ ម្តង 1 time/day ☐	3
		២-៣ដងក្នុង១ថ្ងៃ 2-3 times/day ☐	4
		ច្រើនជាង៣ដងក្នុង១ថ្ងៃ >3 times/day ☐	5
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
HANDS 2	13. តើអ្នកលាងដៃ ជាមួយសាប៊ូនៅពេលណា? សូមកុំបង្ហើបសំខ្ទរ យកតែការឆ្លើយតបរបស់អ្នកចូលរួមប៉ុន្នោះ sUmKUsrgVg;ykcMeIIyEdlបានផ្តល់ឲ្យTaMgGs; When do you wash your hands with soap? Do not prompt – only tick applicant responses. Circle ALL answers given	នៅពេលដែលគេប្រឡាក់ When they are dirty ☐	1
		មុនពេលញ៉ាំបាយ Before eating ☐	2
		ក្រោយពេលញ៉ាំបាយ After eating ☐	3
		ក្រោយពេលបន្ទោបង់ After defecation ☐	4
		ក្រោយពេលប្រើប្រាស់បង្គន់ After any toilet use ☐	5
		មុនពេលបញ្ចុកអាហារក្មេង Before feeding child ☐	6
		ក្រោយពេលកាន់សំរាម After handling rubbish ☐	10
		ក្រោយពេលកាន់កន្ទបក្មេង/លាមក After handling baby's diaper/feces ☐	11
		មុនពេលរៀបចំអាហារ Before preparing food ☐	12
		After handling animals ក្រោយពេលកាន់ ឬប៉ះពាល់សត្វ ☐	13
		epSgeTot Other specify ☐	7
		_____	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
HANDS 3	14. ជាធម្មតា តើអ្នកលាងសំអាតដៃរបស់អ្នកជាមួយសាប៊ូនៅកន្លែងណា? សូមកុំធ្វើការស្មាន យកតែការឆ្លើយតបរបស់អ្នកចូលរួមប៉ុន្នោះ sUmKUsrgVg;ykcMeIIyEdlទទួលបានTaMgGs; ;Where do you usually wash your hands with soap? Do not prompt – only tick applicant responses. Circle ALL answers given	ជាធម្មតា មិនលាងដៃជាមួយសាប៊ូទេ ☐	0
		Don't usually wash hands with soap	
		លាងដៃនៅក្នុងផ្ទះបាយ / ពេលរៀបចំអាហារ ☐	1
		In the kitchen/food preparation area	
		នៅក្នុងបង្គន់អនាម័យ In the latrine ☐	2
		ពេលនៅជិតបង្គន់អនាម័យ Near the latrine ☐	3
		ពេលនៅជិតប្រភពទឹក At the water source ☐	4
		epSgeTot Other specify ☐	7
		_____	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
TOILET	15. CaFmµta etIsmaCikRKYsarrbs;Gñkប្រើប្រាស់បង្គន់ប្រភេទណាដែរ?	bgÁn;cucTwkbɤcak;Twk Flush or pour flush	1

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1	KUsrgVg;cMellyEtmYy ebIKµanbgÁn;eT sUmrMlgeTAsMnYrTI ១៨ What kind of toilet facility do members of your household usually use? Circle ONLY ONE answer If no facility bush/field to this question - jump to question 18	toilet ☐ bgÁn;reNþAmanKMrb Pit latrine with slab ☐ bgÁn;reNþAKµanKMrb Pit latrine without slab/open pit ☐ eRbIkenßar Bucket toilet ☐ bgÁn;elITwk Toilet over water ☐ គ្មានបង្គន់/បន្ទាយបង់នៅវាល/ព្រៃ No facility bush/field ☐ epSgeTot Other specify ☐ _____ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	2 3 4 5 6 7 8 9
TOILET 2	16. etIGñkប្រើbgÁn;rYmCamYyRKYsarepSgរែរឺទេ? សូមគូសចម្លើយតែមួយគត់ *ebIKµanbgÁn;eT sUmrMlgeTAsMnYrTI*១៨ Do you share this toilet facility with other households? Circle ONLY ONE answer If No to this question – jump to question 18	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
TOILET 3	17. តើមានប៉ុន្មានគ្រួសារ ដែលប្រើបង្គន់នេះ? សូមគូសចម្លើយតែមួយគត់ How many households use this toilet facility? Circle ONLY ONE answer	តិចជាង១០ Less than 10 ☐ ច្រើនជាង១០ More than 10 ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
TOILET 4	18. ជាធម្មតា តើអ្នកជានាក់ ជួយកុមារ(ឈ្មោះ)ក្នុងការbenÞarbg;? ebIKµan sUmrMlgeTAsMnYrTI ១៩ ebIman sUmrMlgeTAsMnYrTI 20 Are you usually the person who helps (NAME) defecate? If no jump to question 19. If Yes,to question 20	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
TOILET 5	19. តើនរណាជាមនុស្សម្នាក់ដែលជាធម្មតាអាចជួយ (ឈ្មោះ)ក្នុងការbenÞarbង់? *KUsrgVg;cMellyEtmYy* Who is the person who usually helps (NAME) defecate? Circle ONLY ONE answer	ម្តាយបង្កើត Biological mother ☐ ជីដូន Grandmother ☐ ឪពុក Father ☐ បងស្រី Sister ☐ bgb¥ÚnRbus Brother ☐ epSgeTot Other specify ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 4 5 7 8 9
TOILET 6	20. ជាធម្មតាតើ(ឈ្មោះ)benÞarbង់នៅកន្លែងណា? KUsrgVg;cMellyEtmYy What is the usual place that (NAME) defecates Circle ONLY ONE answer	បង្គន់Toilet ☐ ការ្តោរ Potty ☐ ទីក្បែរគានផ្ទះ Yard ☐ ខាក់ខោ ឬ កន្តុប Cambodian diaper/underpants ☐ ខាក់ខោទឹកនោម Disposable diaper ☐ epSgeTot Other specify ☐ _____ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 4 5 7 8 9
TOILET 7	21. តើអ្នកធ្លាប់ឃើញដូចម្តេចចំពោះលាមក(ឈ្មោះ) ក្រោយការbenÞarbង់ចុងក្រោយរបស់គេ? KUsrgVg;cMellyEtmYy	កុមារប្រើបង្គន់ Child used toilet ☐ ចោលទៅក្នុងបង្គន់ Stools thrown in toilet ☐	1 2

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	The last time (NAME) defecated, what was done with the stools? Circle ONLY ONE answer	Stools thrown in drain/ditch ចោលទៅក្នុងលូ ☐	3
		Stools thrown in garbage ចោលទៅក្នុងធុងសំរាម ☐	4
		Stools buried ដុតចោល ☐	
		Stools left in open ទុកចោលបាឬវាល ☐	
		epSgeTot Other specify ☐	7
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
TOILET 8	22. បើកុមារ (ឈ្មោះ) មិនប្រើបង្គន់ឬ កន្តោ តើអ្នកលើកលាមកទៅចោល ដោយរបៀបណា? KUsrgVg;cMellyEtmYy When (NAME) is NOT using a latrine/potty, how do you move the stools? Circle ONLY ONE answer	ប្រើដៃ Hands ☐	1
		Leaves/grass ប្រើស្លឹកឈើ ឬ ស្មៅ ☐	2
		Cloth/paper ប្រើក្រណាត់ ឬ ក្រដាស់ ☐	3
		Tool e.g. shovel ប្រើសំភារផ្សេងៗ ឧ> ប៉ែលចូក ☐	4
		epSgeTot Other specify ☐	7
		Refused to respond បដិសេធមិនឆ្លើយ ☐	8
		Don't know មិនដឹង ☐	9
TOILET 9	23. តើអ្នកលាងសម្អាតគូថកូនរបស់អ្នកភ្លាមទេ បន្ទាប់ពីគេbenÞarbង់រួច ?ហើយ ញឹកញាប់ប៉ុន្មាណា? បើមិនធ្លាប់សូមរំលងទៅសំនួរលេខ 27 (បើសិនជាចាំបាច់ត្រូវបង្ហើបចំលើយ) Do you clean your child immediately after s/he defecates, and how often? (Prompt if necessary). If No, Never to this question – jump to question 27	No, never ទេ, មិនធ្លាប់ ☐	0
		Yes sometimes បាទ/ចាស ធ្លាប់រាលខ្លះ ☐	1
		Yes usually បាទ/ចាស ធ្លាប់ជាញឹកញាប់ ☐	2
		Yes always បាទ/ចាស គ្រប់ពេល ☐	3
		Refused to respond បដិសេធមិនឆ្លើយ ☐	8
		Don't know មិនដឹង ☐	9
TOILET 10	24. តើជាធម្មតាអ្នកលាង សម្អាតគូថកូនរបស់អ្នក យ៉ាងដូចម្តេច បន្ទាប់ពីគេbenÞarbង់រួច? (បើសិនជាចាំបាច់ត្រូវបង្ហើបចំលើយ) How do you usually clean your child after s/he defecates? (Prompt if necessary)	With a cloth/paper only សម្អាតតែជាមួយក្រណាត់ឬក្រដាស់ប៉ុន្នោះ ☐	0
		With water only លាងតែ ជាមួយទឹកប៉ុន្នោះ ☐	1
		With water and soap/detergent លាងជាមួយទឹកនិងសាប៊ូ ☐	2
		epSgeTot Other specify ☐	7
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
TOILET 11	25. តើអ្នកសម្អាតដៃរបស់អ្នកភ្លាមដែរឬទេ បន្ទាប់ពីសម្អាតកូនអ្នករួច ហើយញឹកញាប់ប៉ុន្មាណា? បើមិនធ្លាប់សូមរំលង ទៅសំនួរទី27 (បើសិនជាចាំបាច់ត្រូវបង្ហើបចំលើយ) Do you clean your hands immediately after this process and how often? (Prompt if necessary). If No to this question – jump to question 27	No, never ទេ, មិនធ្លាប់ ☐	0
		Yes sometimes បាទ/ចាស ធ្លាប់រាលខ្លះ ☐	1
		Yes usually បាទ/ចាស ធ្លាប់ជាញឹកញាប់ ☐	2
		Yes always បាទ/ចាស គ្រប់ពេល ☐	3
		Refused to respond បដិសេធមិនឆ្លើយ ☐	8
		Don't know មិនដឹង ☐	9
TOILET 12	26. តើជាធម្មតាអ្នកសម្អាតដៃរបស់អ្នកដូចម្តេចខ្លះ? (បើសិនជាចាំបាច់ត្រូវបង្ហើបចំលើយ) How do you usually clean your hands? (Prompt if necessary)	With a cloth/paper only សម្អាតតែជាមួយក្រណាត់ឬក្រដាស់ប៉ុន្នោះ ☐	0
		With water only លាងតែជាមួយទឹកប៉ុន្នោះ ☐	1
		With water and soap/detergent លាងជាមួយទឹកនិងសាប៊ូ ☐	2
		epSgeTot Other specify ☐	7
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

		មិនដឹង Don't know ☐	9
TOILET 13	27. តើអ្នកបានអនុវត្តខុសគ្នាឬទេចំពោះលាមករបស់កូនអ្នក នៅពេលដែលគាត់/នាងមានជំងឺរាក? បើសិនជាបាទ/ចាសសូមពន្យល់ Do you manage the feces of your child differently when she /he has diarrhoea? If yes, how	ទេ No ☐ បាទ/ចាស Yes ☐ ពន្យល់បិស្តេះ Specify how: _____ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
MOSNET	28. តើផ្ទះរបស់អ្នកមានចងមុង ឬទេនៅពេលគេង? Do you do anything to avoid mosquito bites when you go to sleep? If no, go to question 29. If yes, what do you do? Tick all that apply	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
MOSNET 2		ចងមុង Use bed nets ☐ ដាក់សំណាញ់ ទ្វាឬបង្អួច Use window/door nets ☐ ប្រើថ្នាំបាញ់ឬធូកម្ញស Use spray or coils ☐ epSgeTot Other specify ☐ _____ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 7 8 9
INCOME1	29. តើប្រភពចំណូលសំខាន់របស់គ្រួសាររបស់អ្នកបានមកពីណាខ្លះ? *KUscMellyEtmYy* What is the main source of income for this household? Circle ONLY ONE answer	មន្ត្រីរាជការFormal/public sector work ☐ ការងារឯកជន Private sector ☐ ការងារសំណង់ Construction work☐ ការងារអោងចក្រ Factory work ☐ រត់ម៉ូតូឌុប ឬ តុក តុកMotodop/tuktuk ☐ លក់ដូរតិចតួច Trading (small shop/vendor) ☐ ជីសសំរាម Waste picking ☐ epSgeTot Other specify ☐ _____ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 4 5 6 7 8 9
INCOME2	30. តើប្រភពចំណូលសំខាន់ទី២ របស់គ្រួសាររបស់អ្នកបានmkBIណា បើសិនជាមានសូមពន្យល់? *KUscMellyEtmYy* What is the second source of income for this household, if any? Circle ONLY ONE answer	No second source of income គ្មានប្រភពចំណូលសំខាន់ទី២ទេ ☐ មន្ត្រីរាជការFormal/public sector work ☐ ការងារឯកជន Private sector ☐ ការងារសំណង់ Construction work☐ ការងារអោងចក្រ Factory work ☐ រត់ម៉ូតូឌុប ឬ តុក តុកMotodop/tuktuk ☐ លក់ដូរតិចតួច Trading (small shop/vendor) ☐ ជីសសំរាម Waste picking ☐ epSgeTot Other specify ☐ _____ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	 1 2 2 3 4 5 6 7 8 9
INCOME3	31. តើប្រាក់ចំណូលជាមធ្យមក្នុងគ្រួសាររបស់អ្នកក្នុងមួយខែ ស្មើប៉ុន្មានដែរ? សរសេរចេញតែមួយ What is this household's average income each month?	$ _____	1

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

	Write ONLY ONE answer	ប្រៀល OR Riel _____	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9

INCOME 4	តើគ្រួសារបស់អ្នកមានសម្ភារ[3] ឬ ក៏សមាជិកណាម្នាក់នៃគ្រួសារបស់អ្នកជាម្ចាស់នៃរបស់ទាំងនេះ....ឬទេ? គួសរង្វង់ ១ ឬ ២ សម្រាប់របស់នីមួយៗ Does your household have OR Does any member of your household have: Circle 1 or 2 for each item		មាន Yes	ទេ No
		អគ្គិសនី Electricity	1	2
		វិទ្យុម៉ាញ៉េទិស៊ីនី radio	1	2
		ទូរទស្សន៍ television	1	2
		ទូរស័ព្ទដៃ mobile phone	1	2
		ទូរទឹកកក refrigerator	1	2
		m:asIunedr sewing machine	1	2
		kg; Bicycle/Cyclo :	1	2
		m:UtU Motorcycle/Scooter	1	2
		Lan Car/Truck/Van	1	2
		កុំព្យូទ័រ computer	1	2
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8	
		មិនដឹង Don't know ☐	9	

IDPOOR	32. តើគ្រួសារនេះត្រូវបាន កត់សំគាល់ថាក្រីក្រឬទេ តាមរយៈការកំណត់អត្តសញ្ញាណគ្រួសារក្រីក្រដែលធ្វើឡើងដោយអ្នកតំណាងភូមិនិងត្រូវបានដាក់នៅលើបញ្ជីរគ្រួសារក្រីក្រឬទទួលបាន b½NÑmUlniFismFm' bx b½NÑGaTiPaBRkIRk Edrbx¤eT? សុំមើល b½NÑmUlniFismFm' bx b½NÑGaTiPaBRkIRk និង កាតផ្សេងៗទៀត រួមទាំងកាតចេញពីក្រោយ ការកំណត់អត្តសញ្ញាណ។ កត់ចំណាំថាបានមើលឃើញ / មិនបានឃើញ Has this household been identified as poor through the Identification of Poor Households process conducted by village representatives, and been placed on the List of Poor Households or received an Equity Card or Priority Access Card? Ask to see the equity, priority access card and other card include post-identification. Note is seen/not seen		ចាស, បានឃើញb½NÑ Yes, card seen	ទេ, មិនបានឃើញb½NÑ Yes, card not seen	ទេ No
			1	2	0
		b½NÑmUlniFismFm' (ពណ៌ផ្កាឈូក) Equity card (pink)	☐	☐	☐
		b½NÑGaTiPaBRkIRk(ពណ៌ស) Priority access card (white)	☐	☐	☐
		បដិសេធមិនឆ្លើយ Refused to respond ☐			8
		មិនដឹង Don't know ☐			9

SUBSIDY 1	33. តើមានសមាជិកក្រុមគ្រួសារណាម្នាក់ ដែលទទួលបានការ ថែទាំសុខភាពឥតគិតថ្លៃពីអ្នកណា និង/ឬមានអ្នកណាបង់ថ្លៃថែទាំសុខភាពនោះឲ្យអ្នក? បើសិនជាគ្មាន សូមបន្តទៅសំនួរចុងបញ្ចប់ Do members of this household receive free or subsidized health care that other people would normally have to pay for? If no, go to question end	ទេ No ☐	0
		)aT¼cas+ minbg;éf Yes, free ☐	1
		)aT¼cas+ eKbg;éføCMnYs Yes, subsidised ☐	2
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
SUBSIDY 2	34. តើ ការឧបត្ថម្ភ និង/ឬការបង់ថ្លៃលើការថែទាំសុខភាពប្រភេទណាខ្លះដែលសមាជិកក្រុមគ្រួសារណាម្នាក់ ដែលទទួលបានការ? What are free and/or subsidized health care that any member of this household received?	mUlniFismFm' Health equity funds ☐	1
		karFanar:ab;rgsuxPaBtamshKmn_ Community based health insurance ☐	2
		sMbuRtbBa¢ak;Ca®sþImanépÞeBaH Maternity voucher ☐	3
		epSgeTot Other specify ☐ _____	7
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9

សូមនិយាយថា៖ អរគុណសម្រាប់ចម្លើយរបស់អ្នក។ សូមយកបញ្ជីសំនួរនោះហើយអញ្ជើញទៅតុបន្ទាប់ ។

Say: Thank you for answering these questions. Please take this questionnaire and go to the next station.

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTinñn½y (Interviewer ID, IVID): ____ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ____

ទម្រង់ទី៣ៈ ប្រសិទ្ធភាពនៃគ្រឹះរបស់ការសិក្សា- ទម្រង់បញ្ជីសំនួរប្រមូលទិន្នន័យមូលដ្ឋាន - mnusSmaRtviTüa

Form 3F: Efficacy trial, baseline data collection form - anthropometry

eQµaHkumar Name of child (NAMECH)	
eQµaHអ្នកមើលថែកុមារ Name of caregiver (NAMECG)	

ឥឡូវយើងនឹងធ្វើការថ្លឹងទម្ងន់ និង វាស់កំពស់របស់អ្នក ព្រមទាំងធ្វើការថ្លឹងទម្ងន់ វាស់កំពស់ កម្រាស់ដៃនិងជាតិខ្លាញ់របស់អ្នក។
Now we are going to measure your weight and height and your baby's weight, height, arm thickness, and fat.

MUMWT1 CHWT1	1. ថ្លឹងទម្ងន់អ្នកមើលថែកុមារ លើកទី១ គិតជាគីឡូក្រាម(កម្រិតលម្អៀង0.1kg)? បន្ទាប់មក នៅពេលដែលអ្នកមើលថែកុមារ កំពុងស្ថិត នៅលើជញ្ជីងដដែលនោះ ចុចជញ្ជីងឲ្យទៅលេខ0 ហើយហុចកុមារឲ្យទៅអ្នកមើលថែកុមារ ហើយកត់ត្រាទ្ងន់កុមារដែលបង្ហាញលើជញ្ជីងគិតជាគីឡូក្រាម Weigh mother 1st time in kilograms to the closest 0.1kg . With mother still on scale, zero, pass child to mother, record child's weight in kilograms to the closest 0.1kg	ទម្ងន់អ្នកមើលថែកុមារ ១(kg) Mother's weight 1 (kg) ទម្ងន់កុមារ១(kg) Child's weight 1 (kg) បដិសេធ Mother refused ☐ 8 ផ្សេងៗ Other ☐ 9	
MUMWT2 CHWT2	2. ឲអ្នកមើលថែកុមារ ឡើងលើជញ្ជីងម្តងទៀត ថ្លឹងទម្ងន់អ្នកមើលថែកុមារ ជាលើកទី២ គិតជាគីឡូក្រាម(កម្រិតលម្អៀង0.1kg)? បន្ទាប់មក នៅពេលដែលអ្នកមើលថែកុមារ កំពុងស្ថិតនៅលើជញ្ជីងដដែលនោះ ចុចជញ្ជីងឲ្យទៅលេខ0 ហើយហុចកុមារឲ្យទៅអ្នកមើលថែកុមារ ហើយកត់ត្រាទ្ងន់កុមារជាលើកទី២ ដែលបង្ហាញលើជញ្ជីងគិតជាគីឡូក្រាម Caregiver steps on scale again. Weigh caregiver 2nd time in kilograms to the closest 0.1kg . With caregiver still on scale, zero, pass child to caregiver , record child's 2nd weight in kilograms to the closest 0.1kg	ទម្ងន់អ្នកមើលថែកុមារ ២ (kg) Mother's weight 2 (kg) ទម្ងន់កុមារ២(kg) Child's weight 2 (kg) បដិសេធ Mother refused ☐ 8 ផ្សេងៗ Other ☐ 9	
MUMMUAC1 MUMMUAC2	**3.** ¢MµaHkUr Ï ë Ö " y TMhMeBlHï Î TMrY t¼(MUAC)TMH ¢ អ្នកមើលថែកុមារ ЛЗ¦ Ч ТнЁРЗ ъВУ Ј З ¤Ю ЦЗ .. Ч ТнЁРЗ ў ЏЧ ¢ ВЋ Caregiver's mid upper arm circumference (MUAC) in cm closest 0.1cm Measure 2nd time.	អ្នកមើលថែកុមារ Mother MUAC 1 (cm) អ្នកមើលថែកុមារ Mother MUAC 2 (cm) បដិសេធ Mother refused ☐ 8 ផ្សេងៗ Other ☐ 9	
CHMUAC1 CHMUAC2	**4.** ¢MµaHkUr Ï ë Ö " y TMhMeBlHï Î TMrY t¼(MUAC)TMH ë ў Т ЛЗ¦ Ч ТнЁРЗ ъВУ Ј З ¤Ю ЦЗ .. Ч ТнЁРЗ ў ЏЧ ¢ ¤Y ë ИЁр ¢MH ¤¤MµaHkUr Ж j¢Ï ШР НУ ВЖ ¢ ТнЮ ЪЫ ¢ЛМЁЛЋТК Ч ЗЛ¤ С Ґ Ї ЪТЛЋЖК Ч ¢Ū МЎЛ¢ЌЖў ТR ў МЎЛЧ ЗЮ Ч ъВУ ЪЫ ЛЋЇ ЗТМН ЋЫ Р ¤ЛŪ ЛУ Ї Ж ¢Ч Р¤З " П ¢ЛМЁ Л ë ЋЇ ТКЗў ТR ЮЗ С ŵ ТЇ ў Т	កុមារ Child MUAC 1 (cm) Child MUAC 2 (cm) បដិសេធ Mother refused ☐ 8	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

	&aN ā¤'Ū ЛЦЂЇ Ђ¤ſ Ŷ ТЮВ₽ЖЋ₭Ў ш(яЉОЗ¦ КЋ₭ЎО Ч ў ıС ЂаК Ĉıп МУ ęЬ ЂЇ ЛЂЕЗ Мψ ₫Ї ф(О ОЋЗ ĈЮ Р ЛЂ₽ıОЙĈў ıС ЂаЛЂйĈУ ўС ЂЇ ıВ₽▫₽О Р ЛЂ₽ıОЙĈМЧ ЋЦМ₴ ЂЬ Ќў Р ЋЙЙЇх С Ї ¡ ТЌЎ ТЯ Мψ ЏЧЕ ıОТ Child's mid upper arm circumference (MUAC) in cm closest 0.1cm Measure 2nd time.. If red, Inform supervisor – say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is severely malnourished. This is very serious. You need to take your child to the hospital. We will give you money for transport to go to the hospital if necessary . EXCLUDE AND END QUESTIONNAIRE	ផ្សេងៗ Other ☐ មិនទទួលយកការសិក្សាEXCLUDED ☐	9 99
MUMTSF1 MUMTSF2	5. kMras;Es,kbt;edIméd របស់អ្នកមើលថែកុមារ (កម្រិតលម្អៀង0.2cm) Caregiver's triceps Skinfold Thickness (TSF) (to the closest 0.2cm). Measure twice.	អ្នកមើលថែកុមារ 1 Mother's TSF 1 (cm) ☐☐●☐ អ្នកមើលថែកុមារ 2 Mother's TSF 2 (cm) ☐☐●☐ បដិសេធ Mother refused ☐ ផ្សេងៗ Other ☐	 8 9
CHTSF1 CHTSF2	6. kMras;Es,kbt;edIméd របស់កុមារ (កម្រិតលម្អៀង0.2cm) វាស់២ដង Child's Triceps Skinfold Thickness (TSF) (to the closest 0.2cm). Measure twice.	កុមារ 1 Child's TSF 1 (cm) ☐☐●☐ កុមារ 2 Child's TSF 2 (cm) ☐☐●☐ បដិសេធ Mother refused ☐ ផ្សេងៗ Other ☐	 8 9
SCAPSF1 SCAPSF2	7. kMras;Es,k ចុងស្លាបប្រចៀវ របស់កុមារ (កម្រិតលម្អៀង0.2cm) Child's Subscapular Skinfold Thickness (SSF) (to the closest 0.2cm)	SSF 1 (cm) ☐☐●☐ SSF 2 (cm) ☐☐●☐ បដិសេធ Mother refused ☐ ផ្សេងៗ Other ☐	 8 9
MUMHT1 MUMHT2	Ї Р Ч អ្នកមើលថែកុមារ (cm) 8. ЛЗ¦ Ч ТнЁЇ₽Р ў3 &ĉР З У ıР ёТ 0.1cm'= Ц Ч ıЦО С Ю Ї ë ў Ї Тк ĈА Т Caregiver's height in centimetres to the closest 0.1cm.	កម្ពស់អ្នកមើលថែកុមារ ១ (cm) Mother's height 1 (cm) ☐☐☐●☐ កម្ពស់អ្នកមើលថែកុមារ ២(cm) Mother's height 2 (cm) ☐☐☐●☐	

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer:_____ GñkRbmUlTiñn½y (Interviewer ID, IVID): ☐ (Form ID, FORMID) 0 3

kumar (Child´s ID, CHID): ☐☐☐☐

	Measure standing. Measure twice.	បដិសេធMother refused ☐ ផ្សេងៗ Other ☐	8 9
CHHT1 CHHT2	9. វាស់ប្រវែងÏ ÿ Ū ТЪ₴ļ Ч ТнёЙ₴₽ Ъ3 &ё Р₴З У ш₽ ёТh0.1cm'= Ц Ч ш Q У ъВ У Ю Ї ё ÿ Ū Тк Ĝ ш В Ї Ќ ж ў Ц Ч ļ ё ш Y ё ¸ Й р ш Ю С Ю Ї ё ÿ Ū Тк Ĝ ш В Ї Л Ъ Ж ŝ Ї WHZ ĉ М Н ₣ Ш ш М ₲ -3 Т ┌ > +3 ĉ З Ф Н У ъ В Ж с Ђ ш Q Ъ ї ĉ Л Ъ М Є Л Ъ h ĉ М Н ₣ Ш ш М ₲ -3 Ч ф ₽ Л ₴ С Ґ Ї Ъ Т Л Ъ Ж Ч ĉ Ū М Ў Л ₡ Ќ Ф Ў Т Ґ ў М ₲ П Ч ф ₽ ш ц Ч ъ В У Ъ ї Л ₴ ї ф Т М Н ā ъ ї Р ₣ Ш Ū Л У Ї ж ₲ ё Ч Р ▫ З ″ ĉ Л Ъ М Є ј Л ₡ ў ¡ Т Ќ ф Ў Т Ґ ш Q С ŵ Ї ÿ Ū Т & ш ¸ N ā я ' Ū Л Ц Т ъ ї Ґ ъ ѓ Ŷ Т ш ₽ З ₽ Ќ Ґ ў ш Ц я Л ъ О З ₴ ļ К Ц Ґ К Ґ Ў Ч ў ш С ъ к Ĝ ш М У ę Ъ ї Л ъ Б З М ψ ф Ї ф Ш Q О ₣ З Ĝ Ω Р Л ъ ₽ Q Й Ĉ ў ш С ъ Л ъ й Ĉ У ę Ъ ї ш В ₽ ▫ ₽ Q Р Л ъ ₽ Q Й Ĉ Р ₣ Й Й ж У С Ї ¡ Т Ќ ф Ў Т Ґ М ψ ₲ Н ш ѓ Т	ប្រវែងកុមារ(cm) Child length 1 (cm) ☐☐☐.☐ ប្រវែងកុមារ(cm) Child length 2 (cm) ☐☐☐.☐ បដិសេធ Mother refused ☐ ផ្សេងៗ Other ☐ WHZ ĉ М Н ₣ Ш ш М ₲ -3 Т ┌ > +3 <-3or >+3 ទេ No☐ បាទ/ចាស Yes ☐ មិនទទួលយកការសិក្សា *EXCLUDED* ☐	8 9 99

Child's length in centimetres to the closest 0.1cm. *Measure lying down. Measure 2nd time lying down. SOP. Calculate WHZ.* ***If <-3 or >+3, i****nform supervisor.* ***S****ay: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is severely malnourished. This is very serious. You need to take your child to the hospital. We will give you money to go to the hospital.*
EXCLUDE AND END QUESTIONNAIRE

បើសិនជាអ្នកទទួលបានចម្លើយដែលមិនទទួលយកការចូលរួមពីសំនាក់អ្នកថែរក្សាកុមារ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួមដោយសារកុមារ (ឈ្មោះ) មានជំងឺកង្វះអាហាររូបត្ថម្ភស្រួចស្រាវ វាជាជំងឺធ្ងន់ធ្ងរ។ អ្នកត្រូវតែយកកូនរបស់អ្នកទៅមន្ទីពេទ្យ។ យើងនឹងផ្តល់ប្រាក់ដល់អ្នកសម្រាប់ការចំណាយលើការធ្វើដំណើរក្នុងការយកកូនរបស់អ្នកទៅមន្ទីពេទ្យបើសិនជាចាំបាច់។

If you get a WHZ or MUAC that excludes the child, say: Thank you for your willingness to participate. Unfortunately, your child is not eligible to participate because s/he is severely malnourished. This is very serious. You need to take your child to the hospital. We will give you money for transport to go to the hospital if necessary.

បើសិនជាអ្នកសួរនូវសំនួរទាំងអស់ហើយ ហើយអ្នកថែរក្សាកុមារ/កុមារនោះមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួម សូមនិយាយថា៖ អរគុណសម្រាប់ចម្លើយរបស់អ្នក។ សូមយកបញ្ជីសំនួរនោះហើយអញ្ជើញទៅតុបន្ទាប់

If the child is eligible to participate, say: Thank you for answering these questions. Please take this questionnaire and go to the next station.

Appendix 5.4 Form 4: Monthly questionnaire

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (4IVNAME1): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, 4IVID1): [ ] (Form ID, FORMID) [0][4]

កុមារ (Child´s ID, CHID): [ ][ ][ ][ ] ខែ Month [ ]

ទម្រង់ទី៤៖ ប្រសិទ្ធភាពទិន្នន័យជារៀងរាល់ខែ៖ខែ៤ **Form 4: Efficacy Trial - monthly data collection, month 4**

ទម្រង់ទី៤.១៖ ទម្រង់សម្រាប់ជ្រើសរើសការចូលរួម និងសំណួរសម្រាប់មិនទទួលយកការសិក្សា **Form 4.1: recruitment and exclusion**

ឈ្មោះកុមារ Name of the child (M4CHNAME1)	
ឈ្មោះអ្នកថែទាំកុមារ Name of caregiver (M4CGNAME1)	
លេខកំណត់អត្តសញ្ញាណកុមារ Child´s ID (M4CHID1)	[ ][ ][ ][ ]
ទីកន្លែងផ្តល់អាហារ Data collection site name: (M4SITE)	
ទីកន្លែងផ្តល់អាហារ Data collection site number: (M4SITENBR)	
កាលបរិច្ឆេទ Date (M4DATE1)	[ ][ ] [ ][ ] [2][0][1][6] ថ្ងៃ Day ខែ Month ឆ្នាំ Year

ប្រាប់ទៅអណាព្យាបាល៖ Tell caregiver: (M4CONSENT)

ជំរាបសួរ ខ្ញុំបាទ/នាងខ្ញុំឈ្មោះ_____ ។ ខ្ញុំបាទ/នាងខ្ញុំធ្វើការងារជាមួយគំរោងផលិតនំត្រី។
អ្នកបានយល់ព្រមចូលរួមក្នុងការសិក្សានូវការទទួលយកបាននៃអាហារបំប៉នដែលអាចញ៉ាំបានតែម្តងដោយមិនបាច់ចម្អិនហើយផលិតក្នុងស្រុក
យើងនឹងធ្វើការប្រមូលពិតមានអំពីកូនរបស់អ្នកនិង ខ្លួនអ្នកផ្ទាល់ ដូចជាសុខភាព កម្ពស់ ទំងន់ និងរបបអាហារ ។
មកលើកនេះមិនមានការបូមឈាមទៀតទេ។ ពិតមានទាំងអស់ដែលបានប្រមូលនឹងត្រូវរក្សាដោយសម្ងាត់។
វានឹងមិនមានហានិភ័យអ្វីទាំងអស់។

Hello, my name is _____ and I work with the Num Trey Project. You have agreed for you and your child to participate in the Num Trey project which is a trial of a locally produced ready-to-use-supplementary food.
We will collect information about your child's and your health, height, weight and diet. We will not collect blood or stool again until the end of the project.
All information collected will be kept private and confidential. There are no risks to this study.

ការចូលរួមរបស់អ្នកគឺជាជំរើសរបស់អ្នកទាំងស្រុង។ យើងសង្ឃឹមថាអ្នកនឹងបន្តចូលរួមជាមួយការសិក្សារបស់យើងសំរាប់រយៈពេល៦ខែពេញ ប៉ុន្តែ អ្នកអាចបញ្ឈប់ការចូលរួមរបស់អ្នកពេលណាក៏បានក្នុងកំឡុងពេលសិក្សានេះ។ យើងដឹងថាពេលវេលារបស់អ្នកមានតំលៃ ដូច្នេះហើយអ្នកនឹងទទួលបានអំណោយឬក៏អាហារប្រសិនបើអ្នកចូលរួម ក្នុងរយៈពេល៦ខែពេញ។ មិនតែប៉ុណ្ណោះ យើងនឹងផ្តល់ជូននូវថវិការសំរាប់ធ្វើដំណើរ ចំនួន៤០០០រៀលនិងអំណោយតិចតួចជារៀងរាល់ពេលដែលអ្នកអញ្ជើញមកកន្លែងសិក្សានេះ។

Your participation is your choice. We hope you will continue with the study for the full 6 months, but you are free to stop participating at any time. We realize that your participation is valuable, so you will receive $1 for transport and a small gift or food each time you come.

បើសិនជាអ្នកមានសំណួរ ឬបើអ្នកចង់ពិភាក្សាអំពីការចូលរួមរបស់អ្នកក្នុងការសិក្សានេះ
អ្នកអាចនិយាយទៅកាន់បុគ្គលិករបស់គម្រោងនេះ ឬអ្នកអាចទូរសព្ទ័មក លេខ:០១១ ៥៦៤៨០១

If you have any questions or if you would like to discuss your participation in this study, you can talk to the project staff, or you can call this number: 011 564 801.

តើអ្នកចង់បន្តការសិក្សាជាមួយយើងដែរឬទេ ? បាទ/ចាស ☐ ទេ ☐

Do you want to continue to participate? (M4CONSENTQ) Yes ☐ No (M4WDRAW) ☐

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (4IVNAME1): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, 4IVID1): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

បើសិនជាមានសូមអនុញ្ញាត្តិឲ្យ

ខ្ញុំសួរនូវសំនួរមួយចំនួនដើម្បីដឹងថាអ្នកនិងកូនអ្នកមានលក្ខណៈគ្រប់គ្រាន់សម្រាប់បន្តក្នុងការសិក្សានេះដែរឬទេ។

សូរសំនួរដូចខាងក្រោម

If yes, please let me ask some questions to see if you and your child are still suitable participants. *Ask the following questions*:

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (4IVNAME1): ____________________ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, 4IVID1): [ ] (Form ID, FORMID) [0] [4]

កុមារ (Child´s ID, CHID): [ ] [ ] [ ] [ ] ខែ Month [ ]

Variable name	សូមសួរទៅអ្នកមើលថែកុមារ PLEASE ASK THE CAREGIVER	ចម្លើយ RESPONSE	កូដ Code
M4EXILL1 M4EXILL2	1. ឃើ ĺ ቋጠ TMH ឆៅ Ï ឈ្ឈោ Ū ЛЦ ឆ្K ៀК ዋ ឃើ= BĶ] ЦጠĥВЧ д TឃMhỳ У ў ឃើ Ū ЛЦ ឆ្K ៀК ዋ ቋ Лዜ C Ŗ 8 ЪTឃЖ Ќឃ ឆ្ ᴙЎЛ€TMH ឆៅ ឃឆ ᶜ Ķ ទ TR ў តែគួរឲ្យស្តាយ ЪÏ ЛዜÏ ቋTMH ឆៅ Pዜ Ū ЛУ Ï ឆ្ ថៃ ЛЂMឆ ЛЌ TR ឃិ C ŵ ឆ3 &ឃN ឆ' Ū ЛЦ ឆ្K ៀК ዋ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ Does this child have any major illness right now (e.g. HIV, TB, etc)? If the child has a major illness, say: Thank you for your willingness to participate. Unfortunately, (name) is not eligible to participate because s/he has a major illness. *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	ទេNo ☐ បាទ/ចាសYes ☐ មិនទទួលយកការចូលរួម *EXCLUDED* ☐	0 1 99
M4EXALRGY M4EXALGY2	2. តើកូនរបស់អ្នកធ្លាប់មានប្រតិកម្មជាមួយអាហារអ្វីខ្លះ? (ឧ. ញុំាហើយធ្វើឲ្យពិបាកក្នុងការដកដង្ហើម ឬមានកន្ទួលរមាស់នៅពេលញុំាអាហារណាមួយ) បើកុមារមានប្រតិកម្មសូមនិយាយថា: អរគុណចំពោះឆន្ទះរបស់អ្នកដើម្បីចូលរួម។ តែគួរឲ្យស្តាយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ចូលរួមដោយសារតែ (ឈ្មោះ)មានប្រតិកម្មអាហារ។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ និងរំលងទៅសារចុងបញ្ចប់នៃការមិនមិនទទួលយក ។ Does this child have allergies or intolerances to any food (e.g. difficulty breathing or a rash if they eat certain foods). If the child has food intolerances, say: Thank you for your willingness to participate. Unfortunately, (name) is not eligible to participate because s/he has food intolerances. *EXCLUDE AND END QUESTIONNAIRE AND GO TO EXCLUSION STATEMENT*	ទេNo ☐ បាទ/ចាសYes ☐ មិនទទួលយកការចូលរួម *EXCLUDED* ☐	0 1 99
M4EXSTUDY	3. ឃើ ĺ ቋጠ TMH ឆៅ Ï ឈ្ឈោ Ќ TR ឃК ṫ ТЧ Ḯ · ļ P€ ЛឃЎЋд į ТЧ Ḯ · BĵЙ ឃិ3 ឃើ= Is the child currently participating in any other study?	ទេNo ☐ បាទ/ចាស តាមដានសុខភាពនឹងអាហាររូបត្ថម្ភ Yes, health & nutrition study ☐ បាទ/ចាស សិក្សាគំរងផ្សេង Yes, another study ☐	0 1 2

សារចុងបញ្ចប់នៃការមិនទទួលយក ឃMឆៅ ЙЙ ¥ Ŧ ЛЛ ឆ្ ឃ P ṫ ЂВУ PዜЙЙ ¥ C Ï į ТЌ TR TMH ឆៅ ЂИ Ïឈ Ū Tឃើ ឃ ЯЧ ቋ Лዜ C Ŗ Γ ЪTឃЖ Ќឃ ឆ្ ᴙЎЛ€ЂВУ ЌЋ Ќ TR Ï ዋ į ТЧ Ḯ · ļ P€ ОК ឃC ឆ្ ឆ3 ЛឆК Ĉ ŵ Ï ŵ "C ЂВУ Ъ Ï ЛዜÏ ቋTMH ឆៅ Pዜ Ū ЛУ Ï ឆ្ ថៃ ЛЂMឆ ЛឃឆᶜĶ TR Ï ዋ į ТЧ Ḯ · ឃិ C ŵ ឆ3

[ឆ MឆP ឃЗ ВĶ ឃ Ï ዋЙ PឆP ЙЙ ¥ C Ï į ТЌ TR TMH ṫ 3 ឆЯ, Ï ÿ TP Pዜ Ū ЛΓ C ЌឃC ў មិនបញ្ចូលគាត់ក្នុងការសិក្សា ☐

EXCLUSION STATEMENT: If you get an answer that excludes the caregiver, please say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because [give the reason from the exclusion form that they were excluded]. Excluded ☐

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

ទម្រង់ទី៤.២៖ ប្រសិទ្ធភាពទិន្នន័យជារៀងរាល់ខែ

Form 4.2: Efficacy Trial - monthly data collection

ឈ្មោះកុមារ Name of the child (M4CHNAME2)	
លេខកំណត់អត្តសញ្ញាណកុមារ Child´s ID (M4CHID2)	☐☐☐☐
កាលបរិច្ឆេទ Date (M4DATE2)	☐☐ ☐☐ 2016

ជាដំបូង ខ្ញុំសូមសួរអំពីព័តមានទូទៅមួយចំនួនអំពីកុមារ (First, I will ask some questions about the child(CHILDQS)

Variable name	Question	Response	Code
M4RSHP	1. តើអ្នកមានទំនាក់ទំនងអ្វីជាមួយនឹងកុមារនេះ? សូមគួសរង្វង់យកចំលើយតែមួយ ប្រសិនបើអ្នកថែទាំមិនមែនជា (ឈ្មោះ) ម្តាយ, រំលងទៅសំណួរទី២។ ប្រសិនបើអ្នកថែទាំគឺជា (ឈ្មោះ) ម្តាយ, រំលងទៅសំណួរទី៣ ។ What is your relationship to (NAME)? Select ONLY ONE answer If the caregiver is not (NAME'S) mother, go to question 2. If the caregiver is (NAME'S) mother, go to question 3.	ម្តាយបង្កើត Biological mother ☐	1
		ជីដូន Grandmother ☐	2
		ឪពុក Father ☐	3
		បងស្រី Sister ☐	4
		បងប្អូនប្រុសBrother ☐	5
M4RSHPDES		ផ្សេងៗ(ពិពណ៌នា) Other (describe) ☐	7
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4MUMWHR	2. តើម្តាយ (នៃឈ្មោះ) នៅឯណាពេលនេះ? សូមគួសរង្វង់យកចំលើយតែមួយ Where is (NAME'S) mother now? Select ONLY ONE answer	At work in PP នៅកន្លែងធ្វើការនៅក្នុងរាជធានីភ្នំពេញ ☐	1
		At work outside PP នៅកន្លែងធ្វើការនៅខាងក្រៅរាជធានីភ្នំពេញ ☐	2
		At work outside Cambodia នៅកន្លែងធ្វើការនៅក្រៅប្រទេសកម្ពុជា ☐	3
		ស្លាប់ Not alive ☐	4
		ផ្សេងៗ(ពិពណ៌នា) Other (describe) ☐	7
		M4MUMWHR2	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4USUALCG	3. តើអ្នកជាអ្នកថែទាំ របស់កូននេះជាប់លាបឬទេ? សូមគួសរង្វង់យកចំលើយតែមួយ Are you the child's usual caregiver? Select ONLY ONE answer	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

M4CARE2W	4. តើ២សប្តាហ៍ចុងក្រោយនេះ អ្នកបានមើលថែទាំកុមារនេះដែរឬទេ? **សូមគួសរង្វង់យកចំលើយតែមួយ** Have you been looking after (NAME) for at least the last two weeks? Select ONLY ONE answer	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4ILL2W	5. តើ២សប្តាហ៍ចុងក្រោយ នេះ កុមារ(ឈ្មោះ)មានឈឺទេ? **បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ៨** In the past 2 weeks, has (NAME) been ill? If No to this question – jump to question 8	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4ILL2W2	6. ជាគំនិតរបស់អ្នក តើកុមារ(ឈ្មោះ) មានជំងឺធ្ងន់ មធ្យម ឬស្រាល? **បើសិនជាជំងឺធ្ងន់ធ្ងរ សូមរំលងទៅសំនួរ៧** In your opinion , was (NAME'S) illness serious, moderate or slight? If Serious go to question 7.	ជំងឺធ្ងន់ Serious ☐ មធ្យម Moderate ☐ ស្រាល Slight ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	1 2 3 8 9
M4ILLDR M4ILLDREX	7. តើអ្នកបានយក (ឈ្មោះ) ទៅជួបគ្រូពេទ្យឬទេ? ប្រសិនបើបានទៅវេជ្ជបណ្ឌិត សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈដែលចង់ចូលរួម។ ប៉ុន្តែសូមទោសដោយអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួមដោយសារ(ឈ្មោះ)មានជំងឺធ្ងន់ធ្ងរកាលពី២សប្តាហ៍មុននេះ ។ មិនយកហើយបញ្ចប់សំនួរ Did you take (NAME) to the doctor? If yes, visited the doctor – Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) has been seriously ill in the last 2 weeks. EXCLUDE AND END QUESTIONNAIRE	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐ មិនទទួលយកការសិក្សា EXCLUDED ☐	0 1 8 9 99
M4FEVER2W	8. តើកុមារ(ឈ្មោះ)មានក្តៅខ្លួនទេ ក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? Has (NAME) been ill with a fever at any time in the past 2 weeks?	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4ARI2W1	9. តើកុមារ(ឈ្មោះ)មានក្អកទេក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយនេះ? **បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរ១២** Has (NAME) had an illness with a cough at any time in the past 2 weeks? If No to this question – jump to question 12	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4ARI2W2	10. នៅពេលកុមារ(ឈ្មោះ)មានជំងឺក្អក តើគេមានដកដង្ហើមញាប់ជាងធម្មតាដោយដង្ហក់ដកដង្ហើយញឹក ឬមានការពិបាកក្នុងការដកដង្ហើមឬទេ? **បើសិនចម្លើយទេ សូមរំលងទៅសំនួរ១២** When (NAME) had an illness with a cough, did he/she breathe faster than usual with short, fast breaths or had difficulty breathing?). If No to this question – jump to question 12	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): ____________________ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

M4AR2W3	11. មានការដកដង្ហើមញឹកញាប់ ឬមានការពិបាកក្នុងការដកដង្ហើមដោយមានបញ្ហានៅដើមទ្រូង ឬមានស្ទះនៅច្រមុះ? Was the fast or difficult breathing due to a problem in the chest or a blocked nose?)	ដើមទ្រូងChest only ☐ ច្រមុះNose only ☐ ទាំង២Both ☐ ផ្សេងទៀត ចូររៀបរាប់ Other (describe) ☐ M4ARIOTH ____________________ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹងDon't know ☐	1 2 3 7 8 9
M4DIAR2W1	12. តើកុមារមានរាគទេក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? ឧ. បន្ទោរបង់៣ទៅ៤ដងក្នុងរយៈពេលល២៤ម៉ោង បើមាន បន្តទៅសំនួរ ១៣ បើទេ បដិសេធ មិនដឹង រំលងទៅសំនួរ១៤ Has (NAME) had had diarrhoea in the past 2 weeks? i.e. 3 or more loose stools during a 24 hour period. If Yes – go to question 13. If No, Refused, Don't know – go to question 14	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4DIAR2W2 M4DIAR2WEX	13. តើកុមារមានបន្ទោរបង់ដោយមានឈាមជាប់លាមកទេ? បើមាន សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានបន្ទោរបង់ឈាម ដែលបញ្ជាក់ថាគាត់មានជំងឺធ្ងន់ក្នុងរយៈពេល២សប្តាហ៍មុននេះ។យើងឲ្យយោប ល់ថាអ្នកគួរតែទៅពិនិត្យនៅមណ្ឌលសុខភាព ឬគ្លីនិក។ បើទេ បដិសេធ មិនដឹង រំលងទៅសំនួរ ១៤ Was there any blood in the stools? If Yes – Say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) has had blood in their stools, which indicates a serious illness, in the last 2 weeks. We suggest that you visit a health care provider or clinic. EXCLUDE AND END QUESTIONNAIRE If No, Refused, Don't know – go to question 14	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐ មិនទទួលយកការសិក្សា EXCLUDED ☐	0 1 8 9 99
M4VOMIT2W	14. តើកុមារមានក្អួតទេ រយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? Has (name) vomited in the past 2 weeks?	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4APPET2W	15. តើកុមារ(ឈ្មោះ)ញុំាអាហារជាធម្មតា ឬច្រើនជាងធម្មតា ឬតិចជាងធម្មតានៅក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? Has (name) been eating normally, more than usual, or less than usual in the 2 weeks?	ធម្មតាNormally ☐ ច្រើនជាងធម្មតាMore than usual ☐ តិចជាងធម្មតាLess than usual ☐ បដិសេធមិនឆ្លើយRefused to respond ☐ មិនដឹងDon't know ☐	0 1 2 8 9
M4RASH2W	16. តើកុមារ (ឈ្មោះ)មានឡើងកន្ទួលលើស្បែកទេក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? Has (name) had a skin rash in the past 2 weeks?	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

M4SYMP2W	17. តើកុមារមានរោគសញ្ញា ឬជំងឺអ្វីផ្សេងទៀតដែលខ្ញុំមិនបានសួរក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? បើមាន សូមបញ្ជាក់ Has (name) had any other sickness or symptoms that I have not asked about in the past 2 weeks? If yes - Please specify.	ទេNo ☐ បាទ/ចាសYes ☐ បើសិនជាមាន តើរោគសញ្ញា ឬជំងឺអ្វីដែរ If yes, what sickness or symptoms? M4SYMP2W2_____ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4MEDS2W	18. តើកុមារ (ឈ្មោះ)មានលេបថ្នាំអ្វីទេក្នុងរយៈពេល២សប្តាហ៍ចុងក្រោយ នេះ? ប្រសិនបើលេប តើបានលេបថ្នាំអ្វីខ្លះ? គូសនូវចម្លើយទាំងអស់ដែលទទួលបាន	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4MEDSDES	Has (name) taken any medicine in the past 2 weeks? If yes, which medicines did (NAME) take? Tick all that apply.	M4MEDSDES/1 វីតាមីន Vitamins ☐ M4MEDSDES/2 ថ្នាក្អួត Anti-vomiting ☐ M4MEDSDES/3 ថ្នាំរាក Anti-diarrhea ☐ M4MEDSDES/4 ថ្នាក្អក Anti-cough ☐ M4MEDSDES/5 ថ្នាំបំបាត់ការឈឺចាប; Painkillers ☐ M4MEDSDES/6 ថ្នាំបំបាត់ការរលាក Anti-inflammatories ☐ M4MEDSDES/7 ថ្នាអង់ទីប៊ីយូទិក Antibiotics ☐ M4MEDSDES/11 ថ្នាំជំងឺគ្រុនចាញ់Anti-malarial ☐ M4MEDSDES/12 ថ្នាំផ្សេងៗទៀតដែលអោយដោយអ្នកជំនាញខាងសុខភាព ពិព័ណនា ☐ M4MEDOTH1_____ Other medicine supplied by health professionals (describe) M4MEDSDES/13 ថ្នាំផ្សេងៗទៀតដែលអោយដោយមិនមែនអ្នកមានជំនាញខាងសុខភាពពិព័ណនា ☐ M4MEDOTH2_____ Other medicine supplied by non-health professionals (describe) M4MEDSDES/8 បដិសេធមិនឆ្លើយ Refused to respond ☐ M4MEDSDES/9 មិនដឹង Don't know ☐	1 2 3 4 5 6 7 11 12 13 8 9

បើសិនជាអ្នកទទួលបានចម្លើយដែលមិនទទួលយកការចូលរួមពីកុមារ សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នកនិងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ ក្រៅក្រាន់ក្នុងការចូលរួម ដោយសារអោយផ្តល់នូវមូលហេតុដែលទទួលដូចនៅក្នុងបញ្ជីសំនួរខាងលើ បើសិនជាបញ្ហានោះពាក់ព័ន្ធជាមួយនឹងបញ្ហាសុខភាព សូមប្រាប់គាត់ឬឲ្យគាត់យកកូនរបស់គាត់ទៅមណ្ឌលសុខភាព/មន្ទីរពេទ្យ។

If you get an answer that excludes the child, say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because [give the reason]. [If health related reason, say] We suggest that you go to OR you take your child to the health clinic.

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): ______________ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): [ ] (Form ID, FORMID) [0][4]

កុមារ (Child´s ID, CHID): [ ][ ][ ][ ] ខែ Month [ ]

ឥឡូវនេះខ្ញុំនឹងសួរសំណួរមួយចំនួនអំពីឥរិយាបទរបស់កូននេះ។ Now I'm going to ask some questions about this child's behaviour.

Variable name	សូមសួរទៅអ្នកមើលថែកុមារ PLEASE ASK THE CAREGIVER	ចម្លើយ RESPONSE	Code
M4SMILE M4SMILEOB	19. ពើ ḯÿ Ṻ ПшIяБ Б Ԣ ъВТд шЙ= ពើ ḯ ḯ Ќ пKḯ ТЧ шЊ шР ÿ Ŧ ЛъВТд шЙ? Ч Ф шР ÿ ĉМЧ Д шМ ÿ Ṻ ТБ Б Ԣ &ÓØū РшВḯ р Ќ Ĉ Ṻ ТшН Ќ' ÿ Does this child smile? Can we try to observe that? See if the child smiles (try to make it laugh).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ шЊ ТМЧ ЋЇ Ч ю Ч Лј Interviewer observed ☐ ЪЇ Ч ю Ч ЛР Д Ŧ ЛшKḯ ТЧ шЊ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4SOUND M4SOUNDO	20. ពើ ḯ ឝ ПшIяŦ Лķ Ї Ї æУ ТМЧ шЊ Ї Ч шЦ Тд шЙ? ពើ ḯ ḯ Ќ пKḯ ТЧ шЊ шР ÿ Ŧ ЛъВТд шЙ? шР ÿ Ŗ ពើ ḯ Ṻ Т шIяŦ Лъ ĉМЇ æУ ТМЧ шЊ Ї Ч шЦ Тд шЙ &A ТшΩ Oрû С Ї Ṻ ТІ Ĵ ℓЧ ĉŪ РъВ' ÿ Does this child turn its head to sounds? Can we try to observe that? See if the child turns its head to sounds (stand behind it and snap fingers).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ шЊ ТМЧ ЋЇ Ч ю Ч Лј Interviewer observed ☐ ЪЇ Ч ю Ч ЛР Д Ŧ ЛшKḯ ТЧ шЊ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4SIGHT M4SIGHTOB	21. ពើ ḯ ឝ ПшIяŦ Лŏ РшР ÿ ЪВУ ĉМ Ї Ṯ шПЇ ТМЧ шЊ шЙ? ពើ ḯ ḯ Ќ пKḯ ТЧ шЊ шР ÿ Ŧ ЛъВТд шЙ? Ч Ф шР ÿ ĉМЧ Д шМ ÿ Ṻ Тŏ РшР ÿ &̈ шḯ ĉŪ РъВ шΩ Oр ÿ шПЇ ТМЧ шЊ' ÿ Does this child follow things with its eyes? Can we try to observe that? See if the child follows (move fingers in front of eyes).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ шЊ ТМЧ ЋЇ Ч ю Ч Лј Interviewer observed ☐ ЪЇ Ч ю Ч ЛР Д Ŧ ЛшKḯ ТЧ шЊ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4HEAD M4HEADOB	22. ពើ ḯ ф ПшIяſ Ќ шМЇ æУ ТМЧ шЊ шЦ Ŧ Лш Й? ពើ ḯ ḯ Ќ пKḯ ТЧ шЊ шР ÿ Ŧ ЛъВТд шЙ? Ч Ф шР ÿ ĉМЧ Д шМ ÿ Ṻ Т Ќ шМЇ æУ ТМЧ шЊ шЦ & ю ЪЇ ъИ ю Ї ℓ Ṻ ТшЋ ● МР ÿ ТКшУ ḯ ъВĉЇ Φ Ω Oр ÿ шЋ шВ р ĵ З шМ шР ÿ ' Does this child hold its head up? Can we try to observe that? See if the child holds its head up (ask caregiver to put child on tummy and wave to make it look up).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ шЊ ТМЧ ЋЇ Ч ю Ч Лј Interviewer observed ☐ ЪЇ Ч ю Ч ЛР Д Ŧ ЛшKḯ ТЧ шЊ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4ROLL M4ROLLOB	23. ពើ ḯ ф ПшIя Ќ яĉЇ ŷ МшЙ? ពើ ḯ ḯ Ќ пKḯ ТЧ шЊ шР ÿ Ŧ ЛъВТд шЙ? Ч Ф шР ÿ ĉМЧ Д шМ ÿ Ṻ Т Ќ ĉЇ ŷ МҒ Л& ю ЪЇ ъИ ю Ї ℓ у Ū ТшЋ ● МР ÿ шУ шŨ я Лшу ḯ Й Ќ З шВ р ĉЇ ŷ Мc Does this child roll over? Can we try to observe that? Ask caregiver to put child on tummy and encourage to roll.	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ шЊ ТМЧ ЋЇ Ч ю Ч Лј Interviewer observed ☐ ЪЇ Ч ю Ч ЛР Д Ŧ ЛшKḯ ТЧ шЊ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4REACH M4REACHOB	24. ពើ ḯ ф ПшIяŦ ЛшŅ ТшΩ к МЬ Ŧ ЛъВТд шЙ? ពើ ḯ Ќ пKḯ ТЧ шЊ шР ÿ Ŧ ЛъВТд шЙ? Ч Ф шР ÿ ĉМЧ Д шМ ÿ Ṻ Т ЌшŅ ТшΩ к МЕ ÿ Є ъВУ шΩ Oр ÿ шЊ ÿ Does this child reach for things? Can we try to observe that? See if the child reaches for an object in front of it.	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ТЧ шЊ ТМЧ ЋЇ Ч ю Ч Лј Interviewer observed ☐ ЪЇ Ч ю Ч ЛР Д Ŧ ЛшKḯ ТЧ шЊ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): ____________________ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): [ ] (Form ID, FORMID): 0 4

កុមារ (Child´s ID, CHID): [ ] [ ] [ ] [ ] ខែ Month [ ]

M4BABBLE M4BABBLOB	25. [illegible] [illegible] [illegible] Does this child babble? Can we try to observe that? Ask caregiver to babble to child.	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ [illegible] Interviewer observed ☐ [illegible] Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4TALK M4TALKOB	26. [illegible] [illegible] [illegible] Does this child form words? Can we try to observe that? Ask caregiver to "say" its words.	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ [illegible] Interviewer observed ☐ [illegible] Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4USTAND M4USTNDOB	27. [illegible] [illegible] [illegible] Can this child understand some words? Can we try to observe that? See if the child responds to some words.	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ [illegible] Interviewer observed ☐ [illegible] Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4MOUTH M4MOUTHOB	28. [illegible] [illegible] [illegible] Does this child bring things to its mouth? Can we try to observe that? See if the child brings a candy to its mouth – leave the candy with caregiver – do not reuse.	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ [illegible] Interviewer observed ☐ [illegible] Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4SIT M4SITOB	29. [illegible] [illegible] [illegible] Can this child sit with support? Can we try to observe that? See if the child can sit with support (ask caregiver to sit child up).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ [illegible] Interviewer observed ☐ [illegible] Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4SIT2 M4SIT2OB	30. [illegible] [illegible] [illegible] Can this child sit without support? Can we try to observe that? See if the child can sit without support (ask caregiver to sit child up).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ [illegible] Interviewer observed ☐ [illegible] Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): ____________ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): [ ] (Form ID, FORMID) [0] [4]

កុមារ (Child´s ID, CHID): [ ] [ ] [ ] [ ] ខែ Month [ ]

M4CRAWL M4CRAWLOB	31. ឃ្ើ ĶŲTuĐ C uḉMḅBЛĦ ŲЋ ЛъBTд uЙ? ឃ្ើ ĶuḴ ҴuḥῺ uPy Ŧ ЛъBTд uЙ? uPy Ŗ ឃ្ើ ĶŲTuĐ C uḉMḅBЛĦ ŲЋ Лд uЙу &Ŧ Mк Ъї ъИŗ юĐ Ї uĺ к uŲЋ MPy ĶuЕ uЋ' Can this child crawl on its hands and knees? Can we try to observe that? See if the child can crawl on its hands and knees (ask caregiver to put child on tummy and call it to them).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ҴuḥῺ ΤΜΗ ቆї Ч ǿ Ч Лј Interviewer observed ☐ Ъї Ч ǿ Ч ЛРĦŦ ЛuĶ ҴuḥῺ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4STAND M4STANDOB	32. ឃ្ើ ĶA TuĐ C Ū ЛЦЖ Ŧ ЛъBTд uЙ? ឃ្ើ ĶuḴ ҴuḥῺ uPy Ŧ ЛъBTд uЙ? uPy Ŗ ឃ្ើ ĶA ŦЛuĐ C Ū ЛЦЖ д uЙу &Ŧ Mк Ъї ъИŗ юĐ Ї uĺ к A ЂНĕ uў Ър Can this child stand with assistance? Can we try to observe that? See if the child can stand with assistance (ask caregiver to stand child against chair).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ҴuḥῺ ΤΜΗ ቆї Ч ǿ Ч Лј Interviewer observed ☐ Ъї Ч ǿ Ч ЛРĦŦ ЛuĶ ҴuḥῺ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4WALK M4WALKOB	33. ឃ្ើ ĶuBŦ ЛuĐ C Ū ЛЦЖ д uЙ? ឃ្ើ ĶuḴ ҴuḥῺ uPy Ŧ ЛъBTд uЙ? uPy Ŗ ឃ្ើ ĶuBŦ ЛuĐ C Ū ЛЦЖ д uЙу čŦ Mк Ъї ъИŗ юĐ Ї uĺ к A ЂНĕ uў ЪрuЩ uЕ Ї ŷ T Can this child walk with assistance? Can we try to observe that? See if the child can walk with assistance (ask caregiver to stand child against chair and call it to them).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ҴuḥῺ ΤΜΗ ቆї Ч ǿ Ч Лј Interviewer observed ☐ Ъї Ч ǿ Ч ЛРĦŦ ЛuĶ ҴuḥῺ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4STAND2 M4STND2OB	34. ឃ្ើ ĶA TuĐ C ĵ ãЛЦЖ Ŧ ЛъBTд uЙ? ឃ្ើ ĶuḴ ҴuḥῺ uPy Ŧ ЛъBTд uЙ? uPy Ŗ ឃ្ើ ĶA ŦЛuĐ C ĵ ãЛЦЖ д uЙу čŦ Mк Ъї ъИŗ юĐ Ї uĺ к A T Can this child stand without assistance? Can we try to observe that? See if the child can stand without assistance (ask caregiver to stand child).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ҴuḥῺ ΤΜΗ ቆї Ч ǿ Ч Лј Interviewer observed ☐ Ъї Ч ǿ Ч ЛРĦŦ ЛuĶ ҴuḥῺ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4WALK2 M4WALK2OB	35. ឃ្ើ ĶuBŦ ЛuĐ C ĵ ãЛЦЖ д uЙ? ឃ្ើ ĶuḴ ҴuḥῺ uPy Ŧ ЛъBTд uЙ? uPy Ŗ ឃ្ើ ĶuBŦ ЛuĐ C ĵ ãЛЦЖ д uЙу čŦ Mк Ъї ъИŗ юĐ Ї uĺ к A TuЩ uЕ Ї ŷ T Can this child walk without assistance? Can we try to observe that? See if the child can walk without assistance (ask caregiver to stand child and call it to them).	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ҴuḥῺ ΤΜΗ ቆї Ч ǿ Ч Лј Interviewer observed ☐ Ъї Ч ǿ Ч ЛРĦŦ ЛuĶ ҴuḥῺ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9
M4LOOK M4LOOKOB	36. ឃ្ើ Ķяŏ PЇ uPy ΤΜΗ єĐУ ъВУ uḈ ŭ Ї єУ Ћ ъBTд uЙ? ឃ្ើ ĶuḴ ҴuḥῺ uPy Ŧ ЛъBTд uЙ? Mķ ĕБ ᏰŷĆ uĐ Ї ŷ T Mß ĺMPЇ ŭ Ї Ᏸŷ яuЩ uPy Ŗ ឃ្ើ ŏ PЇ uPy Ᏸŷ яд uЙу Does this child look for things out of view? Can we try to observe that? Show the	អ្នកមើលថែកុមារនិយាយថា ទេ caregiver says no ☐ អ្នកមើលថែកុមារនិយាយថាចាស ឬ បាទ caregiver says yes ☐ į ҴuḥῺ ΤΜΗ ቆї Ч ǿ Ч Лј Interviewer observed ☐ Ъї Ч ǿ Ч ЛРĦŦ ЛuĶ ҴuḥῺ Interviewer didn't observe ☐ អ្នកមើលថែកុមារបដិសេធមិនឆ្លើយ caregiver refused to respond ☐ អ្នកមើលថែកុមារនិយាយថាមិនដឹង caregiver doesn't know ☐	0 1 3 4 8 9

	child an object, then hide the object and see if the child looks for it.		

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

ជាតំបូង ខ្ញុំសូមសួរអំពីរបបអាហារកុមារ

Now I will ask some questions about the child's diet (4DIET)

M4BFG	37. តើកុមារ(ឈ្មោះ)បានកំពុងបៅទឹកដោះម្តាយឬទេ? បើមាន សូមបន្តទៅសំនួរលេខ៣៨ បើអត់ សូមរំលងទៅសំនួរលេខ៣៩ Is (NAME) still being breastfed? If yes go to question 38. If no, go to question 39	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9
M4BFGFREQ	38. តើកុមារ(ឈ្មោះ)បានបៅទឹកដោះម្តាយប៉ុន្មានដង កាលពីម្សិលមិញ និង យប់មិញ ? (ចន្លោះ២៤ម៉ោងចុងក្រោយ) How many times did (NAME) breastfeed yesterday (last 24 hours) during the day and the night?	កាលពីម្សិលមិញ មិនបានបៅទឹកដោះម្តាយ ☐ Did not breastfeed yesterday បានបៅទឹកដោះម្តាយ ១ ទៅ ២ដង ☐ Breastfed 1-2 times បានបៅទឹកដោះម្តាយ ៣ ទៅ ៥ដង ☐ Breastfed 3-5 times បានបៅទឹកដោះម្តាយ ៦ ទៅ ៨ដង ☐ Breastfed 6-8 times បានបៅទឹកដោះម្តាយ ច្រើនជាង៨ដង ☐ Breastfed >8 times បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 2 3 4 8 9
M4BMS24H	39. តើម្សិលមិញ ឬ យប់មិញ (ឈ្មោះ) បានផឹកទឹកអ្វីមួយពីដបទឹកដោះគោដែរឬទេ ? Did (NAME) drink anything from a bottle with a nipple yesterday or last night?	ទេ No ☐ បាទ/ចាស Yes ☐ បដិសេធមិនឆ្លើយ Refused to respond ☐ មិនដឹង Don't know ☐	0 1 8 9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

M4DDGEN

40. តើកុមារ (ឈ្មោះ) បានញ៉ាំអាហារ ឬផឹកទឹកអ្វីខ្លះចាប់តាំងពីគេចេះញ៉ាំអាហារមក? គូសនូវចម្លើយទាំងអស់ដែលទទួលបាន

What foods or drinks does *(NAME)* usually eat or drink since they began solids? *Tick all that apply*

Plain water ទឹកជម្អតា ☐	1
Liquids such as tea, juice, soda, etc សារធាតុរាវដូចជាទឹកតែ ទឹកផ្លែឈើ ទឹកសូដា។ល។ ☐	2
Soup ទឹកស៊ុប ☐	3
Milk (tinned, powdered, or fresh animal milk) ទឹកដោះគោ ដូចជា ទឹកដោះគោកំប៉ុងម្សៅទឹកដោះគោឬទឹកដោះគោស្រស់។ ☐	4
Infant formula. ញ៉ាំទឹកដោះគោកូនក្មេង ដែលផ្សំតាមរូបមន្ត ដូចជា ហ្គ្រង់បេបេ ឌុយមុិច មីឡាក់ ឬទេ? បើមាន តើ ☐	5
Any brand of commercially fortified baby food, e.g., Cerelac]?	6
ញ៉ាំអាហារដែលបញ្ចូលពពួកមីក្រូសារជាតិដែលមានម៉ាកឈ្មោះពាណិជ្ជកម្ម ដូចជាសេរ៉ាឡាក់ ដែរឬទេ? ☐	
ញ៉ាំ នំប៉័ង បាយ នំបញ្ចាក មី បបរ ឬអាហារផ្សេងទៀតធ្វើពីគ្រាប់ធញ្ញជាតិ? ☐	10
Bread, rice, noodles, borbor or other food made from grain	
Pumpkin, carrots, yellow or orange sweet potatoes ល្ពៅ ការ៉ុត ដំឡូងជ្វាពណ៌លឿង ឬ ពណ៌ទឹកក្រូច ☐	11
White potatoes, white yams, manioc, cassava, roots	12
ញ៉ាំ ដំឡូងស ក្រាវ ដំឡូងមី ឆៃថាវ ឬអាហារផ្សេងទៀតដែលមាន មើម ឬស ដែរឬទេ? ☐	
Dark green, leafy vegetables ញ៉ាំ បន្លែបៃតងចាស់ បន្លែមានស្លឹកច្រើន ដែរឬទេ ☐	13
Ripe mangoes, papayas? ស្វាយទុំ ល្ហុងទុំ ☐	14
Any other fruit or vegetables ញ៉ាំ ផ្លែឈើ ឬបន្លែផ្សេងទៀត ឬទេ? ☐	15
Liver, kidney, heart or other organ meats? ថ្លើមសត្វ, ក្រលាន,បេះដូងសត្វឬគ្រឿងក្នុងសត្វផ្សេងៗ ? ☐	16
សាច់សត្វផ្សេងៗទៀត ឧ. សាច់គោ,សាច់ជ្រូក, សាច់ជ្រៀម,សាច់ពពែ,សាច់មាន់ឬសាច់ទា ☐	17
Any other meat, e.g. beef, pork, lamb, goat, chicken, or duck	
Eggs ពងមាន់ ☐	18
Fresh or dried fish or shellfish ត្រីស្រស់ឬត្រីក្រៀមឬខ្យងខ្មៅ ☐	19
ចំណីអាហារដែលផលិតពីសណ្តែកសៀង សណ្តែកហោឡាំងតាវ សណ្តែកបាយ ឬ សណ្តែកផ្សេងៗ ☐	20
Any foods made from beans, peas, lentils, or nuts	
Yoghurt, cheese or any other food made from milk យ៉ាអួរ ឈីស ឬ អាហារដ៏ទៃទៀតដែលផលិតពីទឹកដោះគោ ☐	21
Any foods made with oil, fat, or butter ចំណីអាហារណាដែលផលិតពីប្រេង ខ្លាញ់ ឬប៊ឺរ ☐	22
Any snake, snail, frog, rat, or insects ប្រភេទពស់ផ្សេងៗ, ខ្យង, កង្កែប, កណ្តុរ, ឬសត្វល្អិត ☐	23
Sweet or salty snacks eg chips, cakes, candies បង្អែម ឬអាហារញ៉ាំលេងប្រៃ ឧ. ប្រភេទនំស្រួយៗ នំខេក ស្ករគ្រាប់ ☐	24
Any other solid, semi-solid, or soft food? ប្រភេទអាហាររឹង ផ្សេងៗ ប្រភេទអាហារ ជ្រាយៗ ឬប្រភេទអាហារទន់ៗ ☐	7
Other (describe) ផ្សេងទៀត ចូររៀបរាប់	

M4DDGENOT

M4DDGENOT _____

បដិសេធមិនឆ្លើយ Refused to respond ☐	8
មិនដឹង Don't know ☐	9

M4FOOD24H

41. តើកុមារ (ឈ្មោះ) មានញ៉ាំអាហាររឹង អាហារជ្រាយឬអាហារទន់ទេនៅពេលថ្ងៃ ឬពេលយប់កាលពីម្សិលមិញ? ប្រសិនបើមាន សូមបន្តទៅសំនួរលេខ ៤២ ប្រសិនបើអត់ សូមបន្តទៅសំនួរលេខ ៤៥

Did (NAME) eat any solid, semi-solid, or soft foods yesterday during the day or at night? If yes, go to question 42. If no, go to 45

ទេ No ☐	0
បាទ/ចាស Yes ☐	1
បដិសេធមិនឆ្លើយ Refused to respond ☐	8
មិនដឹង Don't know ☐	9

M4DD24H

42. តើ កាលពីម្សិលមិញកុមារ (ឈ្មោះ) បានញ៉ាំ ឬផឹកអ្វីខ្លះ?

គូសនូវចម្លើយដែលទទួលបាន

What foods yesterday did (NAME) eat or drink yesterday?

Plain water ទឹកជម្អតា ☐	1
Liquids such as tea, juice, soda, etc សារធាតុរាវដូចជាទឹកតែ ទឹកផ្លែឈើ ទឹកសូដា។ល។ ☐	2
Soup ទឹកស៊ុប ☐	3
Milk (tinned, powdered, or fresh animal milk) ទឹកដោះគោ ដូចជា ទឹកដោះគោកំប៉ុងម្សៅទឹកដោះគោឬទឹកដោះគោស្រស់។ ☐	4
M4MILK24 If yes, how many times?ebIman³ etI ¬eQµaH¦ júa b:unµandg? ☐☐	
Infant formula. ញ៉ាំទឹកដោះគោកូនក្មេង ដែលផ្សំតាមរូបមន្ត ដូចជា ហ្គ្រង់បេបេ ឌុយមុិច មីឡាក់ ឬទេ? បើមាន តើ ☐ ☐☐	5

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

Tick all that apply		
	M4IF24H If yes, how many times?eblman³ etI ¬eQµaH¦ júa b:unµandg? Any brand of commercially fortified baby food, e.g., Cerelac]?	6
☐	ញ៉ាំអាហារដែលបញ្ចូលពពួកមីក្រូសារជាតិដែលមានម៉ាកឈ្មោះពាណិជ្ជកម្ម ដូចជាសេរ៉ាឡាក់ ដែរឬទេ?	
☐	ញ៉ាំ នំប៉័ង បាយ នំបញ្ចាក មី បបរ ឬអាហារផ្សេងទៀតធ្វើពីគ្រាប់ធញ្ញជាតិ? Bread, rice, noodles, borbor or other food made from grain	10
☐	Pumpkin, carrots, yellow or orange sweet potatoes ល្ពៅ ការ៉ុត ដំឡូងជ្វាពណ៌លឿង ឬ ពណ៌ទឹកក្រូច	11
☐	White potatoes, white yams, manioc, cassava, roots ញ៉ាំ ដំឡូងស ក្រាវ ដំឡូងមី ឆៃថាវ ឬអាហារផ្សេងទៀតដែលមាន មើម ឬស ដែរឬទេ?	12
☐	Dark green, leafy vegetables ញ៉ាំ បន្លែបៃតងចាស់ បន្លែមានស្លឹកច្រើន ដែរឬទេ	13
☐	Ripe mangoes, papayas? ស្វាយទុំ ល្ហុងទុំ	14
☐	Any other fruit or vegetables ញ៉ាំ ផ្លែឈើ ឬបន្លែផ្សេងទៀត ឬទេ?	15
☐	Liver, kidney, heart or other organ meats? ថ្លើមសត្វ, ក្រលាន,បេះដូងសត្វឬគ្រឿងក្នុងសត្វផ្សេងៗ ?	16
☐	សាច់សត្វផ្សេងៗទៀត ឧ. សាច់គោ,សាច់ជ្រូក, សាច់ដៀម,សាច់ពពែ,សាច់មាន់ឬសាច់ទា Any other meat, e.g. beef, pork, lamb, goat, chicken, or duck	17
☐	Eggs ពងមាន់	18
☐	Fresh or dried fish or shellfish ត្រីស្រស់ឬត្រីក្រៀមឬខ្យងខ្មៅ	19
☐	ចំណីអាហារដែលផលិតពីសណ្តែកសៀង សណ្តែកហោឡាំងតារ សណ្តែកបាយ ឬ សណ្តែកផ្សេងៗ Any foods made from beans, peas, lentils, or nuts	20
☐	Yoghurt, cheese or any other food made from milk យ៉ាអួរ ឈីស ឬ អាហារដ៏ទៃទៀតដែលផលិតពីទឹកដោះគោ	21
☐	Any foods made with oil, fat, or butter ចំណីអាហារណាដែលផលិតពីប្រេង ខ្លាញ់ ឬប៊ឺរ	22
☐	Any snake, snail, frog, rat, or insects ប្រភេទពស់ផ្សេងៗ, ខ្យង, កង្កែប, កណ្តុរ, ឬសត្វល្អិត	23
☐	Sweet or salty snacks eg chips, cakes, candies បង្អែម ឬអាហារញ៉ាំលេងប្រៃ ឧ. ប្រភេទនំស្រួយៗ នំខេក ស្ករគ្រាប់	24
☐	Any other solid, semi-solid, or soft food? ប្រភេទអាហារវិង ផ្សេងៗ ប្រភេទអាហារ ជ្រាយៗ ឬប្រភេទអាហារទន់ៗ	7
	Other (describe) ផ្សេងទៀត ចូររៀបរាប់ M4DDOT24H _____	
	បដិសេធមិនឆ្លើយRefused to respond	8
	មិនដឹងDon't know	9

M4FF24H	43. តើ (ឈ្មោះ) បានញ៉ាំអាហារវិងឬ អាហារជ្រាយល្មម ឬអាហារទន់ ប៉ុន្មានដងកាលពីម្សិលមិញ នៅពេលថ្ងៃ ឬពេលយប់? (តែមិនរាប់បញ្ចូលប្រភេទគ្រឿងទឹកទេ) How many times did (NAME) eat solid or semisolid foods (NOT drinks) yesterday during the day or at night?	☐ ១ ទៅ ២ ដង 1-2 times	1
		☐ ៣ ទៅ ៤ ដង 3-4 times	3
		☐ ៥ ឬ ច្រើនជាងនេះ 5 or more times	5
		☐ បដិសេធមិនឆ្លើយRefused to respond	8
		☐ មិនដឹងDon't know	9
M4FOODAMT	44. កាលពីម្សិលមិញ អំឡុងពេលថ្ងៃ និង នៅពេលយប់ តើកុមារបានបរិភោគអាហាររឹង អាហារជ្រាយ និង អាហារទន់បានប្រហែលប៉ុន្មានដែរ ? (តែមិនរាប់បញ្ចូលប្រភេទគ្រឿងទឹកទេ) Approximately how much eat solid or semisolid foods (NOT drinks) did (NAME) eat each time yesterday during the day or at night?	☐ <2 tablespoonfuls each time ម្តង <២ ស្លាបព្រាបាយពេញ	0
		☐ 2-3 tablespoonfuls each time ម្តង ២ ទៅ ៣ ស្លាបព្រាបាយពេញ	1
		☐ < 1/2 bowl each time ម្តងតិចជាងកន្លះចានចង្កឹះ ម្តង< ១/២ ចានចង្កឹះ	2
		☐ About 1 bowl each time **ម្តង**កន្លះ ទៅ មួយចានចង្កឹះ	3
		☐ >1 bowl each time **ម្តង**ច្រើជាង១ចានចង្កឹះ	4
		☐ បដិសេធមិនឆ្លើយRefused to respond	8
		☐ មិនដឹងDon't know	9
M4SUPPS	45. តើកូនរបស់អ្នកធ្លាប់បានញ៉ាំ ស្ព្រីងខល ហេប៊ី ស៊ីអេសប៊ីផ្លើសផ្លើសឬអាហារបំប៉ន់ស្រដៀងគ្នា ឬអាហារបំប៉ន់បន្ថែម ឬ វីតាមីនផ្សេងៗណាឬទេ ? បើសិនជាចម្លើយទេ សូមរំលងទៅសំនួរចុងបញ្ចប់ Has (NAME) ever used Sprinkles, HEBs, CSB++ or similar supplementary foods or supplements/vitamins? If No to this question – jump to end.	☐ ទេ No	0
		☐ បាទ/ចាស Yes	1
		☐ បដិសេធមិនឆ្លើយ Refused to respond	8
		☐ មិនដឹង Don't know	9

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME2): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID2): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

M4WHSUPPS M4WHSUPP2	46. តើអាហារប៉ន់មួយណា ឬអាហារបន្ថែមណា/វីតាមីនណាដែលកូនរបស់អ្នកបានប្រើ? សូមកុសត្រីសចំពោះអាហារទាំងនុះ (បង្ហាញកញ្ចប់ ឬគំរូនៃអាហារ) បើប្រើស្ព្រីងខល បន្តទៅសំនួរទី **47**។ បើសិនជាហេប៊ីសូមរំលងទៅសំនួរទី**49**។ បើសិនជាមិនប្រើស្ព្រីងខល ឬហេប៊ីសូមបញ្ចប់សំនួរ។ បើមិនបានប្រើស្ព្រីងខលទេ សូមរំលងទៅសំនួរចុងបញ្ចប់ Which supplementary foods or supplements/vitamins has (NAME) used? Tick all that apply. (show packages or examples of foods). If using Sprinkles, go to question 47. If using HEBs go to question 49. If not using Sprinkles or HEBs, go to end.	ស្ព្រីងខល Sprinkles ☐	1
		ស៊ីអេសប៊ីធ្លឺសធ្លឺស CSB++ ☐	2
		ហេប៊ី HEBs ☐	3
		នំ ត្រី Num Trey ☐	4
		អាហារប៉ន់ផ្សេងទៀតបើមាន ហើយសូមរៀបរាប់ Other supplementary foods (describe) ☐ _____	5
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4SPRINK1	47. តើ កុមារញ៉ាំស្ព្រីងខល ញឹកញាប់ប៉ុណ្ណា? How often does (NAME) have Sprinkles?	ស្ទើតែមិនដែលញ៉ាំសោះ Almost never ☐	0
		ញ៉ាំស្ទើតែរាល់ថ្ងៃ Almost daily ☐	1
		ញ៉ាំ២ ទៅ ៣ ដងក្នុងមួយ 2-3 times/week ☐	2
		១សប្តាហ៍ ញ៉ាំម្តង Once a week ☐	3
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4SPRINK2	48. តើកុមារញ៉ាំស្ព្រីងខល ម្តងប៉ុន្មានកញ្ចប់ក្នុងមួយថ្ងៃ? How many sachets of Sprinkles does (NAME) have each day?	១កញ្ចប់ 1 sachet ☐	1
		២កញ្ចប់ 2 sachets ☐	2
		>២កញ្ចប់ >2 sachets ☐	3
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4HEB1	49. តើ កុមារញ៉ាំហេប៊ីញឹកញាប់ប៉ុណ្ណា? How often does (NAME) eat HEBs?	ស្ទើតែមិនដែលញ៉ាំសោះ Almost never ☐	0
		ញ៉ាំស្ទើតែរាល់ថ្ងៃ Almost daily ☐	1
		ញ៉ាំ២ ទៅ ៣ ដងក្នុងមួយ 2-3 times/week ☐	2
		១សប្តាហ៍ ញ៉ាំម្តង Once a week ☐	3
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4HEB2	50. តើកុមារញ៉ាំហេប៊ីម្តងប៉ុន្មានក្នុងមួយថ្ងៃ? How many HEBs does (NAME) have each day?	១-២ 1 -2 ☐	1
		៣-៤ 3-4 ☐	3
		>៤ >4 ☐	5
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9

សូមនិយាយថា៖ អរគុណសម្រាប់ចម្លើយរបស់អ្នក។ សូមយកបញ្ជីសំនួរនោះហើយអញ្ជើញទៅតុបន្ទាប់ ។
Say: Thank you for answering these questions. Please take this questionnaire and go to the next station. (1THANK)

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME3): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID3): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

ទម្រង់ទី៤.៣ ៖ - mnusSmaRtviTüa

Form 4.3: Efficacy Trial - anthropometry

កាលបរិច្ឆេទ Date (M4DATE3)	☐☐ ☐☐ 2016
ឈ្មោះកុមារ Name of the child (M4CHNAME3)	
លេខកំណាត់អត្តសញ្ញាណកុមារ Child´s ID (M4CHID3)	☐☐☐☐
ថ្ងៃខែឆ្នាំកំនើតកុមារ Child's date of birth (M4DOB3)	☐☐ ☐☐ 2015 éf Day Ex Month qñaM Year
យែនឌ័រ Child's sex (M4SEX3)	ប្រុស Male ☐ 1 ស្រី Female ☐ 2

ឥឡូវយើងនឹងធ្វើការថ្លឹងទម្ងន់ និង វាស់កំពស់របស់កុមារ ព្រមទាំងធ្វើការថ្លឹងទម្ងន់ វាស់កំពស់ កម្រាស់ដៃនិងជាតិខ្លាញ់របស់កូនរបស់អ្នក ។

Now we are going to measure your baby's weight, height, arm thickness, and fat. (1ANTHRO)

M4MUMWT1 M4CHWT1	51. ថ្លឹងទម្ងន់អ្នកមើលថែកុមារ លើកទី១ គិតជាគីឡូក្រាម(កម្រិតលម្អៀង0.1kg)? បន្ទាប់មក នៅពេលដែលអ្នកមើលថែកុមារ កំពុងស្ថិតនៅលើជញ្ជីងដដែលនោះ ចុចជញ្ជីងឲ្យទៅលេខ០ ហើយហុចកុមារឲ្យទៅអ្នកមើលថែកុមារ ហើយកត់ត្រានូវទម្ងន់កុមារដែលបង្ហាញលើជញ្ជីងគិតជាគីឡូក្រាម Weigh mother 1st time in kilograms to the closest 0.1kg . With mother still on scale, zero, pass child to mother, record child's weight in kilograms to the closest 0.1kg	ទម្ងន់អ្នកមើលថែកុមារ ១(kg) Mother's weight 1 (kg) ☐☐.☐ ទម្ងន់កុមារ១(kg) Child's weight 1 (kg) ☐☐.☐ បដិសេធ Mother refused ☐ 8 ផ្សេងៗ Other ☐ 9	
M4MUMWT2 M4CHWT2	52. ឲអ្នកមើលថែកុមារ ឡើងលើជញ្ជីងម្តងទៀត ថ្លឹងទម្ងន់អ្នកមើលថែកុមារ ជាលើកទី២ គិតជាគីឡូក្រាម(កម្រិតលម្អៀង0.1kg)? បន្ទាប់មក នៅពេលដែលអ្នកមើលថែកុមារ កំពុងស្ថិតនៅលើជញ្ជីងដដែលនោះ ចុចជញ្ជីងឲ្យទៅលេខ០ ហើយហុចកុមារឲ្យទៅអ្នកមើលថែកុមារ ហើយកត់ត្រានូវទម្ងន់កុមារជាលើកទី២ ដែលបង្ហាញលើជញ្ជីងគិតជាគីឡូក្រាម Caregiver steps on scale again. Weigh caregiver 2nd time in kilograms to the closest 0.1kg . With caregiver still on scale, zero, pass child to caregiver , record child's 2nd weight in kilograms to the closest 0.1kg	ទម្ងន់អ្នកមើលថែកុមារ ២ (kg) Mother's weight 2 (kg) ☐☐.☐ ទម្ងន់កុមារ២(kg) Child's weight 2 (kg) ☐☐.☐ បដិសេធ Mother refused ☐ 8 ផ្សេងៗ Other ☐ 9	
M4CHMUAC1 M4CHMUAC2	**53.** ប្រវែងពាក់កណ្តាលរង្វង់ដៃផ្នែកខាងលើ (MUAC)**របស់កុមារ** គិតជា សង់ទីម៉ែត្រដែលខិតទៅជិត០.១សង់ទីម៉ែត្រ។ វាស់ជាលើកទី២ ប្រសិនបើពណ៌ក្រហមផ្តល់ដំណឹងទៅអ្នកគ្រប់គ្រងរួច សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ)មានជំងឺកង្វះអាហារូបត្ថម្ភធ្ងន់ធ្ងរ។នេះគឺពិតជាធ្ងន់ធ្ងរណាស់។ យើងឲ្យយោបល់ថាអ្នកគួរតែបញ្ជូនកូនទៅពិនិត្យនៅមន្ទីរពេទ្យ។ យើងនឹងឱ្យលុយអ្នកដើម្បីទៅមន្ទីរពេទ្យប្រសិនបើចាំបាច់។ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ Child's mid upper arm circumference (MUAC) in cm closest 0.1cm. Measure 2nd time.. If red, Inform supervisor – say: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is severely malnourished. This is very serious. You need to take your child to the hospital. We will give you money for transport to go to the hospital if necessary . EXCLUDE AND END QUESTIONNAIRE	កុមារ Child MUAC 1 (cm) ☐☐.☐ Child MUAC 2 (cm) ☐☐.☐ បដិសេធ Mother refused ☐ 8 ផ្សេងៗ Other ☐ 9	
M4MUACEXC		មិនទទួលយកការសិក្សាEXCLUDED ☐	99

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME3): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID3): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

M4CHTSF1 M4CHTSF2	54. កំរាស់ស្បែកបត់ដើមដៃ របស់កុមារ (កម្រិតលម្អៀង 0.2cm) វាស់២ដង Child's Triceps Skinfold Thickness (TSF) (to the closest 0.2cm). Measure twice.	កុមារ 1 Child's TSF 1 (cm) ☐☐ . ☐ កុមារ 2 Child's TSF 2 (cm) ☐☐ . ☐ បដិសេធ Mother refused ☐	8
		ផ្សេងៗ Other ☐	9
M4SCAPSF1 M4SCAPSF2	55. កំរាស់ស្បែក ធុងស្ពាបប្រចៀវ របស់កុមារ (កម្រិតលម្អៀង 0.2cm) Child's Subscapular Skinfold Thickness (SSF) (to the closest 0.2cm)	SSF 1 (cm) ☐☐ . ☐ SSF 2 (cm) ☐☐ . ☐	
		បដិសេធ Mother refused ☐	8
		ផ្សេងៗ Other ☐	9
M4CHHT1 M4CHHT2	56. វាស់ប្រវែងកុមារគិតជាសង់ទីម៉ែត្រ(កម្រិតលម្អៀង0.1cm)? វាស់ពេលដែលដាក់កុមារឲ្យដេកចុះ។ វាស់ជាលើកទី២ដោយដាក់កុមារឲ្យដេក គណនារក WHZ ប្រសិនបើ<-3 រឺ >+3 ត្រូវផ្តល់ដំណឹងទៅអ្នកគ្រប់គ្រង ប្រសិនបើ<-3 សូមនិយាយថា៖ អរគុណសម្រាប់ឆន្ទៈចូលរួម។ ប៉ុន្តែសូមទោសដែលអ្នក និងកូនរបស់អ្នកមិនមានលក្ខណៈសម្បត្តិ គ្រប់គ្រាន់ក្នុងការចូលរួម ដោយសារកុមារ (ឈ្មោះ) មានជំងឺកង្វះអាហារូបត្ថម្ភធ្ងន់ធ្ងរ។នេះគឺពិតជាធ្ងន់ធ្ងរណាស់។ យើងឲ្យយោបល់ថាអ្នកគួរតែបញ្ជូនកូនទៅពិនិត្យនៅមន្ទីរពេទ្យ។ យើងនឹងឱ្យលុយអ្នកដើម្បីទៅមន្ទីរពេទ្យ មិនទទួលយកការចូលរួម បញ្ចប់សំនួរ Child's length in centimetres to the closest 0.1cm. *Measure lying down. Measure 2nd time lying down. SOP. Calculate WHZ.* ***If <-3 or >+3,*** *inform supervisor.* ***S****ay: Thank you for your willingness to participate. Unfortunately, you and your child are not eligible to participate because (name) is severely malnourished. This is very serious. You need to take your child to the hospital. We will give you money to go to the hospital.* EXCLUDE AND END QUESTIONNAIRE	ប្រវែងកុមារ(cm) Child length 1 (cm) ☐☐☐ . ☐ ប្រវែងកុមារ(cm) Child length 2 (cm) ☐☐☐ . ☐ បដិសេធ Mother refused ☐	8
		ផ្សេងៗ Other ☐	9
M4WHZ		WHZ ¢MH ₦ıuM₭-3 T┌>+3 *<-3or >+3* ទេ No ☐	
M4CHHTEXC		បាទ/ចាស Yes ☐ មិនទទួលយកការសិក្សា *EXCLUDED* ☐	99

បើសិនជាអ្នកសួរនូវសំនួរទាំងអស់ហើយ ហើយអ្នកថៃរកុមារ/កុមារនោះមានលក្ខណៈគ្រប់គ្រាន់ក្នុងការចូលរួម សូមនិយាយថា៖ អរគុណសម្រាប់ចម្លើយរបស់អ្នក។ សូមយកបញ្ជីសំនួរនោះហើយអញ្ជើញទៅតុបន្ទាប់

If the child is eligible to participate, say: Thank you for answering these questions. Please take this questionnaire and go to the next station. (1THANK3)

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME4): ________________ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID4): [ ] (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): [ ][ ][ ][ ] ខែ Month [ ]

ទម្រង់ទី៤.៤៖ការប្រើប្រាស់និង ការអនុលោមតាមច្បាប់
ប្រសិនបើលើក្រុមត្រួតពពិនិត្យរំលងផ្នែកនេះ

Form 4.4: Consumption and compliance
If control group, skip this section. (1NOTCTRL)

ឈ្មោះកុមារ Name of the child (M4CHNAME4)	
លេខកំណត់អត្តសញ្ញាណកុមារ Child´s ID (M4CHID4)	[ ][ ][ ][ ]
កាលបរិច្ឆេទ Date (M4DATE4)	[ ][ ] [ ][ ] 2 0 1 6

ឥឡូវនេះខ្ញុំនឹងសួរសំណួរមួយចំនួនអំពីឥរិយាបទរបស់កូននេះ អំពីអាហារនៅខែមុន

Now I'm going to ask some questions about this child's consumption of the food in the past month. (CONSUMP)

M4EATMTH	ខែរបស់អាហារ Month on this food:	ខែទី១ 1st ☐	1	ខែទី៣ 3rd ☐	3	ខែទី៥ 5th ☐	5
		ខែទី២ 2nd ☐	2	ខែទី៤ 4th ☐	4	ខែទី៦ 6th ☐	6

M4PRODUCT	Code		M4AMTPVD	M4AMTRMG	M4DIFF
ផលិតផល Product			បរិមាណដែលត្រូវការសម្រាប់ខែមុន មើលនៅក្នុង ID ចាស់ Amount of food provided last month Fill in from the ID card	បរិមាណនៅសល់ Amount of food remaining today	បរិមាណអាហារដែរក្មេងញុំអស់ Amount of food the child ate
នំ ត្រី Num Trey ☐	1	Sachets Ï ψ Ⓜe= (Wafers MЮK Ï = '	M4NTBAGPV M4NTPCPV	M4NTBAGRM M4NTPCRM	M4NTBAGEAT M4NTPCEAT
ស៊ីអេសប៊ីផ្លឹសផ្លឹស CSB++ ☐	2	Kg	M4CSBPVD	M4CSBRM	M4CSBEAT
ស្ព្រីងខល Sprinkles ☐	3	Sachets Ï ψ Ⓜe=	M4SPRPVD	M4SPRRM	M4SPREAT
ក្រុមផ្ទៀងផ្ទាត់—អត់មានផលិតផល Control group – no product ☐	4				

Variable	Question	Response	Code
M4NAMEEAT	57. តើ (ឈ្មោះ) មានញុំាអាហារ? ប្រសិនបើមាន តើ(ឈ្មោះ) បានញុំាអស់ប៉ុនណ្ណា? Did (name) eat the food? If yes, how much of the food did (name) eat?	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4HOWMCH1		ស្ទើតែមិនបានញុំាសោះ None or almost none ☐	0
		អស់ជិតពាក់កណ្ដាល Almost half ☐	1
		ស្ទើតែទាំងអស់ Most ☐	2
		ញុាំបានទាំអស់ All ☐	3
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4WHOEAT	58. តើមាននរណាផ្សេងមានញុំាអាហារ? ប្រសិនបើមាន នរណាគេ? គូសចំលើយច្រើន	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4WHOEAT2	Did anyone else eat the food? If yes, who? Tick all that apply	ម្ដាយបង្កើត/ ឪពុក Mother/father ☐	1

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME4): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID4): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

		ជីដូន Grandmother/grandfather ☐	2
		bgb¥ÚnRbus // បងប្រុស Siblings ☐	3
		ផ្សេងៗ(ពិពណ៌នា) Other (describe) ☐	7
		M4WHOEAT3	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4HOWMCH2	59. តើពួកគេបានញ៉ាំអស់ប៉ុណ្ណា? How much of the food did they eat?	ស្ទើតែមិនបានញ៉ាំសោះ None or almost none ☐	0
		អស់ជិតពាក់កណ្តាល Almost half ☐	1
		ស្ទើតែទាំងអស់ Most ☐	2
		ញ៉ាំបានទាំអស់ All ☐	3
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4GIVESELL	60. តើអាហារនេះមានអោយអ្នកណា អ្នកជិតខាង លក់ បោះចោល ចាក់អោយសត្វស៊ី ឧទាហរណ៍: (សត្វមាន់) បាត់ កណ្តុរស៊ី យកទៅបោះចោល ? គូសចំលើយច្រើន Was any of the food given away, sold, thrown away, fed to animals (e.g. chickens), lost, eaten by rats, or disposed of some other way? Tick all that apply	ទេ No ☐	0
		បាទ/ចាស អោយទៅគេ Yes, given away ☐	1
		បាទ/ចាស យកទៅលក់ Yes, sold ☐	2
		បាទ/ចាស បោះចោល Yes, thrown away ☐	3
		បាទ/ចាស អោយសត្វស៊ី Yes, fed to animals ☐	4
		បាទ/ចាស បាត់ Yes, lost ☐	5
		បាទ/ចាស កណ្តុរស៊ីអស់ Yes, eaten by rats, ☐	6
		ផ្សេងៗ(ពិពណ៌នា) Other (describe) ☐	7
		M4GIVEDES	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4HOWMCH3	ប្រសិនបើមានអស់ប៉ុណ្ណា? If yes, how much?	ស្ទើតែមិនបានញ៉ាំសោះ None or almost none ☐	0
		អស់ជិតពាក់កណ្តាល Almost half ☐	1
		ស្ទើតែទាំងអស់ Most ☐	2
		ញ៉ាំបានទាំអស់ All ☐	3
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4REMAIN	61. ĉMH ĦıuMĝQ Ч У € Ŷ ТЧ ЖТ ıHЦ3 ЬþĝТ ЛĮ Ч У € Ŷ ТıuIя= គូសចំលើយច្រើន If there is remaining food ask: Why has some of the food not been eaten? Tick all that apply	មិនមានសល់អាហារ No food remaining ☐	10
		មិនចូលចិត្តអាហារនេះទេ Didn't like the food at all ☐	0
		ចូលចិត្តតែញ៉ាំច្រើនហើយ Too much to eat ☐	1
		ចូលចិត្តតែធុញហើយញ៉ាំរាល់ថ្ងៃLike food but boring to eat every day ☐	2
		ភ្លេចឬរវល់មិនបានដាក់អោយញ៉ាំទេ Forgot or too busy to eat the food every day ☐	3
		អាហារនេះបានធ្វើអោយកុមារនេះឈឺ Our food made baby sick (vomiting, diarrhea) so stopped/ate less ☐	4
		អាហារផ្សេងទៀតដែរធ្វើអោយកុមារឈឺហើយឈប់ញ៉ាំ Something else made my baby sick and baby stopped eating food/ate less ☐	5
		ផ្សេងៗ(ពិពណ៌នា) Other (describe) ☐	7
		M4REMAIN2	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8

ឈ្មោះអ្នកសម្ភាសន៍ Name of interviewer (M4IVNAME4): _____ អ្នកប្រមូលទិន្នន័យ (Interviewer ID, M4IVID4): ☐ (Form ID, FORMID) 0 4

កុមារ (Child´s ID, CHID): ☐☐☐☐ ខែ Month ☐

		មិនដឹង Don't know ☐	9
M4DFRC	62. តើអ្នកគិតថាអាហារធ្វើអោយសុខភាពអាកប្បកិរិយាកុមាប្រែប្រួលដែលឬទេឬក៏នៅដដែល? Do you think that the food has made any difference (positive or negative) to the child's health or behaviour?	ទេ No ☐	0
		បាទ/ចាស Yes ☐	1
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9
M4DFRC2	ប្រសិនបើមាន តើមានអ្វីខុសប្លែក? គូសចំលើយច្រើន If yes, what difference? Tick all that apply	មានកំលាំង ឬក៏បន្ថែមកំលាំង More energy ☐	1
		ចូលចិត្តញ៉ាំច្រើន Better appetite ☐	2
		ធំលូតលាស់លឿន Growing faster (height, weight) ☐	3
		កុមារឆ្លាតវាងវៃនឹងរពឹសចេះស្តាប់នឹងនិយាយបានច្រើន Baby seems smarter, listens/speaks more ☐	4
		កុមារឈឺ Baby got sick ☐	5
		កុមារធម្មតា Baby normal, no change ☐	6
		ផ្សេងៗ(ពិព៌ណនា) Other (describe) ☐	7
		M4DFRC3	
		បដិសេធមិនឆ្លើយ Refused to respond ☐	8
		មិនដឹង Don't know ☐	9

M4LIKE	63. ត្រូវនិយាយថា៖ កូនរបស់អ្នកបានញ៉ាំអាហារអស់រយៈពេល..... ហើយ។ តើអ្នកគិតថាកូនរបស់អ្នកចូលចិត្តអាហារនេះឬទេ? Say: Your child has been eating this food for ____ month/s. How do you think your child likes this food

1 =មិនចូលចិត្តទាល់តែសោះ 1 = Dislikes a lot	2 =មិនចូលចិត្តតិចៗ 2 = Dislikes a little	3 =ធម្មតា 3 = Neither likes nor dislikes	4 =ចូលចិត្តតិចៗ 4 = Likes a little	5 =ចូលចិត្តខ្លាំង 5 = Likes a lot
				

អរគុណសម្រាប់ចម្លើយរបស់អ្នកនេះជាអាហារសំរាប់ខែក្រោយកូនរបស់អ្នក សូមយកបញ្ជីរសំនួរនោះហើយអញ្ជើញទៅតុបន្ទាប់

Thank you for answering these questions. Here is your baby's food for the next month. Please go to the next station.

Appendix 5.5: Come back cards

សូមត្រឡប់មកវិញជាថ្មីនៃខែក្រោយម្តងទៀត
PLEASE COME BACK AGAIN NEXT MONTH! (CSB++ & RUSF)

ក្រុមការងារខាងអង្គានឹងទំនាក់ទំនងទៅបងទៅតាមលេខទូរស័ព្ទ
We'll give you a call in advance.

ទីកន្លែងផ្តល់អាហារ Site: _____

សូមចាំថា:

- ផ្តល់អាហារបំប៉នបន្ថែមនេះទៅកូនរបស់អ្នកនូវបរិមាណដែលបានណែនាំ
- អាហារបំប៉ននេះគឺគ្រាន់តែជានំបន្ថែម
- ផ្តល់ចំណីអាហារដល់កូនរបស់អ្នកតាមធម្មតា (៣-៥ដងក្នុងមួយថ្ងៃអាស្រ័យលើអាយុ)
- បន្តបំបៅដោះកូនរបស់អ្នកតាមធម្មតា
- លាងដៃអ្នកនិងដៃកូនរបស់អ្នកមុនពេលបរិភោគអាហារ / ពេលបញ្ចុកអាហារ
- កើបនិងបោះចោលលាមកឲ្យបានត្រឹមត្រូវ
- លាងដៃរបស់អ្នកបន្ទាប់ពីអ្នកបន្ទោរបង់ ឬ បន្ទាប់ពីទារកបន្ទោរបង់

Please remember:

- Feed your baby this supplementary food in the recommended dosage
- This food is an extra snack.
- Continue to feed your baby normally, 3-5 times daily.
- Continue breastfeeding your baby
- Wash your hands and baby's hands before eating/feeding
- Dispose safely of stool
- Wash your hands after you or baby defecate

សូមត្រឡប់មកវិញជាថ្មីនៃខែក្រោយម្តងទៀត
PLEASE COME BACK AGAIN NEXT MONTH! (CONTROL)

ក្រុមការងារខាងអង្គានឹងទំនាក់ទំនងទៅបងទៅតាមលេខទូរស័ព្ទ
We'll give you a call in advance.

ទីកន្លែងផ្តល់អាហារ Site: _____

សូមចាំថា:

- ផ្តល់ចំណីអាហារដល់កូនរបស់អ្នកតាមធម្មតា (៣-៥ដងក្នុងមួយថ្ងៃអាស្រ័យលើអាយុ)
- បន្តបំបៅដោះកូនរបស់អ្នកតាមធម្មតា
- លាងដៃអ្នកនិងដៃកូនរបស់អ្នកមុនពេលបរិភោគអាហារ / ពេលបញ្ចុកអាហារ
- កើបនិងបោះចោលលាមកឲ្យបានត្រឹមត្រូវ
- លាងដៃរបស់អ្នកបន្ទាប់ពីអ្នកបន្ទោរបង់ ឬ បន្ទាប់ពីទារកបន្ទោរបង់

Please remember:

- Continue to feed your baby normally, 3-5 times daily.
- Continue breastfeeding your baby
- Wash your hands and baby's hands before eating/feeding
- Dispose safely of stool
- Wash your hands after you or baby defecate

សូមត្រឡប់មកវិញជាថ្មីនៃខែក្រោយម្តងទៀត
PLEASE COME BACK AGAIN NEXT MONTH! (SPRINKLES)

ក្រុមការងារខាងអង្គានឹងទំនាក់ទំនងទៅបងទៅតាមលេខទូរស័ព្ទ
We'll give you a call in advance.

ទីកន្លែងផ្តល់អាហារ Site: _____

សូមចាំថា:

- ផ្តល់អាហារបំប៉នបន្ថែមនេះទៅកូនរបស់អ្នកនូវបរិមាណដែលបានណែនាំ
- ផ្តល់ចំណីអាហារដល់កូនរបស់អ្នកតាមធម្មតា (៣-៥ដងក្នុងមួយថ្ងៃអាស្រ័យលើអាយុ)
- បន្តបំបៅដោះកូនរបស់អ្នកតាមធម្មតា
- លាងដៃអ្នកនិងដៃកូនរបស់អ្នកមុនពេលបរិភោគអាហារ / ពេលបញ្ចុកអាហារ
- កើបនិងបោះចោលលាមកឲ្យបានត្រឹមត្រូវ
- លាងដៃរបស់អ្នកបន្ទាប់ពីអ្នកបន្ទោរបង់ ឬ បន្ទាប់ពីទារកបន្ទោរបង់

Please remember:

- Feed your baby this supplementary food in the recommended dosage
- Continue to feed your baby normally, 3-5 times daily.
- Continue breastfeeding your baby
- Wash your hands and baby's hands before eating/feeding
- Dispose safely of stool
- Wash your hands after you or baby defecate

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