

**ADHERENCE TO COMPLEMENTARY FEEDING GUIDELINES AS  
A PREDICTOR OF BETTER HEALTH OUTCOMES IN INFANTS  
SIX TO TWENTY FOUR MONTHS OF AGE IN CAMBODIA**

**by**

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## **Abstract**

Rates of child malnutrition in Cambodia have continued to rise throughout the last ten years despite marginal improvements in food security. After 6 months of age, when complementary feeding often begins, rates of stunting in Cambodia increase from 16% to 42% (CDHS, 2010). Given that the first two years of life are the most important for physical and cognitive development, addressing the health consequences that result from malnutrition is a priority. In the current thesis, I hypothesized that a) infants whose caregivers adhered to at least 80% of Cambodia's complementary feeding guidelines were less likely to have had diarrhea in the last two weeks, to be anemic or to be stunted and b) infants whose caregivers adhered to at least 80% of the guidelines would have greater dietary diversity than infants whose caregivers did not adhere. To test these hypotheses, I utilized data from a cross sectional survey conducted by The Joint Program for Children, Food Security, and Nutrition in Cambodia. Infant caregivers were defined as adhering to the guidelines if they complied with at least 80% of each one of Cambodia's five complementary feeding recommendations. I utilized logistic regression to estimate the risk of diarrhea, anemia and stunting among infants whose caregivers adhered compared to those whose caregivers did not adhere to the guidelines. Only 36 (5.1%) caregivers adhered to at least 80% of Cambodia's complementary feeding guidelines. I did not observe any excess risk for diarrhea in the preceding two weeks, anemia or stunting among infants whose caregivers did not adhere to the feeding guidelines. There was minimal difference in dietary diversity between the two groups. Consumption of meat, grains, legumes, dairy, and vitamin A rich foods varied by at most 13% between infants whose caregivers adhered and did not adhere to the guidelines. My

results indicate that the overwhelming majority of families in Cambodia are not adhering to Cambodia's current complementary feeding guidelines. Furthermore, adherence is not associated with greater dietary diversity or better pediatric health outcomes. Future studies should consider testing the utility of guidelines that incorporate recommendations for dietary diversity to improve health outcomes.

## **Preface**

Ethics approval for my study was obtained through the UBC Behavioral Research Ethics Board with certificate number H12- 00427.

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## **List of Abbreviations**

BCC- Behavior Change Communication

BF- Breastfeeding

BME- Breast milk energy

BMI- Body mass index

CDHS- Cambodia Demographic Health Survey

CI- Confidence interval

DRI- Dietary reference intake

FAO- Food and Agricultural Organization

GDP- Gross Domestic Product

IDECG- International Dietary Energy Consultative Group

IDA- Iron deficiency anemia

IUGR- Intrauterine growth restriction

IYCF- Infant and young child feeding

JP- Joint Program [for Children, Food Security, and Nutrition in Cambodia]

KAP- Knowledge, attitudes and practices

MDG- Millennium Development Goal

MUAC- Mid upper arm circumference

NCHS- National Center for Health Statistics

OR- Odds ratio

ORS- Oral rehydration solution

ORT- Oral rehydration therapy

PPS- Probability proportionate to size

RNI- Recommended nutrient intake

SD- Standard deviation

TEE- Total energy expenditure

UKDH- United Kingdom Department of Health

UNICEF- United Nations International Children's Emergency Fund

UNU- United Nations University

WHO- World Health Organization

WRA- Women of Reproductive Age

## **Introduction**

Cambodia is a small country of 181,035 square kilometers divided into 24 provinces and four municipalities (CDHS, 2010). Despite a significant amount of arable land in Cambodia, as well as the fact that the agricultural sector provides more than 40% of the country's total Gross Domestic Product (GDP), Cambodia continues to have one of the highest rates of child under-nutrition in the world and was recently listed as one of 36 countries to account for 90% of all stunted children worldwide (Black et al., 2008). In spite of marginal improvements in the nutritional status of women and children within the last decade, under-five child mortality continues to be high at 54 per 1000 live births (CDHS, 2010). Out of every 1,000 babies born in Cambodia, 45 do not survive to their first birthday (CDHS, 2010).

Exclusive breastfeeding for six months followed by a) the introduction of adequate and appropriate complementary foods, b) supplementation with zinc, iron and vitamin A and c) continuation of breastfeeding until two years of age can prevent one third of child deaths (Bryce, Boschi-Pinto, Shibuya, & Black, 2005; Jones et al., 2003). When exclusive breastfeeding ceases, and children are introduced to family foods, they enter a period of vulnerability. These foods may pose threats such as contamination, and often times, do not meet the energy and micronutrient requirements of the child (K. Dewey, 2003; K G Dewey, Cohen, Rivera, & Brown, 1998). Malnutrition that is left untreated during the first two years of life can cause physiological and cognitive delays that are irreversible. Appropriate complementary feeding can prevent malnutrition in infants under two years of age, therefore, understanding whether adherence to

Cambodia's complementary feeding guidelines is associated with improved feeding practices and the prevention of diarrhea, anemia, and stunting is crucial (K. Dewey, 2003; WHO/UNICEF, 1998).

The purpose of this thesis was to examine whether caregiver adherence to at least 80% of Cambodia's complementary feeding guidelines was associated with better health outcomes in children 6 to 23 months of age. I defined better health outcomes as a) less likely to have had diarrhea in the two weeks prior to survey administration, b) less likely to have been anemic when the survey was taken and c) less likely to have been stunted when the survey was taken. I also examined whether infants whose caregivers were adhering to the guidelines were consuming a larger diversity of foods in greater amounts and were meeting the minimum dietary diversity requirements more often when compared to their non-adhering counterparts.

The primary objectives of my research were to a) determine whether infants whose caregivers adhered to at least 80% of the guidelines had diarrhea, anemia or stunting less often than infants whose caregivers did not adhere, and b) determine whether infants whose caregivers adhered consumed a greater diversity of foods, and in greater amounts, than infants whose caregivers did not adhere.

I hypothesized that children whose caregivers adhered to at least 80% of each of the recommendations were less likely to have been identified as having had diarrhea in the last two weeks, less likely to have been anemic when the survey was taken, and less likely to have been stunted when the survey was taken. I also hypothesized that children whose caregivers were adhering to at least 80% of the guidelines had a greater diversity

of foods in their diets, and that these infants consumed a greater amount of diverse foods than their non-adhering counterparts.

I undertook a cross sectional study utilizing data from The Joint Program (JP) for Children, Food Security, and Nutrition in Cambodia and compared the dietary diversity and health outcomes of infants whose caregivers adhered to at least 80% of Cambodia's complementary feeding guidelines to infants whose caregivers did not. The JP was a population-based study conducted in February and March of 2010 to address maternal and child health related issues including mortality rates and under-nutrition in Cambodia. An itemized food questionnaire, anthropometric measurements and a haemoglobin test were given to 1600 caregivers of children between the ages of 12 to 36 months and all remaining children under five years of age residing in the same household. The survey collected information about infant dietary patterns, anemia rates, and stunting rates. Question 1 and Question 2 of the thesis are written in manuscript style and thus contain repeated information from previous sections. I have also changed the wording in these chapters from possessive to plural ("my study" to "our study").

Complementary feeding guidelines used in Cambodia are unique because they include recommendations on total bowls and consistency of food consumed. Adherence to these guidelines has not been evaluated to date and it is not known whether these guidelines promote diversity in food intake and improve infant health. Findings of this study will be of value to Cambodian policy makers and will add to the evaluative literature on complementary feeding guidelines and practice in developing countries.

## Background

### Cambodia

#### *Cambodian Family Dynamics*

Legally, the husband in a Khmer (Cambodian) family is the head, however, the wife has substantial authority as well, especially in family economics (Congress, 2012). Typically, the husband is in charge of providing food and shelter for his family and the wife is in charge of organizing the family budget and serves as the primary ethical and religious model for the children (Congress, 2012). In rural areas, the male is mainly responsible for tending to the yearly harvest by plowing and harrowing the rice paddies, collecting sugar palm juice, caring for cattle, or buying and selling cows and chickens (Congress, 2012). Women are responsible for transplanting rice seedlings, tending to gardens, making sugar, and weaving (Congress, 2012). About 80% of the labor force is engaged in agriculture, forestry or fishing. The main crop is rice made in a flooded parcel of arable land (paddy rice). Public sector employment including industrial workers, artisans, teachers, and armed forces personnel amount to approximately 8% of the working population (Congress, 2012).

Adult Khmers typically eat three or more meals per day and dietary habits are the same among most Cambodians. Traditional Cambodian cuisine was almost wiped out completely during the Khmer Rouge (appendix 1), but has since made a comeback and re-entered the diets of many Cambodian families. Rice and fresh water fish are the largest influences in Khmer cuisine. The basic foods consumed daily are rice, fish, and local

vegetables, especially *trakuon* (water convolvulus or water spinach) (Congress, 2012). Fermented fish that has been made into a sauce or paste is an important protein supplement in the diet. For flavor, many Khmer dishes contain hot peppers, lemon grass, mint, ginger and sugar. Fruits that grow abundantly throughout the country include bananas, mangoes, papayas, rambutan, and palm fruit (Congress, 2012). Vegetables that are commonly consumed in Cambodia are winter melon, bitter melon, cabbage, baby corn, and bamboo shoots (Congress, 2012). Infants who are beginning to feed are given watery rice porridge that may contain seasonal vegetables or small pieces of meat (usually fish). For snacks, infants are given seasonal fruit, fried bananas, toasted rice snacks, cookies or shrimp chips. Soya bean is considered the second most important crop in Cambodia, after rice, and is richer in protein and oil than any other legume, making it an excellent health food. Soy milk is consumed frequently in Cambodia and is preferred over cow milk, however, only 6.6% of infants 6 to 23 months of age are consuming foods made from legumes (CDHS, 2010). Cows milk is expensive in Cambodia and therefore cheese, yoghurt, and other milk products are infrequently consumed (CDHS, 2010).

### *Health Beliefs*

Many Cambodians believe that disease and sickness are caused by some underlying evil spirit that can be expelled from the body (Congress, 2012). Herbal remedies are sometimes used to treat illness and traditional healing practices include scraping the skin with a coin, ring or other small object, spraying water on the sick person and prayer (Congress, 2012). Westernized health facilities are most commonly accessed during illness in both urban and rural populations, with only 5.4% of the population seeking the non-medical sector for health related interventions (CDHS, 2010).

## *Maternal and Child Health in Cambodia*

Mortality rates are highly influenced by urban and rural living. Infant mortality in rural areas is close to three times higher than in urban areas (64 deaths compared to 22 deaths per 1,000 live births) (CDHS, 2010). According to the 2010 Cambodia Demographic and Health Survey (CDHS) approximately one in every 11 deaths of Cambodian women over the last seven years has been a result of pregnancy or pregnancy related issues (CDHS, 2010). The maternal mortality ratio for Cambodia for the period of 2004 to 2010 was 206 (95% Confidence Interval (CI): 124- 288) deaths for every 100,000 live births (CDHS, 2010). Converted to a lifetime risk of dying from maternal causes, the risk of dying is 1 in 165 for all women.

The incidence of diarrhea, anemia, and stunting in Cambodia increases in infants after six months of age when most (88%) have begun to consume complementary foods (CDHS, 2010). According to the most recent CDHS (2010) 23% of children 6 to 23 months of age were reported as having had diarrhea in the two weeks prior to survey administration, compared to only 14% of children less than six months of age (CDHS, 2010). Younger children who were 6 to 11 months of age were more prone to diarrhea than older children who were 12 to 23 months of age (26% vs. 21%, respectively) (CDHS, 2010). Rates of severe and moderate stunting also varied dramatically between infants less than six months of age and children 6 to 23 months of age (16% vs. 42%, respectively) (CDHS, 2010). Approximately 80% of infants 6 to 23 months were reported as being mildly, moderately, or severely anemic. Anemia rates were not given for infants less than six months of age, however, it is well established in the literature that nutritional

birth stores are able to meet an infant's iron requirements until six months of age (K. Dewey, 2003; WHO, 2000).

### *Food Security*

Although Cambodia has been generally food self-sufficient for the past ten years, food security remains a problem for many households. With the exception of Phnom Penh and Battambang, every other province in the country is considered “chronically food-insecure” (WFP, 2007). Food insecurity occurs when people do not have “physical and economic access to sufficient, safe, nutritious, and culturally acceptable food to meet their dietary needs” (UNMP, 2005). In July 2008, a Cambodia based survey found that 1.7 million Cambodians experience food insecurity due to high food prices resulting from the international food price crisis (CDRI, 2008; Klotz, De Pee, Thorne-Lyman, Kraemer, & Bloem, 2008). This number was estimated to reach 2.8 million (roughly 20% of the population) during the lean season (August- November) of the same year (CDRI, 2008; Klotz et al., 2008).

Rural households typically have a poorer diet than urban households and food insecurity is higher in the rural areas (CDRI, 2008). The 2010 CDHS looked at the affects of food security on malnutrition and found that in the under 5 population, 40% were chronically malnourished (stunted), 28% were underweight, 11% were acutely malnourished (wasted), and 55% were anemic (CDHS, 2010). These results were consistent in all provinces. Food insecurity has caused households to adopt harmful coping strategies in order to sustain their livelihoods: reducing total food consumption; increasing intake of starch based staple foods; decreasing the intake of micronutrient rich foods; and selling agricultural land and other household assets (Klotz et al., 2008).

Studies continue to show how these harmful practices can lead to impairments in health, child development, and food security, with lasting negative consequences (CDRI, 2008; K. Dewey, 2003; Klotz et al., 2008; WHO, 2000).

## Infant and Young Child Feeding

The first step to reducing under-five mortality rates and improving child nutrition is through optimal feeding practices (K. Dewey, 2003). According to UNICEF and the WHO, optimal infant and young child feeding implies that mothers are empowered to initiate breastfeeding within the first hour of birth and are continuing to breastfeed exclusively for the first six months of their child's life (Bhutta et al., 2008; K. Dewey, 2003; WHO/UNICEF, 1998). After six months of age, mothers should begin to introduce age appropriate and nutritionally adequate complementary foods (K. Dewey, 2003; WHO/UNICEF, 1998).

### *Micronutrient Birth Stores*

Micronutrient acquisition is essential for all infants under two years of age. During the third trimester of pregnancy, women provide their babies with many essential nutrients that they store until birth. Infants of malnourished mothers are unable to fully benefit from these birth stores as maternal stores of key micronutrients such as iron, vitamin A, vitamin E, and zinc are positively associated with newborn micronutrient status (K. Dewey, 2003; Shah et al., 1987; Shah & Rajalakshmi, 1984; Simmer & Thompson, 1985). Pre-term infants are also unable to fully benefit from maternal micronutrient transfer, and thus, are at higher risk of many micronutrient deficiencies, especially iron since such a high concentration of haemoglobin is required for newborns

(Georgieff & Innis, 2005; Krebs & Hambidge, 2007; Shah et al., 1987; Shah & Rajalakshmi, 1984; Simmer & Thompson, 1985).

For mothers who are iron deficient during pregnancy there are certain protective mechanisms that the body utilizes in an attempt to maximize the amount of iron transferred to the fetus. For example, although iron absorption from foods is increased during pregnancy, women who are iron deficient will have further enhanced absorption so that more iron is available for the fetus (Barrett, Whittaker, Williams, & Lind, 1994). Additionally, greater transport of iron to the fetus is achieved in women who are iron deficient through the up regulation of transport proteins that move iron across the placenta from the maternal to fetal circulation (Gambling et al., 2001). Several longitudinal studies have shown that maternal haemoglobin during pregnancy is positively associated with newborn iron status at birth (Colomer et al., 1990; De Pee et al., 2002; Kilbride et al., 1999; Preziosi et al., 1997).

### *Breastfeeding*

Exclusively breastfeeding a child during the first six months is considered the single most important protective factor against under-five morbidity and mortality (K. Dewey, 2003). Exclusive breastfeeding protects the child against pathogens that can cause diarrhea, infection, and even death. Children who consume no breast milk are almost six times more likely to die by the age of one month than children who have consumed at least some breast milk during their infancy (Daelmans, Martines, Saadeh, Dewey, & Brown, 2003).

Human breast milk contains low concentrations of iron and zinc, however infant birth stores are often able to provide sufficient amounts of these nutrients until six months

of age (K. Dewey, 2003). In infants whose iron birth stores are low, medicinal iron drops are more beneficial than the cessation of exclusive breastfeeding before six months of age (K G Dewey, 2001; K G Dewey et al., 1998). Infant zinc status before six months of age has been shown to have little to do with infant length and weight gain, and thus it is recommended that infants continue to be exclusively breastfed until six months of age (K G Dewey et al., 1998). Breast milk concentration of certain micronutrients such as vitamin A, vitamin D, vitamin B<sub>12</sub>, riboflavin, and vitamin B<sub>6</sub> are dependent on maternal status (K G Dewey, 2001). Similarly, improving diet or providing supplements to mothers who are malnourished is the preferred solution for increasing infant concentration of these vitamins rather than terminating exclusive breastfeeding before six months of age (K G Dewey, 2001). Maternal diet is thought to have little to do with the concentration of other nutrients in breast milk (Black et al., 2008; K. Dewey, 2003; K G Dewey, 2001).

Exclusive breastfeeding for six months along with the introduction of adequate and appropriate complementary foods, zinc, iron and vitamin A supplementation can prevent one third of child deaths (Bryce et al., 2005; Jones et al., 2003). In contrast, non-exclusive breastfeeding during the first six months is estimated to contribute to 1.4 million deaths per year, as well as 10% of the disease burden in children less than five years of age (Black et al., 2008). One study found that no breastfeeding from 6 to 23 months increased the odds of all cause mortality by 3.68 (CI: 1.46-9.29) when compared to any breastfeeding from 6 to 23 months (Black et al., 2008).

Breastfeeding in Cambodia starts to decline after the initiation of complementary foods (CDHS, 2010). One study conducted in Timor-Leste found that breastfeeding in continuation with complementary feeding decreased from 72.4% in the first year (12 to 15

months) to 32.5% in the second year (20 to 23 months) (U Senarath, Dibley, & Agho, 2007).

The rate of exclusive breast-feeding in Cambodia is 60% within the 4 to 6 month age group and the median duration of any breastfeeding is 19.8 months (CDHS, 2005). Similarly, 66% of newborns receive breast milk within the first hour after birth, yet only half of all children continue to be breastfed until two years of age (CDHS, 2010). As a result, complementary foods are introduced into a child's diet too early, often only providing the minimal amount of nutrients needed to sustain development.

### *Complementary Feeding*

Starting at six months, mothers should introduce adequate, safe, and age appropriate complementary foods, while continuing to breast feed for at least two years (Cohen, Brown, Canahuati, Rivera, & Dewey, 1994; K. Dewey, 2003). The key complementary feeding recommendations by the WHO are to give foods that are rich in energy and nutrients, clean and safe, easy to prepare from family foods, and locally available and affordable (WHO, 2000). It is recommended that complementary foods (meals and snacks) be given three times a day to infants who are 6 to 7 months of age, while gradually increasing to five times a day for children who are 12 months of age or older (WHO, 2000). Introducing appropriate complementary foods at four months rather than six months does not result in differences in energy intake, weight gain, and length gain between the two groups, and therefore should be avoided in developing countries (Cohen et al., 1994). Complementary foods need to be given at appropriate times because if initiated too early the child is at greater risk of diarrhea from contaminated foods, and if initiated too late the child is at risk of malnourishment (Cohen et al., 1994).

According to the 2005 CDHS, less than half of all children in Cambodia between the ages of 6 to 23 months are receiving adequate complementary feeding (CDHS, 2005). Inappropriate complementary feeding practices are one of the main causes of malnutrition in young children (K. Dewey, 2003; WHO/UNICEF, 1998). It is well established in the literature that the first two years of life is the “critical window” for promoting optimal growth and lasting health, implying that proper infant and young child feeding is crucial during this period (Cohen et al., 1994; K. Dewey, 2003; Kathryn G Dewey & Adu-afarwuah, 2008). A recent systematic review found that in developing countries, infants between 6 to 23 months of age are at the highest risk of nutritional deficiencies and faltering growth (Kathryn G Dewey & Adu-afarwuah, 2008). Similarly, it is during this time period, also known as the “1000 days”, that reverses in micronutrient deficiencies can occur and physiological and mental delays may not leave a permanent scar.

### Implications of Under Nutrition

Poor nutrition is linked to poverty, impaired child development, and economic decline, thus resulting in many negative consequences at both an individual and population level. Under-nutrition in childhood significantly, and often permanently, reduces cognitive ability as well as physical development (K. Dewey, 2003; WHO/UNICEF, 1998). New studies are beginning to link malnutrition to impaired emotional and behavioral development (Belsky, Moffitt, Arseneault, Melchior, & Caspi, 2010). The total amount of productivity lost as a result of under-nutrition has been estimated to reduce a country’s GDP by at least 2 to 3% annually (WHO, 2008). It was estimated that 50% to 70% of all measles, malaria, diarrhea, and lower respiratory infection cases in 2001 in the developing world were attributable to malnutrition

(Daelmans et al., 2003; WHO, 2002). Over the last decade many researchers have started to view malnutrition as a neglected disease, and have considered safe and adequate access to proper nutrition to be a child's right, with the hopes that such access will not only contribute to equity among individuals, but also economic development within societies (UNICEF, 1990).

### *Diarrhea*

The WHO and UNICEF define diarrhea as having loose or watery stools three times or more per day (UNICEF/WHO, 2009). Diarrhea is caused by infection in the gastrointestinal system through exposure to harmful pathogens (UNICEF/WHO, 2009). Although most cases of diarrhea are mild, acute cases result in significant fluid loss and severe dehydration, that left untreated, can lead to death (UNICEF/WHO, 2009). Children who are undernourished are at greater risk of severe and prolonged episodes of diarrhea (UNICEF/WHO, 2009). These children are also at risk of worsening nutritional status due to decreased appetite that is associated with diarrhea and reduced nutrient absorption (UNICEF/WHO, 2009).

Diarrhea is responsible for 1.5 million deaths per year in children under five years of age in the developing world (UNICEF/WHO, 2009). Each year, diarrhea kills more children than AIDS, malaria, and measles combined (UNICEF/WHO, 2009). Diarrhea is more prevalent in children in the developing world because of the lack of safe drinking water, poor sanitation and hygiene practices, and weakened child immunity due to malnutrition (UNICEF/WHO, 2009).

Appropriate treatment of diarrhea involves the administration of oral rehydration therapy (ORT) (a solution of liquid, salt, and water) to treat the dehydration associated

with diarrhea (UNICEF/WHO, 2009). In 1975 UNICEF and the WHO agreed on a single formula for an oral rehydration solution (ORS) that results in safe and optimal absorption of electrolytes and prevents dehydration among infants with diarrhea. This ORS solution is comprised of four parts (1) 3.5 grams sodium chloride, (2) 2.9 grams trisodium citrate, dihydrate, (3) 1.5 grams potassium chloride, and (4) 20 grams glucose (UNICEF/WHO, 2009). Limited trend data exists on the rates of appropriate treatment of diarrhea, however, data that is available suggests that only 39% of children with diarrhea in developing countries receive the recommended treatment (UNICEF/WHO, 2009).

### *Anemia*

Iron deficiency is the result of long-term negative iron balance in the body and may or may not lead to anemia (UNICEF/WHO, 2001). Iron deficiency anemia (IDA) is defined by UNICEF/WHO as a haemoglobin level below two standard deviations (-2SD) of the distribution mean for haemoglobin in a normal population of the same age and gender living at the same altitude (UNICEF/WHO, 2001). It is expected that 2.5% of people would have IDA in a normal population (UNICEF/WHO, 2001). In other words, IDA represents the extreme lower end of the distribution of individuals who are iron deficient. Similarly, just as iron deficiency can be present without resulting in anemia; anemia can be present from causes other than iron deficiency (UNICEF/WHO, 2001). Haemolysis (the rupturing of red blood cells) caused by malaria, congenital hereditary defects in haemoglobin synthesis, and deficits in vitamin A, B<sub>12</sub>, C, and folic acid can all lead to anemia (UNICEF/WHO, 2001). Blood loss associated with intestinal worms can also result in iron deficiency and anemia (UNICEF/WHO, 2001). Given that anemia is the most common indicator used in screening for iron deficiency, the terms anemia, iron

deficiency, and iron deficiency anemia are often used interchangeably (UNICEF/WHO, 2001). In this paper, the concentration of hemoglobin in blood is used to categorize infants into one of four anemic groups: severe ( $< 7$  grams (g)/deciliter (dl)), moderate (7-9.9 g/dl), mild (10-10.9 g/dl), and normal ( $> 11$  g/dl).

### *Stunting*

In South Asia, the WHO and UNICEF have reported that close to one half of all preschool children suffer from stunting (WHO/UNICEF, 1998). An individual is stunted when they have failed to reach their genetic potential for height (Golden, 2009). As with anemia, an infant is considered stunted if their height is below two standard deviations ( $-2SD$ ) of the distribution mean for height in a normal population of the same age and gender (WHO, 2006). Causes of stunting include intrauterine growth restriction, inadequate nutrition to support infant growth and developmental needs, and frequent infections during infancy (Frongillo, 1999). Stunting is often not diagnosed until three or four years of age, however, stunting commonly begins in utero (Kathryn G Dewey & Begum, 2011). Stunting can occur in utero as a result of maternal under nutrition, tobacco use, and indoor air pollution (Kathryn G Dewey & Begum, 2011).

Stunting is irreversible after two years of age and results in permanent short stature in adult life (Kathryn G Dewey & Begum, 2011). Individuals who are stunted are at greater risk of death, diminished childhood and adult health, and decreased learning capacity and productivity (Kathryn G Dewey & Begum, 2011). Furthermore, maternal stunting is a risk factor for fetal morbidity (Kathryn G Dewey & Begum, 2011). Maternal stunting restricts uterine blood flow and growth of the uterus and placenta, and may cause intrauterine growth restriction (IUGR) (Kathryn G Dewey & Begum, 2011). Infants with

IUGR commonly suffer from delayed neurological and intellectual development, and are often stunted for the duration of their lives, thus continuing the vicious cycle (Kathryn G Dewey & Begum, 2011). Southeast Asia is said to have the highest prevalence of stunting among women of reproductive age with 15.1% stunted in Bangladesh, 14.1% stunted in Nepal, 11.4% stunted in India, and 7.7% stunted in Cambodia (Kathryn G Dewey & Begum, 2011). Therefore, knowing whether current complementary feeding recommendations in Cambodia are effective in preventing stunting is crucial.

## Global Review of the WHO Complementary Feeding Guidelines

### *WHO/UNICEF 1995 Expert Consultation*

In November of 1995, the WHO and UNICEF jointly hosted an expert consultation on “Complementary Feeding of Infants and Young Children” for 35 expert participants in Montpellier, France. To prepare for this meeting, both organizations had asked the International Nutrition Program at the University of California at Davis (USA) to create a detailed and comprehensive review containing all of the relevant scientific literature on complementary feeding that was available to date. This paper would serve as the background document to this expert consultation. The goals of the consultation were to (1) reach a scientific consensus, based on the literature review, that would establish unified programming guidelines that could strengthen existing and future nutrition and feeding interventions, and (2) to determine those areas where research was limited or lacking in order to achieve optimal complementary feeding practices.

An important question addressed at the consultation was the amount of energy needed from complementary foods to ensure optimal infant development. It was identified

that further research was needed on this topic, as many of the studies presented reported contradictory findings and some were based on unreliable data. A key conclusion from the consultation was the need for research on the bioavailability of nutrients from complementary foods.

In 1998, the WHO and UNICEF formally released a joint document:

“Complementary Feeding of Young Children in Developing Countries: A Review of Current Scientific Knowledge” (WHO/UNICEF, 1998). This document was largely developed from the background document, which was presented at the consultation three years prior. The goal of the document was to provide the essential information that was needed to create and enhance intervention programs that focused on infant and young child feeding. This document also created estimates of energy requirements from complementary foods needed for children six months of age and older. Given that energy requirements are different for children of different ages, the document divided infants into three categories based on age: 6 to 8, 9 to 11, and 12 to 23 months. Recommendations were made for infants up to 23 months of age due to the limited research on the amount of energy transferred from breast milk after two years of age. Energy requirements from complementary foods were calculated as the difference in total energy requirements per age group and the amount of energy transferred in breast milk to children in that age group. Recommendations that were presented in this document have been incorporated into many intervention programs and other infant feeding documents, most notably in the WHO manual “Complementary feeding: family foods for breastfed children” (Daelmans, Dewey, & Arimond, 2009; K. Dewey, 2003; WHO, 2000).

### *WHO/UNICEF 2001 Expert Consultation*

To address the new research on complementary feeding that was available since the 1995 consultation, the WHO convened another global consultation for 60 experts in December 2001 in Geneva. The goals of this consultation were to (1) update the current global recommendations for complementary feeding with recent research findings and (2) provide more detailed and precise information on how to implement the recommendations and to create better and more sustainable feeding programs. There was a general consensus that revisions needed to be made to the WHO/UNICEF (1998) document. Specifically, the estimates on energy requirements from complementary foods had to be decreased for children who are expected to consume an average amount of breast milk. These new estimates were 200 kcal/day (previously 269 kcal/day) for infants 6 to 8 months, 300 kcal/day (previously 451 kcal/day) for infants 9 to 11 months and 550 kcal/day (previously 746 kcal/day) for children 12 to 23 months. Meal frequencies were also discussed and recommendations were created on preferred number of meals per day that would maintain breastfeeding frequencies, assuming a nutrient density of 0.8 kcal per gram and low breast milk intake (in order to meet the requirements of most children).

These recommendations were:

- 2 to 3 meals per day for infants 6 to 8 months of age
- 3 to 4 meals per day for infants 9 to 11 months of age and children 12 to 23 months of age
- Additional nutritious snacks may be offered 1 to 2 times a day, as desired by the child.

Participants of the global consultation were able to review and comment on a draft

document written by Kathryn Dewey titled “Guiding Principles for Complementary Feeding of the Breastfed Child” (K. Dewey, 2003). The final version of these guiding principles was published in 2003 and contained many of the updated recommendations that were discussed at the 2001 consultation. The document also commented on the diversity of the complementary food diet. It was recommended that children should eat:

- Meat, poultry, fish, and eggs daily or as often as possible
- Vitamin A rich fruits and vegetables daily
- Diets should have adequate fat content.

These updated guidelines have been the foundation of many infant and young child feeding programs and interventions, and continue to be used today. The WHO has not officially published any other documents on complementary feeding that focus in detail on the defining standards and indicators for appropriate feeding.

#### *Energy Requirement Calculations:*

The recommendations for energy intake that the WHO/UNICEF (1998) document relied on were first presented in 1994 by the International Dietary Energy Consultative Group (IDECG) (WHO/UNICEF, 1998). Unlike the WHO/UNICEF (1998) document, the IDECG broke down energy requirements for children into two groups: 0 to 12, and 12 to 23 months (Butte, 1996; Torun et al., 1996). Measurements on energy requirement were created by using a doubly labeled water method to determine total daily energy expenditure (TEE), and by using the WHO/National Center for Health Statistics (NCHS) growth curves for estimating the energy contents of fat and protein deposited during growth (Kathryn G Dewey & Brown, 2003). The doubly labeled water method uses stable isotopes of hydrogen and oxygen to measure energy expenditure (Coward, Ritz, & Cole,

1994). Subjects ingest these isotopes in the form of water and the elimination of these isotopes is measured through body fluids (Coward et al., 1994). The total carbon dioxide production rate is then calculated by measuring the elimination rates of the labeled oxygen and hydrogen (Coward et al., 1994). By using the respiratory quotient (typically ranging from 0.7 to 1.0) for the food ingested by subjects during the observation period, the carbon dioxide production rate can then be converted into energy expenditure (Coward et al., 1994).

In 2000, Butte et al. published a study that determined total energy requirements derived from longitudinal measurements of total energy expenditure (TEE) (Butte et al., 2000). Similar to the IDECG method, Butte et al. used a doubly labeled water method to determine TEE (Butte et al., 2000). The study found that energy requirements were approximately 80% of the current recommendations made by the WHO/UNICEF (1998) document (Butte et al., 2000).

This study was conducted just as the Food and Agriculture Organization (FAO)/WHO/United Nations University (UNU) were in the process of conducting a formal review of the literature on energy requirements in order to publish a revision of the estimates. The study by Butte et al. used the same longitudinal data sets that the FAO/WHO/UNU group was planning to use to determine energy expenditures by children at different ages. Given that Butte et al. used the majority of the data that were available in the data sets, and that they had already subdivided the children into appropriate age groups and determined the energy requirements for each age group, the FAO/WHO/UNU group published results on total energy requirements based entirely on US longitudinal data that was analyzed in the Butte et al. study (Butte et al., 2000;

Kathryn G Dewey & Brown, 2003). Therefore, daily energy requirement estimates from the FAO/WHO/UNU revision was about 5% to 18% less than the previous WHO/UNICEF (1998) document. These new estimates were used in the document by Kathryn Dewey titled “Guiding Principles for Complementary Feeding of the Breastfed Child” (K. Dewey, 2003).

Given that there was only one new study published on the energy content of breast milk from mothers living in developing countries, and that the results of the study were similar to previous reports, the data were not sufficient to warrant any change in the estimates of breast milk energy intake (Kathryn G Dewey & Brown, 2003).

### *Energy Required from Complementary Foods*

The amount of energy required from complementary foods was calculated in both documents (WHO/UNICEF 1998 and K. Dewey 2003) by subtracting the average energy intake from breast milk at each age by the total energy requirements within that age. Table 1 shows the differences in energy requirements calculated by the WHO/UNICEF (1998) report and the new US longitudinal data that was used in the 2003 document by Dewey (Kathryn G Dewey & Brown, 2003).

Table 1: Energy requirements from complementary foods according to age group\*

Age group (months)	Total energy requirements		Milk energy intake	Energy required from complementary foods	
	WHO/UNICEF (1998)	US Longitudinal Data		WHO/UNICEF (1998)	US Longitudinal Data
	kcal/day				
6-8	682	615	413	269	202
9-11	830	686	379	451	307
12-23	1,092	894	346	746	548

\* Food and Nutrition Bulletin, 2003, by permission (©Kathryn G Dewey & Brown, 2003)

No new research has been done to assess what the preferred number of meals and nutrient density of these meals should be in order to meet the nutritional requirements of infants who continue to breastfeed. For this reason, theoretical calculations have been done to assess the nutrient density required of complementary foods when adjusted for the number of meals per day and the breast milk intake (low, average, high) (table 2).

Table 2: Minimum dietary energy density required to attain the level of energy needed from complementary foods\*

Energy	6 to 8 months			9 to 11 months			12 to 23 months		
	Low BME**	Average BME	High BME	Low BME	Average BME	High BME	Low BME	Average BME	High BME
Total energy required + 2SD (kcal/day)	769	769	769	858	858	858	1,118	1,118	1,118
BME (kcal/day)	217	413	609	157	379	601	90	346	602
Energy required from complementary foods (kcal/day)	552	356	160	701	479	257	1,028	772	516
Minimum energy density (kcal/g)									
1 meal/day	2.22	1.43	0.64	2.46	1.68	0.90	2.98	2.24	1.50
2 meals/day	1.11	0.71	0.32	1.23	0.84	0.45	1.49	1.12	0.75
3 meals/day	0.74	0.48	0.21	0.82	0.56	0.30	0.99	0.75	0.50
4 meals/day	0.56	0.36	0.16	0.61	0.42	0.23	0.74	0.56	0.37
5 meals/day	0.44	0.29	0.13	0.49	0.34	0.18	0.60	0.45	0.30

\* Food and Nutrition Bulletin, 2003, by permission (©Kathryn G Dewey & Brown, 2003)

\*\* BME: Breast Milk Energy Intake

These calculations are based on total daily energy requirements plus two standard deviations (in order to meet the needs of most children) for each age group, and the assumption that both healthy and malnourished infants have a gastric capacity of 30g/kg body weight per day (Kathryn G Dewey & Brown, 2003). Though these tables provide valuable information, the ability to translate this knowledge into recommendations that

are clear and concise to the targeted populations remains a challenge. Currently, the most effective way to achieve this is by assuming low breast milk intake, and by looking at the energy density of meals that is expected to be achieved by most households in the target population, and to recommend the number of meals required to feed a child based on these statistics (table 3).

Table 3: Minimum daily number of meals required to attain the level of energy needed from complementary foods for children with low level of breast milk energy intake\*

Energy density (kcal/g)	Number of meals		
	6 to 8 months	9 to 11 months	12 to 23 months
0.6	3.7	4.1	5.0
0.8	2.8	3.1	3.7
1.0	2.2	2.5	3.0

\* Food and Nutrition Bulletin, 2003, by permission (©Kathryn G Dewey & Brown, 2003)

### *Protein and Micronutrient Requirements from Complementary Foods*

To assess the amounts of protein and micronutrients needed from complementary foods in order to meet nutritional requirements, the WHO/UNICEF (1998) document subtracted the amounts that were provided in breast milk from the recommended nutrient intakes (RNIs) for each age group (6 to 8, 9 to 11, and 12 to 23 months) (WHO/UNICEF, 1998). Information on the amount of nutrients provided in breast milk was obtained through a comprehensive literature review that included studies from 1980 onward in both developing and industrialized countries (WHO/UNICEF, 1998). Studies were included in the review if they provided quantitative information on breast milk consumption or total daily nutrient intake from breast milk (WHO/UNICEF, 1998). The RNIs used in the 1998 document were taken from several different sources. Most of the intakes were based on values from the United Kingdom Department of Health (UKDH, 1991), however, protein

intake was taken from a 1996 IDECG report, folate and iron were taken from the FAO/WHO estimate, and zinc was derived from metabolic study calculations (Butte, 1996; K G Dewey, Beaton, Fjeld, Lönnerdal, & Reeds, 1996; Torun et al., 1996; WHO/UNICEF, 1998). New dietary reference intakes (DRIs) became available after the publication of the WHO/UNICEF (1998) document. The DRIs were published by the US Institute of Medicine and contained recommendations for many micronutrients (Kathryn G Dewey & Brown, 2003). Given the amount and complexity of data available on micronutrient requirements, it remains unclear which recommendation to use for each nutrient (Kathryn G Dewey & Brown, 2003).

## Introduction to the Joint Program for Children, Food Security and Nutrition in Cambodia

### *Background*

In order to understand and address health related issues in maternal and child health, such as food security status, hygiene and sanitation practices, and nutrition in children under five years of age, the Joint Programme (JP) for Children, Food Security, and Nutrition in Cambodia was developed in January 2010. The development of the JP involved extensive consultations with government partners, UN agencies, and other relevant stakeholders. The JP was designed to contribute to the achievement of three of the eight Millennium Development Goals (MDG): (MDG 1) eradicating extreme poverty and hunger, (MDG 4) reducing child mortality, and (MDG 5) improving maternal health (UNDAF, 2010). The MDGs are international development goals that all 193 United Nations member states have agreed to achieve by the year 2015. The overall objective of

the JP is to reduce mortality and under-nutrition among vulnerable populations, including children 0-23 months and pregnant and lactating women.

A first step in meeting these objectives was the initiation of a self-reported cross-sectional survey to document infant caregiver's knowledge and practices related to food security, health, and nutrition. The baseline was conducted in February and March of 2010 with four provinces participating. The survey included a questionnaire that assessed six topics related to nutrition and food security: household characteristics including hygiene and sanitation, maternal nutrition and health, infant and young child feeding practices, knowledge, attitudes and practices (KAP), and household food security; anthropometric measurements including height, weight and mid-upper arm circumference (MUAC) to check for severe acute malnutrition; an oedema check for protein deficiency by trained personnel; and an assessment of haemoglobin levels in all women participants and children 0 to 59 months by finger pricking and the use of a hemocue kit (UNDAF, 2010). The questionnaire component of the survey was based primarily on previously used questions from the CDHS, the Cambodian Anthropometric Survey, and The Good Food for Children Survey as these questionnaires were specifically adapted to Cambodia by UNICEF and the Cambodian Ministry of Health (UNDAF, 2010).

Each caregiver was asked to sign a consent form prior to enrolment in the study. The original survey, which was created in English, was translated into the local language, Khmer, and then back-translated. A pre-test was conducted to identify questions that were open to different interpretations according to cultural groups, and revisions were made as necessary. Individuals were recruited as survey enumerators if they had previous experience with surveys in Cambodia. All enumerators attended a three-day training

session that focused on familiarizing staff with the survey material and provided hands on training in anthropometry.

### *Intervention*

The JP survey was given to two intervention provinces: Svay Rieng, and Kampong Speu and two comparison provinces: Takeo and Prey Veng. Once the baseline survey was completed, the intervention provinces received an integrated comprehensive package of nutrition and food security interventions that is currently being administered through government health services and existing community agencies in the areas of education, agriculture, food security, and nutrition (UNDAF, 2010). The intervention includes the implementation of a nationwide comprehensive Behavior Change Communication (BCC) plan comprising mass media, interpersonal communication and social mobilization for breastfeeding, complementary feeding, and iron and folic acid supplementation during pregnancy and in the post-partum period (UNDAF, 2010). This intervention will continue until 2013, after which the survey will be repeated to determine whether there were any significant differences in the health of children under five years of age who lived in the intervention provinces and received the comprehensive nutrition intervention when compared to children who lived in the control provinces and did not

### *Survey Design*

To determine total nutrient density of complementary foods, the JP used an itemized food questionnaire that asked caregivers what foods were given to their children the day before. This itemized questionnaire is different from others that have assessed dietary intake in children in many ways (UNDAF, 2010). First, easily understood forms of measurements (such as bowls and spoons) were used to evaluate the quantity of food

consumed. Second, caregivers were asked about the consistency of porridges that were given to children so that estimates could be made on the nutrient density of these foods.

To determine diarrhea status, caregivers were asked whether their child had diarrhea, defined as loose stools three or more times a day, in the last two weeks. To determine anemia status, hemocue kits with finger pricking were used to quantitatively assess the amount of haemoglobin in blood. Infants were categorized into four groups on the basis of anemia status: (1) severe anemia [ $< 7$  gram (g)/deciliter (dl)], (2) moderate anemia [7-9.9 g/dl], (3) mild anemia [10-10.9 g/dl], and normal [ $>10.9$  g/dl]. All infants had their weight, height/length, and mid upper arm circumference (MUAC) measured by trained personnel.

### *Participants*

The project aims to address under-nutrition in children who are within the 0 to 5 years age bracket. As the JP will last for a total of three years, children at 12 to 36 months of age were selected for inclusion. The survey was directed to female caregivers, as their individual practices are most predictive of household food characteristics in developing countries (UNICEF, 2007). In order for a household to be eligible to participate in this study, there had to be a female caregiver with a child between the ages of 12-36 months living in the same household. Once a household was eligible for inclusion in the survey, information was collected on all children under 5 years of age in the household. Hence, the study population consisted of women caregivers of children who were 12-36 months of age and all children under the age of 5 years who reside in the same household as the caregiver. There were no exclusion criteria for the study.

## Sample Size

Sample size for the JP survey was based on the variable of interest that required the largest number of participants in order to have sufficient power to detect a clinically meaningful difference between the control and intervention group. Table 4 shows the sample size needed in order to detect varying differences in several variables of interest.

Table 4: Sample size calculations for variables of interest by the JP

INDICATOR	AGE GROUP	BASELINE % (P1)	ENDLINE % (P2)	CHANGE %	SAMPLE SIZE (n)
Underweight*	12-36 mo	30	22	8	736
Wasting*	12-36 mo	10	5	5	679
Stunting*	12-36 mo	40	30	10	556
Anemia infants**	12-17 mo	60	50	10	611
Anemia mothers**	WRA***	47	37	10	580
Early initiation of Breastfeeding**	Under 5 yrs	35	50	15	262
Exclusive breastfeeding 4-5 mo**	Under 36 mo	45	60	20	268
Mother's BMI**	15-49 yrs	20	15	5	1420

\*Baseline prevalence from the Cambodian Anthropometric Survey (2008)

\*\*Baseline prevalence from the Cambodian Demographic Health Survey (2005)

\*\*\*WRA = Women of Reproductive Age (15-49 yrs)

Within the target age group (12-36 months), the prevalence of underweight in participating provinces was ~ 30% prior to the study onset. In order to detect a decrease of 8% between baseline and end-line, a total of 736 participants would be required per group (intervention and control) with alpha = .05 and beta = .80. To compensate for non-response, missing data and possible errors in data entry this number was increased by approximately 10% to 800, for a total sample size of 1600 children between 12-36 months of age.

### *Selection Methods:*

Households were randomly selected to participate in the survey through a two-stage stratified cluster design in which the first stage of sample selection consisted of clusters (villages) being selected with probability-proportionate-to-size (PPS), and the second stage consisted of choosing a constant number of households (25) from within each cluster. Clusters were stratified based on urban and rural designation, and the number of urban and rural clusters selected for participation in the survey was determined by the rural-urban distribution in each province. A total of 32 clusters were selected from each province, and within each cluster, 25 households were selected to participate in the study (UNDAF, 2010). Households with a child in the target age group were identified through village lists, and random selection methods were used to select these target households.

## Literature Review:

### Complementary Feeding Guidelines

Cambodia's complementary feeding guidelines were extracted from the countries unpublished infant and young child feeding policy (table 5). The rationale for these guidelines can be found in the guiding principles document on complementary feeding (K. Dewey, 2003).

Table 5: Cambodia's current complementary feeding guidelines\*

Age	Texture	Frequency	Amount at each meal
6 month	Start with thick enriched Borbor**, well mashed foods, e.g. mashed cooked banana, sweet potato, pumpkin, etc.	Start foods 2 times per day plus frequent breastfeeds at least 8 times per day	Start with 2-3 tablespoonfuls per feed
7-8 months	Thick enriched Borbor**, well mashed foods,	Increasing to 3 times per day plus frequent breastfeeds at least 8 times per day	Increasing gradually to 1/2 of Chan Chang Koeh*** at each meal
9-11 months	Thick enriched Borbor**, finely chopped or mashed foods, and foods that baby can pick up	3 meals plus 1 snack between meals plus breastfeeds at least 6 times per day	Increasing gradually to 1 Chan Chang Koeh***
12-23 months	Family foods, chopped or mashed if necessary, thick enriched Borbor**	3 meals plus 2 snacks between meals plus breastfeeds as the child wants, at least 3 times per day	1 Chan Chang Koeh***
<b>If baby is not breastfed, give in addition 1-2 extra meals per day.</b>			

\* Extracted from the unpublished Cambodia Infant and Young Child Feeding Policy

\*\*Borbor: plain rice porridge

\*\*\*Chan Chang Koeh: bowl

### Rationale for Cambodia's Complementary Feeding Guidelines

Complementary foods are to be given at six months of age, and not sooner as previously recommended, as several studies have shown improved health status in infants

from developing countries that initiate complementary feeding at 6 rather than 4 months. Cohen et al. (1994) performed a randomized intervention study in Honduras and found that infants of primiparous mothers who initiated complementary feeding at four months rather than six months of age had no difference in total energy intake and infant weight or length gain (Cohen et al., 1994). In this study, it was concluded that there are no benefits of introducing complementary foods before six months of age, although there are many potential risks (Cohen et al., 1994). These risks include contamination from complementary foods that can lead to disease and death. Furthermore, complementary foods may not meet infant nutritional needs, whereas breast milk can meet the needs of almost all children, including malnourished children, until six months of age in the developing world (K. Dewey, 2003). A systematic review by Kramer and Kakuma (2004) reviewed 20 independent studies from the developed (11) and developing (9) world and found that neither the trials nor the observational studies suggested that infants who received complementary foods at six months of age rather than sooner had deficits in weight or length gain (Kramer & Kakuma, 2004). Concerns regarding the introduction of complementary foods at six months include the potential risk of zinc deficiency and iron deficiency anemia, especially in preterm infants who have low iron stores, and concerns regarding the higher incidence of food allergies among infants who begin complementary feeding later in life (Fewtrell, Wilson, Booth, & Lucas, 2011). However, studies have found that premature infants, who are thought to have low iron stores, benefit more from receiving medicinal iron drops than from early initiation of complementary feeding (K G Dewey et al., 1998; Domellöf et al., 2001). Furthermore, although the zinc concentration of human milk is known to be relatively low, the bioavailability is high and no studies

have shown that zinc limits growth before six months of age (K. Dewey, 2003). Although some studies have suggested that the risk of allergies in infants is higher in those who consume complementary foods later in life, there have been no studies that show this relationship in infants from the developing world (Symon & Bammann, 2012).

Thick consistency (high viscosity) of complementary foods was also included as a recommendation in Cambodia's complementary feeding guidelines. Given that borbosor, a plain rice porridge, is fed to all infants in Cambodia who are beginning to transition to family foods, recommendations are given for a thick consistency porridge as it is believed that a thicker consistency is the result of less water dilution and thus translates to a more energy dense meal. After the WHO/UNICEF (1998) publication on complementary feeding recommendations for infants in the developing world, there were several studies that examined how the viscosity of complementary foods affects the total energy intake of infants. One study looked at whether there would be a difference in the amount of food consumed or the total energy intake at a meal if children were given either a low viscosity local maize porridge (energy density: 0.6 to 1.1 kcal/g) or a similar porridge (energy density: 1.0 to 1.3 kcal/g) that was fortified with  $\alpha$ -amylase, a salivary enzyme, in order to maintain a low viscosity (den Besten, Glatthaar, & Ijsselmuiden, 1998). The study found that although children consumed roughly 6% less of the energy dense porridge with  $\alpha$ -amylase, their total energy intake from the meal was 24% more than infants who consumed regular porridge (den Besten et al., 1998). Another study looked at whether there was a difference in food and energy intake when children were given either a low or high viscosity porridge that contained either 0.6 kcal/g or 1.1 kcal/g (Bennett et al., 1999). Results were similar to the previous study in that children

consumed significantly more of the low-energy-density diets (both high and low viscosity); however, their total energy intake was significantly higher from the high-energy-density, low viscosity diet. There were no significant differences in energy intake from the high energy density, high viscosity diet and low energy density, low viscosity diet, suggesting that the best preparation choice for infants should be high energy density and low viscosity (Bennett et al., 1999). One flaw of the Bennett et al (1999) study was that none of the infants were being breastfed; therefore more research is needed to determine what the relationship is between energy intake from high or low energy density meals and frequency of breastfeeds. A study by Vieu et al. also found that infants 6 to 10 months of age who were given either an unmodified gruel, or one of three higher energy modified gruels (modification was based on gruels being progressively sweeter), consumed significantly more of the lower energy gruel (Vieu, Traoré, & Trèche, 2001). As with the previous studies, however, the infants who consumed the higher energy gruels had about a 40% increase in total energy intake, despite lower amounts of the gruel being consumed (Vieu et al., 2001). As expected, Vieu et al. found that consumption of the higher energy gruel was also related to sweetness, with intake being progressively higher for the sweetest gruels (Vieu et al., 2001). All three studies provide consistent results and show that the amount of food consumed by infants is related to the energy density of the complementary foods, and that infants consume greater amounts of low energy density foods (Bennett et al., 1999; Vieu et al., 2001; den Besten et al., 1998). However, these studies also show that despite lower amounts of high energy density complementary foods being consumed by infants, total energy intake is increased when the energy density of complementary foods are high, and intakes of these high-density foods increases with

added sweetness. Although only one of the studies looked at viscosity independently, it found that low viscosity foods increased the total food intake from infants (Bennett et al., 1999). The WHO/UNICEF (1998) document did not provide consistent recommendations with regards to viscosity of complementary foods, however, in light of this new study, there is greater evidence to suggest that reducing the viscosity of high-energy-density complementary foods will increase the amount consumed and energy intake of these complementary foods. The most important thing to note from these findings is that promoting high energy density meals for infants will result in greater total energy intake only if these meals have a low viscosity (Bennett et al., 1999). To my knowledge, no other studies have looked at viscosity independent from energy density of meals. Therefore, Cambodia's current recommendation to feed infants porridges with a high viscosity may not result in increased energy intake and decreased rates of malnutrition.

One final issue to consider is how much breast milk is displaced as a result of introducing complementary foods into an infant's diet. Infants are known to self regulate their nutrient intake to meet their needs. This means that infants reduce their breast milk intake almost proportionately to the amount of complementary foods they are given, regardless of whether caregivers maintain the number of breastfeeds. Age has been shown to be a factor in estimating how much complementary foods displace breast milk intake (WHO/UNICEF, 1998). One study found that for infants six months of age, each kilocalorie consumed from complementary foods displaced approximately 0.6 to 1.7 kcal from breast milk (WHO/UNICEF, 1998). After six months of age, the proportion was lower in that every kcal consumed from complementary foods displaced 0.3 to 0.4 kcal from breast milk (WHO/UNICEF, 1998). The tradeoff between increasing

complementary foods and decreasing breast milk intake is inevitable; therefore recommendations on the frequency of meals should be made with a region's expected nutrient density of complementary foods in mind. Maintaining breast milk intake also provides other health benefits as it contains protective factors that prevent disease and infection (Goldman, 1977). Few studies have been conducted to date that examine how complementary feeding practices displace breast milk intake. However, one study in Nigeria found that although infants who were fed a high energy density porridge ate a smaller amount of complementary foods, they maintained breastfeeding frequency (Kathryn G Dewey & Brown, 2003). Another study looking at an intervention program in Guatemala that promoted feeding infants five meals per day found that, for certain ages, it caused a significant reduction in the time spent on breastfeeding, likely reducing total breast milk intake (Kathryn G Dewey & Brown, 2003). Although there is limited research on this topic, these two studies suggest that rather than promoting an increase in meal frequency, it may be more beneficial to promote fewer, high-energy meals, in order to maintain breastfeeding frequency.

### Effectiveness of Cambodia's Complementary Feeding Guidelines

To my knowledge, no studies have looked at whether Cambodia's complementary feeding guidelines lead to an increase in dietary diversity or are effective at predicting better health outcomes in infants. However, there have been several studies, which I have described in the preceding paragraphs, looking at the WHO indicators on infant and young child feeding and whether these indicators predict better health outcomes in infants 6 to 23 months of age.

In 2007 the WHO Global Consensus Meeting on Indicators of Infant and Young Child Feeding was held from November 6 to 8. During this meeting, experts on infant feeding practices convened and developed a set of 8 core and 7 optional simple, valid, and reliable indicators for assessing infant and young child feeding practices that can be derived from household survey data. These indicators are meant to be used for (1) assessing national and sub national feeding practices and describing trends over time, (2) targeting populations at risk and helping to make decisions about resource allocation, and (3) monitoring and evaluating programs that are in place (UNICEF/WHO, 2007a). These indicators were not designed to be translated into caregiver messages for improved infant and young child feeding practices, therefore, it is expected that these indicators will not represent exactly what has been adapted for each countries complementary feeding guidelines. Rather, each country's complementary feeding recommendations are to be derived from the guiding principles document by Dewey (2003). The main purpose of these indicators is to reflect population-level progress towards optimal feeding practices (UNICEF/WHO, 2007a).

The core indicators are:

- (1) Early initiation of breastfeeding: proportion of children born in the last 24 months who were put to the breast within one hour of birth
  - a. Based on historic recall
- (2) Exclusive breastfeeding under 6 months of age: proportion of infants 0 to 5 months of age who are fed exclusively with breast milk

- a. Exclusive breastfeeding requires infants to receive breast milk (including milk expressed or from a wet nurse) and allows infants to receive ORS, and vitamin or mineral drops, syrups, or medicines.
- (3) Continued breastfeeding at one year: proportion of infants 12 to 15 months of age who are fed breast milk
- (4) Introduction of solid, semi-solid, or soft foods: proportion of infants 6 to 8 months of age who receive solid, semi-solid, or soft foods
- (5) Minimum dietary diversity: proportion of children 6 to 23 months of age who receive foods from four or more food groups
- a. Food groups are: (1) grains, roots, and tubers, (2) legumes and nuts, (3) dairy products, (4) flesh foods, (5) eggs, (6) vitamin A rich fruits and vegetables, and (7) other fruits and vegetables.
  - b. So long as the item is not used as a condiment, any quantity of each food group is sufficient.
- (6) Minimum meal frequency: proportion of breastfed and non-breastfed children 6 to 23 months of age who receive solid, semi-solid, or soft foods the minimum number of times or more per day.
- a. Breastfed children 6 to 8 months of age should consume a minimum of 2 meals per day (including snacks)
  - b. Breastfed children 9 to 23 months of age should consume a minimum of 3 meals per day (including snacks)
  - c. Non breastfed children 6 to 23 months of age should consume a minimum of 4 meals per day (including snacks)

- (7) Minimum acceptable diet: proportion of children 6 to 23 months of age who receive a minimum acceptable diet (not including breastfeeds)
- a. Calculated by combining the proportion of children 6 to 23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day, divided by the total number of children 6 to 23 months of age
- (8) Consumption of iron rich or iron-fortified foods: proportion of children 6 to 23 months of age who receive an iron rich or iron fortified food that has been designed for infants or has been fortified at home.
- a. Flesh foods are a suitable iron fortified food

Several studies have examined whether adhering to these indicators has resulted in decreased rates of malnutrition. One study compared the most recent demographic health survey data from 14 low- income countries, including Cambodia, to examine whether following the IYCF indicators was associated with reduced odds of being stunted and underweight (Marriott, White, Hadden, Davies, & Wallingford, 2011). It found that meeting the IYCF indicator for dietary diversity paired with high maternal education was associated with a lower odds of being stunted (OR: 0.69, CI: 0.61, 0.77), and being underweight (OR: 0.74, CI: 0.66, 0.84) (Marriott et al., 2011). Infants who met the minimum acceptable diet indicator and were from a family with high maternal education were also less likely to be stunted (OR: 0.83, CI: 0.74- 0.94) (Marriott et al., 2011). However, these associations were not found in infants whose caregivers had low maternal education. This study also found that feeding frequency was not associated with a lower

probability of being underweight or stunted, and suggested that perhaps recommendations on dietary diversity should be emphasized more rather than recommendations on feeding frequency (Marriott et al., 2011). Another Cambodia based study used data collected from the 2000 and 2005 CDHS and obtained information from the youngest child in the household under the age of 23 months (Marriott, White, Hadden, Davies, & Wallingford, 2010). In total, 956 and 1104 infants 6 to 23 months of age were available for analysis from the 2000 and 2005 CDHS, respectively (Marriott et al., 2010). The study tested whether following the eight core WHO feeding indicators had an association with decreased rates of stunting and underweight among infants 0 to 23 months of age (Marriott et al., 2010). This study found that compliance to the WHO feeding indicator for minimum acceptable diet in infants 6 to 23 months of age, minimum dietary diversity, and minimum feeding frequency was not significantly associated with lower probabilities of stunting or underweight based on either the 2000 or 2005 data obtained from the CDHS (Marriott et al., 2010). Marriott et al (2010) also found that compliance with all of the 8 core indicators did not result in significant differences in the rate of stunting or underweight in either the 2000 or 2005 CDHS population. Cambodia's current complementary feeding guidelines give recommendations based on feeding frequency rather than dietary diversity, therefore, it is still unclear whether these guidelines should be revised to include recommendations on dietary diversity rather than frequency of meals and snacks given to the child. Furthermore, Cambodia's complementary feeding guidelines do not include recommendations on the consumption of iron-fortified foods or other micronutrient supplements. Rather, the recommendations are based entirely on feeding infants family foods. A study by Vosenaar and Solomons

(2012) looked at the nutritional adequacy of the diet of Guatemalan children ages 6 to 23 months who were continuing to receive breast milk and “family foods” rather than specially formulated baby foods as complementary foods (Vossenaar & Solomons, 2012). The purpose of the paper was to examine whether family foods could provide the nutritional requirements of infants 6 to 23 months of age, and whether it is feasible for caregivers to completely bypass specially formulated infant foods (such as iron fortified foods, or foods with micronutrient supplementation) and proceed directly to family foods (Vossenaar & Solomons, 2012). The authors used a “best-case scenario” approach, meaning they selected family food menus with the highest nutrient density from caregivers, and determined whether the nutritional composition of these family foods were adequate to meet the needs of infants from poor urban and rural households in Guatemala (Vossenaar & Solomons, 2012). The authors speculated that even if some caregivers from poor urban and rural areas were providing infants with these “best-case scenario” menus, then creating recommendations for these foods at a population level would be feasible. The study found that these family foods provided adequate nutrient density for protein, thiamin, riboflavin, and vitamins B-6, B-12 and C (Vossenaar & Solomons, 2012). However, these diets were not adequate in meeting infants’ Vitamin A, calcium, and folate requirements (Vossenaar & Solomons, 2012). Furthermore, foods that had both a high and low bioavailability of zinc and iron were also unable to meet the nutritional requirements of infants (Vossenaar & Solomons, 2012). As a result, family foods were found to fall short of meeting the full nutritional requirements of children 6 to 23 months of age, suggesting that there is in fact a need for home fortification or pre-

fortified complementary foods, with specific emphasis on calcium, zinc, and iron (Vossenaar & Solomons, 2012).

### **Study Contribution:**

To address the above gap, I will test whether or not adherence to Cambodia's current complementary feeding recommendations are predictive of better health outcomes in children 6 to 23 months of age. My research will therefore determine whether the recommendations are effective in promoting adequate infant and young child feeding practices in Cambodia. My study will also report the caregiver adherence rate to Cambodia's complementary feeding guidelines and will examine whether adherence to these guidelines results in increased dietary diversity and decreased rates of diarrhea, anemia and stunting among infants 6 to 23 months of age. This in turn will assist policy makers to decide whether revisions need to be made to the guidelines.

# Question 1: Does Adhering to Cambodia's Complementary Feeding Guidelines Result in Better Health Outcomes?

## Introduction

Cambodia is a small country of 181,035 square kilometers divided into 24 provinces and four municipalities (CDHS, 2010). Despite a significant amount of arable land in Cambodia, as well as the fact that the agricultural sector provides more than 40% of the country's total Gross Domestic Product (GDP), Cambodia continues to have one of the highest rates of child under-nutrition in the world and was recently listed as one of 36 countries to account for 90% of all stunted children worldwide (Black et al., 2008). In spite of marginal improvements in the nutritional status of women and children within the last decade, under-five child mortality continues to be high at 54 per 1000 live births (CDHS, 2010). Out of every 1,000 babies born in Cambodia, 45 do not survive to their first birthday (CDHS, 2010).

Exclusive breastfeeding for six months followed by a) the introduction of adequate and appropriate complementary foods, b) supplementation with zinc, iron and vitamin A and c) continuation of breastfeeding until two years of age can prevent one third of child deaths (Bryce et al., 2005; Jones et al., 2003). When exclusive breastfeeding ceases, and children are introduced to family foods, they enter a period of vulnerability. These foods may pose threats such as contamination, and often times, do not meet the energy and micronutrient requirements of the child (K G Dewey et al., 1998; K. Dewey, 2003). Malnutrition that is left untreated during the first two years of life can cause physiological and cognitive delays that are irreversible. Appropriate

complementary feeding can prevent malnutrition in infants under two years of age, therefore, understanding whether adherence to Cambodia's complementary feeding guidelines is associated with improved feeding practices and the prevention of diarrhea, anemia, and stunting is crucial (K. Dewey, 2003; WHO/UNICEF, 1998).

The incidence of diarrhea, anemia, and stunting in Cambodia increases in infants after six months of age when most (88%) have begun to consume complementary foods (CDHS, 2010). According to the most recent Cambodia Demographic and Health Survey (CDHS) 23% of children 6 to 23 months of age were reported as having had diarrhea in the two weeks prior to survey administration, compared to only 14% of children less than six months of age (CDHS, 2010). Younger children who were 6 to 11 months of age were more prone to diarrhea than older children who were 12 to 23 months of age (26% vs. 21%, respectively) (CDHS, 2010). Rates of severe and moderate stunting also varied dramatically between infants less than six months of age and children 6 to 23 months of age (16% vs. 42%, respectively) (CDHS, 2010). Approximately 80% of infants 6 to 23 months were reported as being mildly, moderately, or severely anemic. Anemia rates were not given for infants less than six months of age, however, it is well established in the literature that nutritional birth stores are able to meet an infant's iron requirements until six months of age (K. Dewey, 2003; WHO, 2000).

According to the 2005 CDHS, less than half of all children in Cambodia between the ages of 6 to 23 months are receiving adequate complementary feeding (CDHS, 2005). Inappropriate complementary feeding practices are one of the main causes of malnutrition in young children (K. Dewey, 2003; WHO/UNICEF, 1998). The first two years of life are the "critical window" for promoting optimal growth and lasting health,

implying that proper infant and young child feeding is crucial during this period (Cohen et al., 1994; K. Dewey, 2003; Kathryn G Dewey & Adu-afarwuah, 2008). A recent systematic review found that in developing countries, infants between 6 to 23 months of age are at the highest risk of nutritional deficiencies and faltering growth (Kathryn G Dewey & Adu-afarwuah, 2008). Similarly, it is during this time period, also known as the “1000 days”, that reverses in micronutrient deficiencies can occur and physiological and mental delays may not leave a permanent scar.

Cambodia’s complementary feeding guidelines are adapted from Kathryn Dewey’s guiding principles document on complementary feeding (K. Dewey, 2003). The Ministry of Health in Cambodia created guidelines for four different age groups (6 months, 7-8 months, 9-11 months, and 12-23 months) in order to meet the unique energy requirements of growing children who are 6 to 23 months of age. Within each age group, the complementary feeding guidelines provided recommendations on five variables: (1) total number of breast feeds per day, (2) total number of meals per day, (3) total number of snacks per day, (4) total amount of food eaten per day, measured in bowls and (5) consistency of porridges (table 6). The objective of our study was to determine whether caregiver adherence to at least 80% of Cambodia’s complementary feeding guidelines was predictive of better health outcomes in infants 6 to 23 months of age.

## METHODS

We conducted a cross sectional study, using data collected for the Joint Program (JP) for Children, Nutrition and Food Security in Cambodia to determine whether children whose mothers followed at least 80% of Cambodia’s complementary feeding guidelines had better health outcomes than children whose mothers did not. Better health

outcomes were defined as less likely to have had diarrhea in the last two weeks, less likely to have been anemic, and less likely to have been stunted when the survey was taken.

### *Participants*

Our sample included all caregivers who were included in the original JP questionnaire whose youngest child was between the ages of 6 to 23 months of age. An exclusion criterion was a negative answer to question 70 of the food questionnaire: “Was this a typical day’s food intake for the child.” The survey contained information on 835 children between the ages of 6 to 23 months (figure 1). Of these 835 children, 84 cases were excluded because the data was either not representative of a typical day’s food intake (n=76) or missing (n=8). One caregiver did not report on the number of meals and/or snacks her child had the previous day, and there were three instances of data entry error. One of the instances of data entry error occurred when looking at total bowls of food. One child was reported as receiving “0” bowls of food, however, the survey was designed to only account for answers that state “less than 1/2 a bowl” indicating an error on the part of either the survey administer or data entry personnel. Because we cannot be sure what the number “0” implies in this situation, we eliminated this case from the analysis. Two cases of data entry error were because of unreliable Z-scores. The WHO classifies Z-scores of  $> 6SD$  or  $< -6SD$  as too extreme, and therefore, unreliable. All missing cases and cases of unreliable data entry were removed from the analysis, giving us a total study population of 747.

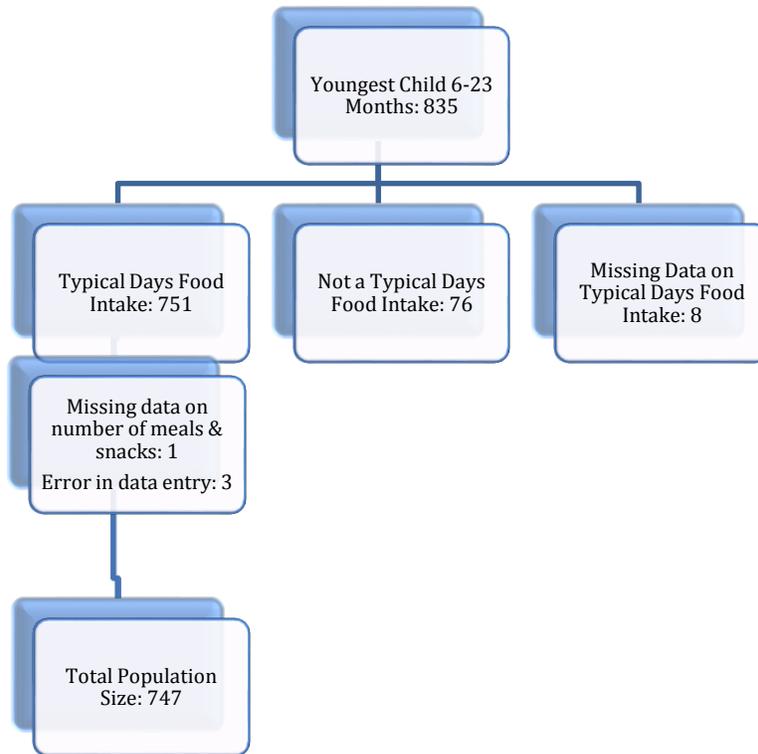


Figure 1: Flow of participants in the study

We looked at information from 747 children aged 6-23 months in four different provinces in rural Cambodia. Each child was the youngest child in the household and no more than one child from each household was selected for our research. We chose to analyze data on the youngest child from each household because of the different feeding practices and attentions that are typically given to the last born child in a household. The last born child in a household is the most vulnerable for a variety of reasons including the greater amount of attention required during feeding times and their inability to communicate what they want and require effectively (K. Dewey, 2003). Furthermore, we were able to limit the effect of recall bias by asking breast-feeding related questions regarding the youngest, and therefore, most recently breast-fed child.

Information on infant and young child feeding practices, anthropometric measurements, and haemoglobin concentration was collected through a cross sectional

survey administered by the JP for Children, Nutrition and Food Security in Cambodia. The JP was developed in January 2010 in order to understand and address health related issues in maternal and child health, such as food security status, hygiene and sanitation practices, and nutrition in children less than five years of age.

All data was entered into and analyzed using Predictive Analytics Software Statistics (PASW) 18 (formerly SPSS). A copy of the survey can be found in appendix 2. We combined question 61 of the survey (How many times did you breastfeed (NAME) last night between sunset and sunrise?) and question 62 (How many times did you breastfeed (NAME) yesterday during the daylight hours?) to measure the total number of breastfeeds per day for each child. To test the validity of the responses, we crosschecked our new variable for total number of breastfeeds per day to question 59 (Are you still breastfeeding (NAME)?). All caregivers who answered “No” to question 59 should have been categorized as a missing case in our new variable; this turned out to be the case. We then recoded all of the missing values as 0, indicating that they had been breastfed 0 times in the last 24 hours. It is unclear in the survey whether questions 61 and 62, which address the number of times an infant was breastfed the previous day, also takes into account whether the mother supplied her breast milk through manual pumps. However, given the study population, and the accessibility of these types of tools in the communities that were targeted, we can assume that infants who were reported as not being breastfed had received no breast milk.

For every complementary feeding recommendation, each caregiver was given either a score of 1 (complying) if they met at least 80% of the recommendation for that category or 0 (not complying) if they did not. Caregivers who received a final score of 5,

indicating that they had complied with at least 80% of each recommendation, were then classified as Adhering whereas all other caregivers were categorized as Not Adhering. Given that increased snacking has been shown to actually hinder optimal child growth by (1) providing empty calories and (2) resulting in lower food intake during meals (which are typically more nutritious), we considered caregivers of infants who over-snacked by more than 50% of the current recommendations as not complying with the guidelines. Furthermore, the recommendations encourage caregivers who give their infants borbor sor (plain porridge) to ensure that the porridge is of a thick consistency. With 100% of children consuming borbor sor as a staple, caregivers needed to have responded that their children were receiving porridge of thick consistency in order to have been considered adhering. Once all infants in each age group were categorized as having caregivers who were either adhering or not adhering to the current complementary feeding recommendations, we collapsed all groups so that the independent variable was binary (adhering, not adhering).

Table 6: Complementary feeding guidelines for typical days food intake vs. 80% of typical days food intake

Age (months)	Frequency of Breast Feeding	80% Frequency of Breast Feeding	Number of Meals	80% Number of Meals	Number of Snacks	80% Number of Snacks	Total Bowls Consumed	80% Total Bowls Consumed
6	8	6	2	2	0	0	< ½	< ½
7-8	8	6	3	2	0	0	1 ½	1
9-11	6	5	3	2	1	1 to 2	3	2
12-23	3	2	3	2	2	2 to 3	3	2

To determine diarrhea status, caregivers were asked whether their child had diarrhea, defined as loose stools three or more times a day, in the last two weeks. To

determine anemia status, hemocue kits with finger pricking were used to quantitatively assess the amount of haemoglobin in blood. Infants were categorized into four groups on the basis of anemia status: (1) severe anemia [ $< 7$  gram (g)/deciliter (dl)], (2) moderate anemia [7-9.9 g/dl], (3) mild anemia [10-10.9 g/dl], and normal [ $>10.9$  g/dl]. All infants had their weight, height/length, and mid upper arm circumference (MUAC) measured by trained personnel (UNDAF, 2010). Stunting was determined by Z-score values, which we calculated from the WHO Child Growth Standards software for PASW 18, and divided into the three stunting categories identified by the WHO: (1) severe stunting [ $>-3$  standard deviations (SD)], (2) moderate stunting [ $-2$  to  $-2.9$  SD] and (3) normal height for age [ $>-2$  SD] (Frongillo, 1999).

To assess whether infants of caregivers who adhered to 80% of Cambodia's complementary feeding guidelines were less likely to have had diarrhea in the previous two weeks, we performed a binary logistic regression. In order to assess whether these infants were less likely to have had anemia or to have been stunted we performed a multinomial logistic regression. The results of the regression are presented as odds ratios with 95% confidence intervals. Change in the odds ratio of 10% with the addition of each variable tested individually as a confounder in the model resulted in the retention of that variable (Steingart, Cotterchio, Kreiger, & Sloan, 2003). The following variables were tested as potential confounders:

- (1) Total number of people living in household (Q6)
- (2) Total years of schooling caregiver has completed (Q13)
- (3) Highest level of education caregiver attended (Q14)
- (4) Caregiver as main income earner in household (Q22)

(5) Are you still breastfeeding (NAME) (Q59)

(6) Household food security status

## Sample Size

In the most recent CDHS (2010) report, 23% of infants 6 to 23 months of age were identified as having had diarrhea in the two weeks prior to survey administration. Therefore to detect a relative reduction of 20% in the rate of diarrhea among infants 6 to 23 months of age whose caregivers did and did not adhere to Cambodia's complementary feeding guidelines, with a power of 0.8, alpha of 0.05 and performing a one sided test we would need a sample size of 491 infants in each group.

In the most recent CDHS (2010) report, 80% of infants 6 to 23 months of age were identified as being anemic. Therefore to detect a relative reduction of 20% in the rate of anemia among infants 6 to 23 months of age whose caregivers did and did not adhere to Cambodia's complementary feeding guidelines, with a power of 0.8, alpha of 0.05 and performing a one sided test we would need a sample size of 45 infants in each group.

In the most recent CDHS (2010) report, 30% of infants 6 to 23 months of age were identified as being stunted. Therefore to detect a relative reduction of 20% in the rate of stunting among infants 6 to 23 months of age whose caregivers did and did not adhere to Cambodia's complementary feeding guidelines, with a power of 0.8, alpha of 0.05 and performing a one sided test we would need a sample size of 345 infants in each group.

## Results

None of the confounders tested resulted in a change in the odds ratio of 10% or greater; therefore, we reported unadjusted odds ratios. In total, information on 747 infants between the ages of 6-23 months was available for the analysis. Of these 747 infants, 223 were reported as no longer being breastfed and 44 had never been breast-fed. All caregivers answered yes to question 65 (Has (NAME) started receiving semi-solid or mushy foods?), and there were no missing data for number of meals or number of snacks fed to the infant on the previous day. Rates of breastfeeding were high in all children under 12 months of age (table 7). After 12 months of age, breastfeeding compliance began to decrease. A great majority of the caregivers (99.1%) were complying with the number of meals required per day. Fewer (55%) complied with at least 80% of the recommended snack intake. Caregivers of infants in each age group who were not complying with the snacking recommendations were more likely to be over snacking than under snacking (figure 2). Compliance was lowest (32%) in total bowls of food consumed per day. Compliance to total bowls consumed was low for every age group except in the six-month age group. Complementary feeding guidelines recommend less than half a bowl of food to be consumed per day for this age group, and given that “less than half a bowl” is the lowest option available for caregivers to select in this category, it is expected that 100% of caregivers of infants who are 6 months of age would be complying with this recommendation. Furthermore, given that almost all caregivers are adhering to the number of meals recommendation (99.1%), yet few caregivers are complying with the total bowls of food per day recommendation (32%), this shows that although infants are likely to get the recommended number of meals per day, the quantity

of food being consumed is not enough to fulfill the current recommendations. Therefore, infants are likely eating less food per meal than is recommended. Compliance with consistency recommendations was low in each age group, and no infants in the six-month age group consumed porridges of thick consistency. Only 36 infants were categorized as adhering to at least 80% of all five recommendations, all of whom were in the 12 to 23 month age group.

Table 7: Rates of compliance for each complementary feeding recommendation and rate of overall adherence, separated by age group

<b>Compliance to 80% of Breast Feeding Recommendations by Age Group</b>			
<u>Age Group (Months)</u>	<u>Complying (%)</u>	<u>Not Complying</u>	<u>Total</u>
6	6 (100)	0	6
7-8	12 (100)	0	12
9-11	18 (90)	2	20
12-23	486 (68.5)	223	709
<u>Total:</u>	522 (69.9)	225	747
<b>Compliance to 80% of Number of Meals Recommendations by Age Group</b>			
6	5 (83.3)	1	6
7-8	12 (100)	0	12
9-11	20 (100)	0	20
12-23	703 (99.2)	6	709
<u>Total:</u>	740 (99.1)	7	747
<b>Compliance to 80% of Number of Snacks Recommendations by Age Group</b>			
6	4 (66.7)	2	6
7-8	7 (58.3)	5	12
9-11	10 (50)	10	20
12-23	387 (54.6)	322	709
<u>Total:</u>	408 (54.6)	339	747
<b>Compliance to 80% of Total Bowls Consumed Recommendations by Age Group</b>			
6	6 (100)	0	6
7-8	2 (16.7)	10	12
9-11	1 (5)	19	20
12-23	230 (32.4)	479	709
<u>Total:</u>	239 (32)	508	747
<b>Compliance to Consistency Recommendations by Age Group</b>			
6	0 (0)	6	6
7-8	2 (16.7)	10	12
9-11	3 (15)	17	20
12-23	369 (52)	340	709
<u>Total:</u>	374 (50.1)	373	747
<b>Adherence to 80% of All Recommendations by Age Group</b>			
6	0 (0)	6	6
7-8	0 (0)	12	12
9-11	0 (0)	20	20
12-23	36 (5.1)	673	709
<u>Total:</u>	36 (4.8)	711	747

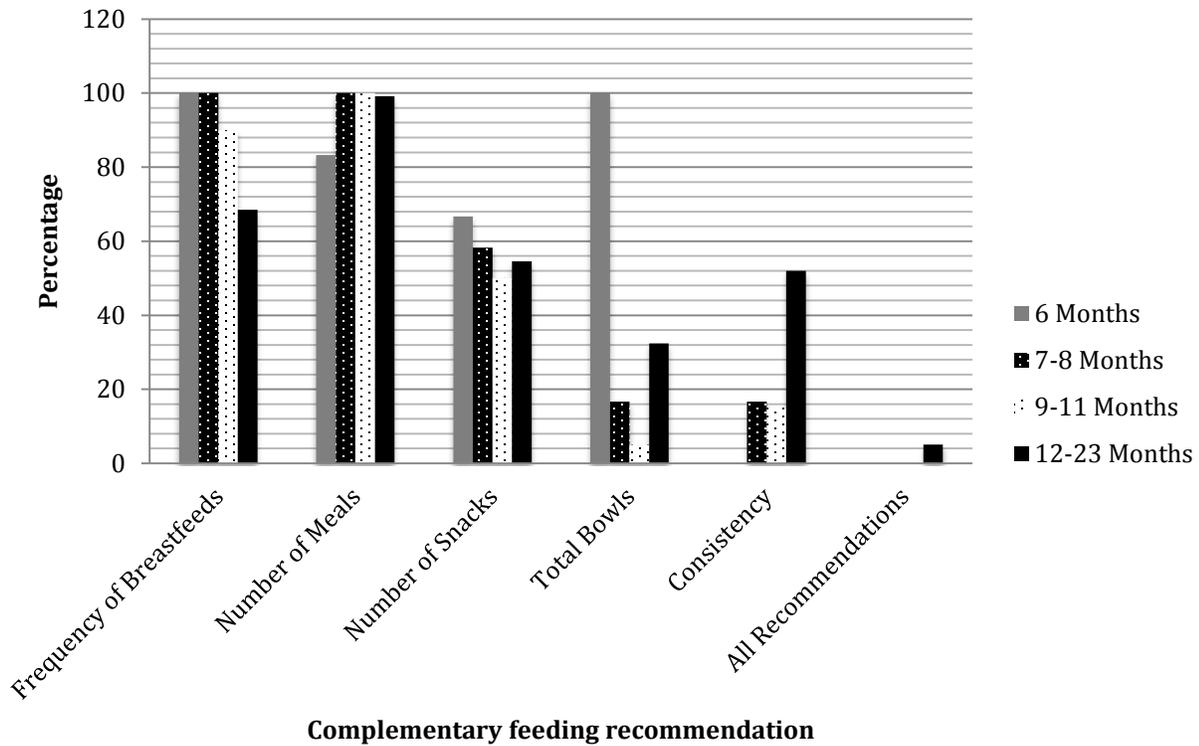


Figure 2: Percentage of children who adhere to at least 80% of Cambodia's complementary feeding recommendations, separated by age

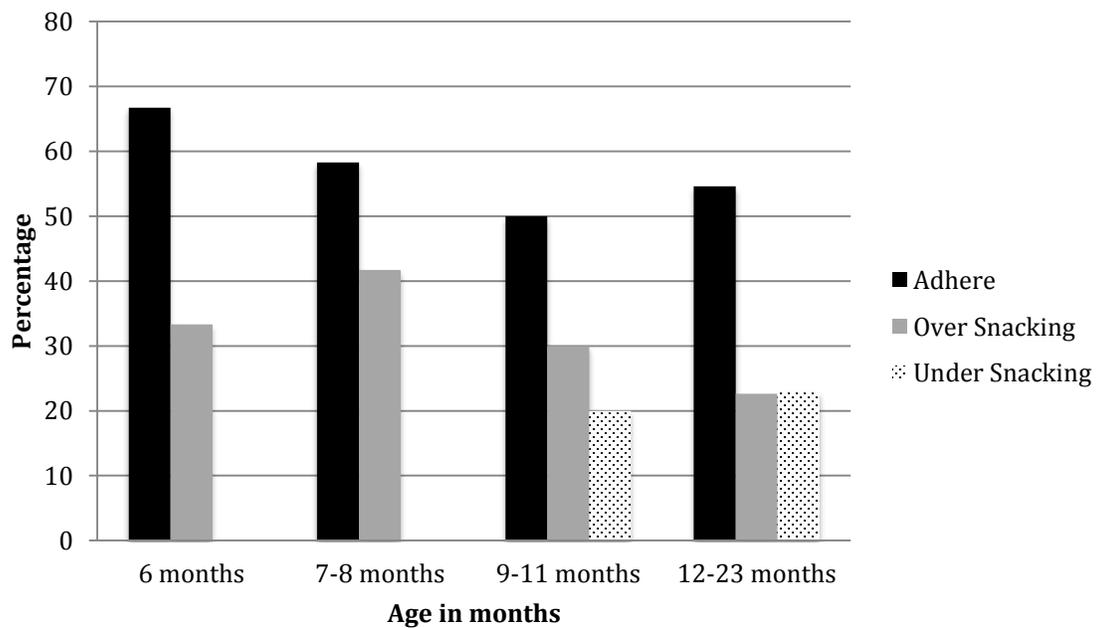


Figure 3: Percentage of children who adhere to snacking and who do not adhere because of over or under snacking, separated by age

Disease status among infants whose caregivers adhered and did not adhere to all five complementary feeding recommendations were similar (table 8). Roughly 28% of those whose caregivers adhered and did not adhere to the recommendations had diarrhea in the last two weeks. Approximately 62% of the study population was moderately anemic, and 21% were moderately stunted. The largest difference (9.4%) in disease status among infants whose caregivers adhered and did not adhere was among infants who were categorized as having mild anemia.

Table 8: Prevalence of diarrhea, anemia and stunting among those who adhere and do not adhere to at least 80% of Cambodia's complementary feeding guidelines

	Total	Diarrhea (%)	Severe Anemia (%)	Moderate Anemia (%)	Mild Anemia (%)	Severe Stunting (%)	Moderate Stunting (%)
Not Adhering	711	200 (28.1)	19 (2.7)	452 (63.6)	150 (21.2)	44 (6.2)	144 (20.3)
Adhering	36	10 (27.8)	1 (2.8)	22 (61.1)	11 (30.6)	2 (5.6)	8 (22.2)
Total	747	210 (28.1)	20 (2.7)	474 (63.5)	161 (21.6)	46 (6.2)	152 (20.3)

Our findings did not demonstrate statistically significant associations between caregiver adherence to Cambodia's complementary feeding guidelines and adverse health outcomes (table 9). Infants of caregivers who did not adhere to Cambodia's breastfeeding recommendations were significantly more likely to have had diarrhea in the last two weeks [OR: 1.52 (CI: 1.09- 2.14)]. However, not adhering to breastfeeding recommendations appeared to be protective for all other variables. Given that very few caregivers did not comply with the number of meal recommendations (n=7) there was not enough data to perform a multinomial logistic regression to determine differences in either anemia or stunting status by caregiver compliance to Cambodia's complementary

feeding guidelines. Our results show that infants whose caregivers do not adhere to the number of snack recommendations are significantly less likely to have mild anemia [OR: 0.58 (CI: 0.35- 0.97)]. Aside from caregiver adherence to breastfeeding recommendations being protective against diarrhea, caregiver adherence to all other recommendations was not associated with improved health outcomes. However, infants whose caregivers did not adhere to all recommendations appeared to be less likely to have severe anemia, moderate anemia, mild anemia, and moderate stunting.

Table 9: Odds ratio and 95% confidence intervals of illness relative to adherence status

	Diarrhea (CI)	Severe anemia (CI)	Moderate anemia (CI)	Mild anemia (CI)	Severe stunting (CI)	Moderate stunting (CI)
Do not adhere to frequency of breastfeeds	1.52 (1.09- 2.14)	0.73 (0.26- 2.08)	0.65 (0.41- 1.47)	0.86 (0.50- 1.47)	0.86 (0.44- 1.68)	0.78 (0.52- 1.17)
Do not adhere to number of meals	1.02 (0.20- 5.32)	*	*	*	*	*
Do not adhere to number of snacks	1.08 (0.78- 1.48)	1.07 (0.41- 2.83)	0.73 (0.47- 1.14)	0.58 (0.35- 0.97)	1.28 (0.70- 2.33)	1.25 (0.87- 1.78)
Do not adhere to total bowls consumed	0.89 (0.64- 1.25)	0.94 (0.34- 2.61)	1.14 (0.71- 1.84)	0.98 (0.57- 1.68)	1.37 (0.69- 2.71)	1.05 (0.71- 1.54)
Do not adhere to consistency	0.95 (0.69- 1.31)	0.52 (0.19- 1.41)	0.93 (0.60- 1.46)	1.07 (0.64- 1.79)	0.70 (0.38- 1.29)	1.08 (0.75- 1.55)
Do not adhere to total recommendations	1.02 (0.48- 2.15)	0.42 (0.04- 4.90)	0.46 (0.11- 1.98)	0.03 (0.07- 1.40)	1.09 (0.25- 4.76)	0.90 (0.40- 2.02)

\*Only 7 children did not adhere to number of meals therefore I could only do calculations for diarrhea.

Table 10: Compliance to breastfeeding recommendations according to intake of food bowls

Compliance to breastfeeding	Amount of bowls consumed (%)							Total
	< ½ a bowl	½ bowl	¾ bowl	Full bowl	1 ½ bowl	2 bowls	> 2 bowls	
Not Complying	2 (0.9)	17 (7.6)	6 (2.7)	44 (19.6)	45 (20.0)	49 (21.8)	62 (27.6)	225 (100)
Complying	72 (13.8)	91 (17.4)	33 (6.3)	128 (24.5)	78 (14.9)	69 (13.2)	51 (9.8)	522 (100)
Total	74 (9.9)	108 (14.5)	39 (5.2)	172 (23)	123 (16.5)	118 (15.8)	113 (15.1)	747 (100)

To investigate why not complying with the breastfeeding recommendations seems to have a protective effect against anemia and stunting, we examined the relationship between breastfeeding compliance and amount of food consumed by the infant. Our analysis found that a higher percentage of infants whose caregivers were not adhering to the current breastfeeding recommendations were consuming 1 ½ or more bowls of food than those who were adhering (69.4% versus 37.9%) (table 10). Furthermore, infants whose caregivers did not comply with breastfeeding recommendations were significantly more likely to comply with the recommendation on total bowls of food consumed [OR: 3.0 (CI: 2.2- 4.2)]. This is likely because caregivers who do not provide their infants with the recommended amount of breast milk per day instead provide their infants with greater amounts of food. Similarly, infants who are not consuming enough breast milk are hungrier than other infants and, as a result, consume more food.

We performed a multinomial logistic regression to see whether total bowls of food consumed confounded the association between complying with breastfeeding recommendations, anemia status and stunting status. Adjustment for total bowls of food did not change our conclusions.

## Discussion

It does not appear that infants of caregivers who adhered to at least 80% of Cambodia's complementary feeding recommendations were less likely to have diarrhea, be anemic, or be stunted. We did find that infants of caregivers who did not comply with breastfeeding recommendations were significantly more likely to have had diarrhea, and infants of caregivers who did not comply with snacking recommendations were less likely to be mildly anemic. Although it makes biological sense that infants who are not

receiving optimal amounts of breast milk are more prone to infection, it remains unclear why not adhering to snacking recommendations is protective against mild anemia. Given that not complying with snacking recommendations is due to over snacking for the majority of infants, we speculate that snacks provided in these communities are more nutritious than previously believed. In order for these snacks to protect against anemia, however, they need to be rich in iron. As we do not have information on the types of snacks provided to these infants, it would be beneficial for future studies to further examine the relationship between caregiver adherence to snacking recommendations and infant rates of anemia.

Although the majority of infants were complying with recommendations on the number of meals per day, only a small portion were complying with recommendations on the total bowls of food. Based on this information, it is likely that infants are not consuming enough food at each meal. This could be due to over snacking in between meals, or because not enough food is available at meal times. Although all infants who were six months of age were consuming the recommended amount of food per day of “less than half a bowl” this recommendation is vague and the JP survey was unable to measure the amount of food infants six months of age consumed more precisely.

Breastfeeding rates also decreased substantially after the first year of life, with only 68.5% of caregivers with children ages 12 to 23 months complying with the recommendations. Two studies conducted in developing countries by Onyango et al. (1999) and Simondon et al. (2001) found that longer durations of breastfeeding are associated with enhanced linear growth (Onyango, Esrey, & Kramer, 1999; K. B. Simondon, Simondon, Costes, Delaunay, & Diallo, 2001). Therefore promoting

breastfeeding past 12 months of age may reduce the prevalence of stunting in this population.

Of the 36 children who were adhering, all were in the 12 to 23 month age group. No caregiver of an infant less than one year of age was adhering to all recommendations. The first year of life is extremely important for optimal growth and health, and the lack of adherence in this age group is a critical concern. Senarath et al. (2012) also found that the age of a child was a significant determinant of complementary feeding practices and that infants who were younger had a more difficult time adhering to complementary feeding indicators set out by the WHO (Upul Senarath, Agho, et al., 2012). Our results provide further evidence that infants less than one year of age have a more difficult time meeting specific complementary feeding recommendations. No research has found whether complementary feeding programs that specifically target infants less than one year of age have seen improved rates of feeding among these age groups. In a study looking at complementary feeding practices in South Asia, it was found that the most consistent determinants of poor complementary feeding practices among all age groups were lack of maternal education and low household income (Upul Senarath, Agho, et al., 2012). Maternal education was not found to be a confounder in our study and we did not have information on caregiver household income.

Our results suggest that adhering to Cambodia's complementary feeding guidelines provides no protective effect against diarrhea, anemia, or stunting. One possibility for our unexpected results is that caregivers of children who are ill may be more likely to follow the recommendations and enforce better feeding practices. If this were the case, then infants who are ill would be likely to follow Cambodia's

complementary feeding guidelines and we would see no significant results in our analyses.

This study was the first to look at whether adhering to Cambodia's complementary feeding guidelines are protective against diarrhea, anemia, and stunting in infants 6 to 23 months of age. Strengths of our study include the detailed food questionnaire that included information on the total amount of food consumed and the consistency of foods. The survey used forms of measurements that were familiar to caregivers such as bowls and spoons. Our study population is also representative of both urban and rural households in Cambodia.

Limitations of our study include the lack of clarity as to whether the survey questionnaire was able to accurately measure the frequency of breastfeeds, meals, and snacks given to the infant. Although it has been shown that an itemized food questionnaire is appropriate to use in developing countries where the diet has limited diversity, there is always the possibility that the caregivers either over or under estimated the amount of foods that they had given to their children. This could be either deliberate or non-deliberate, depending on the participant's perceptions about the interviewer, the study, and the topic sensitivity. Furthermore, caregivers may not have been present during meal times to see how much food their children were eating, resulting in an inaccurate estimation. One way to improve the precision of these estimates would have been to repeat the survey questionnaire at another time and compare the results, although this would have been more costly and time consuming. Measurements on the prevalence of diarrhea were also subject to recall bias. Caregivers were asked whether their children had diarrhea in the last two weeks, defined as three or more times a day of loose stools.

Due to the vague definition of diarrhea provided by the survey and the difficulty for some caregivers to recall two weeks back, results on diarrhea status may not have been accurate. Caregivers whose infants were ill in the last two weeks may have also been more likely to recall specific feeding practices and types of food fed to their children than caregivers whose infants were not ill. Our study also did not have enough power to determine the association between caregiver adherence to Cambodia's complementary feeding guidelines and any of our outcome variables (diarrhea, anemia and stunting). We anticipated a greater proportion of caregivers adhering to these guidelines, however, lack of overall adherence from caregivers resulted in our study not meeting the sample size requirements. Finally, because the inclusion criteria for the JP baseline survey was a female caregiver with a child 12 to 36 months of age, very few participants in our study were 6 to 11 months of age (n=38). Future studies should aim to include a greater number of infants in this age group.

Anemia rates in the population were high with 88% of children being anemic. It has been estimated that 90% of an infant's iron requirement at 9 to 11 months of age needs to be provided through complementary foods (Gibson, Ferguson, & Lehrfeld, 1998). After six months of age, complementary foods need to provide approximately 97% of an infant's iron requirements (K. Dewey, 2003). Although the consumption of meat foods can fill this gap, the amount required to do so is often too high to be considered feasible for most Cambodian infants (WHO/UNICEF, 1998). One study by Gibson et al. (1998) tested 23 different complementary food mixtures used in parts of Africa, India, Papua New Guinea, the Philippines and Thailand on infants to see which ones were best at providing adequate iron, zinc, and calcium concentrations to infants

(Gibson et al., 1998). The study found that all mixtures, including those that contained meat, were insufficient to meet the children's iron requirements (Gibson et al., 1998). The study concluded that strategies to improve the bioavailability of iron are probably insufficient to overcome the deficits in iron (Gibson et al., 1998). Fortification is likely the best solution for preventing anemia (Gibson et al., 1998).

Cambodia's complementary feeding guidelines do not contain recommendations for minimum food diversity or supplementation. This is a limitation of the guidelines as there is sufficient evidence that dietary diversity is linked to micronutrient adequacy (Upul Senarath, Agho, et al., 2012). Furthermore, it is unlikely that infants would be able to meet their daily iron, zinc and calcium needs without the help of supplements or home/commercial fortification (K. Dewey, 2003; Gibson et al., 1998; WHO/UNICEF, 1998). Another option that has been shown to decrease iron deficiency anemia in women and children through randomized trials in Ethiopia, Brazil, and Malawi is the use of a cast iron pot while cooking (Adish, Esrey, Gyorkos, Jean-Baptiste, & Rojhani, 1999; Borigato & Martinez, 1998; Geerligs, Brabin, Mkumbwa, Broadhead, & Cuevas, 2003). However, this technique poses several limitations including health concerns regarding rusting, decreased manufacturing quality when compared to aluminum pots, difficulty cleaning the pots, and changes in the look and taste of foods when placed in the pots overnight (Prinsen Geerligs, Brabin, Mkumbwa, Broadhead, & Cuevas, 2002). Given that aluminum pots are much more widely used in Cambodia, a study by Charles et al. (2011) examined whether the placement of a small iron ingot in aluminum cooking pots would decrease the rates of iron deficiency anemia in Cambodia (Charles, Dewey, Daniell, & Summerlee, 2011). The study found that households using the iron ingot with routine

follow ups visits aimed at increasing education about iron-deficiency anemia and compliance to using the iron ingot had higher blood iron levels at three months (Charles et al., 2011). However, at six months serum iron level decreased and a greater proportion of women were anemic (Charles et al., 2011). This suggests that although the iron ingot may be a good short-term solution, it proves ineffective for decreasing the rates of anemia long-term. Current knowledge strongly supports that iron supplementation is the most effective way to reduce the prevalence of maternal and child anemia in developing countries (K. Dewey, 2003).

The low rates of compliance with guidelines on total bowls of food consumed per day and consistency of porridges suggest that perhaps there is a food security problem in these communities. However, a previous analysis identified that approximately 55% of these households are considered food secure, and only 10% are considered severely food insecure. Therefore the low compliance to these two recommendations may be due to other factors such as lack of maternal education, insufficient time spent encouraging the child to eat, and/or increased snacking by infants that decreases the amount of food eaten during meals. Food security in these communities should also be reassessed to determine whether there was an error in the previous report.

Over the years interventions that focus on improving rates of exclusive breastfeeding have been widely successful (WHO, 2002). Clear recommendations and easy to follow guidelines in addition to strong political support and appropriate funding have been the backbone of many successful programs that worked to protect, promote, and support breastfeeding (WHO, 2002). However, this same progress has not been made in the area of complementary feeding. Although the body of knowledge available in this

field is expanding steadily and research continues to provide a stronger foundation for creating recommendations, there has been little translation of this new knowledge into action. As it stands, the majority of caregivers are not adhering to Cambodia's current complementary feeding recommendations, and adherence to these recommendations does not provide significant differences in the rates of diarrhea, anemia, and stunting in these communities. More research is needed to determine whether these guidelines are linked to improved health outcomes in infants. One recommendation is to utilize two or more itemized food questionnaires during different days and averaging caregiver results in order to reduce error. It would also be useful to identify what the barriers to adherence of these guidelines are in Cambodia in order to improve adherence in the future.

Our research has highlighted the low adherence rates in Cambodia to the current complementary feeding guidelines and has found no link between adhering to these guidelines and improved health outcomes. We have found that the least commonly adhered to recommendations by caregivers are total bowls of food consumed per day and maintaining a thick consistency of porridges. We also found that infants whose caregivers did not adhere to snacking recommendations were more likely to be over snacking than under snacking, and suggested that improving adherence to snacking recommendations may also improve adherence to total bowls of food consumed per day.

Caregiver adherence to Cambodia's complementary feeding guidelines is not a good predictor of improved health outcomes in Cambodian infants 6 to 23 months of age. Rates of diarrhea, anemia, and stunting are high in this country and more research needs to go into determining whether Cambodia's guidelines need to be revised to include recommendations on dietary diversity and iron supplementation. Future research should

also assess why the rates of caregiver adherence to the recommendations were so low in this population and how governments and policy makers can effectively educate caregivers on these recommendations.

## Question 2: Does Adherence to Cambodia's Complementary Feeding Guidelines Enhance the Diversity of Foods Consumed by Infants 6 to 23 Months of Age?

### Introduction

Starting at six months of age, energy and many micronutrient requirements can normally only be met through a child's consumption of complementary foods. Failure to meet these requirements may result in growth restriction, cognitive deficits, and decreased productivity.

The World Health Organization (WHO) developed and validated simple indicators for appropriate infant and young child feeding in developing countries in response to the 2001 Global Consultation on Complementary Feeding, where it was identified that absence of indicators is one of the factors limiting progress in improving infant feeding (K. Dewey, 2003). Dietary diversity, defined as the number of unique food groups consumed in one day, was one of the indicators created (UNICEF/WHO, 2007a). According to UNICEF, infants who consume food from four or more food groups per day have met the minimum dietary diversity requirements (UNICEF/WHO, 2007b). These groups are: grains, roots and tubers, legumes and nuts, dairy products (milk, yogurt, cheese), flesh foods (meat, fish, poultry and liver/organ meats), eggs, vitamin-A rich fruits and vegetables, and other fruits and vegetables. Furthermore, infants who meet the minimum dietary diversity requirements have a greater chance of consuming at least one animal food source, at least one vegetable food source, and at least one staple food per

day (UNICEF/WHO, 2007a). Dietary diversity is associated with improved nutritional adequacy, which in turn, is associated with improved infant health status (K. Dewey, 2003; UNICEF/WHO, 2007a).

In this study, we examined the association between adherence to Cambodia's complementary feeding guidelines and meeting the minimum dietary diversity requirements. Cambodia has one of the highest rates of child under-nutrition in the world and was recently listed as one of 36 countries to account for 90% of all stunted children worldwide, with 40% of all children under five years of age being stunted (Black et al., 2008). In response to the high rates of malnutrition in the country, the government created a set of complementary feeding guidelines to be used as a guide for caregivers. Cambodia's guidelines do not include recommendations on dietary diversity; therefore, it is not known whether adhering to these guidelines actually increases the dietary diversity of infants.

We hypothesized that infants whose caregivers are adhering to at least 80% of each of Cambodia's complementary feeding guidelines are more likely to be consuming the minimum dietary diversity requirements compared to infants whose caregivers are not adhering to the guidelines. We further hypothesized that a) more infants whose caregivers are adhering to the guidelines are consuming each food group and b) these infants are consuming greater amounts of each food group than infants whose caregivers are not adhering.

## Methods

The Ministry of Health in Cambodia created guidelines for four different age groups (6 months, 7-8 months, 9-11 months, and 12-23 months) in order to meet the

unique energy requirements of growing children who are 6 to 23 months of age. Within each age group, the complementary feeding guidelines provided recommendations on five variables: (1) total number of breast feeds per day, (2) total number of meals per day, (3) total number of snacks per day, (4) total amount of food eaten per day, measured in bowls and (5) consistency of porridges (table 11).

Table 11: Complementary feeding guidelines for typical days food intake vs. 80% of typical days food intake

Age (months)	Frequency of Breast Feeding	80% Frequency of Breast Feeding	Number of Meals	80% Number of Meals	Number of Snacks	80% Number of Snacks	Total Bowls Consumed	80% Total Bowls Consumed
6	8	6	2	2	0	0	< ½	< ½
7-8	8	6	3	2	0	0	1 ½	1
9-11	6	5	3	2	1	1 to 2	3	2
12-23	3	2	3	2	2	2 to 3	3	2

Information on infant and young child feeding practices and itemized food intake was collected through a self-reported cross sectional survey (appendix 2) administered by the Joint Program (JP) for Children, Nutrition and Food Security in Cambodia. The JP was developed in January 2010 in order to understand and address health related issues in maternal and child health, such as food security status, hygiene and sanitation practices, and nutrition in children less than five years of age.

For every complementary feeding recommendation, each caregiver was given either a score of 1 (complying) if they met at least 80% of the recommendation for that category or 0 (not complying) if they did not. Caregivers who received a final score of 5, indicating that they had complied with at least 80% of each recommendation, were then

classified as Adhering whereas all other caregivers were categorized as Not Adhering. Given that increased snacking has been shown to hinder optimal child growth by (1) providing empty calories and (2) resulting in lower food intake during meals (which are typically more nutritious), we considered caregivers of infants who over-snacked by more than 50% of the current recommendations as not complying with the guidelines.

Furthermore, the recommendations encourage caregivers who give their infants borbor sor (plain porridge) to ensure that the porridge is of a thick consistency. With 100% of children consuming borbor sor as a staple, caregivers needed to have responded that their children were receiving porridge of thick consistency in order to have been considered adhering. Once all infants in each age group were categorized as having caregivers who were either adhering or not adhering to the current complementary feeding recommendations, we collapsed all groups so that the independent variable was binary (adhering, not adhering). All data was entered into and analyzed using Predictive Analytics Software Statistics (PASW) 18 (formerly SPSS).

### *Inclusion and Exclusion Criteria*

Our initial sample included all caregivers who were included in the original JP questionnaire whose youngest child was between the ages of 6 to 23 months of age. We then excluded infants whose mothers answered negatively to question 70 of the food questionnaire: “Was this a typical day’s food intake for the child.”

We excluded 84 children whose diet was either not representative of a typical day’s food intake (n=76) or information was missing (n=8). One caregiver did not report on the number of meals and/or snacks her child had the previous day, and there were three instances of data entry error. One of the instances of data entry error occurred when

looking at total bowls of food. One child was reported as receiving “0” bowls of food, however, the survey was designed to only account for answers that state “less than 1/2 a bowl” indicating an error on the part of either the survey administer or data entry personnel. Because we cannot be sure what the number “0” implies in this situation, we eliminated this case from the analysis. Two cases of data entry error were because of unreliable Z-scores. The WHO classifies Z-scores of  $> 6SD$  or  $< -6SD$  as too extreme, and therefore, unreliable. All missing cases and cases of unreliable data entry were removed from the analysis, giving us a total study population of 747 children between 6-23 months (figure 4).

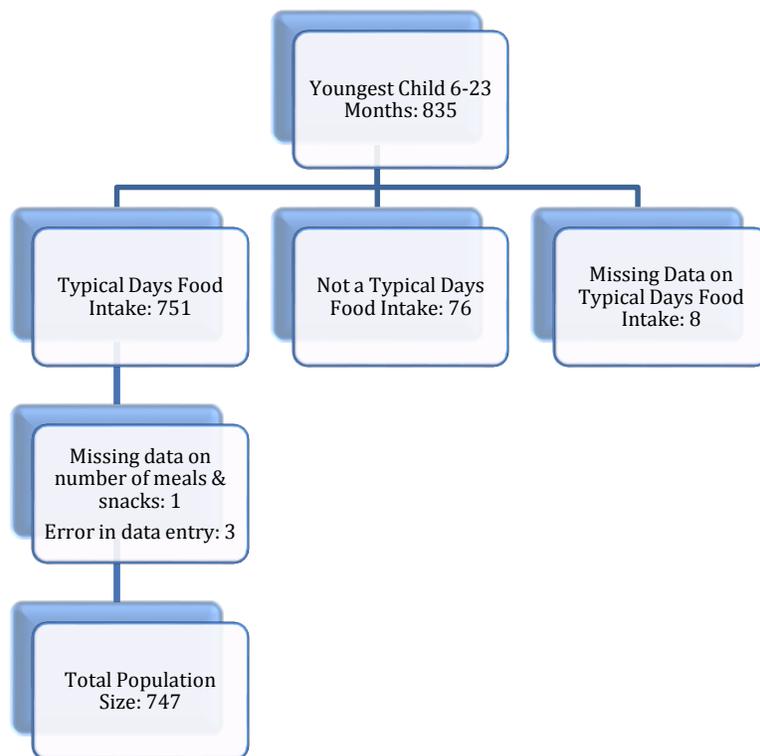


Figure 4: Flow of participants in the study

The Joint Programme questionnaire did not categorize food groups in the same way as UNICEF's Indicators for Assessing Infant and Young Child Feeding document (2007). For this reason, in order to get information on the amount of grains, roots, and tubers consumed we combined survey question 69C which asked whether the child had consumed noodles, bread, or other grains and question 69I which asked whether the child had consumed potatoes, winter melon, sprouts, cucumber, tomato, taro, manioc, sweet potatoes or other tubers in the last 24 hours (table 12). Survey question 69F asked caregivers whether their child consumed beans, peas, tofu or nuts in the last 24 hours. I used question 69N (yogurt, cheese, or other foods made from milk) to look at consumption of dairy products. Question 69D in the questionnaire asked about consumption of flesh foods, and question 69E asked whether the child had consumed eggs in the last 24 hours. In order to assess a child's consumption of vitamin A rich foods I combined question 69H (pumpkin, carrots, yellow/orange sweet potato or other yellow vegetables), question 69K (orange or yellow fruits), and question 69J (green leafy vegetables). Information on consumption of other fruits and vegetables was obtained from question 69L (other fruits, bananas, green papayas or green mangoes). I also included another category looking at consumption of oil, fat, or coconut milk (question 69G).

Table 12: List of UNICEF's dietary diversity groups and combination of questions from JP survey required to match UNICEF groups

UNICEF Dietary Diversity Groups	Combination of questions from survey
Grains, roots, tubers	69C- Noodles, bread, other grains 69F- Potatoes, winter melon, sprouts, cucumber, tomato, taro, manioc, sweet potatoes or other tubers
Legumes and nuts	69F- Beans, peas, tofu or nuts
Dairy products (milk, yoghurt, cheese)	69N- Yoghurt, cheese or other foods made from milk
Flesh foods (meat, fish, poultry and liver/organ meats)	69D- Meat, poultry, fish
Eggs	69E- Eggs
Vitamin A rich fruits and vegetables	69H- Pumpkin, carrots, yellow/orange sweet potato or other yellow vegetables 69K- Orange or yellow fruits 69J- Green leafy vegetables
Other fruits and vegetables	69L- Other fruits, bananas, green papaya, or green mangos

## Results

Information on 747 infants between the ages of 6-23 months was available for the analysis. Only 36 infants were categorized as having caregivers who adhered to at least 80% of all five recommendations, all of which were in the 12 to 23 month age group. Most infants consumed “flesh foods” and “vitamin A rich fruits and vegetables” in the 24 hours previous (87.7% and 69.2%, respectively). However rates of consumption of other food groups was lower, averaging around 30% for grains, roots, tubers; eggs and oil, fat, and coconut milk; and averaging around 5% for legumes and nuts and dairy

products.

There were small differences in the consumption of food groups among children whose caregivers were adhering and not adhering to Cambodia's complementary feeding guidelines (table 13). The largest difference was observed in the consumption of eggs where 13% more infants whose caregivers were adhering to the guidelines had consumed eggs in the last 24 hours. A greater percentage of infants whose caregivers were adhering to Cambodia's complementary feeding guidelines consumed two tablespoon or more of Vitamin A rich fruits and vegetables (44.4% vs. 23.3%) (table 14). Of infants who had consumed legumes or nuts in the last 24 hours, 60% of those whose caregivers were adhering to the guidelines had consumed the greatest amount (three tablespoons) compared to only 24.3% of infants whose caregivers were not adhering. Alternatively, a higher percentage of infants whose caregivers did not adhere to the guidelines consumed one egg or more (40.4% vs. 14.3%) (table 15). Infants whose caregivers did not adhere to the guidelines also consumed two spoons or more of flesh foods compared to those whose caregivers did adhere (47.3% vs. 30.3%). No other differences were found in other food groups between infants whose caregivers adhered and did not adhere to the guidelines.

We examined whether a greater proportion of infants whose caregivers were adhering to Cambodia's complementary feeding guidelines were also meeting the WHO/UNICEF minimum diversity requirements. According to WHO/UNICEF, infants who consume four or more different food groups per day (out of the 7 food groups identified above) have met the minimum dietary diversity requirements (UNICEF/WHO, 2007b). Only 134 (17.4%) children were meeting the diversity requirements; of these

children, 7 (19.4%) had caregivers who were adhering to Cambodia's complementary feeding guidelines, and 127 (17.9%) had caregivers who were not adhering to the guidelines (table 16).

Table 13: Food groups consumed in the last 24 hours relative to adherence status

Status	Grains, roots and tubers (%)	Legumes and nuts (%)	Dairy products (%)	Flesh foods (%)	Eggs (%)	Vitamin A rich fruits and vegetables (%)	Other fruits and vegetables (%)	Oil, fat or coconut milk (%)
Adhering	9 (25.0)	5 (13.9)	1 (2.8)	33 (91.9)	7 (19.4)	24 (66.7)	8 (22.2)	13 (36.1)
Not Adhering	214 (30.1)	37 (5.2)	34 (4.8)	622 (87.5)	230 (32.3)	497 (69.9)	145 (20.4)	219 (30.8)
Total	223 (29.9)	42 (5.6)	35 (4.7)	655 (87.7)	237 (31.7)	521 (69.2)	153 (20.5)	232 (31.1)

Table 14: Amount of different food groups consumed by infants by adherence status

Food Group	Adherence*	Amount consumed over previous 24 hours (%)						
		Half Spoon	One Spoon	Two Spoons	Three Spoons	½ Bowl	¾ Bowl	Full Bowl
Grains, roots, tubers	Adhering	0 (0.0)	0 (0.0)	0 (0.0)	4 (44.4)	4 (44.4)	1 (11.1)	0 (0.0)
	Not Adhering	13 (6.1)	19 (8.9)	19 (8.9)	98 (45.8)	39 (18.2)	13 (6.1)	13 (6.1)
Legumes and nuts	Adhering	0 (0.0)	1 (20.0)	1 (20.0)	3 (60.0)			
	Not Adhering	5 (13.5)	12 (32.4)	11 (29.7)	9 (24.3)			
Dairy products	Adhering				1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Not Adhering				23 (67.6)	7 (17.6)	4 (11.8)	1 (2.9)
Flesh Foods	Adhering	4 (12.1)	19 (57.6)	6 (18.2)	4 (12.1)			
	Not Adhering	130 (20.9)	198 (31.8)	164 (26.4)	130 (20.9)			
Vitamin A rich fruits and vegetables	Adhering	1 (4.5)	5 (22.7)	10 (45.5)	5 (22.7)	1 (4.5)	0 (0.0)	
	Not Adhering	69 (21.0)	91 (22.7)	102 (31.1)	50 (15.2)	14 (4.3)	2 (0.6)	
Other fruits and vegetables	Adhering	2 (25.0)	0 (0.0)	5 (62.5)	1 (12.5)			
	Not Adhering	43 (29.7)	50 (34.5)	30 (20.7)	22 (15.2)			
Oil, fat, or coconut milk	Adhering	8 (61.5)	3 (23.1)	2 (15.4)	0 (0.0)			
	Not Adhering	162 (74.0)	32 (14.6)	14 (6.4)	11 (5.0)			

\* Adherence defined as compliance to at least 80% of each of Cambodia's complementary feeding recommendations

Table 15: Eggs consumed by infants by adherence status

Food Item	Status	Amount of egg consumed in previous 24 hours (%)		
		Half an egg	One egg	More than one egg
Eggs	Adhering	6 (85.7)	1 (14.3)	0 (0.0)
	Not Adhering	137 (59.6)	78 (33.9)	15 (6.5)

Table 16: Number of infants meeting the minimum dietary diversity requirements by adherence status

Status	Meeting minimum diversity requirements (%)	Not meeting minimum diversity requirements (%)
Adhering	7 (19.4)	29 (80.6)
Not Adhering	127 (17.9)	584 (82.1)
Total	134 (17.9)	613 (82.1)

## Discussion

Our results indicate that there are only small differences in the type of foods consumed, amount of foods consumed, and total dietary diversity among infants whose caregivers adhere and do not adhere to Cambodia's complementary feeding guidelines.

Several factors may have influenced our results. Cambodia's complementary feeding guidelines do not include recommendations on the number of unique food groups that should be consumed per day. Therefore even if caregivers are aware of Cambodia's complementary feeding guidelines and strive to follow the recommendations, they may not be aware that including meals that contain a variety of food groups supports infant growth and development. Ideally, infants whose caregivers adhere to Cambodia's complementary feeding guidelines would be consuming a diet rich in diverse foods; however, seasonality, household income, and a caregiver's knowledge of appropriate complementary foods are all factors that can prevent this.

Our results suggest that adherence to Cambodia's complementary feeding guidelines is not a good predictor of increased dietary diversity. The addition of recommendations on the number of diverse foods that should be consumed per day, for example the new infant and young child feeding (IYCF) indicators recommended by the WHO, may improve predictive ability (Daelmans et al., 2009; WHO, 2010). These indicators are based on (1) the proportion of infants 6-8 months of age who receive solid, semi-solid, or soft foods; (2) the minimum dietary diversity based on the consumption of at least four of the seven defined food groups per day; (3) the minimum meal frequency; and (4) the minimum acceptable diet determined by whether infants had at least the minimum dietary diversity and the minimum meal frequency during the previous day

(Daelmans et al., 2009; WHO, 2010). Given that we did not have information on the number of caregivers who were aware that complementary feeding recommendations existed in Cambodia, it is also possible that the majority of caregivers were not aware of these recommendations.

All children in the study population had received borbor sor, a plain rice porridge, in the last 24 hours. Borbor sor is a staple given to infants who are beginning to feed and although borbor sor can be filling, it lacks key nutrients and can cause many micronutrient deficiencies if given to infants without the addition of other foods. Furthermore, caregivers who do supplement the porridge with other food groups typically prepare the borbor sor with a watery consistency, resulting in a lower concentration of nutrients per bowl of food for the infants.

A limitation of this study is that survey administrators were not present during meal times to assess the quality of the foods infants were receiving. Therefore, if a caregiver were to put a small fish in a cooking pot that is meant to feed her entire family she may say that her child consumed more than three spoons of meat that day when in reality the amount of meat the child consumed is negligible. For this reason, the high percentage of meat intake in our analysis does not necessarily mean that these children are consuming large amounts of meat. Our results also show that approximately 70% of children are consuming Vitamin A rich fruits and vegetables daily, however, we did not have access to information on vitamin A deficiencies in the study population. Future studies should examine whether reported intakes of vitamin A rich foods are an accurate predictor of vitamin A deficiency in Cambodia.

Our results are subject to recall bias as information was obtained through an itemized food questionnaire that was administered to caregivers. Although it has been shown that itemized questionnaires are appropriate to use in developing countries where the diet has limited diversity, there is always the possibility that the caregivers either over or under estimated the types and amount of foods that they had given to their children. This could be either deliberate or non-deliberate, depending on the participant's perceptions of the interviewer's supportiveness, the study, and the topic sensitivity (Coulston & Boushey, 2008). One way to improve the precision of these estimates would have been to repeat the survey at another time and average the results. Another limitation of our study is that questions asked in the survey on types of foods consumed were not grouped into the seven categories used by the IYCF indicators. Given that we did the grouping after data collection, it is possible that our results are not an accurate representation of the types of foods infants consumed. It is also difficult to determine the food items that are present in mixed food preparations and how much of each item the child consumed in these preparations.

A strength of our study was that we were able to quantify the amount of food infants consumed in each group. This allowed us to look for differences in the amount of food consumed between infants whose caregivers adhered and did not adhere to Cambodia's complementary feeding guidelines. A diet rich in food diversity is extremely important for infants in the 6 to 23 month age group, as it is the best way to ensure children are meeting their nutritional requirements (UNICEF/WHO, 2007a). Improvements to this study would include having a larger sample of infants whose caregivers are adhering to Cambodia's complementary feeding guidelines and utilizing

results from a survey that has divided questions on food diversity into the groups identified by the WHO report on IYCF indicators.

In conclusion, dietary diversity in Cambodia, defined as consuming four diverse food groups, is inadequate for infants aged 6-23 months, based on our representative sample from 4 of twenty-three provinces in Cambodia. Future research on complementary feeding guidelines should evaluate specific recommendations on dietary diversity, combined with educating infant caregivers about dietary diversity. In addition the impact of adequate dietary diversity on health among infants 6 to 23 months of age in Cambodia also remains to be evaluated.

## Conclusion

The goals of my research were to determine whether infants whose caregivers adhered to at least 80% of Cambodia's complementary feeding guidelines had better health outcomes than infants whose caregivers did not adhere, specifically the prevalence of diarrhea in the preceding two weeks, and anemia and stunting status when the survey was taken. I also examined whether infants of caregivers who adhered to at least 80% of the guidelines consumed a greater proportion of diverse food groups and whether they consumed these foods in greater amounts when compared to their non-adhering counterparts.

Analysis of the survey of 747 female caregivers from four provinces in Cambodia showed that only 36 infants had caregivers who were adhering to at least 80% of Cambodia's complementary feeding guidelines, all of whom were in the 12-23 month age bracket. Differences of 13% or less in the types of foods consumed were observed and 9% or less in the maximum quantity of foods consumed between the two groups, with the exception of legumes and nuts where a difference of 36% in the maximum quantity consumed was observed. We also reported no significant differences in the health status of infants whose caregivers were and were not adhering to at least 80% of Cambodia's complementary feeding guidelines (diarrhea OR: 1.02 (0.48- 2.15), severe anemia OR: 0.42 (0.04- 4.90), moderate anemia OR: 0.46 (0.11- 1.98), mild anemia OR: 0.03 (0.07- 1.40), severe stunting OR: 1.09 (0.25- 4.76), moderate stunting OR: 0.90 (0.40- 2.02)). Given the low rates of adherence in our study population (n=36), we did not have enough power to detect differences of less than 20% in disease status among infants whose

caregivers adhered and did not adhere to Cambodia's complementary feeding guidelines. Although our hypotheses were not correct in predicting that infants who adhered to at least 80% of Cambodia's guidelines would be less likely to have negative health outcomes and more likely to be consuming a greater diversity of foods, perhaps the most significant finding in this thesis is the alarmingly low adherence rates seen in the population. Our report of low adherence rates should enable future researchers to calculate sample size for future studies more accurately to achieve sufficient power to test hypotheses questions.

Previous studies have looked at whether adhering to the WHO's 8 core indicators is associated with improved health status in infants, however, this study is the first to examine the utility of Cambodia's complementary feeding guidelines, as well as the first to examine the relationship between adherence to complementary feeding guidelines and improved health outcomes. Given that no country guidelines have been evaluated in the past, there is no evidence to suggest that adhering to any guidelines may improve health outcomes in infants. For this reason, more research should be done to assess the relationship between adhering to complementary feeding guidelines and improved infant health status. The value of assessing the utility of these guidelines is that we can discover what recommendations work and don't work in real life settings. Once governments are aware and acknowledge which recommendations are difficult to follow they can focus on ways to remove the barriers that prevent adherence. Furthermore, if it is found that adherence to certain recommendations does not improve infant health, more research can go into understanding what other factors influence infant health and how those factors can be incorporated into the recommendations.

The lack of association between adherence to Cambodia's complementary feeding guidelines and decreased rates of diarrhea, anemia and stunting highlight the need for a reassessment of the current guidelines, especially in regards to the inclusion of dietary diversity as a recommendation. The overall low adherence rates found also suggest a need to further examine barriers to adherence to complementary feeding recommendations in Cambodia. Outcomes from this research could potentially highlight priority areas for public health interventions, including increasing maternal education and may suggest the need for providing resources to peer programs that target female caregivers.

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## Appendix 1: History of Cambodia

Very little is known about prehistoric Cambodia. The early southeast of Cambodia consisted almost entirely of a large, shallow gulf. The Mekong River silted up this gulf over time and created flat, mineral-rich land in its place that was ideal for farming. From the 6<sup>th</sup> century onward the Mekong and Tonle Sap Rivers have been where the majority of Cambodians are concentrated (LP, 2012). In the northwest of Cambodia ceramic pots were found and carbon dated back to 4200 BC, indicating the presence of cave dwellers (LP, 2012). Very little is known of these cave dwellers and whether or not they resembled modern day Cambodians (LP, 2012). Fossils that were found and dated back to 1500 BC, however, suggest that individuals who lived in Cambodia at that time resembled Cambodians of today (LP, 2012).

Cambodia gained independence from the French government on November 9, 1953. The post-independence period was one of peace and great prosperity. Phnom Penh grew in size and stature and tourists came from around the world to marvel at the temples of Angkor and specifically Angkor Wat, said to be the world's largest single religious monument. At this time, America was at war with "communist north" Vietnam and Cambodia's peace was to be short lived. Vietnamese communists sought protection in Cambodia and although they were given an ultimatum to return to their homeland or face war with Cambodia, they risked war rather than returning to face American soldiers. On April 20<sup>th</sup> 1970, the United States and South Vietnamese forces invaded Cambodia in an effort to eliminate thousands of North Vietnamese troops who had created military bases in Cambodia. As a result of this invasion, Vietnamese communists withdrew deeper into Cambodia, aggravating and destabilizing the Cambodian government. The army of

Cambodia was minuscule compared to the Vietnamese forces and their Cambodian communist allies, also known as the Khmer Rouge. It only took days for the Cambodian government to be overrun by the Khmer Rouge and for savage fighting to engulf the country. The goal of the Khmer Rouge was to transform Cambodia (what they later renamed to “Kampuchea”) into a peasant-dominated agrarian cooperative (LP, 2012). The advent of the Khmer Rouge rule was known as “year one” (LP, 2012).

Days after the Khmer Rouge came into power, the entire population, including the sick, elderly and disabled, of Phnom Penh and other provincial towns were forced to work as slaves for 12 to 15 hours a day in the Cambodian countryside (PPU, 2012). Children were taken from their parents and put in separate forced labor camps (PPU, 2012). Any individuals who disobeyed or publicly complained were executed immediately (PPU, 2012). Intellectuals and professionals including doctors, lawyers, engineers, and scientists, were murdered and their extended families were not spared (PPU, 2012). Religion, most commonly Buddhism, was banned and all leading Buddhist monks were killed and their temples destroyed (PPU, 2012). During this time Cambodia cut itself from the world by abolishing currency, halting postal services, and shutting down schools, universities, and hospitals (PPU, 2012). A common slogan during the Khmer Rouge read, “to spare you is no profit, to destroy you is no loss” (PPU, 2012). Individuals who were spared from murder were forced to work under excruciating conditions and live in communes deliberately placed far from their former homes (PPU, 2012). Anyone who became ill, which often happened as the food rations were small and people were overworked with little opportunity to sleep, was executed (PPU, 2012). Minority groups such as those who were ethnically Chinese, Vietnamese, or Thai, or

anyone who had ancestors from any of these groups were also targeted and executed (PPU, 2012). Over half of the Muslim population was murdered as well as 8,000 Christians (PPU, 2012). Members of the Khmer Rouge were also repeatedly interrogated and often faced imprisonment or execution on the slightest suspicion of treachery or sabotage (PPU, 2012). Civilians deaths from execution, disease, starvation, and exhaustion have been estimated to be over 2 million (PPU, 2012).

During Cambodia's genocide, China had been planning an attack on Vietnam, and as the Khmer Rouge had links to China, hostility was initiated between communist Vietnam and the Khmer Rouge government (PPU, 2012). For this reason, Vietnam, who was backed by the Soviet Union, invaded Cambodia in 1978 and overthrew the Khmer Rouge government (LP, 2012). Vietnam set up a socialist government that consisted mainly of recent defectors from the Khmer Rouge (LP, 2012). Supporters of the Khmer Rouge who sought refuge in Thailand received help from American relief agencies. They received training from the United States and the UK in land mine use and with this support, continued fighting the Vietnam-backed government (LP, 2012). The United States supported the Khmer Rouge in overthrowing the Vietnamese-backed government (LP, 2012). The support of the United States continued to fuel this war, and delay Cambodia's recovery, for over a decade.

Vietnam withdrew its army from Cambodia in 1989 due to international pressure, United States backed economic sanctions , and cessation of aid from the Soviet Union. Under a temporary coalition government, Cambodia had its name restored and it was once again legal to own land, work, and practice religion. In 1993 democratic elections were held and the former monarch, Prince Sihanouk, was elected to once again lead a

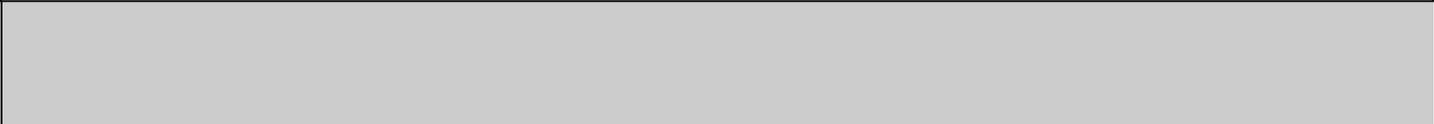
new government. Although the Khmer Rouge continued to oppose the new Cambodian government, their organization had begun to weaken and many former supporters left to plea for forgiveness and enter into the new government (LP, 2012). In 2002 Cambodia held its first local elections to select village and commune level representatives and set the stage for grassroots democracy in the country.

Cambodia is continuing to recover from after nearly three decades of war and close to a quarter of the population (some 1.7 million) dead (PPU, 2012). According to the World Bank, Cambodia has achieved high rates of economic growth since the war, and has cut poverty in half since 1999 (Walque, 2004). However, this growth has been largely concentrated in urban areas (Walque, 2004). The Cambodian government is working hard to tackle core governance issues and increasing investment opportunities, especially in agriculture. Cambodians still live with the threat of unexploded landmines (estimated at 6 to 11 million), bombs, mortars, grenades, and bullets, many of which were placed as booby traps and are still connected to trip wires (PPU, 2012). Since the war, Cambodia has made progress in education enrolment rates as well as several health reforms, however, maternal and child mortality rates remain high (CDHS, 2010). Corruption still remains in the judicial system and an anti-corruption law that was passed in March 2010 brings hope of transparency to the economic system (PPU, 2012).

# Appendix 2: Joint Programme for Children, Food Security and Nutrition in Cambodia- Baseline Survey

**CONFIDENTIAL**

All information collected in this survey is strictly confidential and will be used for statistical purposes



GEOGRAPHIC IDENTIFICATION	INTERVIEW RECORD
<p>PROVINCE : _____ <input style="width: 40px; height: 15px;" type="text"/> <input style="width: 40px; height: 15px;" type="text"/></p> <p>DISTRICT : _____ <input style="width: 40px; height: 15px;" type="text"/> <input style="width: 40px; height: 15px;" type="text"/></p> <p>COMMUNE: _____ <input style="width: 40px; height: 15px;" type="text"/> <input style="width: 40px; height: 15px;" type="text"/></p> <p>VILLAGE : _____ <input style="width: 40px; height: 15px;" type="text"/> <input style="width: 40px; height: 15px;" type="text"/></p> <p>CLUSTER NUMBER : _____ <input style="width: 40px; height: 15px;" type="text"/> <input style="width: 40px; height: 15px;" type="text"/></p> <p>ID HOUSEHOLD : _____ <input style="width: 40px; height: 15px;" type="text"/> <input style="width: 40px; height: 15px;" type="text"/></p> <p>(circle if respondent not mother): <input style="width: 20px; height: 20px;" type="checkbox"/></p> <p>1. Mother deceased</p> <p>2. Mother no longer lives in the house</p>	<p>Interviewer's</p> <p>Name : _____</p> <p>Signature : _____ Date : _____</p> <p>Remarks: _____</p> <p>Monitor's</p> <p>Name : _____</p> <p>Signature : _____ Date : _____</p> <p>Remarks: _____</p>

**MODULE 1: HOUSEHOLD INFORMATION**

1. Name of respondent	_____
2. Are you the mother of the youngest child?	0 = No <input type="checkbox"/> 1 = Yes → Skip to Q4
3. If not please specify your relationship to the youngest child.	_____
4. How old are you?	<input type="text"/> <input type="text"/> Year
5. What is your marital status?	1= Not Married 2= Married <input type="checkbox"/> 3=Widowed 4=Separated or Divorced
6. How many people in total currently live in your household (defined as eating from the same pot each day)?	<input type="text"/> <input type="text"/> People
7. How many children have you given birth to?	<input type="text"/> <input type="text"/> People
8. Have you ever given birth to a child who was born alive but later died?	0 = No → Skip to Q10 1 = Yes <input type="checkbox"/>
9. If yes, how many children have died?	<input type="text"/> <input type="text"/> People
10. How many children (under age 18 years) in total live in your household? (fill in the table below)	<input type="text"/> <input type="text"/> People

11. Please tell me the names, sex and ages of all the children living in your household and whether they are presently attending school. Please begin with the youngest child.

Children						
	Name	Sex	Date or Birth	Age in mo*/years	In School	Child #
1		M (1) F(2)	/ /		N (0) Y (1)	1
2		M (1) F(2)	/ /		N (0) Y (1)	2
3		M (1) F(2)	/ /		N (0) Y (1)	3
4		M (1) F(2)	/ /		N (0) Y (1)	4
5		M (1) F(2)	/ /		N (0) Y (1)	5
6		M (1) F(2)	/ /		N (0) Y (1)	6
7		M (1) F(2)	/ /		N (0) Y (1)	7
8		M (1) F(2)	/ /		N (0) Y (1)	8
9		M (1) F(2)	/ /		N (0) Y (1)	9

\* If under 5 years (60 months)

12. Have you ever attended school?	0 = No → Skip to Q15 <input type="checkbox"/>
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	1 = Yes	
13. If yes, how many years of schooling have you completed		<input type="text"/> <input type="text"/> years
14. What is the highest level of school you attended?	1=Primary school 2=Lower Secondary school 3=Upper Secondary school 4=Higher education 5=Other e.g. literacy program, vocational or skills training (exclude formal school) - Specify _____	<input type="checkbox"/>
15. Has the father of the children (under 5 years of age) attended school?	0 = No → Skip to Q17 1 = Yes	<input type="checkbox"/>
16. If yes, how many years of schooling has the father of the children completed?		<input type="text"/> <input type="text"/> years
17. What is the highest level of school father attended?	1=Primary school 2=Lower Secondary school 3=Upper Secondary school 4=Higher education 5=Other e.g. literacy program, vocational or skills training (exclude formal school) - Specify _____	<input type="checkbox"/>
18. Aside from your own housework, in the past 12 months did you work outside the home (paid or unpaid)?	0 = No → Skip to Q21 1 = Yes	<input type="checkbox"/>
19. If yes what was your work status?	1. Employee/wage worker 2. Employer 3. Self-employed (not employing anyone else) 4. Unpaid family worker 5. In job trainee 6. Member of a cooperative	
20. If yes, what sector do you work in (where do you work)?	1. Agriculture: Rice/crop farmer (if yes then ask Q21) 2. Animal raising/sale of products (e.g. eggs, chicks) 3. Fishing 4. Manufacturing 5. Hotel or restaurant 6. Small business or store (petty trade) 7. Gather goods from the forest 8. Hunting 9. Firewood/charcoal cutting/sales 10. Lend money to others (for interest) 11. Other - Specify _____	<input type="text"/> <input type="text"/>
21. Do you work mainly on your own land, on family land or do you work on land that you rent from someone else? [ONLY ASK IF ANSWER TO Q20 = 1 [Rice/crop farmer]]	1. Own Land 2. Family Land 3. Rented land 4. Someone else's land	<input type="checkbox"/>
22. Are you the main income earner in your household?	0 = No 1 = Yes → Skip to Q27	<input type="checkbox"/>
23. If no, who is the main income earner in your household?	1. Father of the child (ren) 2. Grandparents	<input type="checkbox"/>

	3. Children 4. Other - Specify _____
24. What was the work status of the main income earner over the past 12 months	1. Employee/wage worker 2. Employer 3. Self-employed (not employing anyone else) 4. Unpaid family worker 5. In job trainee 6. Member of cooperative
25. What sector does the main income earner work in?	1. Agriculture: Rice/crop farmer (if yes then ask Q26) 2. Animal raising/sale of products (e.g. eggs, chicks) 3. Fishing 4. Manufacturing 5. Hotel or restaurant 6. Small business or store (petty trade) <input type="checkbox"/> <input type="checkbox"/> 7. Gather goods from the forest 8. Hunting 9. Firewood/charcoal cutting/sales 10. Lend money to others (for interest) 11. Other – Specify _____
26. Does the main income earner of your household work mainly on your own land, on family land or do you work on land that you rent from someone else?  [ONLY ASK IF ANSWER TO Q25= 1 [Rice/crop farmer]]	1. Own Land 2. Family Land <input type="checkbox"/> 3. Rented land 4. Someone else’s land
27. What is the main material of the roof of the house?	1. Roof of bamboo, thatch/grass/hay/ leaves or other temporary materials <input type="checkbox"/> 2. Galvanized iron/aluminum sheet, asbestos cement sheets, tile (clay or wooden) or other permanent material
28. What is the main material of the walls of the house?	1. Walls of bamboo, thatch/grass/reed/ hay/ leaves, earth and salvaged materials <input type="checkbox"/> 2. Wood (including plywood), concrete, brick, stone, galvanized iron/aluminum, asbestos cement sheets or other permanent material
29. What type of fuel does your household usually use for cooking?	1. Electricity 2. LPG (natural gas) 3. Biogas 4. Charcoal <input type="checkbox"/> 5. Wood 6. Straw/shrubs/grass 7. Animal dung 8. Other – Specify _____
30. Does the household have electricity from a power line in the house?	0 = No <input type="checkbox"/> 1 = Yes
31. Does your household have:  Code: 0=No	a. A working radio <input type="checkbox"/> b. A working television <input type="checkbox"/> c. A mobile telephone <input type="checkbox"/>

1=Yes	d. A refrigerator <input type="checkbox"/> e. An ice box <input type="checkbox"/> f. A wardrobe <input type="checkbox"/> g. A water pump <input type="checkbox"/> h. A generator <input type="checkbox"/> i. A large car battery or moto battery <input type="checkbox"/> j. A sewing machine or loom <input type="checkbox"/>
<b>MODULE 2: HYGIENE AND SANITATION</b>	
32. Do you <i>cover</i> leftover cook food?	0 = No → Skip to Q34 1 = Yes <input type="checkbox"/>
33. If yes, what do you cover the leftover cooked food with?	1. Under a safety net <input type="checkbox"/> 2. lid 3. Other specify _____
34. Do you <i>store</i> leftover cooked food?	0 = No → Skip to Q36 1 = Yes <input type="checkbox"/>
35. If yes, where do you store leftover cooked food?	1. In a cupboard 2. Ice box/refridgerator 3. In an open space/area e.g. corner of house. 4. Other – specify _____
36. What is the main source of water used by your household for other purposes such as cooking and hand washing?	1. Pond/river/canal 2. Open ringwell 3. Closed ringwell 4. Open spring <input type="checkbox"/> <input type="checkbox"/> 5. Handpump 6. Tapped water 7. Rain water 8. Bought water 9. Hand dug (no ring) 1. Other – specify _____
37. What is the main source of drinking water for members of your household?	1. Pond/river/canal 2. Open ringwell 3. Closed ringwell 4. Open spring <input type="checkbox"/> <input type="checkbox"/> 5. Handpump 6. Tapped water 7. Rain water 8. Bought water 9. Hand dug (no ring) 10. Other - specify _____
38. Where is the drinking water source located?	1. In dwelling (if yes skip to Q41) 2. In yard/plot outside dwelling <input type="checkbox"/> 3. Elsewhere – specify _____
39. How long does it take to go there, get drinking water, and come back?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Minutes:

40. Who usually goes to this source to fetch the drinking water for your household?	1. Adult woman 2. Adult man 3. Femal child under 15 years old <input type="checkbox"/> 4. Male child under 15 years old 5. Other (Specify)_____
41. Do you treat your water in any way to make it safer to drink?	0 = No → Skip to Q43 1 = Yes <input type="checkbox"/>
42. What do you usually do to the water to make it safer to drink?	1. Boil 2. Add bleach/chlorine 3. White Alum <input type="checkbox"/> 4. Strain it through a cloth 5. Use water filter (ceramic, sand, composite, etc.) 6. Solar disinfection 7. Let it stand and settle 8. Other - specify _____ 9. Don't know
43. Where do adult members of your household usually defecate?	1. closed latrine 2. open latrine 3. river/pond side <input type="checkbox"/> 4. bush/open field 5. other, specify
44. Where do young children of your household usually defecate?	1. closed latrine 2. open latrine 3. river/pond side <input type="checkbox"/> 4. bush/open field 5. around the house 6. other, specify
45. Do you wash your hands with soap?	0 = No → Skip to Q47 1 = Yes <input type="checkbox"/>
46. If yes, when do you wash your hands with soap (check all that apply)? Code: 0=No 1=Yes	a. Before preparing/handling food <input type="checkbox"/> b. Before feeding children <input type="checkbox"/> c. Before eating <input type="checkbox"/> d. After preparing food <input type="checkbox"/> e. After field work/cleaning <input type="checkbox"/> f. After changing babies/cleaning child <input type="checkbox"/> g. After eating <input type="checkbox"/> h. After defecating/using toilet facility <input type="checkbox"/> i. Other - specify _____
47. Do you wash your children's hands with soap?	0 = No → Skip to Q49 1 = Yes <input type="checkbox"/>

48. If yes, when do you wash your children's hands? Code: 0=No; 1=Yes	1. Before they eat <input type="checkbox"/> 2. After they defecate/use toilet facility <input type="checkbox"/> 3. Other - specify _____
49. Do you wash your cooking utensils with soap?	0 = No <input type="checkbox"/> 1 = Yes

### MODULE 3: INFANT AND CHILD HEALTH AND FEEDING PRACTICES

In this section I would like to ask you about the health and nutrition of any children under 5 years of age who are in your care starting with the youngest child who is under 3 years of age (36 months) (part A).

#### A) FOR THE YOUNGEST CHILD IN THE HOUSEHOLD LESS THAN 36 MONTHS

50. What is the name of the youngest child in the household (confirm name, birth date and sex from module1) under 36 months?	Name _____ ID#: 01	Name _____ <b>ID#: 02</b>	Name _____ <b>ID#: 03</b>
51. The youngest child date of birth	<input type="text"/> / <input type="text"/> / <input type="text"/> Day/ Month / Year	<input type="text"/> / <input type="text"/> / <input type="text"/> Day/ Month / Year	<input type="text"/> / <input type="text"/> / <input type="text"/> Day/ Month / Year
52. Enter sex of (NAME)	1. Male <input type="checkbox"/> 2. Female	1. Male <input type="checkbox"/> 2. Female	1. Male <input type="checkbox"/> 2. Female
53. Who is mostly responsible for preparing food for (NAME)?	1. Self (mother/care giver) <input type="checkbox"/> 2. Father <input type="checkbox"/> 3. Grandmother/grandfather 4. Older sibling 5. Neighbor/relatives 6. Other-specify _____		
54. Who is mostly responsible for feeding (NAME)?	1. Self (mother/care giver) 2. Father 3. Grandmother/ grandfather 4. Older sibling <input type="checkbox"/> 5. Neighbor/relatives 6. Other specify _____		
55. Did you ever breastfeed (NAME)?	0 = No → Skip to 63 1 = Yes <input type="checkbox"/>		
56. How long after birth did you first put (NAME) to the breast?  <small>IF LESS THAN 1 HOUR, RECORD '00' HOURS.  IF LESS THAN 24 HOURS, RECORD HOURS.  OTHERWISE, RECORD DAYS.</small>	Within one hour.....000 Hours 1 <input type="text"/> Days 2 <input type="text"/> Don't know 7 <input type="text"/>		
57. Did you feed (NAME) with the colostrum?	0 = No 1 = Yes <input type="checkbox"/> 7=Don't Know		

58. In the first three days after delivery was (NAME) given anything to drink other than breast milk, such as Chher Em, water, sugar water?	0 = No 1 = Yes <input type="checkbox"/> 7=Don't Know		
59. Are you still breastfeeding (NAME)?	0 = No 1 = Yes → Skip to 61 <input type="checkbox"/>		
60. For how many months did you breastfeed (name)?	Months <input type="text"/> <input type="text"/> 77= Don't know		
61. How many times did you breastfeed (NAME) last night between sunset and sunrise?	<input type="text"/> <input type="text"/>		
62. How many times did you breastfeed (NAME) yesterday during the daylight hours (sunrise to sunset)?	<input type="text"/> <input type="text"/>		
63. Did (NAME) drink anything from a bottle with a nipple yesterday or last night?	0 = No 1 = Yes <input type="checkbox"/> 7=Don't Know	0 = No <input type="checkbox"/> 1 = Yes <input type="checkbox"/> 7=Don't Know	0 = No <input type="checkbox"/> 1 = Yes <input type="checkbox"/> 7=Don't Know

<p>64. At any time yesterday or last night has (NAME) received any of the following? READ EACH ITEM ALOUD AND RECORD THE RESPONSE BEFORE PROCEEDING TO THE NEXT ITEM.</p> <p>Code: 0=No; 1=Yes</p>	<p>a. Plain water? <input type="checkbox"/></p> <p>b. Sweetened water, juice or fruit juice (e.g. coconut juice), carbonated drinks? <input type="checkbox"/></p> <p>c. Soup broth? <input type="checkbox"/></p> <p>d. Infant formula? <input type="checkbox"/></p> <p>e. Tinned, powdered or fresh milk? <input type="checkbox"/></p> <p>f. Vitamin, mineral supplements (liquid) or medicine? <input type="checkbox"/></p> <p>g. Oral rehydration solution (ORS/oralyte/Royal D)? <input type="checkbox"/></p> <p>h. Any other liquids e.g. tea, coffee, infusions? <input type="checkbox"/></p> <p>i. Specify _____ <input type="checkbox"/></p> <p>j. Solid or semi-solid (mushy) foods? <input type="checkbox"/></p> <p>k. Received only breast milk? <input type="checkbox"/></p>	<p>a. Plain water? <input type="checkbox"/></p> <p>b. Sweetened water, juice or fruit juice (e.g. coconut juice), carbonated drinks? <input type="checkbox"/></p> <p>c. Soup broth? <input type="checkbox"/></p> <p>d. Infant formula? <input type="checkbox"/></p> <p>e. Tinned, powdered or fresh milk? <input type="checkbox"/></p> <p>f. Vitamin, mineral supplements (liquid) or medicine? <input type="checkbox"/></p> <p>g. Oral rehydration solution (ORS/oralyte/Royal D)? <input type="checkbox"/></p> <p>h. Any other liquids e.g. tea, coffee, infusions? <input type="checkbox"/></p> <p>i. Specify _____ <input type="checkbox"/></p> <p>j. Solid or semi-solid (mushy) foods? <input type="checkbox"/></p> <p>k. Received only breast milk? <input type="checkbox"/></p>	<p>a. Plain water? <input type="checkbox"/></p> <p>b. Sweetened water, juice or fruit juice (e.g. coconut juice), carbonated drinks? <input type="checkbox"/></p> <p>c. Soup broth? <input type="checkbox"/></p> <p>d. Infant formula? <input type="checkbox"/></p> <p>e. Tinned, powdered or fresh milk? <input type="checkbox"/></p> <p>f. Vitamin, mineral supplements (liquid) or medicine? <input type="checkbox"/></p> <p>g. Oral rehydration solution (ORS/oralyte/Royal D)? <input type="checkbox"/></p> <p>h. Any other liquids e.g. tea, coffee, infusions? <input type="checkbox"/></p> <p>i. Specify _____ <input type="checkbox"/></p> <p>j. Solid or semi-solid (mushy) foods? <input type="checkbox"/></p> <p>k. Received only breast milk? <input type="checkbox"/></p>
<p>65. Has (NAME) started receiving any semi-solid or mushy food?</p>	<p>0 = No → Skip to Q75 1 = Yes <input type="checkbox"/></p>	<p>0 = No → Skip to Q101 1 = Yes <input type="checkbox"/></p>	<p>0 = No → Skip to Q101 1 = Yes <input type="checkbox"/></p>
<p>66. At what age did (NAME) start receiving semi-solid food?</p>	<p>Months <input type="text"/> <input type="text"/></p>	<p>Months <input type="text"/> <input type="text"/></p>	<p>Months <input type="text"/> <input type="text"/></p>
<p>67. How many times yesterday, during the day or night, did (NAME) eat any solid, semi-solid or soft foods, including any meals and snacks?</p>	<p>Number of meals <input type="text"/> <input type="text"/></p> <p>Number of snacks <input type="text"/> <input type="text"/></p> <p>77=Don't Know <input type="text"/> <input type="text"/></p>	<p>Number of meals <input type="text"/> <input type="text"/></p> <p>Number of snacks <input type="text"/> <input type="text"/></p> <p>77=Don't Know <input type="text"/> <input type="text"/></p>	<p>Number of meals <input type="text"/> <input type="text"/></p> <p>Number of snacks <input type="text"/> <input type="text"/></p> <p>77=Don't Know <input type="text"/> <input type="text"/></p>
<p>68. How many bowls of food in total did (NAME ) have yesterday?</p>	<p>1. Less than ½ bowl</p> <p>2. ½ bowl</p> <p>3. ¾ bowl <input type="checkbox"/></p> <p>4. Full bowl</p> <p>5. 1 ½ bowls</p> <p>6. 2 bowls</p> <p>7. More than 2 bowls</p>	<p>1. Less than ½ bowl</p> <p>2. ½ bowl</p> <p>3. ¾ bowl <input type="checkbox"/></p> <p>4. Full bowl</p> <p>5. 1 ½ bowls</p> <p>6. 2 bowls</p> <p>7. More than 2 bowls</p>	<p>1. Less than ½ bowl</p> <p>2. ½ bowl</p> <p>3. ¾ bowl <input type="checkbox"/></p> <p>4. Full bowl</p> <p>5. 1 ½ bowls</p> <p>6. 2 bowls</p> <p>7. More than 2 bowls</p>

69. Now I am going to ask you about the foods (NAME of youngest child under 36 months) consumed yesterday (from the time he or she woke up until he or she went to bed at night) and I want to know whether (NAME) consumed the food and how much he/she consumed whether eaten on its own or combined with other foods. I am going to show you some bowls and spoons to help me understand/record how much (NAME) consumed of each food yesterday. I also want to know about how thick some of the foods were that he/she consumed.

FOOD	CONSUMED IN LAST 24 HOURS?	FOOD	CONSUMED IN LAST 24 HOURS?	FOOD	CONSUMED IN LAST 24 HOURS?
a) Borbor sor (plain porridge), plain rice <u>Amount</u>	0.No 1.Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons (~1/4 bowl) 5. ½ bowl 6. ¾ bowl 7. Full bowl	a)Borbor (porridge), rice <u>Amount</u>	0.No 1.Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons (~1/4 bowl) 5. ½ bowl 6. ¾ bowl 7. Full bowl	a)Borbor (porridge), rice <u>Amount</u>	0.No 1.Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons (~1/4 bowl) 5. ½ bowl 6. ¾ bowl 7. Full bowl
<u>Consistency</u>	1. Thin (soup-like) <input type="checkbox"/> 2. Medium (porridge-like) 3. Thick (rice)	<u>Consistency</u>	1. Thin (soup-like) <input type="checkbox"/> 2. Medium (porridge-like) 3. Thick (rice)	<u>Consistency</u>	1. Thin (soup-like) <input type="checkbox"/> 2. Medium (porridge-like) <input type="checkbox"/> 3. Thick (rice) <input type="checkbox"/>
b)Borbor Kroeung (porridge), rice <u>Amount</u>	0.No 1.Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons (~1/4 bowl) 5. ½ bowl 6. ¾ bowl 7. Full bowl	b)Borbor (porridge), rice <u>Amount</u>	0.No 1.Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons (~1/4 bowl) 5. ½ bowl 6. ¾ bowl 7. Full bowl	b)Borbor (porridge), rice <u>Amount</u>	0.No 1.Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons (~1/4 bowl) 5. ½ bowl 6. ¾ bowl 7. Full bowl
<u>Consistency</u>	1. Thin (soup-like) <input type="checkbox"/> 2. Medium (porridge-like) 3. Thick (rice)	<u>Consistency</u>	1. Thin (soup-like) <input type="checkbox"/> 2. Medium (porridge-like) 3. Thick (rice)	<u>Consistency</u>	1. Thin (soup-like) <input type="checkbox"/> 2. Medium (porridge-like) <input type="checkbox"/> 3. Thick (rice) <input type="checkbox"/>
c) Noodles, bread or other grain <u>Amount</u>	0. No.1. Yes <input type="checkbox"/>  1. ~ ¼ bowl <input type="checkbox"/> 2. ~½ bowl <input type="checkbox"/> 3. ¾ bowl 4. Full bowl	c) Noodles, bread or other grain <u>Amount</u>	0. No.1. Yes <input type="checkbox"/>  1. ~ ¼ bowl <input type="checkbox"/> 2. ~½ bowl <input type="checkbox"/> 3. ¾ bowl 4. Full bowl	c) Noodles, bread or other grain <u>Amount</u>	0. No.1. Yes <input type="checkbox"/>  1. ~ ¼ bowl <input type="checkbox"/> 2. ~½ bowl <input type="checkbox"/> 3. ¾ bowl 4. Full bowl
d) Meat, poultry, fish(e.g. beef, pork, lamb, goat, chicken, duck or other birds, fresh or dried fish, seafood or shellfish, snail, frog, congealed blood, liver, kidney, heart or other organ meats) <u>Amount</u>	0. No.1. Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons	d) Meat, poultry, fish(e.g. beef, pork, lamb, goat, chicken, duck or other birds, fresh or dried fish, seafood or shellfish, snail, frog, congealed blood, liver, kidney, heart or other organ meats) <u>Amount</u>	0. No.1. Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons	d) Meat, poultry, fish(e.g. beef, pork, lamb, goat, chicken, duck or other birds, fresh or dried fish, seafood or shellfish, snail, frog, congealed blood, liver, kidney, heart or other organ meats) <u>Amount</u>	0. No.1. Yes <input type="checkbox"/>  1. Half Spoon 2. One Spoon <input type="checkbox"/> 3. Two Spoons 4. Three Spoons
e) Eggs <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/>  1. Half an egg or less <input type="checkbox"/> 2. One egg <input type="checkbox"/> 3. More than one egg	e) Eggs <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/>  1. Half an egg or less <input type="checkbox"/> 2. One egg <input type="checkbox"/> 3. More than one egg	e) Eggs <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/>  1. Half an egg or less <input type="checkbox"/> 2. One egg <input type="checkbox"/> 3. More than one egg

f) Beans, peas, tofu or nuts <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	f) Beans, peas, tofu or nuts <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	f) Beans, peas, tofu or nuts <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons
g) Oil, fat, or coconut milk e.g. alone, added to dessert, meal, curry etc. <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	g) Oil, fat, or coconut milk e.g. alone, added to dessert, meal, curry etc. <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	g) Oil, fat, or coconut milk e.g. alone, added to dessert, meal, curry etc. <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons
h) Pumpkin, carrots, yellow/orange sweet potato or other yellow vegetables <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	h) Pumpkin, carrots, yellow/orange sweet potato or other yellow vegetables <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	h) Pumpkin, carrots, yellow/orange sweet potato or other yellow vegetables <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons
i) Potatoes, winter melon, green leafy vegetables, sprouts, cucumber, tomato, taro, manioc, sweet potatoes or other tubers <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	i) Potatoes, winter melon, green leafy vegetables, sprouts, cucumber, tomato, taro, manioc, sweet potatoes or other tubers <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	i) Potatoes, winter melon, green leafy vegetables, sprouts, cucumber, tomato, taro, manioc, sweet potatoes or other tubers <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons
j) Commercial baby foods (any commercially produced baby cereal from glass, tin or box) <u>Amount</u>  <u>Consistency</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons 1. Thin (soup-like) 2. Medium (porridge-like) 3. Thick (rice)	j) Commercial baby foods (any commercially produced baby cereal from glass, tin or box) <u>Amount</u>  <u>Consistency</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons 1. Thin (soup-like) 2. Medium (porridge-like) 3. Thick (rice)	j) Commercial baby foods (any commercially produced baby cereal from glass, tin or box) <u>Amount</u>  <u>Consistency</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons 1. Thin (soup-like) 2. Medium (porridge-like) 3. Thick (rice)
k) Orange or yellow fruits (ripe mango, papaya)  <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	k) Orange or yellow fruits (ripe mango, papaya)  <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	k) Orange or yellow fruits (ripe mango, papaya)  <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons
l) Other fruits, bananas, green papayas or green mangoes <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	l) Other fruits, bananas, green papayas or green mangoes <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	l) Other fruits, bananas, green papayas or green mangoes <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/> 1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons
m) Any snacks or other foods, such as fried banana, doughnut or other fried foods, glutinous or toasted rice snack, cracker, cookie, cake,	0. No. 1. Yes <input type="checkbox"/>	m) Any snacks or other foods, such as fried banana, doughnut or other fried foods, glutinous or toasted rice snack, cracker, cookie, cake,	0. No. 1. Yes <input type="checkbox"/>	m) Any snacks or other foods, such as fried banana, doughnut or other fried foods, glutinous or toasted rice snack, cracker, cookie, cake,	0. No. 1. Yes <input type="checkbox"/>

shrimp chips, crisps, broken noodle snack, candy, rice cake, or other snack local or imported <u>Total amount of all snacks:</u>	1) ½ bowl <input type="checkbox"/> 2) ¾ bowl <input type="checkbox"/> 3) Full bowl <input type="checkbox"/>	crisps, broken noodle snack, candy, rice cake, or other snack local or imported <u>Total amount of all snacks:</u>	1) ½ bowl <input type="checkbox"/> 2) ¾ bowl <input type="checkbox"/> 3) Full bowl <input type="checkbox"/>	shrimp chips, crisps, broken noodle snack, candy, rice cake, or other snack local or imported <u>Total amount of all snacks:</u>	1) ½ bowl <input type="checkbox"/> 2) ¾ bowl <input type="checkbox"/> 3) Full bowl <input type="checkbox"/>
n)Yogurt, cheese or other foods made from milk Amount	0. No. 1. Yes <input type="checkbox"/>  1. half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons (1/4 bowl) 5. ½ bowl 6.¾ bowl 7. Full bowl	n)Yogurt, cheese or other foods made from milk Amount	0. No. 1. Yes <input type="checkbox"/>  1. half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons (1/4 bowl) 5. ½ bowl 6.¾ bowl 7. Full bowl	n)Yogurt, cheese or other foods made from milk Amount	0. No. 1. Yes <input type="checkbox"/>  1. half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons (1/4 bowl) 5. ½ bowl 6.¾ bowl 7. Full bowl
o) Where any other foods given to the child that were not mentioned above?  Specify foods: <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/>  1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	o) Where any other foods given to the child that were not mentioned above?  Specify foods: <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/>  1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons	o) Where any other foods given to the child that were not mentioned above?  Specify foods: <u>Amount</u>	0. No. 1. Yes <input type="checkbox"/>  1. Half Spoon <input type="checkbox"/> 2. One Spoon <input type="checkbox"/> 3. Two Spoons <input type="checkbox"/> 4. Three Spoons
70. Was this a typical day's food intake for (NAME ID# __)?		0 = No 1 = Yes → <input type="checkbox"/> Skip to72	0 = No 1 = Yes → <input type="checkbox"/> Skip to101		0 = No 1 = Yes → <input type="checkbox"/> Skip to101
71. If it was not typical was it because:  Code: 0=No; 1=Yes		a. Child was not hungry, did not have an appetite <input type="checkbox"/> b. Child was sick <input type="checkbox"/> c. There was not enough food to feed (NAME) more <input type="checkbox"/> d. Other Specify_____	a. Child was not hungry, did not have an appetite <input type="checkbox"/> b. Child was sick <input type="checkbox"/> c. There was not enough food to feed (NAME) more <input type="checkbox"/> d. Other Specify_____	a. Child was not hungry, did not have an appet <input type="checkbox"/> b. Child was sick <input type="checkbox"/> c. There was not enough food to feed (NAME) more <input type="checkbox"/> d. Other Specify_____	
72. Does your youngest child eat from his/her own separate bowl?		0 = No <input type="checkbox"/> 1 = Yes			
73. Do you encourage your youngest child to eat?		0 = No → Skip to 75 1 = Yes <input type="checkbox"/>			

<p>74. If yes, how do you encourage your youngest child to eat (check all responses)?</p> <p>Code: 0=No; 1=Yes</p>	<p>a. Hold the child while eating <input type="checkbox"/></p> <p>b. Talk to the child while eating <input type="checkbox"/></p> <p>c. Look at the child while eating <input type="checkbox"/></p> <p>d. Encourage extra bites of food <input type="checkbox"/></p> <p>e. Other specify _____</p>
<p><b>Now I would like to ask some questions about the health of your youngest child (NAME)</b></p> <p>75. Has (NAME) had diarrhea, (this means 3 or more times a day of loose stools) in the past 2 weeks?</p>	<p>0 = No → Skip to 87</p> <p>1 = Yes <input type="checkbox"/></p>
<p>76. Was there any blood in the stools?</p>	<p>0 = No <input type="checkbox"/></p> <p>1 = Yes</p>
<p>77. How many days did the diarrhea last for (NAME)?</p>	<p><input type="text"/> <input type="text"/></p>
<p>78. Was (NAME) given the same amount to drink as before the diarrhea, or more, or less?</p>	<p>1. Same <input type="checkbox"/></p> <p>2. More</p> <p>3. Less</p> <p>7. Don't know</p>
<p>79. Was (NAME) given the same amount of food to eat as before the diarrhea, or more or less food?</p>	<p>1. Same <input type="checkbox"/></p> <p>2. More</p> <p>3. Less</p> <p>7. Don't know</p>
<p>80. When (NAME) had diarrhea, was he/she given any of the following to drink?</p> <p><b>Read each item from the list</b></p> <p>Code: 0=No; 1=Yes</p>	<p>a. A fluid made from a special packet called Oralyte, Royal D? <input type="checkbox"/></p> <p>b. A home fluid of porridge water with salt and sugar? <input type="checkbox"/></p> <p>c. Coconut juice? <input type="checkbox"/></p> <p>d. Traditional herbal medicine/infusion? <input type="checkbox"/></p>
<p>81. Did the child take zinc tablets for the diarrhea?</p>	<p>0 = No → Skip to 83</p> <p>1 = Yes <input type="checkbox"/></p>
<p>82. If yes, for how many days did he/she take the zinc tablets?</p>	<p><input type="text"/> <input type="text"/></p>

83. Was anything (else) given to treat the diarrhea?	0 = No → Skip to 85 1 = Yes <input type="checkbox"/>
84. If yes, what was given to treat the diarrhea? Code: 0=no; 1=yes	a. Tablet or syrup <input type="checkbox"/> b. Injection (IV or IM) <input type="checkbox"/> c. Other - specify ____
85. Did you seek advice or treatment for the diarrhea?	0 = No → Skip to 87 1 = Yes <input type="checkbox"/>
86. Where did you seek advice (or from whom)? Code: 0=No; 1=Yes	<u>Health sector</u> a. Hospital <input type="checkbox"/> b. Health center/health post <input type="checkbox"/> c. Outreach/mobile clinic <input type="checkbox"/> d. Other - specify: ____ <u>Community</u> e. Midwife <input type="checkbox"/> f. TBA/traditional healer <input type="checkbox"/> g. VHSG <input type="checkbox"/> h. Mother support group <input type="checkbox"/> i. Drug sellers <input type="checkbox"/> j. Friend <input type="checkbox"/> k. Relative or neighbor <input type="checkbox"/> l. Mother or mother-in-law <input type="checkbox"/> m. Other specify _____ _____
87. Has (NAME) been ill with fever at any time in the past 2 weeks?	0 = No <input type="checkbox"/> 1 = Yes <input type="checkbox"/>

88. Has (NAME) been ill with a cough at any time in the past 2 weeks?	0 = No <input type="checkbox"/> 1 = Yes
89. When (NAME) had an illness with a cough, did he/she breathe faster than usual with short, quick breaths or have difficulty breathing?	0 = No <input type="checkbox"/> 1 = Yes
90. When (NAME) had an illness did he/she have a 'hoarse' cry?	0 = No <input type="checkbox"/> 1 = Yes
91. Did you seek advice or treatment for the illness outside the home?	0 = No <input type="checkbox"/> → Skip to 93 1 = Yes <input type="checkbox"/>
92. Where did you seek advice (or from whom)? Code: 0=No; 1=Yes	<p><u>Health sector</u></p> <p>a. Hospital <input type="checkbox"/></p> <p>b. Health center/health post <input type="checkbox"/></p> <p>c. Outreach/mobile clinic <input type="checkbox"/></p> <p>d. Other - specify: _____</p> <p><u>Community</u></p> <p>e. Midwife <input type="checkbox"/></p> <p>f. TBA/traditional healer <input type="checkbox"/></p> <p>g. VHSG <input type="checkbox"/></p> <p>h. Mother support group <input type="checkbox"/></p> <p>i. Drug sellers <input type="checkbox"/></p> <p>j. Friend <input type="checkbox"/></p> <p>k. Relative or neighbor <input type="checkbox"/></p> <p>l. Mother or mother-in-law <input type="checkbox"/></p> <p>m. Other specify _____</p>

93. Has (NAME) ever been measured and diagnosed with malnutrition (i.e. were you told he/she was underweight/small, not growing well or had too small a mid-upper arm?)	0 = No → Skip to 97 1 = Yes <input type="checkbox"/>				
94. If yes, was your child referred to the hospital/clinic or health center?	0 = No <input type="checkbox"/> 1 = Yes				
95. Did your child receive any of the following treatments for malnutrition?  Code: 0=No; 1=Yes	a. Was given extra food to be fed at home e.g. extra rice <input type="checkbox"/> b. Was given a supplementary food product to be fed at home e.g. CSB, BP100, Plumpy Nut <input type="checkbox"/> c. Was given ORS (Oralyte) <input type="checkbox"/> d. Was given and intravenous solution (IV) <input type="checkbox"/> e. Other - specify _____				
96. Is your child still being treated for malnutrition?	0 = No <input type="checkbox"/> 1 = Yes				
97. Do you have a Yellow Card for your youngest child?	0 = No → Skip to 99 1 = Yes <input type="checkbox"/>				
If yes copy the following from the card:  98. Number of plotted points for weight:	<input type="checkbox"/>				
99. Have you ever given your child a vitamin/mineral powder that you were asked to mix with his/her food (show Sprinkles package)?	0 = No → Skip to 101 1 = Yes <input type="checkbox"/>				
100. If yes, for how many months did your child take the vitamin/mineral powder (Sprinkles)?	<input type="text"/> <input type="text"/>				
101. What is the name of the youngest child in the household (confirm name, birth date and sex from module1) <b>age 36-59 months?</b>	Name _____ ID#: 05			Name _____ ID#: 06	Name _____ ID#: 07
102. The youngest child date of birth	<input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> Day/ Month / Year			<input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> Day/ Month / Year	<input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> Day/ Month / Year

103. Enter sex of (NAME)	1. Male <input type="checkbox"/> 2. Female <input type="checkbox"/>	1. Male <input type="checkbox"/> 2. Female <input type="checkbox"/>	1. Male <input type="checkbox"/> 2. Female <input type="checkbox"/>
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**B) FOOD INTAKE OF CHILDREN 36 – 59 MONTHS.**

I would now like to ask you about the foods your child or children between the ages of 36 and 59 months consumed yesterday at any time during the day or night. I would like to know if they consumed the food whether it was eaten separately or combined with other foods

104. Did your child eat or drink:

Code: 0=No; 1=Yes

<p>a. Any rice, noodles, bread, maize or other staple food made from grains <input type="checkbox"/></p> <p>b. Any pumpkin, yellow sweet potatoes, or carrots <input type="checkbox"/></p> <p>c. Any white potatoes, cassava (manioc), white yams or other white root vegetables <input type="checkbox"/></p> <p>d. Any dark green leafy vegetables <input type="checkbox"/></p> <p>e. Any ripe (orange) mangoes or papayas <input type="checkbox"/></p> <p>f. Any other fruits or vegetables <input type="checkbox"/></p> <p>g. Any liver, kidney, heart, blood, intestine or other organs <input type="checkbox"/></p> <p>h. Any meat such as beef, pork, lamb, goat, rabbit, deer, chicken, duck, other birds, snake, snail, frog, rat, insects or other small animals <input type="checkbox"/></p> <p>i. Any eggs <input type="checkbox"/></p> <p>j. Any fresh or dried fish or shellfish* <input type="checkbox"/></p> <p>k. Any foods made from beans, lentils, peas, or nuts <input type="checkbox"/></p> <p>l. Any food made with oil, fats or coconut milk <input type="checkbox"/></p> <p>m. Any sugar or sugary foods such as sweets, chocolate, candies, cakes, pastries, biscuits, sweet soups such as mung bean or pumpkin soup <input type="checkbox"/></p> <p>n. Any fried snacks such as fried bananas, fried sweet potatoes, shrimp chips <input type="checkbox"/></p> <p>o. Any sugary drinks such as soda, fruit juice or soya drink <input type="checkbox"/></p> <p>p. Any milk – fresh, tinned or powdered, or milk products such as cheese or yoghurt <input type="checkbox"/></p> <p>q. Any fish paste or fish sauce <input type="checkbox"/></p>	<p>a. Any rice, noodles, bread, maize or other staple food made from grains <input type="checkbox"/></p> <p>b. Any pumpkin, yellow sweet potatoes, or carrots <input type="checkbox"/></p> <p>c. Any white potatoes, cassava (manioc), white yams or other white root vegetables <input type="checkbox"/></p> <p>d. Any dark green leafy vegetables <input type="checkbox"/></p> <p>e. Any ripe (orange) mangoes or papayas <input type="checkbox"/></p> <p>f. Any other fruits or vegetables <input type="checkbox"/></p> <p>g. Any liver, kidney, heart, blood, intestine or other organs <input type="checkbox"/></p> <p>h. Any meat such as beef, pork, lamb, goat, rabbit, deer, chicken, duck, other birds, snake, snail, frog, rat, insects or other small animals <input type="checkbox"/></p> <p>i. Any eggs <input type="checkbox"/></p> <p>j. Any fresh or dried fish or shellfish* <input type="checkbox"/></p> <p>k. Any foods made from beans, lentils, peas, or nuts <input type="checkbox"/></p> <p>l. Any food made with oil, fats or coconut milk <input type="checkbox"/></p> <p>m. Any sugar or sugary foods such as sweets, chocolate, candies, cakes, pastries, biscuits, sweet soups such as mung bean or pumpkin soup <input type="checkbox"/></p> <p>n. Any fried snacks such as fried bananas, fried sweet potatoes, shrimp chips <input type="checkbox"/></p> <p>o. Any sugary drinks such as soda, fruit juice or soya drink <input type="checkbox"/></p> <p>p. Any milk – fresh, tinned or powdered, or milk products such as cheese or yoghurt <input type="checkbox"/></p> <p>q. Any fish paste or fish sauce <input type="checkbox"/></p>	<p>a. Any rice, noodles, bread, maize or other staple food made from grains <input type="checkbox"/></p> <p>b. Any pumpkin, yellow sweet potatoes, or carrots <input type="checkbox"/></p> <p>c. Any white potatoes, cassava (manioc), white yams or other white root vegetables <input type="checkbox"/></p> <p>d. Any dark green leafy vegetables <input type="checkbox"/></p> <p>e. Any ripe (orange) mangoes or papayas <input type="checkbox"/></p> <p>f. Any other fruits or vegetables <input type="checkbox"/></p> <p>g. Any liver, kidney, heart, blood, intestine or other organs <input type="checkbox"/></p> <p>h. Any meat such as beef, pork, lamb, goat, rabbit, deer, chicken, duck, other birds, snake, snail, frog, rat, insects or other small animals <input type="checkbox"/></p> <p>i. Any eggs <input type="checkbox"/></p> <p>j. Any fresh or dried fish or shellfish* <input type="checkbox"/></p> <p>k. Any foods made from beans, lentils, peas, or nuts <input type="checkbox"/></p> <p>l. Any food made with oil, fats or coconut milk <input type="checkbox"/></p> <p>m. Any sugar or sugary foods such as sweets, chocolate, candies, cakes, pastries, biscuits, sweet soups such as mung bean or pumpkin soup <input type="checkbox"/></p> <p>n. Any fried snacks such as fried bananas, fried sweet potatoes, shrimp chips <input type="checkbox"/></p> <p>o. Any sugary drinks such as soda, fruit juice or soya drink <input type="checkbox"/></p> <p>p. Any milk – fresh, tinned or powdered, or milk products such as cheese or yoghurt <input type="checkbox"/></p> <p>q. Any fish paste or fish sauce <input type="checkbox"/></p>
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105. How many meals or snacks did (NAME) eat yesterday?	Number of meals <input type="text"/> <input type="text"/> Number of snacks <input type="text"/> <input type="text"/> Don't Know <input type="text"/> <input type="text"/>	Number of meals <input type="text"/> <input type="text"/> Number of snacks <input type="text"/> <input type="text"/> Don't Know <input type="text"/> <input type="text"/>	Number of meals <input type="text"/> <input type="text"/> Number of snacks <input type="text"/> <input type="text"/> Don't Know <input type="text"/> <input type="text"/>
106. How many bowls of food in total did (NAME) have yesterday?	1. ½ bowl 2. ¾ bowl <input type="checkbox"/> 3. Full bowl 4. 1 ½ bowls 5. 2 bowls 6. More than 2 bowls	1. ½ bowl 2. ¾ bowl <input type="checkbox"/> 3. Full bowl 4. 1 ½ bowls 5. 2 bowls 6. More than 2 bowls	1. ½ bowl 2. ¾ bowl <input type="checkbox"/> 3. Full bowl 4. 1 ½ bowls 5. 2 bowls 6. More than 2 bowls
107. Was this a typical day's food intake for (NAME)?	0 = No 1 = Yes → Skip to C <input type="checkbox"/>	0 = No 1 = Y → Skip to C <input type="checkbox"/>	0 = No 1 = Yes → Skip to C <input type="checkbox"/>
108. If it was not typical was it because: Code: 0=No; 1=Yes	a. Child was not hungry, did not have an appetite <input type="checkbox"/> b. Child was sick <input type="checkbox"/> c. There was not enough food to feed (NAME) more <input type="checkbox"/> d. Other - specify _____	a. Child was not hungry, did not have an appetite <input type="checkbox"/> b. Child was sick <input type="checkbox"/> c. There was not enough food to feed (NAME) more <input type="checkbox"/> d. Other - specify _____	a. Child was not hungry, did not have an appetite <input type="checkbox"/> b. Child was sick <input type="checkbox"/> c. There was not enough food to feed (NAME) more <input type="checkbox"/> d. Other - specify _____

**C) FOR ALL CHILDREN UNDER 5 YEARS OF AGE IN THE HOUSEHOLD**

I WOULD LIKE TO SEE THE YELLOW CARDS FOR ALL YOUR CHILDREN UNDER AGE 5 YEARS. If mother does not have yellow cards for children, ask if child has received vaccinations, supplements or mebendazole (ask these separately for each child) and probe for dates.

**COPY VACCINATION DATE FOR EACH VACCINE, SUPPLEMENT AND MEBENDAZOLE FROM THE CARD OR FROM INFORMATION OBTAINED FROM THE MOTHER. SHOW VITAMIN A CAPSULE AND EXPLAIN MEBENDAZOLE (DEWORMING TABLETS) AND RECORD DATES. Indicate in column 2 if information was received from the Yellow Card (1) or the mother (2)**

Vaccination/Supplement	YC /M	Child								
		ID__			ID__			ID__		
		Day	Mo	Yr	Day	Mo	Yr	Day	Mo	Yr
BCG										
Hep 0										
Polio 1										
Polio 2										
Polio 3										
DTC Hep B/Hib 1										
DTC Hep B/Hib 2										
DTC Hep B/Hib 3										
Measles										
Measles										
Vitamin A (most recent)										
Vitamin A (2nd most recent)										
Mebendazole										

**MODULE 4: MOTHER'S NUTRITION AND HEALTH**

109. Are you currently pregnant?	0 = No → Skip to 117 <input type="checkbox"/> 1 = Yes 2 = Unsure → Skip to 117
<b>If currently pregnant ask the following:</b> 110. How many months pregnant are you?	<input type="checkbox"/>
111. Are you taking iron tablets?	0 = No <input type="checkbox"/>

	1 = Yes
112.For how many days have you taken iron tablets?	<input type="text"/> <input type="text"/>
113.Have you taken any deworming tablets since you became pregnant?	0 = No <input type="checkbox"/> 1 = Yes 7 = Don't Know
114.Have you seen anyone for antenatal care since you became pregnant?	0 = No <input type="checkbox"/> 1 = Yes
115.Who did you see for your antenatal visits? Someone else? RECORD ALL THE ANSWERS PROVIDED Code: 0=No; 1=Yes	a. Physician/doctor <input type="checkbox"/> b. Midwife <input type="checkbox"/> c. Nurse <input type="checkbox"/> d. Traditional birth attendant <input type="checkbox"/> e. Village health support group <input type="checkbox"/> f. Other - specify _____ g. Don't know <input type="checkbox"/>
116.How many months pregnant were you when you first received antenatal care?	Months <input type="text"/>
<b>If not currently pregnant ask the following:</b>	0 = No <input type="checkbox"/> → Skip to 119 1 = Yes
117.During your most recent pregnancy were you given or did you buy any iron tablets?	
118.During the whole pregnancy for how many days did you take the tablets?	<input type="text"/> <input type="text"/> 77=Don't Know
119.While you were pregnant with (NAME of last child), did you take any deworming tablets?	0 = No <input type="checkbox"/> 1 = Yes 7 = Don't Know
120.Did you see anyone for antenatal care when you were pregnant with (NAME)?	0 = No <input type="checkbox"/> → Skip to 123 1 = Yes 7=Don't Know → Skip to123
121.Who did you see during your antenatal visits? Someone else? RECORD ALL THE ANSWERS PROVIDED Code: 0=No; 1=Yes	a. Physician/doctor <input type="checkbox"/> b. Midwife <input type="checkbox"/> c. Nurse <input type="checkbox"/> d. Traditional birth attendant <input type="checkbox"/> e. Village health support group <input type="checkbox"/> f. Other - specify _____ g. Don't know <input type="checkbox"/>
122.How many months pregnant with (NAME) were you when	Month <input type="text"/>

you first received antenatal care?	
123. Where did you give birth to your youngest child (NAME)?	<p><u>Home</u></p> <ol style="list-style-type: none"> <li>1. Your home</li> <li>2. TBA/midwife's home</li> <li>3. Other home <input type="checkbox"/></li> </ol> <p><u>Public Medical Sector</u></p> <ol style="list-style-type: none"> <li>4. National hospital</li> <li>5. Provincial hospital</li> <li>6. District hospital</li> <li>7. Health center</li> <li>8. Health post</li> <li>9. Other - specify _____</li> </ol> <p><u>Private Medical Sector</u></p> <ol style="list-style-type: none"> <li>10. Private hospital</li> <li>11. Private clinic</li> <li>12. Other private medical</li> <li>13. Other - specify _____</li> </ol>
124. Who was the birth attendant?	<p><u>Health professional</u></p> <ol style="list-style-type: none"> <li>1. Doctor/medical assistant</li> <li>2. Midwife</li> <li>3. Nurse <input type="checkbox"/></li> </ol> <p><u>Other</u></p> <ol style="list-style-type: none"> <li>4. Traditional birth attendant</li> <li>5. Relative/friend</li> </ol>
125. When your youngest child, (NAME), was born, was he/she very large, larger than average, average, smaller than average, or very small?	<ol style="list-style-type: none"> <li>1. Very large</li> <li>2. Larger than average <input type="checkbox"/></li> <li>3. Average</li> <li>4. Smaller than average</li> <li>5. Very small</li> <li>6. Do not know</li> </ol>
126. Was (NAME) weighed at birth?	<p>0=No <input type="checkbox"/></p> <p>1=Yes</p> <p>7=Don't know</p>
127. How much did he/she weigh? (Record weight in kg from health card if available.)	<input type="text"/> <input type="text"/>

128. While you were pregnant with (NAME), did you have difficulty with your vision during daylight?	0=No <input type="checkbox"/> 1=Yes 7=Don't know
129. While you were pregnant with (NAME), did you have difficulty with your vision during night time?	0=No <input type="checkbox"/> 1=Yes 7=Don't know
130. While you were pregnant with (NAME) or lactating, did you ever have tingly or numb feet?	0=No <input type="checkbox"/> 1=Yes 7=Don't know
131. After your delivery did you receive a Vitamin A dose like this? Show capsule.	0=No <input type="checkbox"/> 1=Yes 7=Don't know
<p>FOOD INTAKE – Mother or caregiver . Now I would like to ask you about drinks or foods that you may have had yesterday during the day or at night and how many times you ate. I want to know if you had the food alone or in combination with other foods.</p> <p>132. Did you eat or drink: Code: 0=No; 1=Yes</p>	<p>a) a. Any rice, noodles, bread, maize or other staple food made from grains <input type="checkbox"/></p> <p>b) Any pumpkin, yellow sweet potatoes, or carrots <input type="checkbox"/></p> <p>c) Any white potatoes, cassava (manioc), white yams or other white root vegetables <input type="checkbox"/></p> <p>d) Any dark green leafy vegetables <input type="checkbox"/></p> <p>e) Any ripe (orange) mangoes or papayas <input type="checkbox"/></p> <p>f) Any other fruits or vegetables <input type="checkbox"/></p> <p>g) Any liver, kidney, heart, blood, intestine or other organs <input type="checkbox"/></p> <p>h) Any meat such as beef, pork, lamb, goat, rabbit, deer, chicken, duck, other birds, snake, snail, frog, rat, insects or other small animals <input type="checkbox"/></p> <p>i) Any eggs <input type="checkbox"/></p> <p>j) Any fresh or dried fish or shellfish* <input type="checkbox"/></p> <p>k) Any foods made from beans, lentils, peas, or nuts <input type="checkbox"/></p> <p>l) Any food made with oil, fats or coconut milk <input type="checkbox"/></p> <p>m) Any sugar or sugary foods such as sweets, chocolate candies, cakes, pastries, biscuits, sweet soups such as mung bean or pumpkin soup <input type="checkbox"/></p> <p>n) Any fried snacks such as fried bananas, fried sweet potatoes, shrimp chips <input type="checkbox"/></p> <p>o) Any sugary drinks such as soda, fruit juice or soya drink <input type="checkbox"/></p>

	<p>p) Any milk – fresh, tinned or powdered, or milk products such as cheese or yoghurt <input type="checkbox"/></p> <p>q) Any fish paste or fish sauce <input type="checkbox"/></p>
133.How many times did you have meals or snacks yesterday?	<p>a) Number of meals <input type="checkbox"/></p> <p>b) Number of snacks <input type="checkbox"/></p>
134.Was this a typical day’s food intake for (NAME )?	<p>0 = No 1 = Yes → Skip to 136</p>
135.If it was not typical was it because: Code: 0=No; 1=Yes	<p>c) I was not hungry, did not have an appetite <input type="checkbox"/></p> <p>d) I was sick <input type="checkbox"/></p> <p>e) There was not enough food <input type="checkbox"/></p> <p>a. Other - specify _____</p>
<b>MODULE 5: Mother's KNOWLEDGE AND ATTITUDES</b>	
136.Do you own or have access to any of the following? Code: 0=No; 1=Yes	<p>a) Television <input type="checkbox"/></p> <p>b) Radio <input type="checkbox"/></p> <p>c) Mobile phone <input type="checkbox"/></p> <p>d) Computer with Internet <input type="checkbox"/></p>
<b>I now want to ask you about advice or information you may have received on feeding or caring for your children</b>	
137.Did you receive advice on breastfeeding during pregnancy?	<p>0 = No → Skip to 139 <input type="checkbox"/></p> <p>1 = Yes</p>
138.If yes, where or from whom did you receive advice on breastfeeding? RECORD ALL SOURCES MENTIONED	<p><u>Health sector</u></p> <p>a. Hospital <input type="checkbox"/></p> <p>b. Health center/health post <input type="checkbox"/></p> <p>c. Outreach/mobile clinic <input type="checkbox"/></p> <p>d. Other - specify _____</p> <p><u>Community</u></p> <p>a. Midwife <input type="checkbox"/></p> <p>b. TBA/traditional healer <input type="checkbox"/></p> <p>c. VHSG <input type="checkbox"/></p> <p>d. Mother support group <input type="checkbox"/></p> <p>e. Drug sellers <input type="checkbox"/></p> <p>f. Friend <input type="checkbox"/></p> <p>g. Relative or neighbor <input type="checkbox"/></p> <p>h. Mother or mother-in-law <input type="checkbox"/></p> <p>i. Other - specify _____</p>
139.Have you ever heard or seen any messages promoting breastfeeding?	<p>0 = No → Skip to 141 <input type="checkbox"/></p> <p>1 = Yes</p>
140.If yes, where did you hear or see any messages promoting breastfeeding? (check all that are applicable and prompt for more e.g. ask Where else?)	<p>a) Radio <input type="checkbox"/></p> <p>b) Television <input type="checkbox"/></p> <p>c) Newspaper <input type="checkbox"/></p>

	d) Banner/poster <input type="checkbox"/> e) Friend/neighbor <input type="checkbox"/> f) Community health worker <input type="checkbox"/> g) Community members (VHV/VDC etc) <input type="checkbox"/> h) Doctor <input type="checkbox"/> i) School <input type="checkbox"/> j) NGO staff <input type="checkbox"/> k) Other - specify _____
141. Can you tell me until what age a baby should receive <i>only</i> breastmilk, that is, no other food, water or teas?	<input type="checkbox"/> <input type="checkbox"/> Months <input type="checkbox"/> <input type="checkbox"/> Years <input type="checkbox"/> <input type="checkbox"/> 77=Don't know
142. Can you tell me at what age a baby should start receiving foods such as porridge, mashed or solid foods?	<input type="checkbox"/> <input type="checkbox"/> Months <input type="checkbox"/> <input type="checkbox"/> Years <input type="checkbox"/> <input type="checkbox"/> 77=Don't know
143. Can you tell me until what age or for how long a child should still be receiving breast milk?	1. Months <input type="checkbox"/> <input type="checkbox"/> 2. years 3. Until the mother's milk dries out 4. Until the child no longer wants the breast 5. Until the mother becomes pregnant again 6. Don't know
144. Did you receive any advice on what to feed your children other than breastmilk?	0 = No → Skip to 146 <input type="checkbox"/> 1 = Yes
145. If yes, where or from whom did you receive advice on what to feed your children other than breastmilk (complimentary feeding)? RECORD ALL SOURCES MENTIONED	<u>Health sector</u> a. Hospital <input type="checkbox"/> b. Health center/health post <input type="checkbox"/> c. Outreach/mobile clinic <input type="checkbox"/> d. Other - specify _____ <u>Community</u> e. Midwife <input type="checkbox"/> f. TBA/traditional healer <input type="checkbox"/> g. VHSG <input type="checkbox"/> h. Mother support group <input type="checkbox"/> i. Drug sellers <input type="checkbox"/> j. Friend <input type="checkbox"/> k. Relative or neighbor <input type="checkbox"/> l. Mother or mother-in-law <input type="checkbox"/> m. Other - specify _____

146. Have you ever heard or seen any messages promoting complementary feeding (food given addition to breastfeeding).	0 = No → Skip to 148 1 = Yes	<input type="checkbox"/>
147. If yes, where did you see or hear messages that promote complimentary feeding? (check all that are applicable and prompt for more e.g. ask Where else?)	a) Radio b) Television c) Newspaper d) Banner/poster e) Friend/neighbor f) Community health worker g) Community members (VHV/VDC etc h) Doctor i) School j) NGO staff k) Other - specify _____	<input type="checkbox"/> <input type="checkbox"/>
148. Have you ever attended a mother support group where they talked about how to feed your children?	0 = No 1 = Yes	<input type="checkbox"/>
149. Can you tell me how many times a day you should feed your child any meals or snacks other than breastmilk:	<u>Meals</u> <u>Snacks</u> a) When they are 6 months old? # times b) 12 months old? # times c) 24 months old? # times	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
150. How many meals should a woman eat every day when she is pregnant?	<input type="checkbox"/>	
151. How many meals should a woman eat every day when she is breastfeeding?	<input type="checkbox"/>	
152. Did you work in a factory, casino, tourism or other business when your last child was under 12 months old, or you were pregnant with this child?	0 = No → Skip to Q 166 1 = Yes	<input type="checkbox"/>
153. Did you receive maternity leave when you were pregnant with this child	0 = No → Skip to Q 155 1 = Yes	<input type="checkbox"/>
154. If yes, did you get PAID maternity leave?	0 = No 1 = Yes	<input type="checkbox"/>
155. Were you offered lighter work during 2 last months of your pregnancy and/or 2 months after birth?	0 = No 1 = Yes	<input type="checkbox"/>
156. Were you allowed to leave work earlier when pregnant?	0 = No 1 = Yes	<input type="checkbox"/>
157. Were you provided with a seat at your workspace when pregnant?	0 = No 1 = Yes	<input type="checkbox"/>

158.If your workplace has more than 100 workers, does your workplace have a day care center?	0 = No skip to 160 1 = Yes	<input type="checkbox"/>
159.If yes, have you been using it?	0 = No 1 = Yes	<input type="checkbox"/>
160.If your workplace has more than 100 workers, does your workplace provide for a nursery?	0 = No skip to 162 1 = Yes	<input type="checkbox"/>
161.If yes, have you been using it?	0 = No 1 = Yes	<input type="checkbox"/>
162.Did you receive time off at work to breast feed your child?	0 = No → Skip to 166 1 = Yes	<input type="checkbox"/>
163.If yes, how much time each day did you receive off to breastfeed your child?	Minutes: <input type="checkbox"/>	
164.Where you offered any other incentives other than time off to breast feed when your child was under 6 months?	0 = No → Skip to 166 1 = Yes	<input type="checkbox"/>
165.If yes what were you offered?	a) Baby formula b) Cash c) Other - specify _____	<input type="checkbox"/>
166.Have you ever heard or seen any messages promoting iron/folic acid tablets for women?	0 = No → Skip to 168 1 = Yes	<input type="checkbox"/>
167.If yes, where did you hear any messages promoting iron/folic acid (prod for answers e.g. where else)?	a) Radio b) Television c) Newspaper d) Banner/poster e) Friend/neighbor f) Community health worker g) Community members (VHV/VDC etc) h) Doctor i) School j) NGO staff k) Other - specify _____	<input type="checkbox"/> <input type="checkbox"/>
168.How many iron/folic acid tablets should a woman take during pregnancy?	<input type="checkbox"/> <input type="checkbox"/>	
169.How many iron/folic acid tablets should a post partum mother take after delivery?	<input type="checkbox"/> <input type="checkbox"/>	
170.Do you know any reasons why a woman should take iron/folic acid tablets when she is pregnant or post partum?	0 = No → Skip to 172 1 = Yes	<input type="checkbox"/>
171.If yes, <i>why</i> should a woman take iron/folic acid (prompt to list as many reasons as possible)?	1. _____ 2. _____ 3. _____ 4. _____	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

172. Do you know of any foods that contain iron?	0 = No      → Skip to 174 1 = Yes	<input type="checkbox"/>
173. If yes, what foods do you know that contain iron (prompt to list as many as possible)?	1. _____ 2. _____ 3. _____ 4. _____	
174. Have you ever heard or seen any messages about vitamin A or vitamin A capsules?	0 = No      → Skip to 176 1 = Yes	<input type="checkbox"/>
175. If yes, where did you hear about vitamin A (prod for answers e.g. Where else)?	a) Radio b) Television c) Newspaper d) Banner/poster e) Friend/neighbor f) Community health worker g) Community members (VHV/VDC etc h) Doctor i) School j) NGO staff k) Other - specify _____	<input type="checkbox"/> <input type="checkbox"/>
176. Do you know who should take vitamin A?	0 = No      → Skip to 178 1 = Yes	<input type="checkbox"/>
177. If yes, identify who should take vitamin A (probe for groups who should take vitamin A).	1. _____ 2. _____ 3. _____	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
178. Do you know any reasons why they should take vitamin A?	0 = No      → Skip to 180 1 = Yes	<input type="checkbox"/>
179. If yes, what are the reasons to take vitamin A (prompt to list as many reasons as possible)?	1. _____ 2. _____ 3. _____ 4. _____	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
180. Can you identify any food sources of vitamin A?	0 = No      → Skip to 182 1 = Yes	<input type="checkbox"/>
181. If yes, what foods do you know that contain vitamin A (prompt to list as many as possible)?	1. _____ 2. _____ 3. _____	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
182. When a child has diarrhea should he/she be given less to	1. Same	<input type="checkbox"/>

drink than usual, about the same or more than usual?	2. More 3. Less 4. Don't know
183. When a child has diarrhea should he/she be given less to eat than usual, about the same, more than usual or nothing to eat?	1. Same 2. More 3. Less 4. Nothing to eat 5. Don't know <input type="checkbox"/>
184. Have you ever heard or seen any messages on how to treat diarrhea?	0 = No → Skip to 186 1 = Yes <input type="checkbox"/>
185. If yes, where did you see or hear about how to treat diarrhea (prod for answers-where else)?	a) Radio <input type="checkbox"/> b) Television <input type="checkbox"/> c) Newspaper <input type="checkbox"/> d) Banner/poster <input type="checkbox"/> e) Friend/neighbor <input type="checkbox"/> f) Community health worker <input type="checkbox"/> g) Community members (VHV/VDC etc) <input type="checkbox"/> h) Doctor <input type="checkbox"/> i) School <input type="checkbox"/> j) NGO staff <input type="checkbox"/> k) Other - specify _____

**MODULE 6: HOUSEHOLD FOOD SECURITY**

186. Does your household have any agricultural land (e.g. commercial crops such as rice, beans, maize)?	0 = No → Skip to Q190 1 = Yes
187. How much agricultural land does your household have (in square meters)	..... Square meter ..... Hechta <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Hecta ..... Rai
188. Which crop did you grow on this plot in the last season?	1. Rice only 2. Other crops (water melon, pumpkin, vegetables, maize, bean, potato, etc.) 3. Rice and other crops <input type="checkbox"/> 4. Perennial trees (specify) _____ 5. None
189. What is the main source of water for the agricultural land at this time?	1. no irrigation 2. pond/river/canal 3. open ringwell 4. closed ringwell <input type="text"/> <input type="text"/> 5. open spring 6. Handpump 7. rain water 8. bought 9. hand dug (no ring) 10. other specify _____

<p>190.If you have a homestead garden, what type of garden do you have?</p>	<p>0. no garden <b>Skip to Question 198</b></p> <p>1. traditional <input type="checkbox"/></p> <p>2. mixed/medium</p> <p>3. year round</p> <p>4. N/A</p>
<p>191.What is the size of your current homestead garden (include the area outside homestead land where vegetables are planted) in square meters?</p>	<p><input type="text"/><input type="text"/> Square meters</p>
<p>192.What is the number of different types of vegetables currently in your garden (include volunteer plants)?</p>	<p><input type="text"/><input type="text"/></p>
<p>193.What is/are your sources(s) of seeds for vegetable production? Code: 0=No; 1=Yes</p>	<p>a. Demonstration farm <input type="checkbox"/></p> <p>b. Own <input type="checkbox"/></p> <p>c. Neighbor <input type="checkbox"/></p> <p>d. Market <input type="checkbox"/></p> <p>e. Farmer groups <input type="checkbox"/></p> <p>f. Rural credit <input type="checkbox"/></p> <p>g. Government field extension work <input type="checkbox"/></p> <p>h. NGO <input type="checkbox"/></p> <p>i. Other – Specify_____</p>
<p>194.What is the number of different varieties of fruit plants in the garden?</p>	<p><input type="text"/><input type="text"/></p>
<p>195.What is/are your sources(s) of seeds/saplings for fruit plants? Code: 0=No; 1=Yes</p>	<p>a. Demonstration farm <input type="checkbox"/></p> <p>b. Own <input type="checkbox"/></p> <p>c. Neighbor <input type="checkbox"/></p> <p>d. Market <input type="checkbox"/></p> <p>e. Farmer groups <input type="checkbox"/></p> <p>f. Rural credit <input type="checkbox"/></p> <p>g. Government field extension work <input type="checkbox"/></p> <p>h. NGO <input type="checkbox"/></p> <p>i. Other – Specify_____</p>

196. What is the main use of fruits or vegetables grown in your garden?	1. Home consumption 2. Sell <input type="checkbox"/> 3. Give to others 4. Other (specify) _____
197. How much of the vegetables/fruits are used for household consumption?	1. Almost all 2. Half <input type="checkbox"/> 3. Very little 4. N/A
198. Does this household own any livestock, herds, farm animals or fish ponds?	0 = No → Skip to Q200 1 = Yes <input type="checkbox"/>
199. If yes, how many of the following animals does this household own?	a. Water buffalo? <input type="checkbox"/> b. Cows or bulls? <input type="checkbox"/> c. Horses? <input type="checkbox"/> d. Goats? <input type="checkbox"/> e. Pigs? <input type="checkbox"/> f. Chickens or ducks? <input type="checkbox"/> g. Fish, in fish ponds? 0. No 1. Yes <input type="checkbox"/>
200. How much rice was consumed in the last 7 days by your household (in cans of raw rice)? (convert later to kg/day)	<input type="checkbox"/>
201. Does your household run out of rice in a normal year?	0 = No → Skip to Q203 1 = Yes <input type="checkbox"/>
202. Between which months does your household run out of rice during a normal year (months)?	Specify _____
203. Has any member of your household received any food or food assistance in the last 12 months?	0 = No → Skip to Q205 1 = Yes <input type="checkbox"/>
204. If yes, from what type of program did you or your family member receive food assistance (check all that apply)? Code: 0=No; 1=Yes	a. TB food assistance (WFP program) <input type="checkbox"/> b. HIV food assistance (WFP or other) <input type="checkbox"/> c. Food for work <input type="checkbox"/> d. School feeding <input type="checkbox"/> e. Take home food rations <input type="checkbox"/> f. Cash to purchase food (cash transfer) <input type="checkbox"/> g. Other specify _____
<b>Household Food Insecurity Access Scale (HFIAS) Measurement Tool</b> For each of the following questions, consider what has happened in the past 30 days. Consider if this happened: never (not even once), rarely (once or twice), sometimes (3-10 times) or often (more than 10 times)?	
205. In the past 30 days, did you worry that your family would not have enough food?	0 = No → Skip to Q206 1 = Yes <input type="checkbox"/>
<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) 2. Sometimes (three to ten times in the past 30 days) <input type="checkbox"/> 3. Often (more than ten times in the past 30 days)

206. In the past 30 days were you or any of your family not able to eat the kinds of foods you would like to eat, <i>such as fish, beef, pork or sweets etc</i> , because you were not able to buy, grow or raise enough of these foods?	0 = No → Skip to Q207 1 = Yes	<input type="checkbox"/>
<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) 2. Sometimes (three to ten times in the past 30 days) 3. Often (more than ten times in the past 30 days)	<input type="checkbox"/>
207. In the past 30 days did you or any of your family have to eat only a few foods, <i>such as only rice with prahok or rice with fish sauce or rice with salt etc</i> , due to not being able to buy or grow enough other foods?	0 = No → Skip to Q208 1 = Yes	<input type="checkbox"/>
<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) 2. Sometimes (three to ten times in the past 30 days) 3. Often (more than ten times in the past 30 days)	<input type="checkbox"/>
208. In the past 30 days did you or any of your family have to eat some foods that you really did not want to eat, <i>such as broken rice, roots (kdourch), banana stalks etc</i> , because you were unable to buy, catch or grow enough other foods?	0 = No → Skip to Q209 1 = Yes	<input type="checkbox"/>
<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) 2. Sometimes (three to ten times in the past 30 days) 3. Often (more than ten times in the past 30 days)	<input type="checkbox"/>
209. In the past 30 days did you or any of your family have to eat less at a meal (e.g. have a smaller breakfast or smaller dinner) than you felt you needed because there was not enough food?	0 = No → Skip to Q210 1 = Yes	<input type="checkbox"/>
<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) 2. Sometimes (three to ten times in the past 30 days) 3. Often (more than ten times in the past 30 days)	<input type="checkbox"/>
210. In the past 30 days did you or any other family member have to eat fewer meals (e.g. eat less than 3 meals) in a day because there was not enough food?	0 = No → Skip to Q211 1 = Yes	<input type="checkbox"/>
<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) 2. Sometimes (three to ten times in the past 30 days) 3. Often (more than ten times in the past 30 days)	<input type="checkbox"/>
211. In the past 30 days was there ever no food to eat of any kind in your house because you had run out of food stores and had no way to get more?	0 = No → Skip to Q212 1 = Yes	<input type="checkbox"/>
<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) 2. Sometimes (three to ten times in the past 30 days) 3. Often (more than ten times in the past 30 days)	<input type="checkbox"/>
212. In the past 30 days did you or any household member go to sleep at night hungry because there was not enough food?	0 = No → Skip to Q213 1 = Yes	<input type="checkbox"/>

<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) 2. Sometimes (three to ten times in the past 30 days) <input type="checkbox"/> 3. Often (more than ten times in the past 30 days)
213. In the past 30 days did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No → Skip to Q214 <input type="checkbox"/> 1 = Yes
<u>How often did this happen?</u>	1. Rarely (once or twice in the past 30 days) <input type="checkbox"/> 2. Sometimes (three to ten times in the past 30 days) <input type="checkbox"/> 3. Often (more than ten times in the past 30 days)
214. Did you or any household member sell household assets (e.g. utensils, furniture, silk sarong) to be able to purchase/obtain food in the past 30 days?	0 = No <input type="checkbox"/> 1 = Yes
215. Did you or any household member sell agricultural or other productive assets (e.g. equipment, tools, seeds, other inputs) to be able to purchase/obtain food in the past 30 days?	0 = No <input type="checkbox"/> 1 = Yes
216. Did you or any household member sell or kill large animals (e.g. oxen, cow, bulls) to be able to purchase/obtain food in the past 30 days?	0 = No <input type="checkbox"/> 1 = Yes
217. Did you or any household member sell land or rent out land to be able to purchase/obtain food in the past 30 days?	0 = No <input type="checkbox"/> 1 = Yes
218. Did your household have to buy food on credit, borrow, or get an advance on next harvest or labour to be able to purchase/obtain food in the past 30 days?	0 = No <input type="checkbox"/> 1 = Yes
219. Did your household have to send children to work/have to let them work at home because there was not enough food in the past 30 days?	0 = No <input type="checkbox"/> 1 = Yes
220. Does your household use iodized salt?	0 = no 1 = yes 7 = don't know <input type="checkbox"/>
221. Ask respondent for a teaspoon of salt. Test salt for iodine and record result.	0 = no, no iodine (< 30ppm) 1 = yes, iodine present (>=30ppm) 2 = not tested/ no salt <input type="checkbox"/>
Thank you very much for participating in this part of the survey! We would now like to measure you and your children's height and weight and check you for anemia (mother/care giver and all children aged 12-59 months)	
<b>ANTHROPOMETRY and HEMOGLOBIN</b>	

Two measurements of height and weight will be taken for each individual and if the difference is > 0.5 cm or .5kg a third measurement should be taken and recorded

### Children

Name Child ID#		Name Child ID#		Name Child ID#					
First	MUAC	Weight	Height	MUAC	Weight	Height	MUAC	Weight	Height
	---'--	--'---	---'	---'--	--'---	---'	---'--	--'---	---'
Second	---'--	--'---	---'	---'--	--'---	---'	---'--	--'---	---'
Third	---'--	--'---	---'	---'--	--'---	---'	---'--	--'---	---'
HB(g/dl)	---'--			---'--			---'--		
Oedema present	Yes No			Yes No			Yes No		

### Mother

Name	_____
Sex	1=Male 2=Female <input type="checkbox"/>
Mother weight	--'---
Mother Height	---'
Mother HB	---'--